Waiver

Exam Guide
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Introduction

Some of you may not have the credentials to waive a course, but still feel that prior coursework or experience gives you the background to waive a core requirement. If this is the case, waiver exams can be another way to avoid what might be a repetitive experience.

During Pre-Term, we will administer waiver exams for the following:

- ACCT611/613 Financial Accounting
- ACCT612 Accelerated Financial Accounting
- FNCE611 Corporate Finance
- FNCE612 Accelerated Corporate Finance
- FNCE613 Macroeconomics and the Global Economic Environment
- MGEC611 Microeconomics for Managers: Foundations
- MGEC612 Microeconomics for Managers: Advanced Applications
- MKTG611 Marketing Management
- OPIM611 Managing the Productive Core of the Firm: Quality and Productivity
- STAT613 Regression Analysis for Business

The dates are listed below, they will also be posted on our website (see “Pre-Term Schedules”), and on the Pre-Term schedule that you will receive in June.

To help you determine if you can realistically pass the exam, we have provided a set of sample waiver or other exams and, in many cases, solution sets. You should review exams for each class that you wish to waive (using the bookmarks to the left can help you speed through the material) and use them to practice. Accounting (ACCT611/612) and Accelerated Corporate Finance (FNCE612) have review classes in Pre-Term that can help you prepare for the exams.

Keep in mind the waiver policies that you must observe:

- All core course waivers either by exam or by credential must be completed by September 5, 2012.

- If you do not meet the requirements for waiver by credential, you may try to waive the same course by taking the waiver exam in all classes except OPIM611. In that course, you can only take the waiver exam if that is recommended.

- You have only one attempt at each waiver exam. If you are unable to waive a core course by credential and cannot take the waiver exam at the scheduled time, you must take the course. There are no make-up waiver exams.

- If your online waiver questionnaire does not indicate that a waiver-by-credential is appropriate, you cannot submit credentials. The waiver exam would be the next step.
If you fail the waiver exam, you cannot then attempt to waive the course by credential. From the perspective of the faculty, you have just proven that your knowledge of the subject is not current.

If you want to waive by credential, you must meet the stated deadlines. If you do not, you may have to enroll in the course or take the waiver exam before you hear about your waiver request.

If you waive the course, but decide you would rather take it, you may enroll, but must do so within a reasonable period after the start of the class.

If you enroll in a course, you have only two class sessions to reconsider and use the waiver. After two class sessions, you are committed to the class and must complete it.

You can register for the exams online using the Waiver Questionnaire in the Pre-Term Registration form. After your arrival, the online registration form will be available through the MBA Program website for changes.

While waiving a course allows you to fit in more electives, don’t spend all your time studying for waiver exams at the expense of enjoying the Pre-Term experience. This is a two-year program that provides ample opportunity to take elective courses and complete one or more majors. If you can pass the exam fairly easily, take the exam. If you cannot, then take the class and use the study time to make new friends, settle into the Program, and take advantage of all the opportunities offered during Pre-Term.

<table>
<thead>
<tr>
<th>Course ID</th>
<th>Course Title</th>
<th>Pre-Term Offering</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCT611/612</td>
<td>Financial Accounting (Waiver and Placement Exams)</td>
<td>Mon 27-Aug 11 a.m-1 p.m./1-3 p.m.</td>
</tr>
<tr>
<td>FNCE611/612</td>
<td>Corporate Finance</td>
<td>Tue 21-Aug 5-8 p.m. †</td>
</tr>
<tr>
<td>FNCE613</td>
<td>Macroeconomics and the Global Economic Environment</td>
<td>Mon 20-Aug 7:30-9:30 p.m.</td>
</tr>
<tr>
<td>MGEC611</td>
<td>Microeconomics for Managers: Foundations</td>
<td>Wed 22-Aug 4:30-6 p.m.</td>
</tr>
<tr>
<td>MGEC612</td>
<td>Microeconomics for Managers: Advanced Applications</td>
<td>Wed 22-Aug 6-7 p.m.</td>
</tr>
<tr>
<td>MKTG611</td>
<td>Marketing Management</td>
<td>Sat 25-Aug 1-3 p.m.</td>
</tr>
<tr>
<td>OPIM611</td>
<td>Managing the Productive Core of the Firm: Quality and Productivity</td>
<td>Sat 25-Aug 10 a.m.-noon</td>
</tr>
<tr>
<td>STAT613</td>
<td>Regression Analysis for Managers</td>
<td>Mon 20-Aug 5-7 p.m.</td>
</tr>
</tbody>
</table>

† Students who score sufficiently well on the FNCE611 waiver exam are granted waivers for FNCE611, FNCE612, and FNCE614. Students who score sufficiently well on FNCE613 waiver exam will be granted waivers for both FNCE613 and FNCE615.
Financial Accounting (ACCT611)
(formerly ACCT620/621)

SAMPLE EXAM 1

NOTE: This exam reflects coursework for the first 3-4 weeks of Financial Accounting and is a good example of the knowledge needed to place into ACCT612).

NAME
(Print)

PENN ID NUMBER
(10 middle digits)

Please Circle the name of your instructor and the time of your class
Instructor: Baiman Carter Guay
Class time: 9:00 a.m. 10:30 a.m. 1:30 p.m.

Instructions

1. This is a 132 point exam. Budget your time to achieve maximum points.

2. Answer the problems only in the space indicated. Answers placed elsewhere will not be graded. Present your work in an orderly fashion to facilitate the awarding of partial credit. Partial credit can only be given for answers that are presented in a manner which is clear, logical, and easily read.

3. There are 18 numbered pages in this booklet. Make sure that you have all of the pages.

4. The exam is closed book. You are only allowed one 8.5 x 11 inch paper for notes.

5. Please print your name in the space provided on the first page and on all subsequent pages if you take the exam apart.

6. Hand in the entire exam when you are done.

<table>
<thead>
<tr>
<th>Question</th>
<th>Points Assigned</th>
<th>Points Scored</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 1</td>
<td>78</td>
<td></td>
</tr>
<tr>
<td>Question 2</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>132</td>
<td></td>
</tr>
</tbody>
</table>
QUESTION I (78 pts)

Baiman-Carter Incorporated (BCI) released preliminary financial statements (balance sheet, income statement, and statement of cash flows) in a press release. Subsequent to the release, the company announced that it would have to restate those financial statements because of transactions that the bookkeeper had neglected to record or had recorded incorrectly. Wayne Guay, principal of Guay Capital, has asked you to indicate the effects these errors. In particular, for each transaction, record the transaction to correct the error or omission and indicate the effect on all line items in the Indirect Statement of Cash Flows and the section in which these changes would appear (i.e. operating, investing or financing). Treat each transaction as independent. Wayne did the first transaction as an example.

Example: Services of $5,000 were provided during the period at an expense (all cash) of $1,000, but BCI has not yet been paid for the services. The bookkeeper didn’t record these.

<table>
<thead>
<tr>
<th>Event/Transactions</th>
<th>Statement of Cash Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Accounts Receivable 5,000 Cr. Revenue 5,000</td>
<td>Net Income +4,000 - Accts Rec. -5,000</td>
</tr>
<tr>
<td>Dr. Operating Expense 1,000 Cr. Cash 1,000</td>
<td>CFO -1,000</td>
</tr>
<tr>
<td></td>
<td>CFI 0</td>
</tr>
<tr>
<td></td>
<td>CFF 0</td>
</tr>
</tbody>
</table>

1. (6 pts) The company paid cash for next year’s insurance coverage ($2,000) on the last day of the accounting period. The bookkeeper never recorded this.

<table>
<thead>
<tr>
<th>Event/Transactions</th>
<th>Statement of Cash Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NI</td>
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<tr>
<td></td>
<td>CFO</td>
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<td></td>
<td>CFI</td>
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<td>CFF</td>
</tr>
</tbody>
</table>
2. **(6 pts)** During the year, $3,000 of prepaid advertisements ran in the local newspaper. The bookkeeper recorded the original payment correctly but no other transactions related to this.

<table>
<thead>
<tr>
<th>Event/Transactions</th>
<th>Statement of Cash Flows</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>NI</td>
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<td>CFO</td>
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<td>CFF</td>
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</tbody>
</table>

3. **(6 pts)** The bookkeeper recorded $1,000 of amortization expense during the year. However, that amount should have been $5,000 not $1,000.

<table>
<thead>
<tr>
<th>Event/Transactions</th>
<th>Statement of Cash Flows</th>
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</thead>
<tbody>
<tr>
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<td>NI</td>
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<td>CFO</td>
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<td>CFI</td>
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</tbody>
</table>
4. *(6 pts)* Dividends of $5,000 were declared and paid on the last day of the year. The bookkeeper never recorded this.

<table>
<thead>
<tr>
<th>Event/Transactions</th>
<th>Statement of Cash Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NI</td>
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</tbody>
</table>

5. *(6 pts)* The company has debt outstanding, with interest expense of $4,000 per year. The interest was incurred this year but will be paid next year. The bookkeeper never recorded this.

<table>
<thead>
<tr>
<th>Event/Transactions</th>
<th>Statement of Cash Flows</th>
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<tbody>
<tr>
<td></td>
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</tbody>
</table>
6. (6 pts) The company purchased, for cash, $10,000 worth of PP&E on the last day of the year. The bookkeeper mistakenly recorded it as $1,000.

<table>
<thead>
<tr>
<th>Event/Transactions</th>
<th>Statement of Cash Flows</th>
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<tbody>
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<td>NI</td>
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</table>

7. (6 pts) A new customer placed an order for $3,000 of widgets whose historical cost on BCI’s books was $2,000. The customer has not yet paid for the order. This order was not shipped at year end. However, the bookkeeper recorded it as a sale transaction during the year.

<table>
<thead>
<tr>
<th>Event/Transactions</th>
<th>Statement of Cash Flows</th>
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<tbody>
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</tbody>
</table>
8. (6 pts) Because of an unexpected windfall of cash, the company repaid $8,000 of long-term debt on the last day of the year. The bookkeeper never recorded this event.

<table>
<thead>
<tr>
<th>Event/Transactions</th>
<th>Statement of Cash Flows</th>
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<tbody>
<tr>
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</tbody>
</table>

9. (6 pts) The company has a multistage project with a customer that is accounted for using the percentage-of-completion method. In the prior year, the customer paid a $9,000 deposit (total revenues for the project are $9,000). During the year, the company delivered 1/3 of the project to the customer incurring costs of $1,000 in cash (total costs for the project are $3,000). The bookkeeper recorded only the receipt of the deposit and not any other transactions related to this project.

<table>
<thead>
<tr>
<th>Event/Transactions</th>
<th>Statement of Cash Flows</th>
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<tbody>
<tr>
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<td>NI</td>
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<td>CFO</td>
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<td>CFI</td>
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</tbody>
</table>
10. (6 pts) The company issued shares for $5,000 cash. The bookkeeper mistakenly recorded this transaction as a $50,000 increase in owners’ equity.

<table>
<thead>
<tr>
<th>Event/Transactions</th>
<th>Statement of Cash Flows</th>
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<tbody>
<tr>
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</table>

11. (6 pts) The company incurred $7,000 of administrative expenses, of which $3,000 were paid by year end. The bookkeeper never recorded these transactions.

<table>
<thead>
<tr>
<th>Event/Transactions</th>
<th>Statement of Cash Flows</th>
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<tbody>
<tr>
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</tbody>
</table>
12. (6 pts) A customer paid a deposit of $8,000 for an order to be delivered next year. The company acquired $2,000 of inventory on account to begin producing widgets. The bookkeeper never recorded these transactions.

<table>
<thead>
<tr>
<th>Event/Transactions</th>
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<tbody>
<tr>
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</tbody>
</table>

13. (6 pts) The bookkeeper salary earned for the last month of the year was $10,000. The company will pay the bookkeeper this $10,000 in the next period.

<table>
<thead>
<tr>
<th>Event/Transactions</th>
<th>Statement of Cash Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NI</td>
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<td>CFO</td>
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</tbody>
</table>
QUESTION II (54 pts)

Callaway Golf Company designs, manufactures and sells high quality golf clubs and golf balls. The Company also sells golf accessories such as footwear, golf bags, golf gloves, golf headwear, golf towels and golf umbrellas. The Company’s products are sold in the United States and in over 100 countries around the world. Refer to the Income Statement, Balance Sheet and Statement of Cash Flows for Callaway which are located on the last three pages of this exam booklet. Please answer the following questions.

Required

1. (4 pts) In which year (among those reported) did Callaway raise the most cash from financing activities?

2. (4 pts) If Callaway had not paid any dividends in 2003, 2004 and 2005, how much more cash from financing activities would have been raised over this three-year period?

3. (4 pts) What was the net book value of long-lived assets sold during 2005?

4. (4 pts) If Callaway had not sold any long-lived assets in 2005, how much would cash from investing activities have changed?

   Answer __________________________________________________________

   (circle one) HIGHER   LOWER   NO CHANGE

5. (4 pts) If Callaway had not sold any long-lived assets in 2005, how much would cash from operating activities have changed?

   Answer __________________________________________________________

   (circle one) HIGHER   LOWER   NO CHANGE

6. (6 pts) Callaway recognizes warranty expenses as a component of Selling Expenses on the income statement. Assume that Callaway’s total costs (cash, replacement equipment, etc) in 2005 to satisfy customers who returned broken golf equipment under warranty was $15,000 thousands (i.e., $15 million). How much warranty expense was included in Selling Expenses by Callaway in their income statement during 2005?
7. **(4 pts)** Provide the entries that reconcile the Retained Earnings T-account between December 31, 2004 and December 31, 2005. Include descriptive titles and amounts for each entry. All dividends declared have been paid by the end of 2005.

<table>
<thead>
<tr>
<th>Retained Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning Balance $437,269</td>
</tr>
<tr>
<td>Ending Balance $430,996</td>
</tr>
</tbody>
</table>

8. **(4 pts)** In 2005, Callaway recognized and paid $26,989 in research and development expenses. All of the research was done internally by Callaway. Which section of the Statement of Cash Flows is affected by these expenditures?

9. **(5 pts)** Assume that all of Callaway’s 2005 revenues were cash sales. How much cash did Callaway collect from its customers in 2005?

10. **(5 pts)** Now ignore Part 9 above and instead assume that 50% of Callaway’s 2005 revenues were cash sales, and the other 50% on account. How much cash would Callaway have collected from its customers in 2005?

11. **(4 pts)** Provide the journal entry to record Callaway’s capital expenditures made in cash in 2005. Assume there were no capital expenditures through acquisitions. Include the account titles and amounts. Make as many entries as necessary.

   Debit ___________________________________________________________________
   Credit ___________________________________________________________________

   Debit ___________________________________________________________________
   Credit ___________________________________________________________________

12. **(6 pts)** Assume that all of Callaway’s inventory costs are paid in cash except for raw materials that are bought on account from suppliers (also assume that Accounts Payable reflect only raw material purchases). How much cash did Callaway spend on inventory costs in 2005?
CALLAWAY GOLF COMPANY
CONSOLIDATED BALANCE SHEETS
(In thousands, except share and per share data)

<table>
<thead>
<tr>
<th>ASSETS</th>
<th>DECEMBER 31, 2005</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current assets:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash and cash equivalents</td>
<td>$49,481</td>
<td>$31,657</td>
</tr>
<tr>
<td>Accounts receivable, net</td>
<td>98,082</td>
<td>100,378</td>
</tr>
<tr>
<td>Inventories, net</td>
<td>241,577</td>
<td>175,982</td>
</tr>
<tr>
<td>Deferred taxes</td>
<td>38,192</td>
<td>32,969</td>
</tr>
<tr>
<td>Income taxes receivable</td>
<td>2,026</td>
<td>28,697</td>
</tr>
<tr>
<td>Other current assets</td>
<td>9,232</td>
<td>14,036</td>
</tr>
<tr>
<td><strong>Total current assets</strong></td>
<td>438,590</td>
<td>393,732</td>
</tr>
<tr>
<td>Property, plant and equipment, net</td>
<td>127,739</td>
<td>135,865</td>
</tr>
<tr>
<td>Intangible assets, net</td>
<td>146,123</td>
<td>159,191</td>
</tr>
<tr>
<td>Goodwill</td>
<td>29,068</td>
<td>30,468</td>
</tr>
<tr>
<td>Deferred taxes</td>
<td>6,516</td>
<td>9,837</td>
</tr>
<tr>
<td>Other assets</td>
<td>16,462</td>
<td>16,667</td>
</tr>
<tr>
<td><strong>Total assets</strong></td>
<td>$764,498</td>
<td>$735,737</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LIABILITIES AND SHAREHOLDERS’ EQUITY</th>
<th>DECEMBER 31, 2005</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current liabilities:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accounts payable</td>
<td>$102,134</td>
<td>$69,394</td>
</tr>
<tr>
<td>Accrued employee compensation and benefits</td>
<td>24,783</td>
<td>26,322</td>
</tr>
<tr>
<td>Warranty liability</td>
<td>13,267</td>
<td>12,043</td>
</tr>
<tr>
<td>Bank line of credit</td>
<td>—</td>
<td>13,000</td>
</tr>
<tr>
<td>Capital leases, current portion</td>
<td>21</td>
<td>39</td>
</tr>
<tr>
<td><strong>Total current liabilities</strong></td>
<td>140,205</td>
<td>120,798</td>
</tr>
<tr>
<td><strong>Long-term liabilities:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deferred compensation</td>
<td>8,323</td>
<td>8,674</td>
</tr>
<tr>
<td>Energy derivative valuation account</td>
<td>19,922</td>
<td>19,922</td>
</tr>
<tr>
<td>Capital leases, net of current portion</td>
<td>—</td>
<td>26</td>
</tr>
<tr>
<td><strong>Commitments and contingencies (Note 13)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Shareholders’ equity:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preferred Stock, $.01 par value, 3,000,000 shares authorized, none issued and outstanding at December 31, 2005 and 2004</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Common Stock, $.01 par value, 240,000,000 shares authorized, 84,950,694 shares and 84,785,694 shares issued at December 31, 2005 and 2004, respectively</td>
<td>850</td>
<td>848</td>
</tr>
<tr>
<td>Additional paid-in capital</td>
<td>393,676</td>
<td>387,950</td>
</tr>
<tr>
<td>Unearned compensation</td>
<td>(9,014)</td>
<td>(12,562)</td>
</tr>
<tr>
<td>Retained earnings</td>
<td>430,996</td>
<td>437,269</td>
</tr>
<tr>
<td>Accumulated other comprehensive income</td>
<td>3,377</td>
<td>11,081</td>
</tr>
<tr>
<td><strong>Less: Grantor Stock Trust held at market value, 5,954,747 shares and 7,176,678 shares at December 31, 2005 and 2004, respectively</strong></td>
<td>(82,414)</td>
<td>(96,885)</td>
</tr>
<tr>
<td><strong>Less: Common Stock held in treasury, at cost, 8,500,811 shares and 8,497,667 shares at December 31, 2005 and 2004, respectively</strong></td>
<td>(141,423)</td>
<td>(141,384)</td>
</tr>
<tr>
<td><strong>Total shareholders’ equity</strong></td>
<td>596,048</td>
<td>586,317</td>
</tr>
<tr>
<td><strong>Total assets</strong></td>
<td>$764,498</td>
<td>$735,737</td>
</tr>
</tbody>
</table>
CALLAWAY GOLF COMPANY
CONSOLIDATED STATEMENTS OF OPERATIONS
(In thousands, except per share data)

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2004</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net sales</td>
<td>$998,093</td>
<td>$934,564</td>
<td>$814,032</td>
</tr>
<tr>
<td>Cost of sales</td>
<td>583,679</td>
<td>575,422</td>
<td>445,417</td>
</tr>
<tr>
<td>Gross profit</td>
<td>414,414</td>
<td>358,822</td>
<td>368,615</td>
</tr>
<tr>
<td>Selling expenses</td>
<td>290,074</td>
<td>263,089</td>
<td>207,783</td>
</tr>
<tr>
<td>General and administrative expenses</td>
<td>80,145</td>
<td>89,878</td>
<td>65,448</td>
</tr>
<tr>
<td>Research and development expenses</td>
<td>26,989</td>
<td>30,557</td>
<td>29,529</td>
</tr>
<tr>
<td>Total operating expenses</td>
<td>397,208</td>
<td>383,524</td>
<td>302,760</td>
</tr>
<tr>
<td>Income (loss) from operations</td>
<td>17,206</td>
<td>1,934</td>
<td>3,550</td>
</tr>
<tr>
<td>Interest and other income (expense), net</td>
<td>(390)</td>
<td>1,934</td>
<td>(3,550)</td>
</tr>
<tr>
<td>Total operating expenses</td>
<td>397,208</td>
<td>383,524</td>
<td>302,760</td>
</tr>
<tr>
<td>Income (loss) before income taxes</td>
<td>14,537</td>
<td>(23,713)</td>
<td>67,883</td>
</tr>
<tr>
<td>Provision for (benefit from) income taxes</td>
<td>1,253</td>
<td>(13,610)</td>
<td>22,360</td>
</tr>
<tr>
<td>Net income (loss)</td>
<td>$13,284</td>
<td>$(10,103)</td>
<td>$45,523</td>
</tr>
</tbody>
</table>

Earnings (loss) per common share:

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2004</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic</td>
<td>$0.19</td>
<td>$(0.15)</td>
<td>$0.69</td>
</tr>
<tr>
<td>Diluted</td>
<td>$0.19</td>
<td>$(0.15)</td>
<td>$0.68</td>
</tr>
</tbody>
</table>

Common equivalent shares:

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2004</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic</td>
<td>68,646</td>
<td>67,721</td>
<td>66,027</td>
</tr>
<tr>
<td>Diluted</td>
<td>69,239</td>
<td>67,721</td>
<td>66,471</td>
</tr>
</tbody>
</table>
### CALLAWAY GOLF COMPANY
### CONSOLIDATED STATEMENTS OF CASH FLOWS

**(In thousands)**

<table>
<thead>
<tr>
<th>YEAR ENDED DECEMBER 31,</th>
<th>2005</th>
<th>2004</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CASH FLOWS FROM OPERATING ACTIVITIES:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net income (loss)</td>
<td>$13,284</td>
<td>$(10,103)</td>
<td>$45,523</td>
</tr>
<tr>
<td>Adjustments to reconcile net income (loss) to net cash provided by operating activities:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depreciation and amortization</td>
<td>38,260</td>
<td>51,154</td>
<td>44,496</td>
</tr>
<tr>
<td>Loss on disposal of long-lived assets</td>
<td>4,031</td>
<td>7,669</td>
<td>24,163</td>
</tr>
<tr>
<td>Tax benefit (reversal of benefit) from exercise of stock options</td>
<td>2,408</td>
<td>2,161</td>
<td>(982)</td>
</tr>
<tr>
<td>Noncash compensation</td>
<td>6,527</td>
<td>1,741</td>
<td>15</td>
</tr>
<tr>
<td>Net noncash foreign currency hedging loss</td>
<td>—</td>
<td>1,811</td>
<td>2,619</td>
</tr>
<tr>
<td>Net loss from sale of marketable securities</td>
<td>—</td>
<td>—</td>
<td>98</td>
</tr>
<tr>
<td>Deferred taxes</td>
<td>(3,906)</td>
<td>7,707</td>
<td>(8,320)</td>
</tr>
<tr>
<td>Changes in assets and liabilities, net of effects from acquisitions:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accounts receivable</td>
<td>2,296</td>
<td>(1,048)</td>
<td>12,698</td>
</tr>
<tr>
<td>Inventories</td>
<td>(65,595)</td>
<td>10,299</td>
<td>4,897</td>
</tr>
<tr>
<td>Other assets</td>
<td>7,583</td>
<td>1,554</td>
<td>(4,743)</td>
</tr>
<tr>
<td>Accounts payable</td>
<td>32,740</td>
<td>(16,945)</td>
<td>(2,561)</td>
</tr>
<tr>
<td>Accrued employee compensation and benefits</td>
<td>5,121</td>
<td>(6,895)</td>
<td>(3,898)</td>
</tr>
<tr>
<td>Warranty liability</td>
<td>1,224</td>
<td>(584)</td>
<td>(838)</td>
</tr>
<tr>
<td>Income taxes receivable and payable</td>
<td>26,676</td>
<td>(40,711)</td>
<td>4,004</td>
</tr>
<tr>
<td>Deferred compensation</td>
<td>(351)</td>
<td>(273)</td>
<td>1,572</td>
</tr>
<tr>
<td>Net cash provided by operating activities</td>
<td>70,298</td>
<td>8,537</td>
<td>118,743</td>
</tr>
<tr>
<td><strong>CASH FLOWS FROM INVESTING ACTIVITIES:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital expenditures on PP&amp;E</td>
<td>(34,259)</td>
<td>(25,986)</td>
<td>(7,810)</td>
</tr>
<tr>
<td>Proceeds from sale of long-lived assets</td>
<td>1,363</td>
<td>431</td>
<td>178</td>
</tr>
<tr>
<td>Acquisitions, net of cash acquired</td>
<td>—</td>
<td>(9,204)</td>
<td>(160,321)</td>
</tr>
<tr>
<td>Proceeds from sale of marketable securities</td>
<td>—</td>
<td>—</td>
<td>24</td>
</tr>
<tr>
<td>Net cash used in investing activities</td>
<td>(32,896)</td>
<td>(34,759)</td>
<td>(167,929)</td>
</tr>
<tr>
<td><strong>CASH FLOWS FROM FINANCING ACTIVITIES:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Issuance of Common Stock</td>
<td>14,812</td>
<td>20,311</td>
<td>17,994</td>
</tr>
<tr>
<td>Acquisition of Treasury Stock</td>
<td>(39)</td>
<td>(6,298)</td>
<td>(4,755)</td>
</tr>
<tr>
<td>Proceeds from (payments on) Line of Credit, net</td>
<td>(13,000)</td>
<td>13,000</td>
<td>—</td>
</tr>
<tr>
<td>Dividends paid</td>
<td>(19,557)</td>
<td>(19,069)</td>
<td>(18,536)</td>
</tr>
<tr>
<td>Other financing activities</td>
<td>(44)</td>
<td>—</td>
<td>(8,117)</td>
</tr>
<tr>
<td>Net cash (used in) provided by financing activities</td>
<td>(17,828)</td>
<td>7,944</td>
<td>(13,414)</td>
</tr>
<tr>
<td>Effect of exchange rate changes on cash and cash equivalents</td>
<td>(1,750)</td>
<td>2,595</td>
<td>1,488</td>
</tr>
<tr>
<td>Net increase (decrease) in cash and cash equivalents</td>
<td>17,624</td>
<td>(15,683)</td>
<td>(61,112)</td>
</tr>
<tr>
<td>Cash and cash equivalents at beginning of year</td>
<td>31,657</td>
<td>47,340</td>
<td>108,452</td>
</tr>
<tr>
<td>Cash and cash equivalents at end of year</td>
<td>$49,481</td>
<td>$31,657</td>
<td>$47,340</td>
</tr>
</tbody>
</table>

**Supplemental disclosures (See Note 3 for acquisition-related disclosures):**

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2004</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash paid for interest and fees</td>
<td>$(2,096)</td>
<td>$(1,384)</td>
<td>$(835)</td>
</tr>
<tr>
<td>Cash paid for income taxes</td>
<td>$(24,837)</td>
<td>$(17,379)</td>
<td>$(30,925)</td>
</tr>
</tbody>
</table>
Financial Accounting (ACCT611)
(formerly ACCT620/621)
SAMPLE EXAM 2

NOTE: This exam and the final exam that follows are good examples of exams needed to waive ACCT611.

NAME
(Print) Last First Nickname

PENN ID NUMBER
(8 middle digits)

Please Circle the name of your instructor and the time of your class

Instructor: Baiman Carter Guay
Class time: 9:00 a.m. 10:30 a.m. 1:30 p.m.

Instructions

1. Please PRINT your name and Penn ID number on THIS PAGE AND THE NEXT PAGE. USE THE FIRST NAME UNDER WHICH YOU ARE REGISTERED. SEPARATELY LIST YOUR NICKNAME IF YOU USE ONE. Please circle your instructor’s name and your class time.

   Please PRINT your name and Penn ID number on the first page of the financial statement packet.

2. This is an 82 point exam. Budget your time to achieve maximum points.

3. This exam consists of a question packet and a separate financial statement packet. The question packet consists of 17 pages. The financial statement packet consists of 10 pages. Make sure you have all of the pages in each packet.

4. Answer the problems only in the space indicated. Answers placed elsewhere will not be graded. Present your work in an orderly fashion to facilitate the awarding of partial credit. Partial credit can only be given for answers that are presented in a manner which is clear, logical, and easily read.

5. The exam is closed book. You are only allowed one 8.5 x 11 inch paper for notes.

6. Hand in both the question packet and the financial statement packet when you are done.

<table>
<thead>
<tr>
<th>Question</th>
<th>Points Assigned</th>
<th>Points Scored</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 1</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Question 2</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Question 3</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Question 4</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>82</td>
<td></td>
</tr>
</tbody>
</table>
Questions 1 – 3 are based on the financial statement of Carter’s Inc. for the period ending Jan. 1, 2005 (referred to as fiscal 2004). Carter’s Inc. is the largest branded marketer of apparel for babies and young children in the department store, national chain, outlet, specialty store, and off-price sales channels, with 8.2% of the market in 2004, up from 7.1% in 2003.

QUESTION I: ACCOUNTS RECEIVABLES AND INVENTORIES

(18 pts assigned) (_____ pts scored)

Assume that Carter’s treats Bad Debt Expense as a contra-revenue account, i.e., it is deducted from Sales Revenue to determine Net Sales.

1. (3 pts) What was the amount of Bad Debt Expense which Carter’s recognized in fiscal 2004?

2. (3 pts) By how much would Carter’s Inc. net income before taxes have been increased or decreased if they had used the Direct Write-Off method rather than the Allowance method to account for its bad debt? Indicate the amount and whether it would have been an increase or decrease.

   $_______________________________________________________________

   (circle one) INCREASED DECREASED

3. (4 pts) What was the net effect of business acquisitions, business divestitures and foreign currency translation adjustments on Accounts Receivables for fiscal 2004? Indicate the amount and whether the net effect resulted in an increase, decrease or no change in Accounts Receivables. To receive credit you must show the work behind your answer.

   $_______________________________________________________________

   (circle one) INCREASE DECREASE NO CHANGE
4. (5 pts) How much in cash did Carter’s Inc. collect from its customers in fiscal 2004?

5. (3 pts) By how much did Carter’s Inc. reduce fiscal 2004’s net income before tax as a result of applying Lower of Cost or Market to its inventory?

QUESTION II: LONG-LIVED ASSETS  (20 pts assigned) (_____ pts scored)

Assume:

1. The depreciation and amortization add-back on the Statement of Cash Flows includes depreciation on Property, Plant and Equipment as well as amortization on other assets.
2. The Loss (gain) on disposal of assets on the Statement of Cash Flows includes the loss (gain) on the sale of property, plant and equipment as well as the loss (gain) on the sale of other assets.
3. All depreciation on property, plant and equipment is expensed.
4. All property, plant and equipment acquired during fiscal 2004 was acquired for cash and all property, plant and equipment sold during fiscal 2004 was sold for cash.
5. Long-lived assets were not affected in fiscal 2004 by any business acquisitions, business divestitures or foreign currency translation adjustments.

1. (3 pts) How much depreciation expense on property, plant and equipment did Carter’s Inc. recognize in fiscal 2004?

2. (3 pts) What was the amount of property, plant and equipment which Carter’s Inc. purchased during fiscal 2004?

3. (4 pts) What was the net book value of the property, plant and equipment which Carter’s Inc. sold (disposed of) during fiscal 2004.
4. (4 pts) What was the gain or loss which Carter’s Inc. recognized on its sale of property, plant and equipment in fiscal 2004?

\[ \] ____________________________

(circle one) GAIN LOSS NO GAIN OR LOSS

5. (3 pts) Refer to the long-lived asset, Trade name. Does Carter’s Inc. treat this asset as one that has a definite life (and is therefore amortizable) or as one that has an indefinite life (and therefore not amortizable)? **You must present your reasoning in order to receive any points.**

6. (3 pts) In the fiscal year ending December 28, 2002, Carter’s Inc. recorded a Write-down of long-lived assets. If that write-down had not been taken, how much greater or less would Carter’s Inc. fiscal 2002 Cash from Operating Activities have been?

\[ \] ____________________________

(circle one) GREATER LESS NO EFFECT
QUESTION III: LONG-TERM DEBT  

Assume:

1. The beginning and ending balances in Current maturities of long-term debt consist entirely of debt that was issued at par.
2. All the debt in the fiscal 2004 beginning balance of Current maturities of long-term debt was retired in fiscal 2004.
3. All long-term debt issued in fiscal 2004 was issued for cash.
4. All long-term debt retired during fiscal 2004 was retired with cash.

1. (3 pts) What was the amount of long-term debt discount amortized by Carter’s Inc. during fiscal 2004?

2. (2 pts) What was the amount of long-term debt issued by Carter’s Inc. in fiscal 2004?

3a. (3 pts) What was the net book value of long-term debt retired at maturity by Carter’s Inc. in fiscal 2004?

3b. (3 pts) What was the gain or loss on the long-term debt which Carter’s Inc. retired at maturity in fiscal 2004?

$ ________________________________

(circle one) GAIN LOSS NO GAIN OR LOSS

4a. (5 pts) What was the cash paid by Carter’s Inc. in fiscal 2004 to retire long-term debt prior to maturity?
4b. (4 pts) What was the net book value of long-term debt retired prior to maturity by Carter’s Inc. in fiscal 2004?

5. (3 pts) Consider Carter’s Inc. senior subordinated debt. As of the end of fiscal 2004 is the yield to maturity (i.e., the market rate of interest) higher, lower, or the same as it was on the date the senior subordinated debt was issued (i.e., the historical yield to maturity)?

$______________________________

(circle one) HIGHER LOWER THE SAME

QUESTION IV: INVENTORY (21 pts assigned) (_____ pts scored)

Question IV refers to the 2005 financial statements of AK Steel. Assume a 35% tax rate.

1. (4 pts) How much greater or less would AK Steel’s 2005 cost of goods sold have been if it had always used FIFO for all of its inventory?

$______________________________

(circle one) GREATER LESS

2. (5 pts) What was the dollar effect of input price inflation or deflation on AK Steel’s LIFO Reserve during 2005?

3. (4 pts) The following statement is made in AK Steel’s Management Discussion and Analysis:

“As a result of the progressively increasing cost of raw materials, the Company recorded LIFO charges in both 2005 and 2004, although those charges decreased to $60.1 from $200.7, year over year.”

What was AK Steel’s LIFO Reserve as of the end of 2003?
4. (8 pts) Assume that AK Steel had always used FIFO rather than LIFO for both financial reporting and tax reporting purposes. This would have affected its Statement of Cash Flows in each year. Below are several line items from AK Steel’s 2005 Operating Activities section of its Statement of Cash Flows. Indicate the effect on the line items in the Cash flows from operating activities that would be different (both the amount of the difference and the sign) if AK Steel had always used FIFO rather than LIFO for financial and tax reporting purposes. **Note that we are just asking for the one-period effect on AK Steel’s 2005 Operating Activities section of its Statement of Cash Flows of AK Steel using FIFO vs. LIFO.** Assume that any additional taxes (to be paid or refunded) in 2005 arising from the use of FIFO rather than LIFO have not yet been paid or received. Assume a 35% tax rate.

<table>
<thead>
<tr>
<th>Name of “Cash flows from operating activities” line item</th>
<th>Amount and direction of effect (use +/- to indicate increase/decrease)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Income</td>
<td></td>
</tr>
<tr>
<td>Adjustments to reconcile net income (loss) to cash flows</td>
<td></td>
</tr>
<tr>
<td>Changes in Inventory</td>
<td></td>
</tr>
<tr>
<td>Changes in Other Assets</td>
<td></td>
</tr>
<tr>
<td>Changes in Other liabilities</td>
<td></td>
</tr>
<tr>
<td>Net cash flows from operating activities of continuing operations</td>
<td></td>
</tr>
</tbody>
</table>
# Carter's, Inc. and The William Carter Company
## Consolidated Balance Sheets

*(dollars in thousands, except for share data)*

<table>
<thead>
<tr>
<th></th>
<th>January 1, 2005</th>
<th>January 3, 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ASSETS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current assets:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash and cash equivalents</td>
<td>$ 33,265</td>
<td>$ 36,061</td>
</tr>
<tr>
<td>Accounts receivable, net of reserve for doubtful accounts of $2,878 in fiscal 2004 and $2,363 in fiscal 2003</td>
<td>80,440</td>
<td>65,318</td>
</tr>
<tr>
<td>Inventories, net</td>
<td>120,792</td>
<td>104,760</td>
</tr>
<tr>
<td>Prepaid expenses and other current assets</td>
<td>4,499</td>
<td>6,625</td>
</tr>
<tr>
<td>Deferred income taxes</td>
<td>12,571</td>
<td>9,045</td>
</tr>
<tr>
<td>Total current assets</td>
<td>251,567</td>
<td>221,809</td>
</tr>
<tr>
<td>Property, plant, and equipment, net</td>
<td>53,187</td>
<td>50,502</td>
</tr>
<tr>
<td>Tradename</td>
<td>220,233</td>
<td>220,233</td>
</tr>
<tr>
<td>Cost in excess of fair value of net assets acquired</td>
<td>139,282</td>
<td>139,282</td>
</tr>
<tr>
<td>Other assets</td>
<td>2,829</td>
<td>3,485</td>
</tr>
<tr>
<td>Total assets</td>
<td><strong>$ 672,965</strong></td>
<td><strong>$ 646,102</strong></td>
</tr>
</tbody>
</table>

| **LIABILITIES AND STOCKHOLDERS’ EQUITY** |                 |                 |
| Current liabilities:               |                 |                 |
| Current maturities of long-term debt | $ 724           | $ 3,336         |
| Accounts payable                   | 26,453          | 30,436          |
| Other current liabilities          | 40,696          | 37,405          |
| Total current liabilities          | **67,873**      | **71,177**      |
| Long-term debt                     | 183,778         | 209,377         |
| Deferred income taxes              | 83,579          | 83,196          |
| Other long-term liabilities        | 9,802           | 9,816           |
| Total liabilities                  | **345,032**     | **373,566**     |
| Commitments and contingencies      |                 |                 |
| Stockholders’ equity:              |                 |                 |
| Carter’s, Inc., preferred stock; par value $.01 per share; 100,000 shares authorized; none issued or outstanding at January 1, 2005 and January 3, 2004 | — | — |
| Carter’s, Inc., common stock, voting; par value $.01 per share; 40,000,000 shares authorized; 28,432,452 shares issued and outstanding at January 1, 2005; 27,985,360 shares issued and outstanding at January 3, 2004 (TWCC’s common stock, voting; par value $.01 per share; 200,000 shares authorized, 1,000 shares issued and outstanding at January 1, 2005 and January 3, 2004) | 284 | 280 |
| Additional paid-in capital         | 247,610         | 241,780         |
| Deferred compensation              | (95)            | —               |
| Retained earnings                  | 80,134          | 91,476          |
| Total stockholders’ equity         | **327,933**     | **272,536**     |
| Total liabilities and stockholders’ equity | **$ 672,965** | **$ 646,102** |

The accompanying notes are an integral part of these financial statements.
### CARTER’S, INC.
### AND THE WILLIAM CARTER COMPANY
### CONSOLIDATED STATEMENTS OF OPERATIONS
(dollars in thousands, except per share data)

<table>
<thead>
<tr>
<th></th>
<th>FOR THE FISCAL YEARS ENDED</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>January 1, 2005</td>
<td>January 3, 2004</td>
<td>December 28, 2002</td>
<td></td>
</tr>
<tr>
<td>Net sales</td>
<td>$ 823,121</td>
<td>$ 703,826</td>
<td>$ 579,547</td>
<td></td>
</tr>
<tr>
<td>Cost of goods sold</td>
<td>525,082</td>
<td>448,540</td>
<td>352,151</td>
<td></td>
</tr>
<tr>
<td>Gross profit</td>
<td>298,039</td>
<td>255,286</td>
<td>227,396</td>
<td></td>
</tr>
<tr>
<td>Selling, general, and administrative expenses</td>
<td>208,756</td>
<td>188,028</td>
<td>174,110</td>
<td></td>
</tr>
<tr>
<td>Write-down of long-lived assets</td>
<td>—</td>
<td>—</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Closure costs</td>
<td>620</td>
<td>1,041</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Deferred charge write-off</td>
<td>—</td>
<td>—</td>
<td>923</td>
<td></td>
</tr>
<tr>
<td>Management fee termination</td>
<td>—</td>
<td>2,602</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Royalty income</td>
<td>(12,362)</td>
<td>(11,025)</td>
<td>(8,352)</td>
<td></td>
</tr>
<tr>
<td>Operating income</td>
<td>101,025</td>
<td>74,640</td>
<td>60,565</td>
<td></td>
</tr>
<tr>
<td>Income before income taxes</td>
<td>82,508</td>
<td>38,926</td>
<td>32,264</td>
<td></td>
</tr>
<tr>
<td>Provision for income taxes</td>
<td>32,850</td>
<td>15,648</td>
<td>13,011</td>
<td></td>
</tr>
<tr>
<td>Net income</td>
<td>$ 49,658</td>
<td>$ 23,278</td>
<td>$ 19,253</td>
<td></td>
</tr>
</tbody>
</table>

**CARTER’S, INC.**

|                        |          |          |          |
| Basic net income per common share | $ 1.77  | $ 0.99   | $ 0.86   |
| Diluted net income per common share | $ 1.66  | $ 0.92   | $ 0.82   |
| Basic weighted average number of shares outstanding | 28,125,584 | 23,611,372 | 22,453,088 |
| Diluted weighted average number of shares outstanding | 29,927,957 | 25,187,492 | 23,544,900 |

The accompanying notes are an integral part of these financial statements.
CARTER’S, INC.
AND THE WILLIAM CARTER COMPANY
CONSOLIDATED STATEMENTS OF CASH FLOWS
(dollars in thousands)

<table>
<thead>
<tr>
<th>FOR THE FISCAL YEARS ENDED</th>
<th>January 1, 2005</th>
<th>January 3, 2004</th>
<th>December 28, 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CASH FLOWS FROM OPERATING ACTIVITIES:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net income</td>
<td>$ 49,658</td>
<td>$ 23,278</td>
<td>$ 19,253</td>
</tr>
<tr>
<td>Loss on extinguishment of debt</td>
<td>xxxxxxxxxx</td>
<td>xxxxxxxxxx</td>
<td>xxxxxxx</td>
</tr>
<tr>
<td>Adjustments to reconcile net income to net cash provided by operating activities:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depreciation and amortization</td>
<td>19,536</td>
<td>22,216</td>
<td>18,693</td>
</tr>
<tr>
<td>Amortization of long-term debt discount</td>
<td>75</td>
<td>126</td>
<td>130</td>
</tr>
<tr>
<td>Non-cash stock compensation expense</td>
<td>xxxxxxxxxx</td>
<td>xxxxxxxxxx</td>
<td>xxxxxxx</td>
</tr>
<tr>
<td>Non-cash closure costs</td>
<td>—</td>
<td>184</td>
<td>—</td>
</tr>
<tr>
<td>Write-down of long-lived assets</td>
<td>—</td>
<td>—</td>
<td>150</td>
</tr>
<tr>
<td>Loss (gain) on disposal of assets</td>
<td>164</td>
<td>61</td>
<td>(9)</td>
</tr>
<tr>
<td>Tax benefit from exercise of stock options</td>
<td>xxxxxxxxxx</td>
<td>xxxxxxxxxx</td>
<td>xxxxxxx</td>
</tr>
<tr>
<td>Deferred tax (benefit) provision</td>
<td>(3,143)</td>
<td>299</td>
<td>(1,264)</td>
</tr>
<tr>
<td>Effect of changes in operating assets and liabilities:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase in accounts receivable</td>
<td>(15,122)</td>
<td>(11,718)</td>
<td>(18,132)</td>
</tr>
<tr>
<td>(Increase) decrease in inventories</td>
<td>(16,032)</td>
<td>940</td>
<td>(16,631)</td>
</tr>
<tr>
<td>Decrease (increase) in prepaid expenses and other assets</td>
<td>2,132</td>
<td>(2,258)</td>
<td>2,055</td>
</tr>
<tr>
<td>(Decrease) increase in accounts payable and other liabilities</td>
<td>(575)</td>
<td>(4,339)</td>
<td>20,660</td>
</tr>
<tr>
<td>Net cash provided by operating activities</td>
<td>42,676</td>
<td>40,506</td>
<td>27,304</td>
</tr>
<tr>
<td><strong>CASH FLOWS FROM INVESTING ACTIVITIES:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purchase of Property, plant and equipment</td>
<td>(20,481)</td>
<td>(17,347)</td>
<td>(18,009)</td>
</tr>
<tr>
<td>Proceeds from sale of property, plant, and equipment</td>
<td>1,304</td>
<td>275</td>
<td>955</td>
</tr>
<tr>
<td>Collections on loan</td>
<td>600</td>
<td>600</td>
<td>1,500</td>
</tr>
<tr>
<td>Net cash used in investing activities</td>
<td>(18,577)</td>
<td>(16,472)</td>
<td>(15,554)</td>
</tr>
<tr>
<td><strong>CASH FLOWS FROM FINANCING ACTIVITIES:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Payments of term loan</td>
<td>(28,286)</td>
<td>(24,138)</td>
<td>(1,250)</td>
</tr>
<tr>
<td>Redemption of 10.875% Senior Subordinated Notes</td>
<td>—</td>
<td>(61,250)</td>
<td>—</td>
</tr>
<tr>
<td>Payment of debt redemption premium</td>
<td>—</td>
<td>(6,661)</td>
<td>—</td>
</tr>
<tr>
<td>Payment of dividend</td>
<td>—</td>
<td>(24,893)</td>
<td>—</td>
</tr>
<tr>
<td>Payments of debt issuance costs</td>
<td>—</td>
<td>(799)</td>
<td>—</td>
</tr>
<tr>
<td>Proceeds from stock option exercises</td>
<td>1,555</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Proceeds from sale of common stock</td>
<td>—</td>
<td>600</td>
<td>1,000</td>
</tr>
<tr>
<td>Net cash used in financing activities</td>
<td>(26,885)</td>
<td>(23,535)</td>
<td>(880)</td>
</tr>
<tr>
<td>Net (decrease) increase in cash and cash equivalents</td>
<td>(2,796)</td>
<td>499</td>
<td>10,870</td>
</tr>
<tr>
<td>Cash and cash equivalents at beginning of period</td>
<td>36,061</td>
<td>35,562</td>
<td>24,692</td>
</tr>
<tr>
<td>Cash and cash equivalents at end of period</td>
<td>$ 33,265</td>
<td>$ 36,061</td>
<td>$ 35,562</td>
</tr>
</tbody>
</table>

The accompanying notes are an integral part of these financial statements.
NOTE 2: Summary of Significant Accounting Policies

Fiscal Year


Property, Plant, and Equipment

Property, plant, and equipment are stated at cost, less accumulated depreciation. When fixed assets are sold or otherwise disposed, the accounts are relieved of the original costs of the assets, and the related accumulated depreciation and any resulting profit or loss is credited or charged to income. For financial reporting purposes, depreciation and amortization are computed on the straight-line method over the estimated useful lives of the assets as follows: buildings—15 to 26 years and machinery and equipment—3 to 10 years. We capitalize the cost of our fixtures designed and purchased for use at major wholesale and mass channel accounts. The cost of these fixtures is amortized over a three-year period.

Cost in Excess of Fair Value of Net Assets Acquired and Other Intangible Assets

Cost in excess of fair value of net assets acquired (“goodwill”) represents the excess of the cost of the Acquisition over the fair value of the net assets acquired.

In connection with the Acquisition, we adopted the provisions of Statements of Financial Accounting Standards (“SFAS”) No. 141, “Business Combinations” (“SFAS 141”), and applied the required provisions of SFAS No. 142, “Goodwill and other Intangible Assets” (“SFAS 142”). Accordingly, our tradename and goodwill are deemed to have indefinite lives and are not being amortized. Our licensing agreements, however, recognized in the allocation of the Acquisition purchase price, were amortized over the average three-year life of such agreements, as it was determined that these agreements have finite lives. Amortization expense on our licensing agreements was $3.1 million for fiscal 2004 and $5.0 million in fiscal 2003 and fiscal 2002. The licensing agreements were fully amortized as of August 15, 2004.

We adopted the remaining provisions of SFAS 142 as of the beginning of fiscal 2002. In accordance with this statement, we identified our reporting units, and have completed the required assessments for impairment of goodwill (by comparing the fair values of our reporting units to their respective carrying values, including allocated goodwill) and our tradename and found that there was no impairment of either asset, either at the initial adoption date or at the most recent assessment performed as of January 1, 2005.

We measure our goodwill and tradename for impairment on at least an annual basis or if events or changes in circumstances so dictate.
NOTE 4: Property, Plant, and Equipment
Property, plant, and equipment consisted of the following:
(dollars in thousands)

<table>
<thead>
<tr>
<th></th>
<th>January 1, 2005</th>
<th>January 3, 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land, buildings, and improvements</td>
<td>$ 27,333</td>
<td>$ 26,326</td>
</tr>
<tr>
<td>Machinery and equipment</td>
<td>53,863</td>
<td>41,766</td>
</tr>
<tr>
<td>Marketing fixtures</td>
<td>11,301</td>
<td>14,686</td>
</tr>
<tr>
<td>Construction in progress</td>
<td>2,064</td>
<td>676</td>
</tr>
<tr>
<td>Accumulated depreciation and amortization</td>
<td>(41,374)</td>
<td>(32,952)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$ 53,187</strong></td>
<td><strong>$ 50,502</strong></td>
</tr>
</tbody>
</table>

Depreciation expense on property, plant and equipment was $16,411,000 for the fiscal year ended January 1, 2005, $172,16,000 for the fiscal year ended January 3, 2004, and $13,693,000 for the fiscal year ended December 28, 2002.

NOTE 5: Long-term Debt
Long-term debt consisted of the following:
(dollars in thousands)

<table>
<thead>
<tr>
<th></th>
<th>January 1, 2005</th>
<th>January 3, 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior credit facility term loan</td>
<td>$ 71,326</td>
<td>$ 99,612</td>
</tr>
<tr>
<td></td>
<td>184,502</td>
<td>212,713</td>
</tr>
<tr>
<td>Current maturities</td>
<td>(724)</td>
<td>(3,336)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$ 183,778</strong></td>
<td><strong>$ 209,377</strong></td>
</tr>
</tbody>
</table>

The fair value of our senior subordinated notes was approximately $13.7 million greater than the book value as of January 1, 2005 and $176 million greater than the book value as of January 3, 2004. The fair values were estimated based on similar issues or on current rates offered to us for debt of the same remaining maturity.

NOTE 12: Valuation and Qualifying Accounts
Information regarding accounts receivable and inventory reserves is as follows:
(dollars in thousands)

<table>
<thead>
<tr>
<th></th>
<th>Accounts receivable reserves</th>
<th>Inventory reserves</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Balance, December 29, 2001</strong></td>
<td><strong>$ 1,673</strong></td>
<td><strong>$ 1,681</strong></td>
</tr>
<tr>
<td>Additions, charged to expense</td>
<td>2,578</td>
<td>1,177</td>
</tr>
<tr>
<td>Write-offs</td>
<td>(2,371)</td>
<td></td>
</tr>
<tr>
<td><strong>Balance, December 28, 2002</strong></td>
<td>1,880</td>
<td>2,858</td>
</tr>
<tr>
<td>Additions, charged to expense</td>
<td>2,161</td>
<td>6,682</td>
</tr>
<tr>
<td>Write-offs</td>
<td>(1,678)</td>
<td>(4,508)</td>
</tr>
<tr>
<td><strong>Balance, January 3, 2004</strong></td>
<td>2,363</td>
<td>5,032</td>
</tr>
<tr>
<td>Additions, charged to expense</td>
<td>3,520</td>
<td>11,119</td>
</tr>
<tr>
<td>Write-offs</td>
<td>(3,005)</td>
<td>(6,267)</td>
</tr>
<tr>
<td><strong>Balance, January 1, 2005</strong></td>
<td><strong>$ 2,878</strong></td>
<td><strong>$ 9,884</strong></td>
</tr>
</tbody>
</table>
AK STEEL HOLDING CORPORATION
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
(dollars in thousands, except per share data)

Inventories

Inventories are valued at the lower of cost or market. The cost of the majority of inventories is measured on the last in, first out (“LIFO”) method. Other inventories are measured principally at FIFO and consist mostly of foreign inventories and certain raw materials.

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finished and semifinished</td>
<td>776.3</td>
<td>738.7</td>
</tr>
<tr>
<td>Raw materials and supplies</td>
<td>344.4</td>
<td>229.4</td>
</tr>
<tr>
<td>Adjustment to state inventories at LIFO value</td>
<td>(351.7)</td>
<td>(291.6)</td>
</tr>
<tr>
<td>Total</td>
<td>769.0</td>
<td>676.5</td>
</tr>
</tbody>
</table>

During 2005, 2004 and 2003, liquidation of LIFO layers increased net income before taxes of $9.0, 25.1 and $11.1, respectively.
Please Circle the name of your instructor and the time of your class

Instructor: Baiman Carter Guay
Class time: 9:00 a.m. 10:30 a.m. 1:30 p.m.

Instructions

1. Please PRINT your Penn ID number on this page and every page of the exam. Please circle your instructor’s name and your class time.

2. This is a 99 point exam. Budget your time to achieve maximum points.

3. This exam consists of a question packet and a separate financial statement packet. The question packet consists of 19 pages. The financial statement packet consists of 13 pages. Make sure you have all of the pages in each packet.

4. Answer the problems only in the space indicated. Answers placed elsewhere will not be graded. Present your work in an orderly fashion to facilitate the awarding of partial credit. Partial credit can only be given for answers that are presented in a manner which is clear, logical, and easily read.

5. The exam is closed book. You are only allowed one 8.5 x 11 inch paper for notes.

6. Hand in only the question packet when you are done.

<table>
<thead>
<tr>
<th>Question</th>
<th>Points Assigned</th>
<th>Points Scored</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 1</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Question 2</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Question 3</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Question 4</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>99</td>
<td></td>
</tr>
</tbody>
</table>
Questions 1, 2 and 3 are based on the financial statement of Health Net Inc.

Health Net, Inc. is an integrated managed care organization that delivers managed health care services. We are among the nation’s largest publicly traded managed health care companies. Our health plans and government contracts subsidiaries provide health benefits through our health maintenance organizations (HMOs), insured preferred provider organizations (PPOs) and point of service (POS) plans to approximately 6.3 million individuals in 27 states and the District of Columbia through group, individual, Medicare, Medicaid and TRICARE programs.

**QUESTION I: TAXES**  
*(35 pts assigned) (_____ pts scored)*

1. *(3 pts)* What was the journal entry to record income tax expense in 2005? You may record a “net” Deferred Tax Asset or Liability – you do not need to distinguish between the two.

<table>
<thead>
<tr>
<th>Account</th>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
</table>

2. *(4 pts)* What was the company’s income before tax in 2005? Note that the Income Statement has not been provided.

3. *(3 pts)* The company has a valuation allowance for deferred tax assets. What would be the impact on 2006 income **after taxes** if the company reduced the valuation allowance to $16.5 million in 2006?

   $_______________________________________________________________

   *(circle one)*  
   INCREASE   DECREASE   NO CHANGE

4. *(3 pts)* Assume the balance in income taxes payable at January 1, 2005 was $20.3 million. What was the balance in income taxes payable at December 31, 2005?
All the parts of Question 5 pertain to the tax exempt interest income the company earned in 2005.

5a. (2 pts) Indicate whether the tax exempt interest income resulted in an INCREASE, DECREASE or NO CHANGE to the statutory tax rate during 2005:

(circle one) INCREASE DECREASE NO CHANGE

5b. (2 pts) Indicate whether the tax exempt interest income resulted in an INCREASE, DECREASE or NO CHANGE to the effective tax rate during 2005:

(circle one) INCREASE DECREASE NO CHANGE

5c. (2 pts) Indicate whether the tax exempt interest income resulted in an INCREASE, DECREASE or NO CHANGE to the deferred tax expense during 2005:

(circle one) INCREASE DECREASE NO CHANGE

5d. (2 pts) Indicate whether the tax exempt interest income resulted in an INCREASE, DECREASE or NO CHANGE to Net Deferred Tax Assets at December 31, 2005:

(circle one) INCREASE DECREASE NO CHANGE

All the parts of Question 6 pertain only to the Unearned (or Deferred) Revenue the company recorded in 2005.

6a. (3 pts) The company recorded greater revenue for tax purposes than for financial reporting purposes in 2005. Indicate TRUE or FALSE.

(circle one) TRUE FALSE

6b. (3 pts) The company has cumulatively recorded greater revenue for tax purposes than for financial reporting purposes as of Dec. 31, 2005. Indicate TRUE or FALSE.

(circle one) TRUE FALSE
6c. (4 pts) For this question only, assume that deferred taxes are recorded at 29%.

How much was the difference between the revenues recognized in 2005 for financial reporting purposes and for tax reporting purposes?

a. 27.7  

b. 58.3  

c. 2  

d. 6.9  

e. 3.3  

f. 16.9

7. (4 pts) Note that Health Net has net Deferred Tax Assets (Deferred Tax Assets are greater than Deferred Tax Liabilities). Suppose Congress announced a tax rate increase commencing in 2006. What effect would this increase in expected future tax rates have on the following for the end of 2005. Indicate whether it would result in an: INCREASE, DECREASE, or NO EFFECT

Net Deferred Tax Asset _______________________________________________________

Income Taxes Payable _______________________________________________________

Income Tax Expense _______________________________________________________

**QUESTION II: INTERCORPORATE INVESTMENTS** (20 pts assigned) (_____ pts scored)

Assume:

1. All of Health Net’s intercorporate investments are classified as Available for Sale
2. There were no business acquisitions, business divestitures, foreign currency translation adjustments or impairments which affected Health Net’s intercorporate investments during 2005
3. All purchases of intercorporate investments were for cash and all sales were for cash.

1. (4 pts) What was the journal entry to record Health Net’s overall adjustment to its cumulative unrealized holding gains and losses in 2005 arising either from increases or decreases in the market prices of investments or from the sales of investments for 2005? There is no need to distinguish between a Deferred Tax Asset and Deferred Tax Liability.

<table>
<thead>
<tr>
<th>Account</th>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
</table>
2. (4 pts) What was the historical cost of the Available for Sale securities which Health Net sold or matured in 2005?

3. (3 pts) What was the realized holding or loss that Health Net recognized in 2005 on the sale of Available for Sale securities? Indicate the amount and whether it was a realized holding gain or loss.

$________________________________________________________________________

(circle one) REALIZED HOLDING GAIN REALIZED HOLDING LOSS

4. (3 pts) How much greater or smaller would Health Net’s 2005 income before tax have been if it had always accounted for its Available for Sale securities as Trading Securities? Indicate the amount and whether income before tax would have been greater or smaller.

$________________________________________________________________________

(circle one) GREATER SMALLER NO DIFFERENT

5. (3 pts) For this question, ignore information from all other parts of this exam.

What tax rate is Health Net using in 2005 to account for the Deferred Taxes arising from the unrealized holding gain and loss of its Available for Sale securities?

6. (3 pts) Assume that Health Net had sold all of its Available for Sale securities on Dec. 31, 2005. How much greater or less would its net income after tax have been? Assume a 40% tax rate. Indicate the amount and whether net income after tax would have been greater or smaller.

________________________________________________________________________

(circle one) GREATER SMALLER NO DIFFERENT
**QUESTION III: SHAREHOLDERS’ EQUITY  (15 pts assigned) (_____ pts scored)**

Please refer to the 2005 financial statements and footnote disclosures of Health Net Inc.

1. (3 pts) How many common shares does Health Net have outstanding at Fiscal year-end 2005?

2. Refer to the Treasury Stock that Health Net held at Fiscal year-end 2005. Assume that all of these shares had been repurchased at the same stock price.
   a. (3 pts) What is the average price per share that Health Net paid for its treasury shares held as of Fiscal year-end 2005?
   b. (3 pts) Provide the journal entry that Health Net would have recorded if it had decided to reissue all of the treasury shares held at Fiscal year-end 2005 for $750 million.

<table>
<thead>
<tr>
<th>Account</th>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Consider the following information disclosed by Health Net:

   **Earnings Per Share**

   Diluted earnings per share is based upon the weighted average shares of common stock and dilutive common stock equivalents (this reflects the potential dilution that could occur if stock options were exercised and restricted stocks were vested) outstanding during the periods presented.

   For the year ended December 31, 2004, common stock equivalents arising from dilutive stock options and restricted common stock amounted to 6,179 shares (thousands).

   Health Net’s 2004 Basic EPS = $0.38

   Weighted average number of shares used in Health Net’s 2004 Diluted EPS = 118,038 shares (thousands)

   a. (3 pts) What is Health Net’s 2004 Net Income?
b. (3 pts) For this question only, assume Health Net’s 2004 net income is $50 million. Also, assume Health Net had paid $10 million in preferred dividends in 2004 (in reality, they paid no preferred dividends in 2004). Compute diluted earnings per share in 2004 under this assumption.

QUESTION IV: LEASES (29 pts assigned) (_____ pts scored)

Please refer to the 2005 financial statements and footnote disclosures of Safeway Inc.

Safeway Inc. is one of the largest food and drug retailers in North America, with 1,775 stores at year-end 2005. The Company’s U.S. retail operations are located principally on the West Coast. The Company’s Canadian retail operations are located principally in British Columbia.

Assume that there were no business acquisitions, business divestitures, foreign currency translation adjustments or impairments associated with Safeway’s leases during 2005. Further assume that all required payments on all leases are made on the last day of the fiscal year.

1. (2 pts) Safeway is considering a new noncancelable lease. The asset to be leased is worth $65,000 and has a useful life of 7 years. The lease would require the firm to pay $11,000 per year for 5 years. There would be no bargain purchase option or transfer of ownership at the end of the lease. Would Safeway categorize this lease as capital or operating?

(circle one) CAPITAL OPERATING

2. (3 pts) Record the journal entry that Safeway expects to make in 2006 related to obligations under capital leases. Assume that no leases are prematurely canceled in 2006 and no new leases are entered into in 2006. You are not required to record the journal entry for the capital leased assets (i.e., you are only required to record the entry for the capital lease liabilities).

<table>
<thead>
<tr>
<th>Account</th>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. (3 pts) Estimate the average interest rate that Safeway is using to determine the net book value of its
capital lease liabilities as of fiscal year-end 2005?

4. (2 pts) Relative to having no leases, what will be the total effect of Safeway’s operating and capital leases on Cash Flow from Operations in 2006? Assume no leases are prematurely canceled in 2006 and no new leases are entered into in 2006.

(circle one) NO EFFECT GREATER SMALLER

by $ ________________________________

5. (2 pts) Relative to having no leases, what will be the total effect of Safeway’s operating and capital leases on Cash Flow from Investing Activities in 2006? Assume no leases are prematurely canceled in 2006 and no new leases are entered into in 2006.

(circle one) NO EFFECT GREATER SMALLER

by $ ________________________________

6. (2 pts) Relative to having no leases, what will be the total effect of Safeway’s operating and capital leases on Cash Flow from Financing Activities in 2006? Assume no leases are prematurely canceled in 2006 and no new leases are entered into in 2006.

(circle one) NO EFFECT GREATER SMALLER

by $ ________________________________

7. (5 pts) Safeway did cancel capital leases early in 2005. What was the net book value of the assets under capital leases that were cancelled in 2005?
8. (7 pts) Assume Safeway were to capitalize its operating leases on January 1, 2006. Further assume that the present value of the operating lease cash flows — using a discount rate of 10% — is $3,589 (millions) and that any resulting assets are amortized straight-line with no salvage value over 10 years.

a. Give the all journal entries for the fiscal year 2006 related to these leases.

<table>
<thead>
<tr>
<th>Account</th>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b. (3 pts) How would Safeway’s 2006 Cash Flow from Operations be different as a result of capitalizing its operating leases. You need to provide only the direction of the difference — not the dollar value. Assume no leases are prematurely canceled in 2006 and no new leases are entered into in 2006.

(circle one) NO CHANGE GREATER SMALLER
HEALTH NET, INC.
CONSOLIDATED BALANCE SHEETS
(Amounts in thousands)

<table>
<thead>
<tr>
<th></th>
<th>DECEMBER 31,</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2005</td>
<td>2004</td>
</tr>
<tr>
<td><strong>ASSETS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Assets:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash and cash equivalents</td>
<td>$ 742,485</td>
<td>$ 722,102</td>
</tr>
<tr>
<td>Investments-available for sale</td>
<td>1,363,800</td>
<td>1,060,000</td>
</tr>
<tr>
<td>Premiums receivable, net of allowance for doubtful accounts (2005–$7,204, 2004–$9,016)</td>
<td>132,019</td>
<td>118,521</td>
</tr>
<tr>
<td>Amounts receivable under government contracts</td>
<td>122,796</td>
<td>129,483</td>
</tr>
<tr>
<td>Other assets</td>
<td>111,512</td>
<td>97,163</td>
</tr>
<tr>
<td>Total current assets</td>
<td>2,911,618</td>
<td>2,492,314</td>
</tr>
<tr>
<td>Property and equipment, net</td>
<td>125,773</td>
<td>184,643</td>
</tr>
<tr>
<td>Goodwill, net</td>
<td>723,595</td>
<td>723,595</td>
</tr>
<tr>
<td>Other noncurrent assets</td>
<td>130,267</td>
<td>207,050</td>
</tr>
<tr>
<td>Total Assets</td>
<td>$ 3,940,722</td>
<td>$ 3,653,194</td>
</tr>
<tr>
<td><strong>LIABILITIES AND STOCKHOLDERS EQUITY</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Liabilities:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reserves for claims and other settlements</td>
<td>$ 1,040,171</td>
<td>$ 1,169,297</td>
</tr>
<tr>
<td>Health care and other costs payable under government contracts</td>
<td>62,536</td>
<td>119,219</td>
</tr>
<tr>
<td>IBNR health care costs payable under TRICARE North contract</td>
<td>265,517</td>
<td>173,951</td>
</tr>
<tr>
<td>Unearned premiums</td>
<td>106,586</td>
<td>139,766</td>
</tr>
<tr>
<td>Accounts payable and other liabilities</td>
<td>364,266</td>
<td>258,923</td>
</tr>
<tr>
<td>Total current liabilities</td>
<td>1,839,076</td>
<td>1,961,156</td>
</tr>
<tr>
<td>Senior notes payable</td>
<td>387,954</td>
<td>397,760</td>
</tr>
<tr>
<td>Other noncurrent liabilities</td>
<td>124,617</td>
<td>121,398</td>
</tr>
<tr>
<td>Total Liabilities</td>
<td>2,351,647</td>
<td>2,380,314</td>
</tr>
<tr>
<td>Commitments and contingencies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stockholders Equity:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preferred stock ($0.001 par value, 10,000 shares authorized, none issued and outstanding)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Common stock ($0.001 par value, 350,000 shares authorized; issued 2005-137898 shares; 2004-134,450 shares)</td>
<td>137</td>
<td>134</td>
</tr>
<tr>
<td>Restricted common stock</td>
<td>6,883</td>
<td>7,188</td>
</tr>
<tr>
<td>Unearned compensation</td>
<td>(2,137)</td>
<td>(4,110)</td>
</tr>
<tr>
<td>Additional paid-in capital</td>
<td>906,789</td>
<td>811,292</td>
</tr>
<tr>
<td>Retained earnings</td>
<td>1,324,165</td>
<td>1,094,380</td>
</tr>
<tr>
<td>Accumulated other comprehensive loss</td>
<td>(13,387)</td>
<td>(3,078)</td>
</tr>
<tr>
<td>Total Stockholders Equity</td>
<td>1,589,075</td>
<td>1,272,880</td>
</tr>
<tr>
<td>Total Liabilities and Stockholders Equity</td>
<td>$ 3,940,722</td>
<td>$ 3,653,194</td>
</tr>
</tbody>
</table>

See accompanying notes to consolidated financial statements.
## HEALTH NET, INC.

### CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY

(Amounts in thousands)

<table>
<thead>
<tr>
<th></th>
<th>Common Stock Shares</th>
<th>Common Stock Amount</th>
<th>Restricted Common Stock</th>
<th>Unearned Compensation</th>
<th>Additional Paid-In Capital</th>
<th>Common Stock Held in Treasury Shares</th>
<th>Common Stock Held in Treasury Amount</th>
<th>Retained Earnings</th>
<th>Accumulated Other Comprehensive Income (Loss) Income</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance as of December 31, 2004</td>
<td>134,450</td>
<td>134</td>
<td>7,188</td>
<td>(6,110)</td>
<td>811,292</td>
<td>(23,173)</td>
<td>(632,920)</td>
<td>1,094,380</td>
<td>(3,078)</td>
<td>1,272,880</td>
</tr>
<tr>
<td>Comprehensive income:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in unrealized holding gain or loss on investments, net of tax benefit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total comprehensive income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise of stock options including related tax benefit</td>
<td>3,411</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repurchases of common stock</td>
<td>30</td>
<td>869</td>
<td>(869)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Issuance of restricted stock</td>
<td>(13)</td>
<td>(345)</td>
<td>345</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forfeiture of restricted stock</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amortization of restricted stock grants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lapse of restrictions of restricted stock grants</td>
<td>20</td>
<td>(829)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employees stock purchase plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balance as of December 31, 2005</td>
<td>137,898</td>
<td>$137</td>
<td>$6,883</td>
<td>(22,137)</td>
<td>$106,789</td>
<td>(23,182)</td>
<td>(633,375)</td>
<td>$1,324,165</td>
<td>(13,387)</td>
<td>$1,589,075</td>
</tr>
</tbody>
</table>

See accompanying notes to consolidated financial statements.
# HEALTH NET, INC.
## CONSOLIDATED STATEMENTS OF CASH FLOWS
*(amounts in thousands)*

<table>
<thead>
<tr>
<th>YEAR ENDED DECEMBER 31,</th>
<th>2005</th>
<th>2004</th>
<th>2003</th>
</tr>
</thead>
</table>

## CASH FLOWS FROM OPERATING ACTIVITIES:

<table>
<thead>
<tr>
<th>Description</th>
<th>2005</th>
<th>2004</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net income</td>
<td>$xxx</td>
<td>$xxx</td>
<td>$xxx</td>
</tr>
<tr>
<td>Adjustments to reconcile net income to net cash provided by (used in) operating activities:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other changes</td>
<td>12,550</td>
<td>3,969</td>
<td>5,138</td>
</tr>
<tr>
<td>Changes in assets and liabilities, net of effects of dispositions:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Premiums receivable and unearned premiums</td>
<td>(46,678)</td>
<td>(18,402)</td>
<td>20,163</td>
</tr>
<tr>
<td>Other current assets, receivables and noncurrent assets</td>
<td>2,356</td>
<td>(86,499)</td>
<td>35,915</td>
</tr>
<tr>
<td>Amounts receivable/payable under government contracts</td>
<td>(49,996)</td>
<td>(175,345)</td>
<td>23,596</td>
</tr>
<tr>
<td>Reserves for claims and other settlements</td>
<td>(129,126)</td>
<td>143,012</td>
<td>2,737</td>
</tr>
<tr>
<td>Accounts payable and other liabilities</td>
<td>112,556</td>
<td>(15,749)</td>
<td>(13,686)</td>
</tr>
<tr>
<td>Net cash provided by (used in) operating activities</td>
<td>191,394</td>
<td>(54,912)</td>
<td>379,772</td>
</tr>
</tbody>
</table>

## CASH FLOWS FROM INVESTING ACTIVITIES:

<table>
<thead>
<tr>
<th>Description</th>
<th>2005</th>
<th>2004</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proceeds from Sales and Maturities of investments</td>
<td>513,640</td>
<td>556,774</td>
<td>967,221</td>
</tr>
<tr>
<td>Purchases of investments</td>
<td>(833,593)</td>
<td>(498,355)</td>
<td>(977,266)</td>
</tr>
<tr>
<td>Sales of property and equipment</td>
<td>79,845</td>
<td>9,670</td>
<td>37</td>
</tr>
<tr>
<td>Purchases of property and equipment</td>
<td>(48,846)</td>
<td>(47,616)</td>
<td>(54,952)</td>
</tr>
<tr>
<td>Cash received from the sale of businesses and properties</td>
<td>1,949</td>
<td>11,112</td>
<td>90,316</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net cash used in investing activities</td>
<td>(244,046)</td>
<td>(14,242)</td>
<td>(105,522)</td>
</tr>
</tbody>
</table>

## CASH FLOWS FROM FINANCING ACTIVITIES:

<table>
<thead>
<tr>
<th>Description</th>
<th>2005</th>
<th>2004</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proceeds from exercise of stock options and employee stock purchases</td>
<td>73,484</td>
<td>19,091</td>
<td>42,330</td>
</tr>
<tr>
<td>Proceeds from issuance of notes payable and other financing arrangements</td>
<td>—</td>
<td>—</td>
<td>5,680</td>
</tr>
<tr>
<td>Repurchases of common stock</td>
<td>(449)</td>
<td>(88,706)</td>
<td>(288,318)</td>
</tr>
<tr>
<td>Repayment of debt and other noncurrent liabilities</td>
<td>—</td>
<td>—</td>
<td>(5,864)</td>
</tr>
<tr>
<td>Net cash provided by (used in) financing activities</td>
<td>73,035</td>
<td>(69,615)</td>
<td>(246,172)</td>
</tr>
<tr>
<td>Net increase (decrease) in cash and cash equivalents</td>
<td>20,383</td>
<td>(138,769)</td>
<td>28,078</td>
</tr>
<tr>
<td>Cash and cash equivalents, beginning of year</td>
<td>722,102</td>
<td>860,871</td>
<td>832,793</td>
</tr>
<tr>
<td>Cash and cash equivalents, end of year</td>
<td>742,485</td>
<td>$722,102</td>
<td>$860,871</td>
</tr>
</tbody>
</table>

## SUPPLEMENTAL CASH FLOWS DISCLOSURE:

<table>
<thead>
<tr>
<th>Description</th>
<th>2005</th>
<th>2004</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest paid</td>
<td>$41,120</td>
<td>$30,722</td>
<td>$36,296</td>
</tr>
<tr>
<td>Income taxes paid</td>
<td>96,324</td>
<td>110,316</td>
<td>126,709</td>
</tr>
</tbody>
</table>

See accompanying notes to consolidated financial statements.
HEALTH NET, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

NOTE 2: Significant Accounting Policies

Cash and Cash Equivalents
Cash equivalents include all highly liquid investments with a maturity of three months or less when purchased.

Investments
Investments classified as available-for-sale are reported at fair value based on quoted market prices, with unrealized gains and losses excluded from earnings and reported as other comprehensive income, net of income tax effects. The cost of investments sold is determined in accordance with the specific identification method and realized gains and losses are included in net investment income.

NOTE 4: Investments
As of December 31, 2005 and 2004, the cost, gross unrealized holding gains and losses, and fair value of our available-for-sale investments were as follows:

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>COST</td>
<td>GROSS UNREALIZED HOLDING GAINS</td>
</tr>
<tr>
<td>Mortgage-backed securities</td>
<td>$ 368.1</td>
<td>$ 0.4</td>
</tr>
<tr>
<td>U.S. government and agencies</td>
<td>371.6</td>
<td>—</td>
</tr>
<tr>
<td>Obligations of states and other political subdivisions</td>
<td>462.8</td>
<td>1.3</td>
</tr>
<tr>
<td>Corporate debt securities</td>
<td>182.6</td>
<td>—</td>
</tr>
<tr>
<td>Other securities</td>
<td>0.2</td>
<td>—</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$1,385.3</strong></td>
<td><strong>$1.7</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>COST</td>
<td>GROSS UNREALIZED HOLDING GAINS</td>
</tr>
<tr>
<td>Mortgage-backed securities</td>
<td>$ 379.1</td>
<td>$ 0.8</td>
</tr>
<tr>
<td>U.S. government and agencies</td>
<td>446.0</td>
<td>0.7</td>
</tr>
<tr>
<td>Obligations of states and other political subdivisions</td>
<td>34.8</td>
<td>0.3</td>
</tr>
<tr>
<td>Corporate debt securities</td>
<td>204.6</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$1,064.5</strong></td>
<td><strong>$2.8</strong></td>
</tr>
</tbody>
</table>
As of December 31, 2005, the contractual maturities of our available-for-sale investments were as follows:

<table>
<thead>
<tr>
<th>COST ESTIMATED FAIR VALUE</th>
<th>(Dollars in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Due in one year or less</td>
<td>$ 94.7</td>
</tr>
<tr>
<td>Due after one year through five years</td>
<td>546.3</td>
</tr>
<tr>
<td>Due after five years through ten years</td>
<td>224.1</td>
</tr>
<tr>
<td>Due after ten years</td>
<td>152.1</td>
</tr>
<tr>
<td>Mortgage-backed securities</td>
<td>368.1</td>
</tr>
<tr>
<td>Total available for sale</td>
<td>$ 1,385.3</td>
</tr>
</tbody>
</table>

**NOTE 10: Income Taxes**

Significant components of the provision for income taxes are as follows for the years ended December 31:

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Dollars in millions)</td>
</tr>
<tr>
<td>CURRENT:</td>
<td></td>
</tr>
<tr>
<td>Federal</td>
<td>$ 111.4</td>
</tr>
<tr>
<td>State</td>
<td>31.0</td>
</tr>
<tr>
<td>Total current</td>
<td>142.4</td>
</tr>
<tr>
<td>DEFERRED:</td>
<td></td>
</tr>
<tr>
<td>Federal</td>
<td>3.6</td>
</tr>
<tr>
<td>State</td>
<td>0.5</td>
</tr>
<tr>
<td>Total deferred</td>
<td>4.1</td>
</tr>
<tr>
<td>Total income tax provision</td>
<td>$ 146.5</td>
</tr>
</tbody>
</table>

A reconciliation of the statutory federal income tax rate and the effective income tax rate on income is as follows for the years ended December 31:

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2004</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statutory federal income tax rate</td>
<td>35.0%</td>
<td>35.0%</td>
<td>35.0%</td>
</tr>
<tr>
<td>State and local taxes, net of federal income tax effect</td>
<td>5.4</td>
<td>4.1</td>
<td>3.6</td>
</tr>
<tr>
<td>Tax exempt interest income</td>
<td>(0.5)</td>
<td>(0.3)</td>
<td>(0.1)</td>
</tr>
<tr>
<td>Goodwill and intangible assets amortization</td>
<td>0.1</td>
<td>0.5</td>
<td>0.1</td>
</tr>
<tr>
<td>Examination settlements</td>
<td>—</td>
<td>(2.7)</td>
<td>(1.9)</td>
</tr>
<tr>
<td>Other, net</td>
<td>(1.1)</td>
<td>0.2</td>
<td>0.8</td>
</tr>
<tr>
<td>Effective income tax rate</td>
<td>38.9%</td>
<td>36.8%</td>
<td>375%</td>
</tr>
</tbody>
</table>
Significant components of our deferred tax assets and liabilities as of December 31 are as follows:

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DEFERRED TAX ASSETS:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accrued liabilities</td>
<td>$100.9</td>
<td>$101.0</td>
</tr>
<tr>
<td>Unearned (or Deferred) Revenues</td>
<td>16.9</td>
<td>18.9</td>
</tr>
<tr>
<td>Tax credit carryforwards</td>
<td>0.5</td>
<td>0.8</td>
</tr>
<tr>
<td>Accrued compensation and benefits</td>
<td>38.1</td>
<td>32.6</td>
</tr>
<tr>
<td>Net operating loss carryforwards</td>
<td>578</td>
<td>54.6</td>
</tr>
<tr>
<td>Other</td>
<td>9.1</td>
<td>2.9</td>
</tr>
<tr>
<td>Deferred tax assets before valuation allowance</td>
<td>223.3</td>
<td>210.8</td>
</tr>
<tr>
<td>Valuation allowance</td>
<td>(19.7)</td>
<td>(19.8)</td>
</tr>
<tr>
<td>Net deferred tax assets</td>
<td>$203.6</td>
<td>$191.0</td>
</tr>
<tr>
<td><strong>DEFERRED TAX LIABILITIES:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depreciable and amortizable property</td>
<td>$45.5</td>
<td>$44.1</td>
</tr>
<tr>
<td>Deferred revenue</td>
<td>19.0</td>
<td>15.1</td>
</tr>
<tr>
<td>Other</td>
<td>14.2</td>
<td>9.4</td>
</tr>
<tr>
<td>Deferred tax liabilities</td>
<td>$78.7</td>
<td>$68.6</td>
</tr>
</tbody>
</table>

The net deferred tax assets and liabilities are reported as current and noncurrent deferred tax assets in our consolidated balance sheets for the years ended December 31, 2005 and 2004 based on when the amounts are expected to be realized.

As of December 31, 2005, we had federal and state net operating loss carryforwards of approximately $119.4 million and $282.0 million, respectively. The net operating loss carryforwards expire between 2007 and 2026. Limitations on utilization may apply to approximately $36.4 million and $126.0 million of the federal and state net operating loss carryforwards, respectively. Accordingly, valuation allowances have been provided to account for the potential limitations on utilization of these tax benefits.
SAFEWAY INC. AND SUBSIDIARIES
CONSOLIDATED BALANCE SHEETS
(In millions, except per-share amounts)

<table>
<thead>
<tr>
<th></th>
<th>YEAR-END 2005</th>
<th>YEAR-END 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ASSETS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current assets:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash and equivalents</td>
<td>$ 373.3</td>
<td>$ 266.8</td>
</tr>
<tr>
<td>Receivables</td>
<td>350.6</td>
<td>339.0</td>
</tr>
<tr>
<td>Merchandise inventories, net of LIFO reserve of $48.4 and $48.6</td>
<td>2,766.0</td>
<td>2,740.7</td>
</tr>
<tr>
<td>Prepaid expenses and other current assets</td>
<td>212.5</td>
<td>251.2</td>
</tr>
<tr>
<td>Total current assets</td>
<td>3,702.4</td>
<td>3,597.7</td>
</tr>
<tr>
<td>Property:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land</td>
<td>1,413.9</td>
<td>1,396.0</td>
</tr>
<tr>
<td>Buildings</td>
<td>4,419.1</td>
<td>4,269.7</td>
</tr>
<tr>
<td>Leasehold improvements</td>
<td>2,958.0</td>
<td>2,621.9</td>
</tr>
<tr>
<td>Fixtures and equipment</td>
<td>6,558.7</td>
<td>5,981.3</td>
</tr>
<tr>
<td>Property under capital leases</td>
<td>779.1</td>
<td>773.8</td>
</tr>
<tr>
<td>Less accumulated depreciation and amortization</td>
<td>(7,031.7)</td>
<td>(6,353.3)</td>
</tr>
<tr>
<td>Total property, net</td>
<td>9,097.1</td>
<td>8,689.4</td>
</tr>
<tr>
<td>Goodwill</td>
<td>2,402.4</td>
<td>2,406.6</td>
</tr>
<tr>
<td>Prepaid pension costs</td>
<td>179.4</td>
<td>321.0</td>
</tr>
<tr>
<td>Investments in unconsolidated affiliates</td>
<td>201.8</td>
<td>187.6</td>
</tr>
<tr>
<td>Other assets</td>
<td>173.8</td>
<td>175.1</td>
</tr>
<tr>
<td>Total assets</td>
<td>$ 15,756.9</td>
<td>$ 15,377.4</td>
</tr>
<tr>
<td><strong>LIABILITIES AND STOCKHOLDERS’ EQUITY</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current liabilities:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current maturities of notes and debentures</td>
<td>$ 714.2</td>
<td>$ 596.9</td>
</tr>
<tr>
<td>Current obligations under capital leases</td>
<td>39.1</td>
<td>42.8</td>
</tr>
<tr>
<td>Accounts payable</td>
<td>2,151.5</td>
<td>1,759.4</td>
</tr>
<tr>
<td>Accrued salaries and wages</td>
<td>526.1</td>
<td>426.4</td>
</tr>
<tr>
<td>Income taxes</td>
<td>124.2</td>
<td>270.3</td>
</tr>
<tr>
<td>Other accrued liabilities</td>
<td>708.8</td>
<td>696.3</td>
</tr>
<tr>
<td>Total current liabilities</td>
<td>4,263.9</td>
<td>3,792.1</td>
</tr>
<tr>
<td>Long-term debt:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes and debentures</td>
<td>4,961.2</td>
<td>5,469.7</td>
</tr>
<tr>
<td>Obligations under capital leases</td>
<td>644.1</td>
<td>654.0</td>
</tr>
<tr>
<td>Total long-term debt</td>
<td>5,605.3</td>
<td>6,123.7</td>
</tr>
<tr>
<td>Deferred income taxes</td>
<td>223.1</td>
<td>463.6</td>
</tr>
<tr>
<td>Accrued claims and other liabilities</td>
<td>744.9</td>
<td>691.1</td>
</tr>
<tr>
<td>Total liabilities</td>
<td>10,837.2</td>
<td>11,070.5</td>
</tr>
<tr>
<td>Commitments and contingencies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stockholders’ equity:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total stockholders’ equity</td>
<td>4,919.7</td>
<td>4,306.9</td>
</tr>
<tr>
<td>Total liabilities and stockholders’ equity</td>
<td>$ 15,756.9</td>
<td>$ 15,377.4</td>
</tr>
</tbody>
</table>
SAFEWAY INC. AND SUBSIDIARIES  
CONSOLIDATED STATEMENTS OF CASH FLOWS  
(In millions)  

<table>
<thead>
<tr>
<th></th>
<th>52 WEEKS</th>
<th>52 WEEKS</th>
<th>53 WEEKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2005</td>
<td>2004</td>
<td>2003</td>
</tr>
<tr>
<td>OPERATING ACTIVITIES:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net income (loss)</td>
<td>$561.1</td>
<td>$560.2</td>
<td>$(169.8)</td>
</tr>
<tr>
<td>Reconciliation to net cash flow from operating activities:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net cash flow from operating activities</td>
<td>1,881.0</td>
<td>2,226.4</td>
<td>1,609.6</td>
</tr>
<tr>
<td>INVESTING ACTIVITIES:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash paid for property additions</td>
<td>$(1,383.5)</td>
<td>$(1,212.5)</td>
<td>$(935.8)</td>
</tr>
<tr>
<td>Proceeds from sale of property</td>
<td>106.1</td>
<td>194.7</td>
<td>189.0</td>
</tr>
<tr>
<td>Other</td>
<td>$(35.1)</td>
<td>$(52.5)</td>
<td>$(48.2)</td>
</tr>
<tr>
<td>Net cash used by investing activities</td>
<td>$(1,313.5)</td>
<td>$(1,070.3)</td>
<td>$(795.0)</td>
</tr>
<tr>
<td>FINANCING ACTIVITIES:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additions to short-term borrowings</td>
<td>$13.0</td>
<td>$11.2</td>
<td>$2.6</td>
</tr>
<tr>
<td>Payments on short-term borrowings</td>
<td>$(23.8)</td>
<td>$(1.5)</td>
<td>$(3.1)</td>
</tr>
<tr>
<td>Additions on long-term borrowings</td>
<td>754.5</td>
<td>1,173.5</td>
<td>1,592.0</td>
</tr>
<tr>
<td>Payments on long-term borrowings</td>
<td>$(1,188.6)</td>
<td>$(2,278.6)</td>
<td>$(2,331.0)</td>
</tr>
<tr>
<td>Purchase of treasury stock</td>
<td>$(1.5)</td>
<td>$(0.4)</td>
<td>—</td>
</tr>
<tr>
<td>Dividends paid</td>
<td>$(44.9)</td>
<td>$(6.6)</td>
<td>$(3.6)</td>
</tr>
<tr>
<td>Net proceeds from exercise of stock options</td>
<td>18.9</td>
<td>24.8</td>
<td>19.1</td>
</tr>
<tr>
<td>Other</td>
<td>5.5</td>
<td>2.0</td>
<td>1.8</td>
</tr>
<tr>
<td>Net cash flow used by financing activities</td>
<td>$(466.9)</td>
<td>$(1,077.6)</td>
<td>$(724.0)</td>
</tr>
<tr>
<td>Effect of changes in exchange rates on cash</td>
<td>5.9</td>
<td>13.5</td>
<td>8.2</td>
</tr>
<tr>
<td>Increase in cash and equivalents</td>
<td>106.5</td>
<td>92.0</td>
<td>98.8</td>
</tr>
<tr>
<td>CASH AND EQUIVALENTS:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beginning of year</td>
<td>266.8</td>
<td>174.8</td>
<td>76.0</td>
</tr>
<tr>
<td>End of year</td>
<td>$373.3</td>
<td>$266.8</td>
<td>$174.8</td>
</tr>
<tr>
<td>OTHER CASH INFORMATION:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash payments during the year for:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest</td>
<td>$412.1</td>
<td>$434.8</td>
<td>$464.2</td>
</tr>
<tr>
<td>Income taxes, net of refunds</td>
<td>624.4</td>
<td>43.8</td>
<td>361.6</td>
</tr>
<tr>
<td>NON-CASH INVESTING AND FINANCING ACTIVITIES:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tax benefit from stock options exercised</td>
<td>$9.1</td>
<td>$17.4</td>
<td>$13.6</td>
</tr>
<tr>
<td>Capital lease obligations entered into</td>
<td>271.0</td>
<td>35.9</td>
<td>113.2</td>
</tr>
<tr>
<td>Mortgage notes assumed in property additions</td>
<td>3.2</td>
<td>5.5</td>
<td>—</td>
</tr>
</tbody>
</table>

See accompanying notes to consolidated financial statements.
NOTE E: Lease Obligations

Approximately 62% of the premises that the Company occupies are leased. The Company had approximately 1,600 leases at year-end 2005, including approximately 225 that are capitalized for financial reporting purposes. Most leases have renewal options, some with terms and conditions similar to the original lease, others with reduced rental rates during the option periods. Certain of these leases contain options to purchase the property at amounts that approximate fair market value.

As of year-end 2005, future minimum rental payments applicable to non-cancelable capital and operating leases with remaining terms in excess of one year were as follows (in millions):

<table>
<thead>
<tr>
<th></th>
<th>CAPITAL LEASES</th>
<th>OPERATING LEASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>$ 106.7</td>
<td>$ 426.1</td>
</tr>
<tr>
<td>2007</td>
<td>104.3</td>
<td>410.6</td>
</tr>
<tr>
<td>2008</td>
<td>103.9</td>
<td>397.3</td>
</tr>
<tr>
<td>2009</td>
<td>94.7</td>
<td>359.9</td>
</tr>
<tr>
<td>2010</td>
<td>86.1</td>
<td>330.2</td>
</tr>
<tr>
<td>Thereafter</td>
<td>875.0</td>
<td>2,645.9</td>
</tr>
<tr>
<td>Total minimum lease payments</td>
<td>1,369.7</td>
<td>$ 4,570.0</td>
</tr>
<tr>
<td>Less amounts representing interest</td>
<td>(686.5)</td>
<td></td>
</tr>
<tr>
<td>Present value of net minimum lease payments</td>
<td>683.2</td>
<td></td>
</tr>
<tr>
<td>Less current obligations</td>
<td>(39.1)</td>
<td></td>
</tr>
<tr>
<td>Long-term obligations</td>
<td>$ 644.1</td>
<td></td>
</tr>
</tbody>
</table>

Amortization expense for property under capital leases was $43.0 million in 2005, $43.4 million in 2004 and $35.4 million in 2003. Accumulated amortization of property under capital leases was $256.7 million at year-end 2005 and $230.9 million at year-end 2004.

The following schedule shows the composition of total rental expense for all operating leases (in millions).

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2004</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property leases:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum rentals</td>
<td>$ 422.4</td>
<td>$ 406.9</td>
<td>$ 411.4</td>
</tr>
<tr>
<td>Contingent rentals(^1)</td>
<td>10.8</td>
<td>9.4</td>
<td>11.5</td>
</tr>
<tr>
<td>Less rentals from subleases</td>
<td>(30.2)</td>
<td>(28.1)</td>
<td>(31.4)</td>
</tr>
<tr>
<td></td>
<td>403.0</td>
<td>388.2</td>
<td>391.5</td>
</tr>
<tr>
<td><strong>Equipment leases</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>25.7</td>
<td>24.1</td>
<td>25.2</td>
</tr>
<tr>
<td></td>
<td><strong>$ 428.7</strong></td>
<td><strong>$ 412.3</strong></td>
<td><strong>$ 416.7</strong></td>
</tr>
</tbody>
</table>

\(^1\) In general, contingent rentals are based on individual store sales.
**Sample Exam 1 Answers ACCT611**

**QUESTION I (78 pts)**

<table>
<thead>
<tr>
<th>Event/Transactions</th>
<th>Statement of Cash Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Prepaid Expense 2000</td>
<td>NI 0</td>
</tr>
<tr>
<td>Cr. Cash 2000</td>
<td>- Increase in Prepaid -2000</td>
</tr>
<tr>
<td>CFO -2000</td>
<td>CFI CFF</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event/Transactions</th>
<th>Statement of Cash Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Advertising Expense 3000</td>
<td>NI -3000</td>
</tr>
<tr>
<td>Cr. Prepaid Expense 3000</td>
<td>+ Decrease in Prepaid +3000</td>
</tr>
<tr>
<td>CFO 0</td>
<td>CFI CFF</td>
</tr>
<tr>
<td>Event/Transactions</td>
<td>Statement of Cash Flows</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Dr. Amortization Expense 4000 Cr. Accumulated Amortization 4000 (or Intangible Assets)</td>
<td>NI -4000 + Amortization +4000</td>
</tr>
<tr>
<td></td>
<td>CFO 0</td>
</tr>
<tr>
<td></td>
<td>CFI</td>
</tr>
<tr>
<td></td>
<td>CFF</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event/Transactions</th>
<th>Statement of Cash Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Retained Earnings 5000 Cr. Cash 5000</td>
<td>NI 0</td>
</tr>
<tr>
<td></td>
<td>CFO 0</td>
</tr>
<tr>
<td></td>
<td>CFI</td>
</tr>
<tr>
<td></td>
<td>Dividends Paid -5000</td>
</tr>
<tr>
<td></td>
<td>CFF -5000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event/Transactions</th>
<th>Statement of Cash Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Interest Expense 4000 Cr. Interest Payable 4000</td>
<td>NI -4000 + Increase in Interest Pay +4000</td>
</tr>
<tr>
<td></td>
<td>CFO 0</td>
</tr>
<tr>
<td></td>
<td>CFI</td>
</tr>
<tr>
<td></td>
<td>CFF</td>
</tr>
</tbody>
</table>
### Event/Transactions

#### 6.

<table>
<thead>
<tr>
<th>Event/Transactions</th>
<th>Statement of Cash Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. PPE 9000</td>
<td>NI 0</td>
</tr>
<tr>
<td>Cr. Cash 9000</td>
<td>CFO 0</td>
</tr>
<tr>
<td></td>
<td>Purchase PPE -9000</td>
</tr>
<tr>
<td></td>
<td>CFI -9000</td>
</tr>
<tr>
<td></td>
<td>CFF</td>
</tr>
</tbody>
</table>

#### 7.

<table>
<thead>
<tr>
<th>Event/Transactions</th>
<th>Statement of Cash Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Revenue 3000</td>
<td>NI -1000</td>
</tr>
<tr>
<td>Cr. A/R 3000</td>
<td>+ Decrease AR +3000</td>
</tr>
<tr>
<td>Dr. Inventory 2000</td>
<td>- Increase Inventory -2000</td>
</tr>
<tr>
<td>Cr. COGS 2000</td>
<td>CFO 0</td>
</tr>
<tr>
<td></td>
<td>CFI</td>
</tr>
<tr>
<td></td>
<td>CFF</td>
</tr>
</tbody>
</table>

#### 8.

<table>
<thead>
<tr>
<th>Event/Transactions</th>
<th>Statement of Cash Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Long Term Debt 8000</td>
<td>NI 0</td>
</tr>
<tr>
<td>Cr. Cash 8000</td>
<td>CFO 0</td>
</tr>
<tr>
<td></td>
<td>CFI 0</td>
</tr>
<tr>
<td></td>
<td>Repay Debt -8000</td>
</tr>
<tr>
<td></td>
<td>CFF -8000</td>
</tr>
</tbody>
</table>
### Event/Transactions

<table>
<thead>
<tr>
<th>Event/Transactions</th>
<th>Statement of Cash Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>9.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Dr. Unearned Revenue</strong></td>
<td></td>
</tr>
<tr>
<td>3000</td>
<td>NI</td>
</tr>
<tr>
<td><strong>Cr. Revenue</strong></td>
<td>+2000</td>
</tr>
<tr>
<td><strong>Dr. Expense</strong></td>
<td>- Decrease in Unearned Rev</td>
</tr>
<tr>
<td>1000</td>
<td>-3000</td>
</tr>
<tr>
<td><strong>Cr. Cash</strong></td>
<td>CFO</td>
</tr>
<tr>
<td></td>
<td>-1000</td>
</tr>
<tr>
<td></td>
<td>CFI</td>
</tr>
<tr>
<td></td>
<td>CFF</td>
</tr>
</tbody>
</table>

| **10.**                                 |                         |
| **Dr. Contributed Capital**             |                         |
| 45000                                   | NI                      |
| **Cr. Cash**                            | 0                       |
|                                         | CFO                     |
|                                         | 0                       |
|                                         | CFI                     |
|                                         | 0                       |
|                                         | - Reversal of issuance  |
|                                         | -45000                  |
|                                         | CFF                     |
|                                         | -45000                  |

| **11.**                                 |                         |
| **Dr. Administrative Expense**         |                         |
| 7000                                   | NI                      |
| **Cr. Cash**                           | -7000                   |
| **Cr. Accrued Expenses**               | + Increase in Accrued Exp |
| 3000                                   | +4000                   |
| 4000                                   |                          |
|                                         | CFO                     |
|                                         | -3000                   |
|                                         | CFI                     |
|                                         | CFF                     |
### Event/Transactions

<table>
<thead>
<tr>
<th>Dr. Cash</th>
<th>Cr. Unearned Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>8000</td>
<td>8000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dr. Inventory</th>
<th>Cr. Accts Payable</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>2000</td>
</tr>
</tbody>
</table>

### Statement of Cash Flows

<table>
<thead>
<tr>
<th>NI</th>
<th>+ Increase in Unearned Rev</th>
<th>+8000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Increase in Inventory</td>
<td>-2000</td>
</tr>
<tr>
<td></td>
<td>+ Increase in Accts Payable</td>
<td>+2000</td>
</tr>
</tbody>
</table>

CFO +8000  
CFI 
CFF

### Event/Transactions

<table>
<thead>
<tr>
<th>Dr. Salary Expense</th>
<th>Cr. Salary Payable</th>
</tr>
</thead>
<tbody>
<tr>
<td>10000</td>
<td>10000</td>
</tr>
</tbody>
</table>

### Statement of Cash Flows

<table>
<thead>
<tr>
<th>NI</th>
<th>-10000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+ Increase in Salary Payable</td>
</tr>
</tbody>
</table>

CFO 0  
CFI 
CFF
QUESTION II (54 pts)

1. 2004

$7,944 in financing cash flow was raised in 2004.

2. $57,162

Total dividends = $19,557 + $19,069 + $18,536 = $57,162

3. $5394

Proceeds from sale of long-lived assets $1,363
Add: Loss on disposal of long-lived assets +$4,031
Book value of long-lived assets sold $5,394

4. $1,363 LOWER

5. $0 NO CHANGE

All cash flow from the sale of long-lived assets is reflected in investing activities. The loss on the sale is a non-cash item that affects net income, but not cash flow. Therefore, it is added back in the operating activities section but does not result in higher operating cash flow.

6. $16,224

<table>
<thead>
<tr>
<th>Warranty Liability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning Balance 12,043</td>
</tr>
<tr>
<td>Less: warranties serviced (15,000)</td>
</tr>
<tr>
<td>Warranty expense (plug) 16,224</td>
</tr>
<tr>
<td>Ending Balance 13,267</td>
</tr>
</tbody>
</table>

Alternatively, change in warranty liability from CFO ($1,224) can be added to Warranties Serviced to obtain $16,224.

7. Retained Earnings

<table>
<thead>
<tr>
<th>Retained Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning Balance $437,269</td>
</tr>
<tr>
<td>+ Net Income 13,284</td>
</tr>
<tr>
<td>- Dividends 19,557</td>
</tr>
<tr>
<td>Ending Balance $430,996</td>
</tr>
</tbody>
</table>

8. CFO
9. $1,000,389

**Accounts Receivable**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning Balance</td>
<td>100,378</td>
</tr>
<tr>
<td>Add: Sales on account</td>
<td>0</td>
</tr>
<tr>
<td>Less: Cash collected from A/R (plug)</td>
<td>(2,296)</td>
</tr>
<tr>
<td>Ending Balance</td>
<td>98,082</td>
</tr>
</tbody>
</table>

Cash revenues of $998,093 + $2,296 collected from A/R equals $1,000,389 in total cash collected from customers.

10. $1,000,389

**Accounts Receivable**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning Balance</td>
<td>100,378</td>
</tr>
<tr>
<td>Add: Sales on account</td>
<td>499,046.5***</td>
</tr>
<tr>
<td>Less: Cash collected from A/R (plug)</td>
<td>(501,342.5)</td>
</tr>
<tr>
<td>Ending Balance</td>
<td>98,082</td>
</tr>
</tbody>
</table>

*** 998,093 x 50%

Cash revenues of $499,046.5 + $501,342.5 collected from A/R equals $1,000,389 in total cash collected from customers.

11. Debit PPE 34,259
Credit Cash 34,259

12. $616,534

**Inventory**

<table>
<thead>
<tr>
<th></th>
<th>A/P</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB</td>
<td>175,982</td>
</tr>
<tr>
<td>Add: New Raw Mats.</td>
<td>649,274 (plug)</td>
</tr>
<tr>
<td>Less: COGS</td>
<td>(583,679)</td>
</tr>
<tr>
<td>EB</td>
<td>241,577</td>
</tr>
</tbody>
</table>

**A/P**

<table>
<thead>
<tr>
<th></th>
<th>BB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add: New Raw Mats.</td>
<td>649,274</td>
</tr>
<tr>
<td>Less: Cash paid for A/P</td>
<td>(616,534) (plug)</td>
</tr>
<tr>
<td>EB</td>
<td>102,134</td>
</tr>
</tbody>
</table>

**Note:** Here, all new inventory is assumed to be raw materials. But, any amount of raw materials up to $649,274 may be assumed as long as the same figure is added to both inventory and A/P, and the remainder of new inventory is assumed to be paid directly in cash.
QUESTION I: ACCOUNTS RECEIVABLES AND INVENTORIES

(18 pts assigned) (_____ pts scored)

1. 3520
   See Note 12

2. $515 INCREASED
   Expense – Allowance Method 3520
   Expense – Direct Write off Method 3005
   Difference 515

3. $0 NO CHANGE
   ∆AR – BS 15,122
   ∆AR – CFS 15,122
   Since the reported changes are the same, the net effect of business acquisitions, etc. must have been zero.

4. $807,999
   Sales - ∆AR = 823,121 -15,122 = 807,999
   Also

<table>
<thead>
<tr>
<th>GROSS AR</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB 65,318 + 2363</td>
</tr>
<tr>
<td>Sales 823,121 + 3520</td>
</tr>
<tr>
<td>EB 80,440 + 2878</td>
</tr>
<tr>
<td>3005 Write-Offs</td>
</tr>
<tr>
<td>807,999 Cash Collected (Plug)</td>
</tr>
</tbody>
</table>

5. $11,119
   See Note 12, the column dealing with inventory
QUESTION II: LONG-LIVED ASSETS  (20 pts assigned) (_____ pts scored)

1. $16,411
   See Note 4

2. $20,481
   See SCF

3. $1385

<table>
<thead>
<tr>
<th>PPE, NET</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB</td>
</tr>
<tr>
<td>Additions</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>EB</td>
</tr>
</tbody>
</table>

4. $81 LOSS
   Proceeds – NBV sold = 1304 – 1385 = 81

5. INDEFINITE
   No change in NBV number on Balance Sheet. Also see Note 2

6. $0 NO EFFECT

QUESTION III: LONG-TERM DEBT  (23 pts assigned) (_____ pts scored)

1. $75
   See CFO

2. $0
   The change in the net book value of debt as reported in the footnote is completely explained by the discount amortization and the change in the reported NBV of the senior credit facility term loan.

3a. 3336
   See beginning balance of Current maturities of long-term debt

3b. $0 NO GAIN OR LOSS
   There is never a gain or loss on the retirement of debt at maturity.
4a. 24,950
   See SCF
   Total cash paid to retire debt - cash paid to retire debt at maturity = cash paid to retire debt prior to maturity
   28,286 – 3,336 = 24,950

4b. 24,950

<table>
<thead>
<tr>
<th>LONG-TERM DEBT, NET</th>
</tr>
</thead>
<tbody>
<tr>
<td>209,377   BB</td>
</tr>
<tr>
<td>724       debt reclassified as current</td>
</tr>
<tr>
<td>0         issued</td>
</tr>
<tr>
<td>24,950    nbv retired prior to maturity - PLUG</td>
</tr>
<tr>
<td>75        discount amortized</td>
</tr>
<tr>
<td>183,778   EB</td>
</tr>
</tbody>
</table>

5. LOWER
   See note 5

QUESTION IV: INVENTORY (21 pts assigned) (_____ pts scored)

1. $60.1
   LESS
   Since the question is asking for the effect in just one year, 2005, use change in the lifo reserve

2. $69.1
   \[ \Delta \text{Lifo Reserve} = \text{price effect} - \text{liquidation effect} \]
   \[ 60.1 = \text{price effect} - 9 \]
   \[ \text{price effect} = 69.1 \]

3. $90.9
   \[ 291.6 - 200.7 = 90.9 \]
4. **Name of “Cash flows from operating activities” line item** | **Amount and direction of effect (use +/- to indicate increase/decrease)**
---|---
Net Income | $39.07 = 60.1 \times (1-.35)$
Adjustments to reconcile net income (loss) to cash flows | 
Changes in Inventory | $-60.1$
Changes in Other Assets | 
Changes in Other liabilities | $21.04 = 60.1 \times .35$
Net cash flows from operating activities of continuing operations | 0
Final Exam Answers ACCT611

**QUESTION I: TAXES** (35 pts assigned) (____ pts scored)

1. **Account** | **Debit** | **Credit**  
--- | --- | ---  
**Tax Expense** | 146.5 |  
**Deferred Tax (Asset or Liability)** |  | 4.1  
**Tax payable** |  | 142.4  
*See the first tax table*

2. $376.6  
   Effective Tax Rate = Tax Expense/Earnings before Taxes  
   Earnings before taxes = Tax expense/ETR = 146.5/.389 = 376.6  
   ETR comes from the second tax table.

3. $3.2 INCREASE  
   The journal entry for reducing the valuation allowance account is:  
   Allowance 3.2  
   Tax expense 3.2

4. $66.376

<table>
<thead>
<tr>
<th>TAX PAYABLE</th>
<th>20.3 BB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Payment</td>
<td>96.324</td>
</tr>
<tr>
<td>See the supplementary cash flow information</td>
<td>142.4 current tax expense (see table 1 in the tax footnote and the answer to question 1)</td>
</tr>
<tr>
<td>66.376 EB</td>
<td></td>
</tr>
</tbody>
</table>

5a. NO CHANGE  
   Tax exempt interest does not affect the statutory tax rate. The statutory tax rate is set by the taxing authorities.

5b. DECREASE  
   Tax exempt interest reduces the effective tax rate since it increases earnings before taxes but does not increase tax expense.
5c. NO CHANGE

Tax exempt interest represents a permanent difference. Deferred taxes arise from timing differences.

5d. NO CHANGE

Tax exempt interest represents a permanent difference. Deferred taxes arise from timing differences.

6a. FALSE

Notice that the deferred tax asset decreased in 2005, therefore there was a credit entry to the account. Hence, Tax expense must have been greater than Tax payable, hence financial income must have been greater than taxable income, hence more revenue must have been recorded for financial than for tax.

6b. TRUE

Since there is a deferred tax asset associated with the Unearned Revenue, cumulatively, more revenue has been recognized for tax than for financial.

6c. d. Change in deferred tax asset/.29 = (18.9 – 16.9)/.29 = 6.9

7. Net Deferred Tax Asset INCREASE
   Income Taxes Payable NO EFFECT
   Income Tax Expense DECREASE

With a higher tax rate the tax shield associated with the deferred tax asset becomes more valuable, reducing future tax payments associated with present and past deferrals, resulting in lower tax expense this period.
QUESTION II: INTERCORPORATE INVESTMENTS  (20 pts assigned) (_____ pts scored)

1. Account                  Debit     Credit
    Other Comprehensive Income   10.341   
    Deferred Tax Liability (or Asset)  6.659   

    Allowance for unrealized price changes

    The credit entry is the change in the allowance account reported in the footnote. The entry to OCI is found in the statement of shareholders’ equity. The entry to DTL is the plug.

2. $512.793

   AVAILABLE FOR SALE – HISTORICAL COST

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BB</td>
<td>1064.5</td>
</tr>
<tr>
<td>Purchases</td>
<td>833.593 from the SCF</td>
</tr>
<tr>
<td>EB</td>
<td>1385.3</td>
</tr>
</tbody>
</table>

3. $847 REALIZED HOLDING GAIN

   Gain = Proceeds – Historical Cost = 513.64 (from SCF) – 512.793 = 847

4. $17 SMALLER

   NIBT(trading) = NIBT(afs) + ΔAllowance

5. 39.2 %

   (17 – 10.341)/17 = .392
   (Pretax effect – after tax effect)/pretax effect

6. $12.9 SMALLER

   21.5 x (1 - .4) = cumulative unrealized holding loss x after tax rate
QUESTION III: SHAREHOLDERS’ EQUITY  (15 pts assigned) (_____ pts scored)

1. 114,716
   Number of shares issued – treasury = 137,898 – 23,182 = 114,716

2. a. $27.33
   633,375/23,173 = $27.33

   b. Account       Debit       Credit
   Cash            750          
   APIC            116.625      
   Treasury Shares 633.375      

3. a. $42,506,420
   Basic EPS x (weighted average number of shares – Basic)
   .38 x (118,038,000 – 6,179,000) = $42,506,420

   b. $.34
   (50,000 – 10,000)/118,038 = .34

QUESTION IV: LEASES  (29 pts assigned) (_____ pts scored)

1. OPERATING
   None of the criteria for capital leases hold

2. Account       Debit       Credit
   Interest expense 66.6          
   Current maturities of leases 39.1   
   Cash            105.7      
   The cash payment and the current maturities come from the lease footnote

3. 9.7%
   Interest expense/net book value of liability = 66.6/683.2 = 9.7%

4. SMALLER by $492.7
   Interest expense (capital lease) + operating lease payment = 66.6 + 426.1 = 492.7
5. **NO EFFECT**

6. **SMALLER** by $39.1

   The effect is the principal payment

7. **$4.6**

   \[
   \begin{array}{|c|c|c|}
   \hline
   & \text{LEASE ASSET — NBV} & \\
   \hline
   \text{BB} & 773.8 - 230.9 & 4.6 \text{ retirements - plug} \\
   \text{New leases} & 271 & 43 \text{ amortization expense} \\
   \text{EB} & 779.1 - 256.7 & \\
   \hline
   \end{array}
   \]

8. **Account** | **Debit** | **Credit**
   
   **PPE**
   
   Long Term Lease Obligations | 3589 | 3589
   
   Long Term Lease Obligation
   
   Current Portion of Lease Obligation | 672 | 672
   
   Interest Expense
   
   Current Portion of Lease Obligation | 358.9 | 
   
   Cash | 672 | 426.1
   
   Amortization Expense
   
   Accumulated Amortization | 358.9 | 3589
   
   **b. GREATER**

   Cash flow from operations would be greater because instead of subtracting the entire lease payment you would only be subtracting the principal payment
Instructions

1. Please don’t open the exam until you are told to do so.

2. This exam is being administered under the University’s rules for academic conduct; the Code of Academic Integrity applies.

3. The exam consists of 5 multiple choice questions and 4 essay questions.

4. Use the white spaces (and backs of pages) in this question booklet as scratch paper for the multiple choice questions. Your final answers should be indicated with a pen in the appropriate boxes on page 1 of your answer sheet booklet.

5. Write your answers to the essay questions in the answer sheet booklet. You can use a pen or a pencil. If you need more answer sheets, you can request them, and they will be provided for you. Do not use the backs of answer sheets, since these back pages will not be graded.

6. IMPORTANT: Print your name and Penn ID number on the first page of your answer sheet booklet.

7. This is an open-book exam, i.e. you are free to use any course material. You are allowed to use a pocket calculator or your PalmPilot. Laptop computers are not allowed.

8. You have two hours. The time left in the exam will be announced periodically. If you finish early, you can quietly hand in your answer sheet booklet and leave, unless there is less than ten minutes left in the exam.

9. Please stop writing when requested to. There will be a penalty of 20 points for the people who don’t.

10. Remain seated until all the answer sheet booklets (not just yours) have been collected.
PART I: MULTIPLE CHOICE QUESTIONS  
(Total points: 25)

INSTRUCTIONS: A correct answer to each of these questions is worth 5 points. An incorrect answer is worth 0. Also, for each question that you choose not to answer, you get 1 point. If you do choose to answer, write your answer clearly in the appropriate box on page 1 of your Answer Sheet Booklet. Your answers should be capital letters written with a pen. An empty box will be interpreted as a “no answer.”

1. A 10-year annuity paying $x at the beginning of every year (i.e. the first of ten payments is made today) is worth the same (today) as an annuity of $300 payable every 6 months for 10 years (20 payments), the first payment of which is due 66 months from now. If the annual interest rate (compounded annually) is 3%, find x.
   a. 232.73  
   b. 502.48  
   c. 506.23  
   d. 508.11  
   e. 521.42

2. A machine costing $3,000 must be replaced at the end of 8 years. The resale value of the machine at the time of replacement is $600. At what annual discount rate (compounded annually) would it be equally economical to use a similar machine costing $4,000 with a life of 8 years and a resale value of $1,900? (Assume that there is no taxes.)
   a. 2.4%  
   b. 2.7%  
   c. 3.0%  
   d. 3.3%  
   e. 3.6%

3. What is the present value of 15 payments of $100 each received every 18 months (the first one occurring in 18 months from now), if the annual discount rate (compounded annually) is 9%?
   a. $620.43  
   b. $875.56  
   c. $930.61  
   d. $951.28  
   e. $1,209.10

4. Corporate managers can maximize shareholder wealth by choosing positive NPV projects because:
   a. all investors have the same preferences.
   b. the unhappy shareholders can sell off their shares.
   c. given the existence of financial markets, investors will be satisfied with the same real investment decisions regardless of personal preferences.
   d. managers are wiser than shareholders regarding investments.
   e. none of the above.
5. In the figure below, the sloping straight line represents the opportunities for investment in the capital market, and the solid curved line represents the opportunities for investment in plant and machinery (real assets). The company’s only asset at present is $21 million in cash.

![Graph of capital market and real asset investment opportunities](image)

Note that the figure is not drawn to scale, and that all the numbers are in millions.

Let $I$ denote the optimal amount that should be invested in real assets, and $r$ the interest rate in capital markets. Calculate $I/r$.

- a. 3.2 million  
- b. 12 million  
- c. 32 million  
- d. 40 million  
- e. 60 million

PART II: ESSAY QUESTIONS (Total points: 75)

INSTRUCTIONS: Each of the following questions is to be answered in the Answer Sheet Booklet. You can use a pen or a pencil. If you need more answer sheets, you can request them, and they will be provided for you. Do not use the backs of answer sheets, since these back pages will not be graded. The number of points for each question is indicated in parentheses at the beginning of the question. In answering these questions, make sure to show all your calculations; in particular, no points will be given for calculator shortcuts.

1. (20 points) Every year, you receive your entire annual salary at the end of the year. This year, your end-of-year salary will be $50,000 (in nominal terms). In real terms, you expect your salary to increase at a rate of 2% per year in the future.

You have decided to start saving for retirement by putting money in a savings account. You plan to retire in 35 years, and you expect to live for 25 years after that. You assess that a reasonable lifestyle during those 25 years will require you to have, at the end of every year, a disposable income of $25,000 in real terms (i.e. the same purchasing power as $25,000 today). The nominal interest rate on your savings account is 8%, and it is expected to stay at that rate forever. The real interest rate is also expected to stay at its current level of 3.5%.
a. What is the inflation rate?

b. How much money (in nominal terms) will you need to have in your savings account when you retire, in 35 years (end of year 35), in order to be able to enjoy the lifestyle that you find reasonable? HINT: First calculate the amount that you will need in real terms.

c. Suppose that you will start saving for retirement at the end of the current year. Suppose further that you plan to make 35 deposits (one at the end of every year). All deposits are a fixed fraction $x$ of your salary. Find the fraction $x$ that will allow you to reach your “reasonable lifestyle” objective. HINT: You will need to make use of the growing annuity formula.

2. (15 points) You are a financial analyst for a company that is considering a new project. If the project is accepted, it will use a fraction of a storage facility that the company already owns but currently does not use. The project is expected to last 10 years, and the annual discount rate is 10% (compounded annually).

You research the possibilities, and find that the entire storage facility can be sold for $100,000 and a smaller (but big enough) facility can be acquired for $40,000. The book value of the existing facility is $60,000, and both the existing and the new facilities (if it is acquired) would be depreciated straight line over 10 years (down to a zero book value). The corporate tax rate is 40%. What is the opportunity cost of using the existing storage capacity? HINT: Think about what you would gain and lose if you did not.

3. (15 points) You own a rental building in the city and are interested in replacing the heating system. You are faced with the following alternatives:

   a. A solar system, which will cost $12,000 to install and $500 at the end of every year to run, and will last forever (assume that your building will too).

   b. A gas-heating system, which will cost $5,000 to install and $1,000 at the end of every year to run, and will last 20 years.

   c. An oil-heating system, which will cost $3,500 to install and $1,200 at the end of every year to run, and will last 15 years.

If your opportunity cost of capital (discount rate) is 10%, which of these three options is best for you?
4. (25 points) The following bonds are traded in a well functioning market:

<table>
<thead>
<tr>
<th>BOND</th>
<th>TYPE</th>
<th>FACE VALUE</th>
<th>COUPON</th>
<th>MATURITY</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Zero Coupon Bond</td>
<td>$100</td>
<td>—</td>
<td>1 year</td>
<td>$92.00</td>
</tr>
<tr>
<td>B</td>
<td>Coupon Bond</td>
<td>$100</td>
<td>8%</td>
<td>2 years</td>
<td>$101.32</td>
</tr>
</tbody>
</table>

a. Assuming that the coupon bond (bond B) makes only annual payments, what discount factors \( (DF_1, DF_2) \) are imbedded in these prices? NOTE: Show all your calculations; no points will be given for answers found by a sophisticated calculator.

b. What are the 1-year, and 2-spot rates \( (r_1 \text{ and } r_2) \)?

c. Suppose that you would like to purchase a two-year coupon bond with a face value of $10,000 and a coupon rate of 6% (with annual coupon payments). Since such a bond is not traded in this economy, what portfolio of bonds A and B could you form to satisfy your needs (i.e. how can you replicate this bond using the original two bonds). NOTE: Make sure to describe that portfolio clearly, i.e. what you are buying/selling.

d. What is the exact yield to maturity on
   i. bond A;
   ii. bond B.

   NOTE: Again, show all your calculations; no points will be given for answers found by a sophisticated calculator. In particular, you will need to use the following formula for the roots of \( ax^2 + bx + c = 0 \):

   \[
x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}
   \]

   Your answers should have at least two decimals, like 9.53%.
Corporate Finance (FNCE611/612)  
(formerly FNCE601/621)  
PLACEMENT/WAIVER EXAM–PART 2

Instructions

PLEASE READ THESE INSTRUCTIONS

1. Please don’t open the exam until you are told to do so.

2. This exam is being administered under the University’s rules for academic conduct; the Code of Academic Integrity applies.

3. The exam consists of 5 multiple choice questions and 4 essay questions.

4. Write all of your answers in the blue booklets. If you need more booklets, you can request them, and they will be provided for you.

5. You must cross out anything that you do not wish to have marked. For the multiple choice questions, please write your letter answers with a pen. (You can do your calculations in either pen or pencil. The calculations will not be marked, only the letter answer, so no partial credit is given). For the essay questions, you may use either a pen or a pencil; partial credit may be given.

6. Important: Print your name and Penn ID number on the first page of your answer sheet booklet. Also indicate which section of the course you attend, so I can return your exam in the proper section.

7. This is an open-book exam, i.e., you are free to use any course material. You are allowed to use a pocket calculator. Laptop computers and PalmPilots are not allowed.

8. You have two hours. The time left in the exam will be announced periodically. If you finish early, you can quietly hand in your answer sheet booklet and leave, unless there is less than ten minutes left in the exam.

9. Please stop writing when requested to. There will be a penalty of 20 points for the people who don’t.

10. Remain seated until all the answer sheet booklets (not just yours) have been collected.
PART I: MULTIPLE CHOICE QUESTIONS  (Total points: 25)

INSTRUCTIONS: A correct answer to each of these questions is worth 5 points. An incorrect answer is worth 0. Also, for each question that you choose not to answer, you get 1 point. If you do choose to answer, write your answer clearly on page 1 of your blue booklet. Your answers should be capital letters written with a pen. Only the final answer will be marked and there shall be no partial credit for the multiple choice questions.

1. (5 points) Suppose that the price of the stock is $S_0$ and its annual volatility is $\sigma$. Suppose also that the annual riskfree rate is $r_f$. According to Black-Scholes, what is the price of a European put option with a strike price of $X$ maturing in $T$ years? NOTE: In the answers below, we use

\[ x = \frac{\log \left( \frac{S_0}{X/(1+r_f)^T} \right)}{\sigma \sqrt{T}} + \frac{1}{2} \sigma \sqrt{T}. \]

a. \[ \frac{X}{(1+r_f)^T} \left[ 1 - N(x - \sigma \sqrt{T}) \right] - S_0 \left[ 1 - N(x) \right] \]

b. \[ S_0 \ N(x) - \frac{X}{(1+r_f)^T} N(x - \sigma \sqrt{T}) \]

c. \[ S_0 \ N(x - \sigma \sqrt{T}) - \frac{X}{(1+r_f)^T} N(x) \]

d. \[ S_0 \left[ 1 - N(x) \right] - \frac{X}{(1+r_f)^T} \left[ 1 - N(x - \sigma \sqrt{T}) \right] \]

e. \[ S_0 \left[ 1 - N(x - \sigma \sqrt{T}) \right] - \frac{X}{(1+r_f)^T} \left[ 1 - N(x) \right] \]

2. (5 points) Which of the following statements are true?

I. In a perfect capital market, it is advantageous for the firm to issue debt (vs. equity) to finance a project, because the cost of debt ($r_D$) is always smaller than the cost of equity ($r_E$).

II. The reason that Modigliani and Miller’s Proposition I does not hold in the presence of corporate taxes is because levered firms pay less taxes than identical unlevered firms.

III. Equity financing is always better than debt financing when the personal tax rate on equity income ($t_E$) is smaller than the personal tax rate on interest income ($t_D$).

a. I and II
d. I, II and III

b. I and III
e. fewer than two statements are true.

c. II and III
3. *(5 points)* If a firm borrows $50 million for one year (i.e., the firm is levered for one year only) at an interest rate of 9%, what is the present value of the interest tax shield? Assume that there are no personal taxes, and that the corporate tax rate is 35%.

- a. $50.000 million
- b. $17.500 million
- c. $4.128 million
- d. $1.575 million
- e. $1.445 million

4. *(5 points)* Suppose that you would like to take a position that will give you the following payoff at time $T$, as a function of the stock price $S_T$ at that time:

![Payoff Diagram](image)

Which of the following strategies will give you this position (assume that all the call and put options are European options maturing at $T$, and are written on the given stock)?

- I. Buy 1 put with a strike price of 60, buy 1 call with a strike price of 40, and buy 1 call with a strike price of 20.
- II. Buy 1 call with a strike price of 40, buy 1 put with a strike price of 20, and lend (at the riskfree rate) the present value of $40 deliverable at time $T$.
- III. Buy 1 put with a strike price of 40, buy 1 put with a strike price of 20, and buy 1 share of the stock.

- a. I and II
- b. I and III
- c. II and III
- d. I, II and III
- e. fewer than two positions will give you the desired payoff.

5. *(5 points)* The Hifalutin Corporation has no debt in its capital structure, and the expected rate of return on its equity is 15%. There are 300,000 shares outstanding. The company has expected annual pre-tax earnings of $3 million in perpetuity. The corporate tax rate is 40%. If Hifalutin announces that it will issue $3.75 million worth of perpetual debt and use the entire proceeds to buy back some stocks, what will be its new share price? (Ignore personal taxes.)

- a. 40.00
- b. 45.00
- c. 48.50
- d. 50.00
- e. 52.50
PART II: ESSAY QUESTIONS (Total points: 75)

INSTRUCTIONS: Each of the following questions is to be answered in the blue booklets. You can use a pen or a pencil. If you need more booklets, you can request them, and they will be provided for you. The number of points for each question is indicated in parentheses at the beginning of the question. In answering these questions, make sure to show all your calculations; in particular, no points will be given for calculator shortcuts. Finally, please keep in mind that I can’t grade what I can’t read.

1. (20 points total) Stiphla Inc.’s real assets are expected to generate earnings before interest and taxes (EBIT) of $102,000 at the end of every year in perpetuity. The firm is currently financed by 50,000 shares each worth $6.11 and by $130,000 worth of perpetual debt issued at a rate of 12%. The corporate tax rate is 35%. Ignore personal taxes and bankruptcy costs.
   a. (2 points) What is the current total firm value of Stiphla Inc.?
   b. (3 points) What is the current expected return on Stiphla’s equity?
   c. (2 points) What is Stiphla’s weighted average cost of capital (WACC)?
   d. (2 points) Show that the value of the firm can be obtained by discounting its after-tax earnings at the weighted average cost of capital.

Janine Finch, the CFO of the company, has just found out that Stiphla could issue an additional $130,000 worth of perpetual debt to buy back some equity. However, because the new debt will be junior to the original debt, Stiphla will have to pay a rate of 14% on that new debt.

   e. (2 points) What is the value of the firm after it goes ahead with the new debt issue?
   f. (4 points) What is the new expected return on the firm’s equity?
   g. (2 points) Explain why the shareholders are better off (in terms of their total wealth).
   h. (3 points) What is Stiphla’s new weighted average cost of capital (WACC)?
2. (10 points total) Firms A and B are both unlevered. The shares of both companies are currently trading at $100, and both offer an annual pre-tax return of 10%. In the case of firm A, the return is entirely in the form of a dividend yield (i.e., the company pays a regular annual dividend of $10 a share). In the case of firm B, the return comes entirely as capital gain (the shares appreciate by 10% a year). Suppose that an investor buys a share of each firm today, and plans to sell them in 10 years. Suppose that dividends and capital gains are both taxed at 30%.

a. (5 points) What is the annual after-tax yield (rate of return) on firm A’s share over the 10-year period?

b. (5 points) What is the annual after-tax yield (rate of return) on firm B’s share over the 10-year period?

3. (25 points total) The Jack & Diane (JD) Corporation is considering a new 5-year project. Since this project is very different from JD’s current operations, the adjusted present value will be used to value the project.

The project requires an initial investment of $750,000 in new assets, which will be depreciated straight-line to 0 over the project’s 5-year life. These assets will be worthless in five years, i.e., they will not be resold. (Assume that the depreciation tax shields can be discounted at the project discount rate). Each year for five years, the project is expected to generate pre-tax revenues of $600,000 and to require pre-tax costs of $240,000. The entire project will be financed through a 5-year bank loan with an annual rate of 10%. The principal on the loan will be repaid in equal installments of $150,000 each (i.e., each year, the company pays $150,000 in principal, and pays the interest on the outstanding loan). It is estimated that the pre-tax costs (payable at time zero) of negotiating the loan will be 4% of the amount borrowed.

The project’s risk is very similar to the risk of Tommy & Gina (TG) Inc.’s assets. This firm is currently financed by 100,000 shares worth $12.50 each, and $750,000 worth of debt. The beta of TG’s stock is 1.5, and the company borrows at a rate of 11%. The riskfree rate in the economy is 8%, and the expected return on the market is 18%. The current corporate tax rate is 45% (assume that it applies to both JD and TG). Ignore personal taxes.

a. (8 points) What would be the appropriate discount rate for the project, if it were all-equity financed?

b. (17 points) What is the adjusted present value of the project?
4. (20 points total) During the upcoming year, the stock price of Delinquent Jesters Inc. (DJ) is expected to go up to $290 or down to $170 with equal probabilities. The beta of the stock is equal to 0.75. The annual riskfree rate is 10.5%, and the expected annual return on the market is 16.5%. You are interested in replicating and pricing a European call option on DJ’s stock. The option has a strike price of $212, and will mature in one year.

a. (4 points) What is the current price of DJ’s stock?

b. (6 points) Using the stock and borrowing/lending (at the riskfree rate), form a portfolio that will replicate the call option. How many shares of DJ will you buy/sell, and how much money will you borrow/lend?

c. (3 points) Use the portfolio derived in part (b) to price the call option.

d. (4 points) What is the beta and expected return of the call option?

e. (3 points) Using the result from part (d), show that the price of the call option found in part (c) can also be derived by discounting the expected cash flow of the option.
PART I: Multiple Choice Questions

1. C. We must have
   \[ x \tilde{a}_{3\%} = \frac{300}{(1.03)^{15}} a_{2\%}, \]
   where the equivalent semiannual interest rate \( \hat{r} \) must satisfy
   \[ (1 + \hat{r})^2 = 1.03 \quad \Rightarrow \quad \hat{r} = 1.4889157\%. \]
   Since \( \tilde{a}_{3\%} = 8.76610 \) and \( a_{2\%} = 17.1874132 \), we find \( x = 506.23 \).

2. D. The interest rate \( r \) must satisfy:
   \[ -3,000 + \frac{600}{(1 + r)^8} = -4,000 + \frac{1,900}{(1 + r)^8} \]
   \[ \Leftrightarrow \quad 1,000 = \frac{1,300}{(1 + r)^8} \]
   \[ \Leftrightarrow \quad r = \left( \frac{1,300}{1,000} \right)^{1/8} - 1 = 3.33\%. \]

3. A. First, let us find the equivalent 18-month rate \( \hat{r} \):
   \[ (1.09)^{3/2} = 1 + \hat{r} \quad \Rightarrow \quad \hat{r} = 13.79934\%. \]

   The present value \( PV \) of the annuity is therefore
   \[ PV = 100a_{3\%} = \frac{100}{0.1379934} \left[ 1 - \frac{1}{(1.1379934)^{15}} \right] = 620.43. \]

4. C. See section I.3.1 of the lecture notes.

5. D. The amount invested in real assets is given by
   \[ I = 21 \text{ million} - 15 \text{ million} = 6 \text{ million}. \]

   The slope of the straight line (capital market investment opportunities) is \(-(1 + r)\), that is
   \[ -(1 + r) = \frac{34.5}{30} \quad \Rightarrow \quad r = 15\%. \]

   Therefore, \( I/r = 40 \text{ million} \).
PART II: Essay Questions

1. (a) (4 points) The inflation rate is given by

\[ i = \frac{1 + r}{1 + R} - 1 = \frac{1.08}{1.035} - 1 = 0.0478261\%. \]

(b) (8 points) At the end of 35 year, the present value \( PV_R \) in real terms of your retirement income is

\[ PV_R = 25,000a_{\overline{35}|0.035} = 25,000 \frac{1}{0.035} \left[ 1 - \frac{1}{(1.035)^{35}} \right] = 412,037.86. \]

Since this amount is in real terms, we need to inflate it for 35 years. Therefore, the nominal amount \( PV_n \) needed in the account in 35 years is

\[ PV_n = 412,037.86(1.043478261)^{35} = 1,827,495.55. \]

(c) (8 points) The present value at time 0 of the amount needed in the account in 35 years is

\[ PV_0 = \frac{412,037.86}{(1.035)^{35}} = 123,601.83. \]

Alternatively, we could do the calculations in nominal terms:

\[ PV_0 = \frac{1,827,495.55}{(1.08)^{35}} = 123,601.83. \]

The present value of your 35 contributions should be equal to this amount. In real terms:

\[ 123,601.83 = \frac{50,000x/(1.043478261)}{0.035 - 0.02} \left[ 1 - \left( \frac{1.02}{1.035} \right)^{35} \right] \Rightarrow x = 9.6713\%. \]

Again, the calculations could have been done in nominal terms, in which case they grow at \( g = (1.02)(1 + i) - 1 = 6.4347826\%: \)

\[ 123,601.83 = \frac{50,000x}{0.08 - 0.064347826} \left[ 1 - \left( \frac{1.064347826}{1.08} \right)^{35} \right] \Rightarrow x = 9.6713\%. \]

2. (15 points) By selling the existing facility, the company would

- gain $100,000 from the sale;
- pay a tax of

\[ ($100,000 - $60,000)(40\%) = $16,000 \]

on the capital gain resulting from this sale;
- lose the yearly depreciation tax shield of

\[ \frac{$60,000}{10}(40\%) = $2,400 \]

for 10 years.
By acquiring the new facility, the company would

- pay $40,000 to buy the facility;
- gain a yearly depreciation tax shield of

\[
\frac{\$40,000}{10} \times 40\% = \$1,600
\]

tax shield for 10 years.

The present value \( PV \) of all these gains and losses represents the opportunity cost of using the existing storage capacity:

\[
PV = 100,000 - 16,000 - \frac{2,400}{0.10} \left( 1 - \frac{1}{(1.10)^{10}} \right) - 40,000 + \frac{1,600}{0.10} \left[ 1 - \frac{1}{(1.10)^{10}} \right]
\]

\[
= 39,084.35.
\]

3. (15 points) There are two equivalent approaches for solving this problem: (i) repeat the cash flows to infinity (which is already done for alternative A), and calculate and compare the net present values; (ii) Calculate and compare the equivalent annual costs of the three alternatives. Let us use the second approach.

A. The present value of the costs is

\[
PV_A = 12,000 + \frac{500}{0.10} = 17,000.
\]

The equivalent annual cost \( C_A \) must solve

\[
17,000 = \frac{C_A}{0.10} \Rightarrow C_A = 1,700.
\]

B. The present value of the costs is

\[
PV_B = 5,000 + \frac{1,000}{0.10} \left[ 1 - \frac{1}{(1.10)^{20}} \right] = 13,513.56.
\]

The equivalent annual cost \( C_B \) must solve

\[
13,513.56 = \frac{C_B}{0.10} \left[ 1 - \frac{1}{(1.10)^{20}} \right] \Rightarrow C_B = 1,587.30.
\]

C. The present value of the costs is

\[
PV_C = 3,500 + \frac{1,200}{0.10} \left[ 1 - \frac{1}{(1.10)^{15}} \right] = 12,627.30.
\]

The equivalent annual cost \( C_C \) must solve

\[
12,627.30 = \frac{C_C}{0.10} \left[ 1 - \frac{1}{(1.10)^{15}} \right] \Rightarrow C_C = 1,660.16.
\]
Therefore, alternative B is the best alternative, since it involves the lowest costs.

4. (a) (6 points) Since the price of every bond must be the sum of its discounted cash flows, the discount factors must solve:

\[ 100DF_1 + 8DF_1 + 108DF_2 = 92.00 \quad (1) \]
\[ 8DF_1 + 108DF_2 = 101.32 \quad (2) \]

Using (1), we have \( DF_1 = 0.92 \). Using this value for \( DF_1 \) in (2), we get

\[ DF_2 = \frac{101.32 - 8(0.92)}{108} = 0.87. \]

(b) (4 points) The discount factors can be written as

\[ DF_t = \frac{1}{(1 + r_t)^t}. \]

Therefore,

\[ r_1 = \frac{1}{DF_1} - 1 = 8.69565\%, \text{ and} \]
\[ r_2 = \frac{1}{DF_2^{1/2}} - 1 = 7.21125\%. \]

(c) (7 points) The bond that you would like to purchase will pay 6%($10,000) = $600 at the end of the first year, and $10,600 at the end of the second year. Let us form a portfolio containing a quantity \( n_A \) of bond A, and \( n_B \) of bond B. We would like this portfolio to pay $600 at the end of the first year, and $10,600 at the end of the second year. Mathematically we would like \( n_A \) and \( n_B \) to satisfy:

\[ 100n_A + 8n_B = 600 \quad (1) \]
\[ 108n_B = 10,600 \quad (2) \]

Using (2), we have \( n_B = \frac{10,600}{108} = 98.148148 \). Using this value for \( n_B \) in (1), we get

\[ n_A = \frac{600 - 8(98.148148)}{100} = -1.851852. \]

Therefore, the portfolio that would replicate the 6% coupon bond would consist in selling 1.851852 units of bond A, and buying 98.148148 units of bond B.

(d) (i) (3 points) The yield on a zero-coupon bond with a maturity of \( t \) years is simply the \( t \)-year spot rate. Therefore the yield \( y_A \) of bond A is \( y_A = r_1 = 8.69565\% \).

(ii) (5 points) The yield to maturity \( y_B \) for bond B has to satisfy

\[ 108 = \frac{8}{1 + y_B} + \left( \frac{108}{1 + y_B} \right)^2 \implies 108x^2 + 8x - 101.32 = 0, \text{ where } x = \frac{1}{1 + y_B}. \]

Solving for \( x \) using the quadratic equation formula, we find

\[ \frac{1}{1 + y_B} = x = \frac{-8 \pm \sqrt{(8)^2 - 4(108)(-101.32)}}{2(108)} = 0.9327379. \]

Solving for \( y_B \) (ignoring the “minus” root, which has no economic meaning), we find

\( y_B = 7.26721\%. \)
Part I: Multiple Choice Questions

1. A. We know from Black-Scholes that the price of a call option with strike $X$ maturity $T$ is

$$C_0 = S_0 N(x) - \frac{X}{(1 + r_f)^T} N(x - \sigma \sqrt{T}).$$

We can then find the price of the put by using the put-call parity relationship:

$$P_0 = C_0 - S_0 + \frac{X}{(1 + r_f)^T}$$

$$= S_0 N(x) - \frac{X}{(1 + r_f)^T} N(x - \sigma \sqrt{T}) - S_0 + \frac{X}{(1 + r_f)^T}$$

$$= \frac{X}{(1 + r_f)^T} \left[ 1 - N(x - \sigma \sqrt{T}) \right] - S_0 \left[ 1 - N(x) \right].$$

2. E. (I) FALSE. In a perfect capital market, the capital structure of a firm does not affect its value. (II) TRUE. The advantage of debt financing comes from the very fact that less taxes are being paid. (III) FALSE. Equity financing is better if $(1-t_E)(1-t_c) > (1-t_D)$. This is not always the case when $t_E < t_D$: if $t_c$ is large enough, the inequality goes the other way, and debt financing is more advantageous.

3. E. The interest payment at the end of the year is $0.09 \times 50 = 4.5$. This amount is expected to shield $0.35 \times 4.5 = 1.575$ of the firm’s profits from taxes. The present value of this amount is $1.575/1.09 = 1.445$.

4. C. It can be shown graphically that the last two strategies will give you the desired position. The first one is incorrect for $S_T > 60$ (the slope after that point is 2, not 1, as desired).

5. B. The value of the unlevered company (before the debt issue) is

$$V_U = \frac{(1 - 0.4)3,000,000}{0.15} = 12,000,000.$$

The value of the levered company (after the debt issue) will be

$$V_L = V_U + t_cD = 12,000,000 + 0.4(3,750,000) = 13,500,000.$$

The new equity value will be

$$E = V_L - D = 13,500,000 - 3,750,000 = 9,750,000.$$
Letting $n$ denote the number of shares repurchased and $S$ the new price per share, we must have

$$ns = 3,750,000$$

$$(300,000 - n)S = 9,750,000$$

Solving for $n$ and $S$ gives $n = 83,333.33$ and $S = 45$.

**PART II: Essay Questions**

1. (20 points total)

   (a) (2 points) We have $D_L = 130,000$ and $E_L = 50,000 \times 6.11 = 305,500$, so that $V_L = D_L + E_L = 435,500$.

   (b) (3 points) The value of the equity can be obtained by discounting the after-tax earnings that will be received by the shareholders:

   $$E_L = \frac{(1 - t_c)(EBIT - r_D D_L)}{r_E}.$$  

   This implies

   $$r_E = \frac{(1 - t_c)(EBIT - r_D D_L)}{E_L}$$

   $$= \frac{(1 - 0.35)[102,000 - (0.12)(130,000)]}{305,500}$$

   $$= 18.38298\%.$$  

   (c) (2 points) Stiphila’s weighted average cost of capital is

   $$WACC = (1 - t_c)r_D \frac{D_L}{V_L} + r_E \frac{E_L}{V_L}$$

   $$= (1 - 0.35)(0.12)\frac{130,000}{435,500} + (0.1838298)\frac{305,500}{435,500}$$

   $$= 15.22388\%.$$  

   (d) (2 points) The value of the firm can also be obtained as follows:

   $$V_L = \frac{(1 - t_c)EBIT}{WACC} = \frac{(1 - 0.35)102,000}{0.1522388} = 435,500.$$  

   (e) (2 points) Let us denote by primed variables all the quantities after the new debt issue. The firm’s value will go up by the present value of its additional tax shields:

   $$V_L' = V_L + t_c (D'_L - D_L) = 435,500 + 0.35(260,000 - 130,000) = 481,000.$$
(f) (4 points) The equity is now worth
\[ E'_L = V'_L - D'_L = 481,000 - 260,000 = 221,000. \]
As before, the value of the equity can be obtained by discounting the after-tax earnings that will be received by the shareholders:
\[ E'_L = \frac{(1 - t_c)[EBIT - (0.12)(130,000) - (0.14)(130,000)]}{r'_E}. \]
This implies
\[ r'_E = \frac{(1 - t_c)[EBIT - (0.12)(130,000) - (0.14)(130,000)]}{E'_L} \]
\[ = \frac{(1 - 0.35)[102,000 - (0.12)(130,000) - (0.14)(130,000)]}{221,000} \]
\[ = 20.05882\%. \]

(g) (2 points) The shareholders are better off because their wealth went from $305,500 (in equity only) to $351,000 ($221,000 in equity, and $130,000 in cash from the debt issue).

(h) (3 points) Stiphla’s new weighted average cost of capital will be given by
\[ WACC' = (1 - t_c)(12\%) \frac{130,000}{481,000} + (1 - t_c)(14\%) \frac{130,000}{481,000} + r'_E \frac{221,000}{481,000} = 13.78378\%. \]
Equivalently, the total debt of $260,000 is issued at an average rate of \( \frac{12\% + 14\%}{2} = 13\% \), so that
\[ WACC' = (1 - t_c)(13\%) \frac{260,000}{481,000} + r'_E \frac{221,000}{481,000} = 13.78378\%. \]
Finally, the firm’s weighted average cost of capital can also be found by using the fact that the firm’s value is given by the after-tax earnings discounted at the WACC:
\[ V'_L = \frac{(1 - t_c)EBIT}{WACC'} \quad \Leftrightarrow \quad WACC' = \frac{(1 - 0.35)102,000}{481,000} = 13.78378\%. \]

(10 points total)

(a) (5 points) Every year, the investor receives $10, which is taxed at 30%. So, after taxes, the investor receives $7 each year. At the end of year 10, the investor will sell his share of firm A for $100, and so will not have any capital gain. His annual after-tax return on his $100, is therefore \( \frac{7}{100} = 7\% \).
(b) (5 points) The investor will not receive any money until year 10, at which point he will sell his share of firm B for $100\times (1.10)^{10} = 259.37$. The capital gains of $259.37 - 100 = 159.37$ will then be taxed at 30%. Therefore, the annual after-tax rate of return $r$ satisfies
\[
(1 + r)^{10} = \frac{259.37 - 0.30(159.37)}{100} \iff r = 7.781%.
\]

3. (25 points total) We are given $r_f = 0.10$, $r_m = 0.18$, and $t_c = 45\%$.

(a) (8 points) Let us first calculate the expected return on TG’s stock using the CAPM:
\[
r_E = r_f + (r_m - r_f)\beta_E = 0.08 + (0.18 - 0.08)(1.5) = 0.23.
\]

TG is financed with $100,000 \times $12.50 = $1,250,000$ of equity and $750,000$ of debt, i.e., $E = 1,250,000$, $D = 750,000$, $V = D + E = 2,000,000$, $D/V = 0.375,$ and $E/V = 0.625$. This means that the present value of its tax shields is $t_c \times D = 0.45 \times 750,000 = 337,500$, and the value of its assets is
\[
A = V - \text{PV(tax shields)} = 2,000,000 - 337,500 = 1,662,500.
\]

In other words, a fraction $1,662,500 = 0.83125$ of the firm’s value comes from its assets, and a fraction $1 - 0.83125 = 0.16875$ comes from its tax shields. Since the firm’s tax shields have the same risk as its debt, we have
\[
0.83125r_A + 0.16875r_D = 0.375r_D + 0.625r_E
\]
\[
\iff 0.83125r_A + 0.16875(0.11) = 0.375(0.11) + 0.625(0.23)
\]
\[
\iff r_A = 0.2002.
\]

Since the project has the same risk as TG’s assets, the appropriate discount rate is $r = r_A = 0.2002$.

Note that this rate could also have been calculated by unlevering TG’s weighted average cost of capital (WACC). Indeed, TG’s WACC is
\[
\text{WACC}_L = (1-t_c)r_D \frac{D}{V} + r_E \frac{E}{V} = (1-0.45)(0.11)(0.375) + (0.23)(0.625) = 0.1664375.
\]

Since \(\text{WACC}_L = \text{WACC}_U (1 - t_c \frac{D}{V})\), we have
\[
r_A = \text{WACC}_U = \frac{\text{WACC}_L}{1 - t_c \frac{D}{V}} = \frac{0.1664375}{1 - (0.45)(0.375)} = 0.2002.
\]

(b) (17 points) The adjusted present value (APV) of the project is given by
\[
\text{APV} = -750,000 + \text{NPV(project)} + \text{PV(interest tax shields)} - \text{PV(after-tax issuance costs)}.
\]
In each of the project’s five years, the after-tax cash flows will be

\[ CF = (\text{after-tax profits}) + (\text{depreciation tax shields}) \]
\[ = 360,000(1 - t_c) + t_c \left( \frac{750,000}{5} \right) \]
\[ = 360,000(1 - 0.45) + 0.45(150,000) \]
\[ = 265,500. \]

Therefore, using the discount rate \( r \) calculated in part (a), we have

\[ \text{NPV(} \text{project)} = 265,500 a_{5|0.2002} = \frac{265,500}{0.2002} \left[ 1 - \frac{1}{(1.2002)^5} \right] = 793,613.59. \]

Note that it could also be argued that the depreciation tax shields should be discounted at a rate lower than \( r \), since they are not directly part of the project. For example, we could discount them at \( r_D = 10\% \), since the company will benefit from these tax shields in the same years that it will benefit from the interest tax shields. They are also often discounted at \( r_f = 8\% \) in practice. In the first case you would then get

\[ \text{NPV(} \text{project)} = 360,000(1 - 0.45)a_{5|0.2002} + 0.45(150,000)a_{5|0.10} = 847,725.53. \]

In the second case, you would get

\[ \text{NPV(} \text{project)} = 360,000(1 - 0.45)a_{5|0.2002} + 0.45(150,000)a_{5|0.08} = 861,355.35. \]

The present value of the interest tax shields can be calculated using the following table:

<table>
<thead>
<tr>
<th>Year</th>
<th>Debt outstanding at start of year</th>
<th>Interest</th>
<th>Interest tax shield</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>750,000</td>
<td>75,000</td>
<td>33,750</td>
</tr>
<tr>
<td>2</td>
<td>600,000</td>
<td>60,000</td>
<td>27,000</td>
</tr>
<tr>
<td>3</td>
<td>450,000</td>
<td>45,000</td>
<td>20,250</td>
</tr>
<tr>
<td>4</td>
<td>300,000</td>
<td>30,000</td>
<td>13,500</td>
</tr>
<tr>
<td>5</td>
<td>150,000</td>
<td>15,000</td>
<td>6,750</td>
</tr>
</tbody>
</table>

Therefore, we have

\[ \text{PV(} \text{interest tax shields)} = \frac{33,750}{1.10} + \cdots + \frac{6,750}{(1.10)^5} = 81,621.89. \]

Finally, the after-tax issuance costs are

\[ \text{PV(} \text{after-tax issuance costs)} = 4\% \times 750,000 \times (1 - 0.45) = 16,500. \]

The adjusted present value of the project is therefore

\[ \text{APV} = -750,000 + 793,613.59 + 81,621.89 - 16,500 = 108,735.48. \]
4. (20 points total) We are given $\beta_s = 0.75$, $r_f = 0.105$, and $r_m = 0.165$.

(a) (4 points) Using the CAPM, the expected return on the stock is

$$r_s = r_f + (r_m - r_f)\beta_s = 0.105 + (0.165 - 0.105)(0.75) = 0.15.$$  

We can find $S_0$, the current price of the stock, by discounting the expected cash flow from the stock at $r_s$:

$$S_0 = \frac{290(0.5) + 170(0.5)}{1.15} = 200.$$  

(b) (6 points) In the up state, the option will be exercised and will pay $290 - 212 = 78$. In the down state, the option will not be exercised; the payoff is therefore zero. Let us form a portfolio by buying $\Delta$ shares of DJ’s stock, and by lending $\$B$. In the up (down) state, this portfolio pays $290\Delta + 1.105B$ ($170\Delta + 1.105B$). We want

$$290\Delta + 1.105B = 78; \quad 170\Delta + 1.105B = 0.$$  

Solving for $\Delta$ and $B$, we find $\Delta = 0.65$ and $B = -100$. This means that the call option can be replicated by buying 0.65 shares of the stock, and borrowing $\$100$.

(c) (3 points) Since the portfolio has exactly the same payoff as the call option, its cost ($200\Delta + B$) should be the price of the call option in a well-functioning market:

$$C_0 = 200\Delta + B = 200(0.65) + (-100) = 30.$$  

(d) (4 points) Since the call option is a portfolio of the stock and riskfree borrowing, the beta of the call option, $\beta_c$, is given by

$$\beta_c = \frac{200(0.65)}{30}\beta_s + \frac{-100}{30}r_f$$

$$= \frac{200(0.65)}{30}(0.75) + \frac{-100}{30}(0)$$

$$= 3.25.$$  

The expected return $r_c$ on the call option can then be obtained using the CAPM:

$$r_c = r_f + (r_m - r_f)\beta_c = 0.105 + (0.165 - 0.105)(3.25) = 0.30.$$  

(e) (3 points) The expected payoff of the call option is $78(0.5) + 0(0.5) = 39$. The price of the option should therefore be

$$C_0 = \frac{39}{1 + r_c} = \frac{39}{1.30} = 30.$$
Macroeconomics and the Global Economic Environment (FNCE613)
(formerly FNCE602)
SAMPLE EXAM

Instructions

DO NOT OPEN BOOKLET UNTIL TOLD TO BY PROCTOR

THERE ARE TWELVE (12) PAGES TO THIS EXAM

1. You must answer all questions on this examination.

2. This is a closed-book exam. Only calculators may be used.

3. Please write in pen. Cross out material that you do not wish to use as your answer.

NO REGRADES WILL BE ACCEPTED FOR EXAMS WRITTEN WITH PENCIL.

<table>
<thead>
<tr>
<th>PART</th>
<th>Maximum Points</th>
<th>YOUR POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>VI</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>VII</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>108</td>
<td></td>
</tr>
</tbody>
</table>

Point Allocation
PART I. MONETARY POLICY

On April 17, 2002 Alan Greenspan, Chairman of the Federal Reserve, testified before the U.S. Joint Economic Committee. In his testimony he said:

“To be sure, over time, the current accommodative stance of monetary policy is not likely to be consistent with maintaining price stability. But prospects for low inflation and inflation expectations in the period ahead mean that the Federal Reserve should have ample opportunity to adjust policy to keep inflation pressures contained once sustained, solid, economic expansion is in view.”

A. What did Mr. Greenspan mean by “the current accommodative stance of monetary policy?” Be specific by indicating what short-term real rates are consistent with an “accommodative policy.” Is the U.S. now in that situation? (3pts.)

B. The following is the behavior of the term structure of interest rates from before to after his testimony:

<table>
<thead>
<tr>
<th>MATURITY</th>
<th>BEFORE TESTIMONY</th>
<th>AFTER TESTIMONY</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Mo</td>
<td>1.731</td>
<td>1.709</td>
</tr>
<tr>
<td>6 Mo</td>
<td>1.976</td>
<td>1.916</td>
</tr>
<tr>
<td>2 Yr</td>
<td>3.374</td>
<td>3.357</td>
</tr>
<tr>
<td>5 Yr</td>
<td>4.526</td>
<td>4.531</td>
</tr>
<tr>
<td>10 Yr</td>
<td>5.190</td>
<td>5.225</td>
</tr>
<tr>
<td>30 Yr</td>
<td>5.662</td>
<td>5.725</td>
</tr>
</tbody>
</table>

1. What happened, in one word, to the “term structure of interest rates” from before to after his testimony? (2 pts.)

2. Why did the 3-month and 6-month treasury bills decline in yield, given that Greenspan gave absolutely no indication that he would reduce the Fed Funds rate? (2 pts.)

3. Why did long rates rise from before to after his testimony? (2 pts.)

4. Would you say that the behavior of the term structure of interest rates showed much confidence or little confidence in Greenspan’s assessment of the economic situation? Explain. (2 pts.)
The following is the Fed Funds futures market and the change on the day. Each contract represents the average closing Fed funds rate during all business days of the month.

<table>
<thead>
<tr>
<th>MONTH OF CONTRACT</th>
<th>CLOSING RATE</th>
<th>CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr 02</td>
<td>1.775</td>
<td>unch</td>
</tr>
<tr>
<td>May 02</td>
<td>1.775</td>
<td>unch</td>
</tr>
<tr>
<td>Jun 02</td>
<td>1.810</td>
<td>-.010</td>
</tr>
<tr>
<td>Jul 02</td>
<td>1.905</td>
<td>-.045</td>
</tr>
<tr>
<td>Aug 02</td>
<td>2.050</td>
<td>-.060</td>
</tr>
<tr>
<td>Sep 02</td>
<td>2.230</td>
<td>-.080</td>
</tr>
<tr>
<td>Oct 02</td>
<td>2.405</td>
<td>-.080</td>
</tr>
<tr>
<td>Nov 02</td>
<td>2.665</td>
<td>-.080</td>
</tr>
<tr>
<td>Dec 02</td>
<td>2.830</td>
<td>-.080</td>
</tr>
<tr>
<td>Jan 03</td>
<td>3.075</td>
<td>-.080</td>
</tr>
</tbody>
</table>

The remaining meetings of the FOMC in 2002 are May 7, June 26, August 13, September 24, November 6, and December 10. Assume that the Fed only changes the Fed funds rate at these meetings and changes of only 25 bps are contemplated.

1. What is the market’s estimate of the probability that the FOMC will raise rates at the June meeting, assuming the market does not expect a change in May? (3 pts.)

2. How did your answer to (a.) change from before to after Greenspan’s testimony? (1 pt.)

3. Assume you know that the risk premium is +2 bps for May and 2 bps higher for each succeeding month. What is your answer to (a.) above? (2 pts.)

4. How would your estimate of the probability in (c.) change if the Fed could change the funds rate in-between meetings? (1 pt.)

5. Would it be approximately accurate to say that the market expects the Fed to start increasing interest rates at its August meeting and continue to increase rates by 25 bps at each succeeding meeting? Explain by referring to the rate that would exist at the end of the year. (2 pts.)
PART II. TRUE OR FALSE?
Are the following statements about macroeconomic theory TRUE or FALSE?

Circle the appropriate answer. No explanation needed. (1 pt. each)

a. A permanent increase in the rate of growth of the money supply will increase long-term interest rates, all other factors holding equal.
   T   F

b. Inflation will occur whenever the money supply is rising as long as real income remains constant.
   T   F

c. Unexpected central bank easing has an uncertain effect on the price of long term bonds.
   T   F

d. The “currency” component in M1 consists of all Federal Reserve notes held only by United States households and firms, but excludes notes held by banks.
   T   F

e. Most economists now agree that the government cannot control the unemployment rate in the long run through macroeconomic demand policy.
   T   F

f. In the final stages of hyperinflation, the real money supply increases dramatically.
   T   F

g. The levels of the Fed funds rates found directly from the prices in the futures markets are apt to be underestimates of the true expectations of investors.
   T   F

h. If relative purchasing power parity does not exist, then the interest rate parity equation is not likely to hold.
   T   F

i. In a dynamic DDDR model, an open market purchase will not change the nominal interest rate or the level of income in the long run.
   T   F

j. The best short-term predictor of exchange rate changes is the difference between the two countries' inflation rates.
   T   F
PART III. SHORT ANSWER QUESTIONS

Answer EACH of the following questions. (12 pts.)

A. One of the great debates in economics is whether an increase in the growth of output is inflationary or not, holding the money supply constant. In a DDRR model, what are the important conditions to decide the answer to this question? In a Velocity framework, what are the important criteria? (4 pts.) Explain your answers.

B. Name two important economic theories that tend to hold more in the long-run than in the short-run. Identify them, describe what they are and explain why don’t they hold in the short-run. (4 pts.)

C. If one looks at a graph of unemployment rates and inflation over the last 50 years, there appears to be no relation between the variables. Yet much macroeconomic theory is based on the “Phillips’ Curve” analysis, which postulates a negative relation. Is there a way to reconcile this contradictory information? (4 pts.)

PART IV. DYNAMIC DDRR EQUILIBRIUM

Describe what happens to each of these four variables in both the short run and the long run: (1) real income, (2) the nominal interest rate, (3) the price level, and (4) the nominal spot exchange rate (foreign currency units per domestic unit), under each of the following three situations. Use DDRR diagrams to illustrate your answer. (24 pts.)

Assumptions: Start from a DDRR equilibrium where \( y = y_s \) and \( \pi = 0 \). Assume that in the long-run PPP* holds with foreign inflation set equal to zero. Assume that in the short run the exchange rate is influenced by income and the interest rate.

Place the following symbols in the boxes if a variable

<table>
<thead>
<tr>
<th>rises</th>
<th>+</th>
</tr>
</thead>
<tbody>
<tr>
<td>falls</td>
<td>-</td>
</tr>
<tr>
<td>unchanged</td>
<td>0</td>
</tr>
<tr>
<td>uncertain</td>
<td>?</td>
</tr>
</tbody>
</table>

When describing the short-run, compare to the initial position. When describing the long-run position of a variable, compare it to both the original or initial position and the short-run position. Correct Diagram is worth 2 pts each and each box is worth 1/2 point.
A. The central bank engages in an open market purchase

B. There is a permanent increase in optimism of consumers and the central bank simultaneously stabilizes the short-term interest rate.
C. There is a tax reduction that impacts both the demand and supply of output, but impacts the demand more than the supply.

![Diagram showing supply and demand curves](image)

### PART V. DDRR EQUILIBRIUM (11 pts.)

**Assume the following:**
1. The marginal propensity for consumers to spend out of disposable income is 3/4.
2. All spending is sold from inventories in the initial period and replenished by producers the next period.

**A. Assume the government increases spending on national defense by $10 billion, the Fed keeps short-term interest rates constant, and there are no other shocks to the economy.**

1. What is the numerical value of the change in (a.) GDP and (b.) Final Sales (6 pts.)
   - i. In the first period
   - ii. In the second period
   - iii. After many, many periods

2. How would your answer to (A. 1. iii.) above change qualitatively if the Fed did not do any open market operations? Explain your answer. (2 pts.)

3. How much would your answer to (A. 1. iii.) change if the Fed did not do any open market operations and the economy is in a “liquidity trap” both before and after the increase in expenditures? Explain your answer using economics and then illustrate your answering using DDRR diagrams. (3 pts.)
PART VI. MARKET REACTIONS

Assume a dollar-based investor holds three portfolios:

A. Long-term U.S. bonds
B. U.S. equities
C. Short-term, non-dollar denominated assets (foreign money market assets)

Circle what will happen to the dollar value of each of these portfolios (Up, Down, No Change, or Uncertain) in each of the following situations: (3 points each)

1. PMI Index 58, consensus 52.

   A. Up  Down  No Change  Uncertain
   B. Up  Down  No Change  Uncertain
   C. Up  Down  No Change  Uncertain

2. CPI Up .7%, expected up .6%; CPI core up .1%, expected up .2%.

   A. Up  Down  No Change  Uncertain
   B. Up  Down  No Change  Uncertain
   C. Up  Down  No Change  Uncertain

3. September Fed funds just before meeting 97.37, Fed decides to keep rates unchanged at 2.75%.

   A. Up  Down  No Change  Uncertain
   B. Up  Down  No Change  Uncertain
   C. Up  Down  No Change  Uncertain
PART VII. TWO COUNTRY PROBLEM (22 pts.)

Answer all parts of the following question. You must show ALL your work to get any credit. Assume two countries, A and B. Country A’s currency is called the alabar and Country B’s the bando. You are given the following data, and are told that real income is measured in 1992 prices. In 1992 the exchange rate was 1 alabar = 2 bando.

\[ P = \text{price level index; } y = \text{real income; } i = \text{1 year market interest rate.} \]

\[ \text{Es} = \text{spot exchange rate (bando/alabar), } \text{E}_F = \text{one year forward rate, } M = \text{Money supply.} \]

<table>
<thead>
<tr>
<th>COUNTRY A</th>
<th>COUNTRY B</th>
</tr>
</thead>
<tbody>
<tr>
<td>(M)</td>
<td>(p)</td>
</tr>
<tr>
<td>Base Year 1992</td>
<td>40</td>
</tr>
<tr>
<td>May 2002</td>
<td>?</td>
</tr>
<tr>
<td>Forecast May 2003</td>
<td>+8%*</td>
</tr>
</tbody>
</table>

* = inflation rate from May 2002 to May 2003

1. Assume that in 1992 the velocity of money in Country A is .05 and in Country B is .08.
   a. Derive the price level for both Countries A and B in 1992. (2 pts.)

   b. If we assume the exchange rate followed PPP* from 1992 through 2002, Can we derive the price level for Country A and/or Country B. If yes, do so, and if not explain why not. (2 pts.)
c. Assume that the price level in May 2002 in Country B is 48. Compute the price level in Country A in that same year.

d. If we assume that the Quantity Theory of Money held between 1992 and 2002, derive the Money Supply in May 2002 in countries A and B.

2. a. Is PPP\,* forecast to prevail from May 2002 to May 2003? Explain. (2pts.)

b. Is the nominal exchange rate of the alabar forecast to appreciate or depreciate from May 2002 to May 2003? Explain. (2 pts.)

c. Is the real exchange rate of the alabar expected to appreciate or depreciate from May 2002 to May 2003? Explain your answer. (2 pts.)

d. Give two economic reasons why the real exchange rate of the alabar is expected to move in this direction. (2 pts.)

3. a. Calculate the one-year forward rate of exchange of the alabar in May 2002. (2 pts.)
b. What forecast rate of return will an alabar-based investor earn from May 2002 to May 2003 by investing in Country B without hedging his investment? Explain. (2 pts.)

c. (2 pts.) What is the forecast rate of return of a bando-based investor in May 2002 if she hedges her investment in Country A? Explain. (2 pts.)
FORMULA

\[(1 + \theta_1)(1 + \theta_2^f) = (1 + \theta_2^e)^2; \quad \sqrt{(1 + \theta_1)(1 + \theta_2^e)} + L_2 = (1 + \theta_2)\]

\[MV = Py;\]

\[R_s = R_s^o + a_s i,\]

\[R_d = R_d^o - a_d i + cy;\]

\[D = C + I + G + NE = D_0 + dy - bi - b_i i_t\]

\[y = \left[D_0 - (b/a)(R_d^o - R_s^o) - b_i i_t\right]/(1 - d + bc/a), \text{ where } a = a_s + a_d.\]

\[g_p = a(y - y_s) + \pi\]

\[i = r + \pi + r \pi\]

\[E_f = E_s (1 + i_f)/(1 + i_d),\]

or % Forward Premium \(\approx i_f - i_d\)
Sample Exam Answers FNCE613

PART I. MONETARY POLICY

A. Low real rates are accommodative (1 pt.), specifically less than the average, about 2% (1 pt.). Currently Fed Funds 1.75%, inflation 1 1/2% to 2 1/2%, so real rate zero or negative, US is in that situation currently (1 pt.).

B. 1. Steepened

2. Bill rates contain **expectations of future funds rates** which declined as a result of Greenspan's testimony

3. Worries that Fed is too accommodative and Fed policy will increase future inflation

4. **Little confidence** (1 pt.), otherwise market would not fear inflation (1 pt.). Greenspan appears “behind the curve.”

C. 1. July first month after June meeting, July rate 1.905, current rate 1.75%, so there is a 62% **probability** (15 1/2 x 4% per bp) if no risk premium, if risk premium positive, **probability < 62%**.

2. Probability went down by 4 times (-.045) or 18 percentage points after testimony (44% or less probability)

3. Risk premium in July is 6 bps, so probability is 62% - 24% or 38%

4. If the Fed could change the funds rate between meeting, **probability goes down of a change at a meeting**.

5. **Yes, it would be accurate**, at end of year, there would have been 4 meetings since June, so rate would be 2.75%, this approximately corresponds to 2.83% in December after risk premium is subtracted.

PART II. TRUE OR FALSE?

a.  **T**

b.  **F** (velocity could change)

c.  **T**
d. F (includes foreign currency holdings)

e. T

f. F (real money falls, prices go up faster than money)

g. F (overestimates with risk premium)

h. F (arbitrage relation, does not depend on theory)

i. T

j. F (investment and speculative changes best short-term predictor)

PART III. SHORT ANSWER QUESTIONS

Answer EACH of the following questions. (12 pts.)

A. In a dynamic DDRR model, it depends on whether $y > y$, in other words if the increase in aggregate supply is greater than the increase in aggregate demand. If the former, prices will decline, otherwise prices will rise. In a Velocity framework the question is whether velocity rises enough to offset the deflationary effect of an increase in $y$, i.e., whether $g_v > g_y$.

B. The two theories are (Relative) purchasing power parity (or relative purchasing power parity) and the Quantity Theory of Money. PPP* does not hold since in the short run because speculative and investment demands dominate, and the Quantity theory does not hold since the velocity is unstable. Less good answers include NAIRU and $y_s$.

C. In the short run (except for Rational Expectation) there is a short run Phillips Curve for a given level of inflationary expectations, $\pi$. But as $\pi$ rises and falls, the Phillips Curve also shifts, so that in the long run there appears to be no correlation.
PART IV. DYNAMIC DDRR EQUILIBRIUM

A.

The RR curve shifts down, economy goes to B, but since $y > y_s$, prices rise and the economy returns to A (C). In the short run since $y$ goes up that is positive for the exchange rate but $i$ shifts down, that is negative and the result is ambiguous. In the long run, since prices rise, the exchange rate must fall (because of the PPP* assumption).

B.

RR and DD curves shift right by equal amounts to B, so that interest rates are unchanged. Since $y > y_s$, prices rise and RR shifts up to point C. In the short run income rises, that is positive for the exchange rate, but in the long run prices rise and that is negative.
C. There are 4 possible correct answers to this question.

CASE 1: Deflationary Case

<table>
<thead>
<tr>
<th>SHORT RUN</th>
<th>LONG RUN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative to Initial</td>
<td>Relative to Initial</td>
</tr>
<tr>
<td>$y$</td>
<td>$+$</td>
</tr>
<tr>
<td>$i$</td>
<td>$+$</td>
</tr>
<tr>
<td>$p$</td>
<td>$0$</td>
</tr>
<tr>
<td>$E_s$</td>
<td>$+$</td>
</tr>
</tbody>
</table>

CASE 2: Inflationary Case

<table>
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CASE 3: Stable Prices Case

\[ D \quad D' \quad R \quad R' \]

\[ i \quad A \quad B \quad C \]

\[ y_s \quad y'_s \]

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CASE 4: Realizes the multiple scenarios above

\[ D \quad D'' \quad R'' \quad R''' \]

\[ i \quad A \quad B \quad C \]

\[ y_s \quad y'_s \]

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PART V. DDRR EQUILIBRIUM (11 pts.)

A. 1. Government purchases rise by $10B, but this is all sold from inventories, so that GDP is unchanged, but final sales are up $10B. ii. In the second period, the $10B of inventories are produced, so GDP is up $10B replacing lost inventories. This creates $10B in income, and $7.5B is used for further consumption (which results in an inventory drawdown of $7.5B). So GDP is up by $10B and Final sales are up an additional $7.5B, or $17.5B total. iii. After many, many periods the Keynesian multiplier prevails, and the multiplier is $1/(1–3/4)$, or 4, so GDP and final sales will both rise by $40B.

2. If the Fed did not do open market purchases, then the interest rate would rise, and aggregate demand would not rise by as much as in A. The answer would be $\leq$ $40B.

3. If the Fed did not do any open market operations the LM curve would be flat, and the rightward movement of the DD curve would be equal to the change in income. Since the interest rate stays at zero, the full effect of the multiplier is felt and the answer is that income would rise by $40B.

See Diagram Below.

![Diagram](https://via.placeholder.com/150)

PART VI. MARKET REACTIONS

1. A. Down, stronger than expected Purchasing Managers interest, interest rates up.
   B. Uncertain, stocks can react either way to stronger than expected data
   C. Dollar up, so foreign portfolio down.

2. A. Up. The core is more important than the overall, so that the lower than expected number will increase bond prices.
   B. Up, Stocks up since stock react well to low inflation
   C. Uncertain. Dollar can go up or down so that foreign portfolio uncertain.
3. A. Uncertain. Market thought there was a possibility of an easing, since Fed Funds 2.63%. But the Fed didn’t ease. Effect on the Long Bond is uncertain.

B. Down. Stocks will go down since stocks react badly when CB does not ease

C. Uncertain. Dollar can go up or down in response to surprise CB action.

PART VII. TWO COUNTRY PROBLEM (22 pts.)

1. a. Use \( MV = Py \), and, substituting, \( P \) in Country A = 2 and \( P \) in Country B = 8.

b. No. \( \text{PPP}^* \) only tells the relative rates of inflation. We know that the bando devalued by a factor of three, so that the price level in B went up three times more than A but we don’t know the absolute value.

c. If we know that the price level in B is 48, then it has gone up 6 times. Then from (b.) above we know that in country A the price level has gone up two times, so \( p = 4.0 \).

d. If the Quantity Theory of Money held, then the velocity is constant in both countries over this time period. Substituting into the Equation of Exchange, \( MV = py \), we get \( M \) in A = 400 and \( M \) in B = 3600.

2. a. No. A has 8% inflation and B has 4% inflation, so the difference is 4%. But the alabar is expected to depreciate by 5%, so \( \text{PPP}^* \) cannot prevail.

b. The nominal exchange rate of the alabar depreciates from 6.0 bando/alabar to 5.7 bando/alabar.

c. The alabar is expected to depreciate by 5%, which is more than \( \text{PPP}^* \) would predict so that there is an expectation of a real depreciation.

d. The expected real growth in A, at 2%, is less than expected real growth in B at 3.3%, and the expected real interest rate in A, zero (= 8% interest minus 8% inflation) is lower than the 6% real expected real return in B (10% interest minus 4% inflation).

3. a. Using IRPE, \( E_t = E_s (1+i_B)/(1+i_A) = 6^*(1.1)/(1.08) = 6.1111 \) alabar/bando.

b. An alabar based investor will earn the interest rate in B plus the expected appreciation in the bando relative to the alabar = 10% + 5% = 15%. Precisely, return is \((1.1)^*6/5.7 = 1.1579\), or a return of 15.79%.

c. A bando-based investor will earn the bando rate of return, or 10%, in A if she hedges her investment, or \( 1.08^*6.1111/6 = 1.10 \) or 10% return.
1. Managing your consulting firm

You own a small IT consulting firm with a product that helps firms manage their personnel costs. The demand for your product is:

\[
Q = 500 - 0.001 \times P
\]

Where \( Q \) is the number of annual service contracts you sell and \( P \) is the annual service fee you charge. Thus if \( P = $100,000 \), then you will sell 400 annual service contracts.

Each contract requires a team of two employees to service the contract, one on-site with the client and the other in the home office. Each employee is paid $100,000 per year. Your firm also has an annual fixed cost charge of $10,000,000 (overhead, development, rental of office space, leasing of hardware, etc.). These facts fully describe your firm’s cost structure.

To maximize the firm’s annual profits (net cash flow) you should charge a price of \__________\ per contract and at that price you can expect to have \__________\ service contracts per year. You will hire \__________\ employees to manage those contracts. Your firm’s annual profits (net cash flow) will be \__________\ per year.

2. Do we move to Greenwich?

New York City is in the midst of a fiscal crisis and their solution has been to raise the sales tax on luxury items. The tax is $250 per item and the tax is levied on the luxury store; that is, the store pays the tax. You run Tiffany’s. Here are the key facts:

Annual demand for luxury items from Tiffany’s NYC store:

\[
Q = 10,000 - P
\]

Where \( Q \) is the number of luxury items sold in the year and \( P \) is the price Tiffany’s charges for the items.

Cost of retailing luxury items in the NYC store:

\[
\text{Total Cost} = C = 500 \times Q
\]

You are upset about the tax since that seems like an increase in costs. Your marketing people tell you that there is an opportunity to relocate the NYC store in Greenwich, CT. If you relocate, your demand and costs in Greenwich will be the same as in NYC, but you can avoid the NYC sales tax.
Unfortunately, Greenwich has its own tax: A Business Privilege Tax which requires each luxury store such as Tiffany’s to pay $500,000/year. This is a fixed tax; that is, you pay no matter what your sales. Worldwide Tiffany headquarters will allow you to relocate only one store in the NY-CT metropolitan area. Do you leave NYC and relocate in Greenwich?

I (will/will not; circle one) relocate my store in Greenwich because:

3. Being a market-maker

In medieval times, face-to-face bargaining and barter trade was the common form of exchange — “I’ll give you a pair of shoes for a bushel of your corn”. But with the development of currencies, barter was replaced by trade — “I’ll give you a pair of shoes for two gold coins,” but bargaining was still very common. Unfortunately, sometimes the person who wanted to sell shoes was offered too low a price and sometimes a person who wanted shoes was asked to pay too much. This discouraged trade and often no, or very limited, trade occurred. BUT THEN CAME THE INVENTION OF MARKET EXCHANGES. The person who ran the exchange matched buyers with sellers at a common market price, trades were concluded, and everyone benefited, including the market-maker.

You arrive at a medieval commerce center and announce that you will set up a market exchange for wheat, but at a price. You will tell the farmers’ cooperative that they need to give you their supply curve for offering wheat — that is, what price they must be paid to offer their wheat — and you tell the bakers’ guild that they will need to give you their demand curve for wheat — that is, what they will pay for a wheat. The head of the Cooperative and Guild canvass their members, everyone reveals their true costs and benefits, and here is what you find.

Farmers’ Cooperative Supply Curve to Offer Wheat:

\[ Q_s = 10 \times P_s \text{–} 400; \text{ where } Q_s = 0 \text{ if } P_s \text{ is } 40 \text{ (guilder) or lower} \]

Bakers’ Demand Curve to Purchase Wheat:

\[ Q_d = 1000 \text{ –} 10 \times P_d \]

\(Q_s\) is the cartloads of wheat supplied if offered the supply price of \(P_s\) guilders per cartload and \(Q_d\) is the cartloads of wheat purchased if offered the demand price of \(P_d\) guilders per cartload. With this information, you realize you can indeed run a successful market. As a market-maker, it is your job to announce a common market price \((P_s = P = P_d)\) at which all transactions between farmers and bakers might take place.

In your best-run market, you announce a market price of _________ guilders per cartload and _________ cartloads of wheat are exchanged at that price. You then charge the Farmers’ Cooperative a lump-sum (fixed) fee of _________ for your services and the Bakers’ Guild a lump-sum (fixed) fee of _________ for your services. In the end — after trade and paying your fee — everyone (including you) agree that market-making is a valuable service.
4. **Cold winters and OJ business**

You grow oranges and you can concentrated orange juice. The concentrated orange juice market is a national market and competitive. The national market price is $3/can of OJ concentrate. You are a small producer and cannot influence this national price and this is what you are paid when you can sell a can of concentrate. You currently use a plant which has the capacity to produce 1 million cans a year. There is no thought of expanding capacity, but you want to make as much as you can each year with the existing plant. The average cost of making one can of concentrate in your plant is:

\[
\text{Your Average Cost per Can in Dollars} = AC = 1 + 5 \times (c_0)
\]

Where \(c_0\) is the cost of one orange and each can needs five oranges — that is, if it costs $.10 (10 cents) to grow an orange or to buy one in the orange market, then AC = $1.50.

You also have your own orange groves and can grow all the oranges you need (5 million) to use your plant to full capacity. Of course, you always have the option to buy or sell your oranges in the national orange market. In a typical growing year, if you grow your own oranges it costs you $.08/orange (8 cents per orange). If you buy or sell in the national orange market you will do so at the market price. Here is what you know about the national orange market:

**Market Demand for Oranges:** \(P_d = $1 - .05 \times Q\)

**Typical Winter Market Supply of Oranges:** \(P_s = .05 + .0028 \times Q\)

where \(Q\) is the total amount of oranges sold (in units of 100 million, so if \(Q = 1\), then 100 million oranges are sold), \(P_d\) is the price demanders of oranges will pay and \(P_s\) is the price that suppliers must receive in a typical growing year. *Unfortunately, this is not a typical growing year.* The weather service announces (with certainty) a cold growing season, and this will raise everyone’s costs of growing oranges. Your costs will rise from $.08/orange to $.13/orange while the prices national suppliers must receive to cover their costs rises by the same $.05/orange to:

**Cold Winter Supply of Oranges:** \(P_s = .10 + .0028 \times Q\)

What happens to your profits in this cold season compared to what they might have been had it been a “typical” growing year?

*Because of the cold growing season my profits from growing oranges and canning concentrate will (rise, remain the same, fall; circle one) by__________________ because:*
5. **The case of the engineer who knew a little economics**

You have been hired to take over the management of your firm’s main production plant. Currently the firm is very labor intensive – that’s the way things have always been done. The plant uses 1600 workers ($L = 1600$) and 9 processing and polishing machines ($K = 9$). The cost per unit of output with this style of production is $1400 per unit. From your experience in the industry, you know the production technology for making your firm’s product is:

\[
Q = L^{0.5}K^{0.5}
\]

Where $Q$ is plant output per day, $L$ is workers per day, and $K$ is machines in use per day. Thus if, $L = 1600$ and $K = 9$, the plant can produce $Q = 120$ units of output per day: $120 = (1600)^{0.5}(9)^{0.5} = 40 \times 3$. 

You also know that the current labor contract allows you to adjust the number of employees at the plant, but you must pay each employee $100/day. A processing-polishing machine can be leased at a cost of $900/day. 1

To improve plant performance how would you adjust the production process? **Whatever you decide, the plant must meet its daily production target of 120 units of output per day.**

To meet the firm production target of 120 units per day, I would recommend we hire _______ workers per day and lease _______ machines per day. This will lower our costs per unit of output to ______ per unit.

6. **Universities are businesses too!**

U.S. states are being hit by the current recession so they are looking to save expenditures and to squeeze additional revenues from all possible sources. States now subsidize higher education. You have been hired by the governor and the president of the state university to “rationalize” the pricing policy for the state university. The price in this case is the tuition charged for a year of coursework at the university. Here are the facts.

First, the admissions office (marketing department!) of the university tells you that the number of qualified applicants ($Q$) who apply and are admitted does depend on annual tuition ($T$), according to the following relationship:

\[
Q = 50,000 - 2 \times T
\]

where $T$ is measured in dollars and $Q$ is the number of qualified students who will apply and attend the university. For example, if $T = $8,000 (the current tuition), then enrollment at the university will be 34,000 students.

1 Notice that with 1600 workers at $100/day your current labor costs are $160,000 per day and with 9 machines at $900 per day your capital costs are $8,100 per day. Thus your total costs are $168,100. The plant makes 120 units and thus the average cost is $1400.83 per unit.
Second, the Provost tells you that it currently costs a constant $5,000/student to educate one student for one year. The Provost also tells you that the University has an annual charge against fixed costs (interest payments) of $152 million dollars per year, which the state now covers through a state budget contribution for higher education. The Provost has been told by the governor that in these tight times, the state can no longer make this contribution. The University is on its own financially.

What do you recommend, if your objective is to maximize the net financial position of the University? Businesses might call the “net financial position” annual profits or net cash flow, but as University types, we cannot be so unrefined. We prefer “net financial position.”

To maximize the net financial position of the university I recommend that university set a course tuition of ____________ per student. (Fortunately, unfortunately; circle one) this tuition (is, is not; circle one) sufficient to cover the university’s annual charges against fixed cost, and therefore the President will need to (hide from, still beg from; circle one) the governor a total net revenue of ____________.

7. **Who gets the new sports franchise?**

In the United States, sports franchises — football, basketball, baseball — are allocated to city locations. The current owners sell new locations of teams to new owners. So if you want a team in your city, you pay a one-time “entry-fee” to the league owners (who divide up the proceeds) for the right to join the league. Suppose L.A. is competing against Oklahoma City for a new team. As President of the National Football League (NFL) you are working on behalf of the current owners; you need to recommend one of the two cities. L.A. is a “big” market and Oklahoma City is a “small” market. Football teams earn revenues from selling seats to the games and from TV rights to broadcast the game in the local area. The costs to the team are the variable costs associated with having fans come to games and the fixed costs of paying the annual interest costs of having a football stadium. There is only one team in each city. Each team plays 10 home games each year. The demand to attend each home game is the same. You can assume all the information below is common knowledge.

**LOS ANGELES**

Demand for Tickets to Each Game: \( Q = 600,000 - 20,000 \times P \)

\( Q \) = Tickets sold and fans attending each game; \( P \) = the ticket price per game.

Variable Costs per Fan in Attendance = \( 20 \times Q \)

Fixed Cost per Year = $10 million

Annual Revenue from TV Rights = $20 million
OKLAHOMA CITY

Demand for Tickets to each Game: \( Q = 100,000 - 1,000 \times P \)
\( Q = \) Tickets sold and fans attending each game; \( P = \) the ticket price per game.

Variable Costs per Fan in Attendance = \( 10 \times Q \)
Fixed Cost per Year = $5 million (smaller stadium than LA)

Annual Revenue from TV Rights = $10 million (smaller TV market than LA)

In computing what the maximum owner might each pay for the rights to have a team in their city, you can assume the annual interest rate for alternative investment is .10 and that each team exists into perpetuity. That is, if the team makes $1 a year, then it has the same value as an alternative asset costing $10 and producing $1 a year in profits. In this case the team is worth $10 = \$1/.10.

\( (Los\ Angeles, \ Oklahoma\ City; \ circle\ one)\) will be awarded the new franchise and the owners in the winning city will pay no less than ____________ and no more than ____________ to the current league owners. In the end, I think ____________ will be paid to the league owners because:
1. The trick here is getting your total costs and total revenue correctly specified, and then your task is to calculate profit maximization as MR = MC. The costs specification is:

\[
TC = 10,000,000 + (2 \text{ employees/contract})(100,000)Q \\
TC = 10,000,000 + 200,000Q \\
MC = 200,000
\]

The total revenue specification is given once we correctly specified demand as \( P = 500,000 - 1000Q \)

\[
TR = PQ = (500,000 - 1000Q)Q = 500,000Q - 1000Q^2 \\
MR = 500,000 - 2000Q
\]

Thus:

\[
MR = 500,000 - 2,000 = 200,000 = MC \\
Q^* = 150 \text{ contracts and from demand } P^* = $350,000.
\]

Since you are servicing 150 contracts, you will need \( L = 300 \) employees. Given the values of \( Q^* \) and \( P^* \) you will find that firm profits are:

\[
\Pi = TR - TC = (500,000 - 1000 \times 150) 150 - 10,000,000 - 200,000 \times 150 = $12,500,000
\]

To maximize the firm's annual profits (net cash flow), you should charge a price of \( $350,000 \) per contract and at that price you can expect to have 150 service contracts per year. You will hire 300 employees to manage those contracts. Your firm's annual profits (net cash flow) will be \( $12,500,000 \) per year.

2. The key point in this question is to understand that taxes are a business expense and this will affect your firm decisions — often where to locate. Once costs are specified correctly inclusive of taxes, you need to maximize firm profits and make your decision.

First, in the case of NYC, your costs will be:

\[
TC = 500Q + \text{Taxation} = 500Q + 250Q = 750Q \\
MC = 750
\]

Total Revenues from being in NYC, after specifying the demand curve as \( P = 10,000 - Q \) will be:

\[
TR = PQ = (10,000 - Q)Q = 10,000Q - Q^2 \\
MR = 10,000 - 2Q
\]
Maximize profits require \( MR = MC \), thus:

\[
MR = 10,000 - 2Q = 750 = MC
\]

\( Q^* = 4625 \) items and the best price \( P^* \) will be $5375.

Firm profits in NYC will then be:

\[
\Pi = TR - TC = (10,000 - 4625) \times 4625 - 750 \times 4625 = $21,390,625
\]

Second, were you to move the store to Greenwich, then you avoid the per unit tax, but you pay a lump-sum annual tax. Demand and revenues are the same as at the NYC location. Compute the new costs and calculate \( MR = MC \) using the new costs. Now your costs are:

\[
TC = 500,000 + 500 \times Q
\]

\[
MC = 500
\]

\[
MR = 10,000 - 2Q = 500 = MC
\]

\( Q^* = 4750 \) items in Greenwich and the best price \( P^* \) will be $5250 per item.

Firm profits in Greenwich will now be:

\[
\Pi = TR - TC = (10,000 - 4750) \times 4750 - 500,000 - 500 \times 4750 = $22,062,500
\]

Therefore, the Greenwich location is preferred. This is a general point in economics. You should prefer that tax structure that has the smallest incentive effects on personal and business decisions. Here the fixed tax does not affect efficient store sales, but rather just takes profits at the end as a lump-sum tax. Notice the prices are lower and the quantity sold is higher (and thus consumer surplus is higher, too) in Greenwich — the location with the better (less damaging) tax structure. Notice, too, that firms will locate where the economic damage is less as well. Thus, this puts pressure on city governments to adopt the more efficient tax, otherwise they will lose business.

I will relocate my store in Greenwich because profits are higher by $1,171,875.

3. Here the point is to appreciate the economic advantages of markets to those who participate and to understand that if you can provide this service — be a market maker — then you can earn some money by charging for the use of the marketplace that you have created. First, compute the best market price and the quantity that will sell at the price. Then, compute the consumers’ surplus earned by the Bakers’ Guild and the producers’ surplus earned by the Farmers’ Cooperative. Consumers’ surplus will be the maximum fee you can charge the Guild and the producers’ surplus will be the maximum fee that you can charge the Cooperative. If you charge a little bit less than the maximum, everyone is better off — particularly you!

Best market price and quantity is found by setting quantity demanded (buyer’s benefit) equal to quantity supplied (producers costs):
\[ Q_s = 10 \times P_s - 400 = Q^* = 1000 - 10 \times P_d = Q_d \]
\[ Q^* = 300 \text{ cartloads and } P^* = P_s = P_d = 70 \text{ guilders per cartload} \]

You can see this graphically as:

![Graph showing supply and demand curves]

Now calculate consumer surplus earned by the Guild as the area under the demand (benefit) curve above the market price:

\[ CS = .5 \times \text{Base} \times \text{Height} = .5 \times 300 \times (100 - 70) = 4500 \text{ Guilders} \]

Why is this area the net benefit to consumers of wheat?

Also calculate the producers’ surplus earned by the Cooperative as the area above the supply curve (cost) below the market price.

\[ PS = .5 \times \text{Base} \times \text{Height} = .5 \times 300 \times (70 - 40) = 4500 \text{ Guilders} \]

Why is this area the net benefit (profit) to producers of wheat?

In your efficient market, you announce a market price of 70 guilders per cartload and 300 cartloads of wheat are exchanged at that price. You then charge the Farmers’ Cooperative a lump-sum (fixed) fee of 4500 guilders minus a little bit for your services and the Bakers’ Guild a lump-sum (fixed) fee of 4500 guilders minus a little bit for your services. In the end — after trade and paying your fee — everyone (including you) agree that market-making is a valuable service.

Why do you take “a little bit’ off the full consumer and producer surpluses?

4. You need to do two things in this problem. First, figure out the market price for oranges in the Florida market. Then, given that price, manage your business. In managing your business, you need to decide whether to sell your oranges to the market at the market price and then whether to can, or not can, concentrate, or to keep your oranges to yourself and can concentrate. In the end, you will find that you should do both activities. Then Ernie arrives and asks if you want to protect your crop
for $300,000. The answer is NO, since the service he offers costs more than the added profits you earn from using the service.

First, compute the Florida market prices for oranges, first in a typical year and then for this cold winter. This is done by setting market demand equal to market supply in both circumstances.

### Typical Year

\[
\begin{align*}
P_s &= 0.05 + 0.0028 \times Q_s = P^* = 1 - 0.05 \times Q_d = P_d \\
\text{Thus } P^* &= 0.10 \text{ and } Q^* = 17.99
\end{align*}
\]

### Cold Winter Year

\[
\begin{align*}
P_s &= 0.10 + 0.0028 \times Q_s = P^* = 1 - 0.05 \times Q_d = P_d \\
\text{Thus } P^* &= 0.15 \text{ (or } 0.1477 \text{ if you did not round) and } Q^* = 17.04
\end{align*}
\]

Now compute your average cost of a can of concentrate if you buy oranges from the market. This will be:

- **Typical Year:** \( AC = 1 + 5 \times 0.10 = $1.50 \)
- **Cold Winter Year:** \( AC = 1 + 5 \times 0.15 = $1.75 \)
  
  (or \( AC = 1 + 5 \times 0.1477 = $1.7385 \) if you did not round)

Next compute your average cost of a can of concentrate if you use your own oranges, produced at a cost of $.08/orange in a typical year and $.13/orange in a cold winter year. This will be:

- **Typical Year:** \( AC = 1 + 5 \times 0.08 = $1.40 \)
- **Cold Winter Year:** \( AC = 1 + 5 \times 0.13 = $1.65 \)

Now you have all the data you need to make your decisions. You have three choices:

- **Strategy I:** Sell oranges to the market and not can any concentrate.
- **Strategy II:** Sell oranges to the market, then buy oranges from the market and can concentrate.
- **Strategy III:** Keep your oranges within the “firm” and use them only to make your own concentrate.

What is your best strategy, first in a typical year and then in a cold winter year?

### Typical Year

**Profits from Strategy I:** Sell 5 million oranges to the market at $0.10/orange. They cost you $.08/orange to grow. Thus, your profits are \( \Pi = TR – TC = 5,000,000($0.10 - $0.08) = $100,000 \). You do not can concentrate (since you have no oranges) and therefore your profits will be just $100,000.

**Profits from Strategy II:** Again, you sell your oranges to the market and make $100,000. But now you also produce orange juice concentrate. But you need oranges. Where will you get them from? The market, of course, but at a cost of $0.10/orange. Still you make nice money. Your AC will be $1.50 and you can sell each can for $3.00, so \( \Pi = TR – TC = 1,000,000($3.00 – $1.50) = $1,500,000 \). Total profits from the Strategy II will be $1,600,000.
Profits from Strategy III: Here you use the oranges you produce at $.08 directly in production. Thus, AC of a can of concentrate will be $1.40 and you can sell each can for $3.00, so $\Pi = TR – TC = 1,000,000 \times (3.00 – 1.40) = 1,600,000$. Total profits from Strategy III will be $1,600,000$.

Either Strategy II or III is best. When might you prefer III? Well, if you have any doubts about orange quality from the market, this might raise the costs of using the market option. Or you can advertise that your firm uses only “home-grown” oranges grown on your family’s farm and picked by the tender hands of loving employees. Blah, blah, blah.

Cold Winter Year

Profits from Strategy I: Sell 5 million oranges to the market at $.15/orange. They cost you $.13/orange to grow. Thus, your profits are $\Pi = TR – TC = 5,000,000 \times (0.15 - 0.13) = 100,000$. You do not can concentrate (since you have no oranges) and therefore your profits will be just $100,000$. (If you did not round up to the nearest penny, then $\Pi = 5,000,000 \times (0.1477 - 0.13) = 88,500$).

Profits from Strategy II: Again, you sell your oranges to the market and make $100,000. But now you also produce orange juice concentrate. But you need oranges. Where will you get them from? The market, of course, but at a cost of $.15/orange. Your AC will be $1.75 and you can sell each can for $3.00, so $\Pi = TR – TC = 1,000,000 \times (3.00 - 1.75) = 1,250,000$. Total profits from the Strategy II will be $1,350,000$. (if you did not round then selling the oranges will make $88,500 and canning the concentrate will make you $\Pi = TR – TC = 1,000,000 \times (3.00 - 1.7385) = 1,261,500$. But again your total profit will be $1,350,000$. Why?)

Profits from Strategy III: Here you use the oranges you produce at $.13 directly in production. Thus, AC of a can of concentrate will be $1.65 and you can sell each can for $3.00, so $\Pi = TR – TC = 1,000,000 \times (3.00 - 1.65) = 1,350,000$. Total profits from Strategy III will be $1,350,000$.

Because of the cold growing season, my profits from growing oranges can canning concentrate will fall by $250,000$ because we can make $1,600,000 in a typical year but only $1,350,000 in a cold winter year.

What about Ernie’s offer? Well, he will lower your costs to $.08/orange, but everyone else’s costs remain the same. This gives you a chance to make some extra money, it seems. How much extra?

Profits from Strategy II with Protection: Sell 5 million oranges to the market at $.15/orange. But with protection, they cost you only $.08/orange to grow. Thus, your profits are $\Pi = TR – TC = 5,000,000 \times (0.15 - 0.08) = 350,000$. (If you did not round up to the nearest penny, then $\Pi = 5,000,000 \times (0.1477 - 0.08) = 338,500$.) Again, you also produce orange juice concentrate. But you need oranges, which you get from the market, but at a cost of $.15/orange. Your AC will be $1.75 and you can sell each can for $3.00, so $\Pi = TR – TC = 1,000,000 \times (3.00 - 1.75) = 1,250,000$. Total profits from the Strategy II will now be $1,250,000 plus $350,000 = 1,600,000$. (If you did not round, then selling the oranges will be $338,500 and canning the oranges will make you $\Pi = TR – TC = 1,000,000 \times (3.00 - 1.7385) = 1,261,500$. But again your total profit will be $1,600,000$). With Protection, you earn $1.6 million but do not forget to subtract the price of protection which is
$300,000. Thus, your net profits after paying for protection will be $1,300,000.

**Profits from Strategy III with Protection:** Here you use the oranges you produce at $.08 directly in production. Thus, AC of a can of concentrate will be $1.40 and you can sell each can for $3.00, so \( \Pi = TR – TC = 1,000,000(\$3.00 – \$1.40) = \$1,600,000 \). Total profits from Strategy III will be $1,600,000. With Protection, you earn $1.6 million but do not forget to subtract the price of protection which is $300,000. Thus, your net profits after paying for protection will be $1,300,000.

Ernie’s Smudge Pot, Inc. offers to fully protect your orange groves — and thus keep production costs at $0.8/orange — for a one year fee of $300,000. Everyone else’s costs rise so the Cold Winters supply of Oranges remains the same. You should reject this offer because you will only save $250,000 but the protection costs $300,000. Not worth it. Your profits are $1.3 million with protection and $1.35 million without protection.

5. Here you need to find the efficient mix of capital and labor to produce \( Q = 120 \) units of output. We know for efficiency that the following rule must be satisfied:

\[
\frac{W}{R} = \frac{MP_L}{MP_K}
\]

Where \( W = \) daily wage = $100 and \( R \) is the daily rental cost of capital = $900. You also need to compute \( MP_L = \) marginal product of labor and \( MP_K = \) marginal product of capital. We know the marginal products from the production functions:

\[
MP_L = \frac{\partial Q}{\partial L} = 0.5 \times L^{-5} K^5 = 0.5 \left( \frac{L^5 K^5}{L} \right) = 0.5 \times \left( \frac{Q}{L} \right)
\]

\[
MP_K = \frac{\partial Q}{\partial K} = 0.5 \times L^5 K^{-5} = 0.5 \left( \frac{L^5 K^5}{K} \right) = 0.5 \times \left( \frac{Q}{K} \right)
\]

And therefore:

\[
\frac{MP_L}{MP_K} = \frac{K}{L}
\]

Since

\[
\frac{W}{R} = \frac{\$100}{\$900}, \text{ then:}
\]

\[
\frac{W}{R} = \left( \frac{1}{9} \right) = \left( \frac{K}{L} \right) = \frac{MP_L}{MP_K}
\]

Or therefore:

\[
L = 9K \text{ when we are efficient}
\]

This result tells us what the efficient mix of capital and labor should be. Notice that the current mix: \( L = 1600 > 81 = 9(K = 9) \); therefore the plant is now using way too much labor and way too little capital. What we need to know is the actual amount of \( K \) and \( L \) to use. This is found by knowing that we can’t to produce 120 units a day. Thus:
Q = 120 = L^{0.5}K^{0.5} which when we are efficient is (9K)^{0.5}K^{0.5} = 3K

Therefore the efficient K* = 40 machines. Knowing that K* = 40, L* = 9 \times 40 = 360 workers. What now are costs? Well,

TC = wL + rK = $100 \times 360 + $900 \times 40 = $72,000

The efficient average cost per unit output when Q = 120 will therefore be:

AC = $72,000/120 = $600/unit.

To meet the firm production target of 120 units per day, I would recommend we hire 360 workers per day and lease 40 machines per day. This will lower our costs per unit of output to $600 per unit.

6. Here you want to treat the university like a business. They can charge a price — tuition — and make revenues which must be balanced against costs. First, compute TR and then TC and then maximize profits — net financial position.

Total Revenues:
TR = T \times Q (25,000 – .5Q)Q = 25,000Q – .5Q^2

MR = 25,000 – Q

Total Costs:
TC = 152,000,000 + 5000Q
MC = 5000

MR = 25,000 – Q = 5000 = MC
Q* = 20,000 and T* = 15,000

“Profits” or “Net Financial Position”
Π = TR – TC = (25,000 – .5 \times 20,000)20,000 – 152,000,000 – 5,000 \times 20,000 = $48,000,000

To maximize the net financial position of the university, I recommend that the university set an annual tuition of $15,000 per student. Fortunately, this tuition is sufficient to cover the university’s annual charges against fixed cost and, therefore, the President will need hide from the governor a net financial position of $48,000,000.

7. In this problem, the city that gets the franchise will be the one that pays the most to the current owners. What each new franchise can afford to pay is that amount equal to or a bit less than the value of franchise in its location. To compute the value of the franchise in each location, we must compute annual profit earned in that location. This is the usual MR = MC calculations for selling seats. Then add in the TV revenues (a fixed revenue item) and subtract the fixed stadium costs per year. Included in variable costs are the costs of players’ salaries and other related variable expenses. Remember they play ten games.
Profits in L.A.
TR from playing one game = \( PQ = (30 - .00005Q)Q = 30Q - .00005Q^2 \)
MC = 20

Profit Maximization for Each Game:
\( MR = 30 - .0001Q = 20 \Rightarrow Q^* = 100,000 \) and \( P^* = 25 \)

Profits per Game from Ticket Sales
TR – TVC = PQ – 20Q = 2,500,000 – 2,000,000 = $500,000/Game

Total annual profits of the L.A. franchise from the 10 game home season will now be:
\[ \Pi = 500,000/game \times 10 \text{ games} + TV \text{ revenues} - \text{Fixed Stadium Costs} \]
\[ \Pi = 5,000,000 + 20,000,000 - 10,000,000 = 15,000,000 \]
Assuming that this is the profit position of the team in perpetuity, we can calculate the value of the team to the L.A. owners as \((15\text{million}/.10) = 150 \text{ million} \) when the alternative investment has a return of 10 percent per annum.

Profits in Oklahoma City
TR from playing one game = \( PQ = (100 - .001Q)Q = 100Q - .001Q^2 \)
MC = 10

Profit Maximization for Each Game:
\( MR = 100 - .002Q = 10 \Rightarrow Q^* = 45,000 \) and \( P^* = 55 \)

Profits from Ticket Sales
TR – TVC = PQ – 10Q = 2,475,000 – 450,000 = $2,025,000/Game

Total annual profits of the Oklahoma City franchise from the 10-game home season will now be:
\[ \Pi = 2,025,000/game \times 10 \text{ games} + TV \text{ revenues} - \text{Fixed Stadium Costs} \]
\[ \Pi = 20,250,000 + 10,000,000 - 5,000,000 = 25,250,000 \]
Assuming this is the profit position of the team in perpetuity, we can calculate the value of the team to the OC owners as \((25.25 \text{ million}/.10) = 252.5 \text{ million} \) when the alternative investment has a return of 10 percent per annum.
Now which city will get the franchise? The L.A. owners can offer only up to $150 million to join the league — the value of their team — while the OC owners can offer up to $252.5 million. So clearly the OC owners can outbid the L.A. owners. The franchise will go to Oklahoma City. Notice that while L.A. is a big market, they have a very elastic demand curve for football, given the number of competitive alternatives for the “entertainment dollar.” Well, in Oklahoma City, football may just be just about it, so the demand curve is very steep. Thus, the high ticket prices in OC. But how much will the OC owners pay to join? At least $150 million to outbid L.A. and no more than $252.5 million. That is the “bargaining range” with the current owners.

But what then will be the “franchise fee” to join the league? Since all this financial information is common knowledge, the current owners (the league) knows that the OC owners will pay up to $252.5 million to join. So they give the OC owners an all-or-nothing offer of $252.5 million minus $1! Take it or leave it! OC owners take it. They join the league at a franchise fee of $252,499,999 million.

Don’t feel bad for the OC owners, however, they are now a member of the “club” and will get to share in the franchise fees of the new teams that might join at a later date.

Oklahoma City will be awarded the new franchise and the owners in the winning city will pay no less than $150 million and no more than $252.5 million to the current league owners. In the end, I think $252.5 million minus $1 will be paid to the league owners because all the bargaining power lies with the current owners. They have the right to exclude Oklahoma City and they know Oklahoma City’s owners reservation price. This is nothing more than first degree discrimination.
1. Two manufacturers of television receivers, BIG and SMALL, compete in the market place. They each produce similar television sets of differing quality, but such quality differences are not readily apparent to the consumer. However, the manufacturers know the quality of their own products and have a good idea of the quality of their rival. The manufacturers are considering introducing warranties on their TVs in an attempt at signaling to the consumer their product’s quality. The cost of providing a warranty differs for the two manufacturers:

- BIG makes HIGH quality TV’s and its cost of providing a warranty is $225 per year.
- SMALL makes LOW quality TV’s and its cost of providing a warranty is $300 per year.

The following chart shows the reservation prices that consumers would place on TV sets of HIGH and LOW quality, together with their valuation of any eventual warranties offered on those sets, if consumers knew the underlying quality.

<table>
<thead>
<tr>
<th>Quality</th>
<th>Reservation Price on TV</th>
<th>Reservation Price on Warranty</th>
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</thead>
<tbody>
<tr>
<td>HIGH QUALITY</td>
<td>$1,000</td>
<td>$100 for each year of warranty</td>
</tr>
<tr>
<td>LOW QUALITY</td>
<td>$500</td>
<td>$200 for each year of warranty</td>
</tr>
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</table>

Note that while costs and benefits of the warranty are expressed in terms of years, the firms are in fact able to offer partial-year-long warranties.

Consumers will assume that the firm that offers the better (i.e., longer) warranty must sell the HIGH quality product. The product with the inferior (i.e., shorter) warranty, or no warranty at all, is assumed to be of LOW quality.

a. BIG will sell its TV at a price of __________ and will have a warranty of __________ years (include the value of any warranty in the sale price)

b. SMALL will sell its TV at a price of __________ and will have a warranty of __________ years (include the value of any warranty in the sale price)

2. Membership plan for traffic violation fines?

In a 2010 entry on the website freakonomics.com, Ian Ayres describes a new Internet-based insurance service:

“A couple weeks ago, I became briefly fascinated and somewhat appalled by the appearance of a new Internet business that offered a sort of insurance against speeding tickets. In return for an annual fee
of $169, ticketfree.org promised to reimburse you for the costs of up to $500 in moving violations. Its webpage enthused:

- We don’t promise that you won’t get a ticket; we just promise that you won’t have to pay for it.
- Never pay another ticket again. Period!
- Never pay late fees on tickets.
- Never worry about speed traps or radar while driving.
- Never need an expensive ticket lawyer.
- Never have a take a day off work to fight a ticket.”

Upon receiving a qualifying ticket, members simply visit the Ticketfree site and enter the details; the company will then pay the associated fine and send the member a confirmation email. Drivers continue, of course, to be at risk of incurring “points” toward the suspension of their license or increases in their car insurance premia. Not covered by Ticketfree’s base plan are parking or red-light tickets.

Note that more than 41 million speeding tickets are issued to drivers in the United States each year, equivalent to one in every six drivers receiving a ticket. The average cost of a speeding ticket is USD 150 each, according to TrafficTicketSecrets.com.

**The Ticketfree service has since been discontinued. What might have been the economic challenges to the viability of their business model?**

3. You are the CEO of a closely-held family firm and, in order to acquire control, you wish to buy shares and become the majority shareholder. There are currently three shareholders. Each holds a different assessment about the value of the firm and has a different supply function for selling shares. The shareholders act as price takers so that these supply functions can be interpreted as the minimum price, \( p \), at which they would sell a quantity, \( q \), of shares.

- Shareholder A: \( p_A = 20 + 2q_A \) Number of shares held = 10
- Shareholder B: \( p_B = 28 + q_B \) Number of shares held = 10
- Shareholder C: \( p_C = 4 + 2q_C \) Number of shares held = 20

You can achieve your objective of becoming the majority shareholder by buying 20 shares.

You plan to conduct an ascending auction to buy the 20 shares where you announce a price \( p \) and bidders state how many shares they are willing to sell at that price \( p \). If the total numbers of shares offered at \( p \) is less than 20, then you announce a higher price and keep increasing \( p \) until the total offer has reached 20 shares. All bidders sell their shares at the same final price.
a. Derive an expression for the total number of shares $Q$ that you can expect to be offered at a given offer price $p$.

b. What price per share will you pay to buy the needed 20 shares?

c. At this price, how many shares will you buy from

Shareholder A:
Shareholder B:
Shareholder C:

4. **The Politics of Lithium**

Suppose that the market demand, $Q$, for Bolivian Andes lithium is given by

$$Q = 1200 - P$$

where $P$ is the price per unit. This lithium can be extracted at no cost by just two firms, one Japanese and one French. Each firm recognizes its own market power and, therefore, the impact of its own production on price. The two firms compete simultaneously in choosing production capacities.

The government’s current ruling party, the Movement for Socialism (MAS), is not a fan of free enterprise, however, and is considering nationalizing the firms by taking them over and running them as a single monopoly. Fearing international backlash, it plans to compensate each firm for one year of lost profits. Any leftover profit is used to pay for a new farming program.

a. How much would the MAS have to pay each firm as part of its nationalization?

b. How much money would the MAS have left over for its new farm program?

5. **Learning about Strategy: The Anglo-Irish Bond Redemption Offer**

**THIS QUESTION HAS TWO PARTS CONTAINED IN THE NEXT PAGES.**

Briefly read the 2011 *Financial Times* article below. Do not fret about specific details and do not worry if you fail to capture some of the aspects right now. The questions below walk you through the strategic problem in the article.
Anglo Irish bondholders face dilemma

In the classic game theory case of the prisoner’s dilemma, two parties can either co-operate for some mutual gain, or each can sell out the other in the hope of a higher individual reward — but with the risk of losing everything if the other beats them to it.

This is the choice facing Anglo Irish junior bondholders when they vote this Friday on an exchange offer that, if approved, would see them receive just 20 per cent of the face value of their bonds.

Bondholders could work together to vote down the deal and force the bank to the negotiating table in the hope of a better offer – just as two theoretical prisoners who each stick to their agreed cover story can ensure neither is found to have committed the crime.

But those bondholders who vote against a deal on their own also risk losing virtually everything as the deal contains a “sweeper” clause where acceptance also counts as a vote to allow the bank to “sweep up” any hold-out investors for just one cent per €1,000 of bonds held.

In other words, if enough investors opt to take the 20 per cent on offer, they in effect sell out their fellow bondholders.

“To a degree there is a camaraderie among investors in an effort to find a better deal and resist this sweep, but on the other hand no one wants to be the last into that room and get swept up,” says one liability management expert.

Part I: Using Game Theory to Analyze the Anglo-Irish Bondholder Problem

We will make some simplifications to understand the strategic issues. Assume that there are only two investors who own all outstanding bonds: Paddy (who owns 50% of the bonds) and Brittany (who owns the other 50%). The redemption offer will be approved with a simple 50% majority: if at least one investor decides to accept the Anglo-Irish redemption offer, the deal moves ahead with Anglo-Irish buying all bonds from the seller(s) at 20% of the bonds’ face value, but applying the “sweeping clause” to a bondholder who rejected the offer.

Assume that both Paddy and Brittany have the same publically-known expectations about the future value they can extract from an alternative deal with Anglo-Irish. Concretely, they expect to obtain 50% of their bonds’ face value in future negotiations if they reject the current offer. The payoff matrix — expressing payoffs as the expected cash obtained for a single bond with a face value of €1000 — looks as follows:
a. Is there a dominant strategy for Brittany? If so, what is it?

b. Circle the Nash equilibrium/equilibria of this game in the above payoff table.

Now assume that Brittany is more pessimistic and expects to collect only €150 if the redemption offer is not accepted. The payoff matrix now looks as follows:

c. Is there a dominant strategy for Brittany? If so, what is it?

d. Circle the Nash equilibrium/equilibria of this game in the above payoff table.

Now assume that Brittany and Paddy have the same low expectations about payoffs were they to both reject the redemption offer (€150).

e. Circle the Nash equilibrium/equilibria of this game in the above payoff table.
Note that we have covered all potential strategic scenarios: a majority of parties have expectations above the Anglo-Irish offer; parties are split in opinions; or a majority of the parties have expectations below the offer.

e. Given what we have learnt in considering these scenarios, has the FT writer taken MGEC611/612? Or in other words: could this situation ever be called a “Prisoner’s Dilemma”? Briefly argue your answer.

Part II: Using Asymmetric Information and Expected Utility to Understand the Offer

Now, let’s introduce some uncertainty to this game. Assume that everyone knows that Paddy believes the future offer to be €500 if all bondholders hold firm now. However, Brittany’s expectations over payoffs in the scenario where both parties reject the redemption offer are less well understood.

Paddy estimates that with probability $p=0.5$, Brittany’s value of holding out is €150 (in which case she will accept the offer for sure), and with probability $1 – p=0.5$ Brittany’s value is €500 (in which case assume that Brittany will reject the offer for sure).

a. What is Paddy’s expected value of rejecting Anglo-Irish’s offer?

b. What assumption do you require about Paddy’s behavior under uncertainty to make him want to accept Anglo-Irish’s offer?

c. Consider the lessons from the questions in parts I and II. Briefly describe Anglo-Irish’s strategy of using the sweeping-clause. How does it take advantage of asymmetric or dispersed information in strategic situations?

6. The market for Natural Gas in the country of CELTIC comprises a dominant producer and 100 identical smaller producers.

The market demand for natural gas in CELTIC is

$$P = 36 - 2Q$$

The marginal cost of the leading firm, TARTAN GAS (T), is

$$MC_T = 2Q_T$$
Aggregated across all small producers, the marginal cost of the fringe is

\[ MC_s = 4 + \frac{2}{3}Q_s \]

The smaller firms look to TARTAN GAS to select its capacity and, in effect, determine the market price. The smaller firms then act as price takers in their production decisions.

a. What is the price of natural gas in CELTIC?

b. How much will be supplied by TARTAN GAS?

c. How much will be supplied by each of the small firms?
Sample Exam Answers MGEC612

1. First, note that the cost to each firm of offering a warranty exceeds any additional revenue it can obtain from selling with a warranty. So whichever firm does not offer the better warranty will be perceived as selling an inferior product and will choose not to offer a warranty

**BIG**
- If BIG is able to offer the best warranty, its TV will sell for 1000 plus the cost of the warranty which is 100Y
- If BIG does not offer the best warranty, it will sell with no warranty for 500
- So the gain from offering the best warranty \((1000 + 100Y) - 500 = 500 + 100Y\)
- The cost of a warranty to BIG is 225Y
- So the MAXIMUM warranty the BIG will offer is determined where the benefit equals the cost
  \[500 + 100Y = 225Y\]  so \(Y < 500/125 = 4\) years

**SMALL**
- If SMALL is able to offer the best warranty, its TV will sell for 1000 plus the cost of the warranty which is 100Y
- If SMALL does not offer the best warranty, it will sell with no warranty for 500
- So the gain from offering the best warranty \((1000 + 100Y) - 500 = 500 + 100Y\)
- The cost of a warranty to SMALL is 300Y
- So the MAXIMUM warranty the BIG will offer is determined where the benefit equals the cost
  \[500 + 100Y = 300Y\]  so \(Y < 500/200 = 2.5\) years

So, all BIG needs to do is to offer a warranty of 2.5+ years to beat SMALL. BIG will not choose any longer than necessary, because the additional revenue from each extra year of the warranty is only 100 but its cost is 225.

So, **Big will offer a 2.5+ warranty and sell its TV for 1000 + 250+ = 1250+**

**Small will offer no warranty and sell its TV for 500**

2. **Ticketfree faces both a moral hazard and an adverse selection problem.**

- Adverse selection: the service is attractive primarily to drivers who know that they have a much higher propensity than the average driver of receiving multiple tickets in a year. With a selection of more risky drivers than average, Ticketfree is likely to have to pay out more in ticket charges than its membership dues, even though the average driver’s chance of receiving a ticket in a given year is low.
Moral hazard: as with other insurance, a worry is that members will engage in more risky driving and receive more tickets than the average driver would; people who are insured against the cost of speeding tickets are more likely to speed.

3. a. Rewrite the supply functions in quantity form

\[ q_A = -10 + 0.5p_A \]  
\[ q_B = -28 + p_B \]  
\[ q_C = -2 + 0.5p_C \]

TOTAL SUPPLY \[ Q = -40 + 2p \]

b. So the buyback price for 20 shares is \( P = 30 \) (i.e., \( 20 = -40 + 2P \))

c. A will sell \(-10 + 0.5p_A = 5\)
B will sell \(-28 + p_B = 2\)
C will sell \(-2 + 0.5p_C = 13\)

4. a. Cournot Equilibrium

Competition is initially in a Cournot (not Bertrand) setting because firms recognize the impact that their choice of output has on the market price. The Cournot equilibrium is found by using the reaction curves of the two firms to solve for levels of output. The reaction curve for firm 1 is found as follows:

Rearranging: \( P = 1200 - Q \)

\[ TR_1 = PQ_1 = (1,200 - Q)Q_1 \]
\[ = 1,200Q_1 - (Q_1 + Q_2)Q_1 \]
\[ = 1,200Q_1 - Q_1^2 - Q_2Q_1 \]

\[ MR_1 = 1,200 - 2Q_1 - Q_2 \]

Set \( MR_1 = MC_1 = 0 \) and solve for \( Q_1 \) to get firm 1’s reaction function:

\[ Q_1 = 600 - (1/2)Q_2 \]  
(1)

Going through the same calculations for firm 2 yields firm 2’s Reaction function:

\[ Q_2 = 600 - (1/2)Q_1 \]  
(2)

Solving (1) and (2) simultaneously for \( Q_1 \) and \( Q_2 \) yields: \( Q_1 = Q_2 = 400 \). Thus the total output is 800 and the price will be $400. So the profit for each firm is \( TR - TC = 400(400) - 0 = 160,000 \).

Hence, the MAS would have to pay each firm 160,000 (for a total of 320,000).
4. b. Monopoly

TR = PQ = (1200 – Q)Q = 1200Q - Q^2, where Q = Q_1 + Q_2
MR = 1,200 - 2Q
Set MR = MC = 0:
1,200 - 2Q = 0
Q = 600
P = 1,200 - 600 = 600

So total profit is 600(600) = 360,000.

Hence, the MAS would have 40,000 (360,000 – 320,000) left over for its new farm program.

5. Part I

a. NO

b. |        | Brittany |
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c. YES ACCEPT

d. |        | Brittany |
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e. |        | Brittany |
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f. The FT writer did not take MGEC611/612: this is never a prisoner’s dilemma. In the prisoner’s dilemma you have to have a situation that is not a Nash equilibrium and in which both players would be better off by cooperating (compared to the actual Nash equilibrium): this is never the case in any of the potential scenarios!

Part II

a. \( \frac{1}{2} \times 500 + \frac{1}{2} \times 0.01 = 250.005 \)

b. You need Paddy to be quite risk-averse. Otherwise he takes his chances for an expected value of 250 which is better than the 200 he gets by accepting the redemption offer.

c. You are using the risk aversion of the agents and “playing each against each other” in order to ensure that most of them will accept the offer (you could also think about the situation where Brittany is also uncertain!

6. **STEP 1**

The supply curve of the following firms is calculated by summing the individual supply curves

\[
MC_s = 4 + \frac{2}{3}Q_s
\]

But we must convert to quantities

\[Q_s = -6 + 1.5P\]

**STEP 2**

Find leader’s supply by subtracting follower supply from market demand

\[
Q_M = 18 - 0.5P \\
Q_S = -6 + 1.5P \\
Q_T = 24 - 2P \quad \text{OR} \quad P = 12 - 0.5Q_T
\]

**STEP 3**

Find leader’s output and price

\[
P = 12 - 0.5Q_T \\
MR = 12 - Q_L = 2Q_T = MC_T \\
Q_T = 4 \quad \text{AND} \quad P = 12 - 0.5Q_T = 10
\]

**STEP 4**

Find followers’ supply where \( P = MC \)

\[
Q_F = -6 + 1.5P = 9 \quad \text{so each firm supplies 9/100}
\]
STEP 5
Check total supply = total demand at price of 10. From market demand curve

\[ P = 36 - 2Q_M \quad \Rightarrow \quad 10 = 36 - 2(4 + 9) \]

a. 10

b. 4

c. 9/100
The MKTG611 waiver exam will require the student to answer a series of questions about a case study (which will vary from year-to-year). Here are some sample questions that might be asked. As expected, the correct answers will be dependent upon the case that is used (cases are often copyrighted, so cannot be reproduced in this document).

1. Two ways to think about “brand strength” are: (1) the Interbrand approach, and (2) brand associations.
   1.1. Describe each of these approaches.

   1.2. In what situation would you favor the Interbrand approach? In what kind of situation would you favor using brand associations?

2. Write a positioning statement for the Wharton School brand. Be sure to touch on the three key elements of a positioning statement.

3. The Apple iPhone is not selling well in India. Bharti Airtel and Vodafone have been offering the iPhone since August 2008. By April 2009, Airtel’s iPhone sales had yet to reach 20,000 handsets (iphones). Vodafone is believed to have sold even fewer. Both companies sell the product stand-alone for a retail price of $700. You are asked to give advice on a new pricing policy. The proposal is for Airtel to use the same pricing and bundling strategy as AT&T in the United States. That is, sell the handset for a retail price of $199, but require the customer to have a two-year service contract with Airtel.

   Assume a variable cost per unit of $175 for manufacturing the iPhone, and a 100% mark-up by Apple when setting the wholesale price to Airtel. There are no advertising costs under either policy for generating the 20,000 customers. Assume for simplicity that customers pay their entire annual phone bill at the end of the year. Also, assume that they have a 60% chance of renewing their two-year service contract once, and zero chance of renewing more than once.
3.1. How much in annual contribution does Airtel need to extract from their average iPhone customer for this new policy to be as profitable as the current policy?

3.2. A senior manager at Airtel proposes giving the iPhone to customers for free. Compute the annual contribution per customer for this strategy to break even with your answer in 3.1.

3.3. Give three reasons why management at Airtel should be interested in calculating customer lifetime value (CLV) for their customers.

4. In January of this year, the BRVZ brand introduced a new “bread & pasta” combination maker for $199. Sales have been slow. Only 100 units per month were sold in the first 6 months. In July of this year, their main competitors from MGE C introduced a slightly more powerful version for $249. Since then, the sales of the BRVZ machine have tripled, while market research has indicated that the sales of the MGE C have been slow. Based on your knowledge of consumer behavior and marketing, what do you think may have caused this boost in sales?

5. Marketers and behavioral economists distinguish among search, experience, and credence goods. For each type of good, identify which of the following three advertising formats is likely to be most effective: product comparison, using a spokesperson, and testimonials. Provide three one-to-one pairings and justify each pairing.

6. In marketing communications, “Gross Rating Points” are calculated as GRPs = Frequency x Reach. Explain when you would favor an advertising campaign emphasizing reach over a campaign emphasizing frequency.
7. The National Health Service (NHS) in a developing country in Central Africa is extremely concerned about patients getting infected while in the hospital for treatment for other major ailments. Some infections can be attributed to clothing, towels, and bed linen not being fully disinfected. Studies suggest that three out of every hundred patients admitted acquire infections due to this reason. Such infections result in an additional hospital stay of 6 days per patient. Also, one out of every hundred thousand patients dies due to hospital-acquired infections that can be directly attributed to clothing, bed-linen, and towels. Each extra day in the hospital is billed by the hospital to NHS and costs the NHS $100.00. The family of the patient who dies is typically compensated $10,000.00 by the hospital.

The GL company has developed a new laundry system that uses high pressure steam and high speed spinning that eliminates infections acquired from clothing, towels, and bed-linen. Studies suggest that the incidence of infections is reduced to only one patient per hundred. The infections are also less severe and the added number of days is only three. The deaths are eliminated.

Each machine can handle washing for 10,000 patients after which it must be replaced. For the purpose of this analysis, the patient stays can also include the additional days a patient has to stay if infected. The variable cost of the machine is $1,000. GL is having a hard time convincing the hospitals to buy the machine. The machine is priced at $5,000.

7.1. Explain why the hospitals are not willing to buy the GL machine. Recommend a revised marketing plan for GL. In this plan, please clearly identify your target segment and the price you will charge. Show how you arrive at your recommendation.

7.2. Imagine that GL has to set an advertising budget for one of its small domestic cleaning machines. You must evaluate a proposal for a change in the advertising budget for GL machines. The estimated advertising elasticity, i.e., the percentage change in sales volume for percentage change in advertising, is 0.32. The machines generate a $50 contribution margin per unit, and the proposal is to increase the budget from $3 million to $4.5 million. The product is a well-established brand in a mature market. Would you approve the proposal?
Sample Exam Questions Answers MKTG611

1.1. The Interbrand approach is based on financial statements and the value of a firm after penalizing for tangible assets.

Brand associations are consumer centered and are about the subjective perceptions that individuals (segments) have about a given brand (e.g., Volvo = safety). A common way to think about this is using an associative network with nodes representing ideas and links representing the strengths of connections.

1.2. The Interbrand approach is useful when trying to evaluate a brand’s financial worth, such as in the context of acquisition (e.g., P&G buying Gillette).

Brand associations are useful when trying to understand how people perceive the brand, such as when developing a positioning, a communication strategy, or a brand extension.

2. The key to a good answer is to cover all three elements: (1) Target Segment(s), (2) Point of Difference, and (3) Frame of Reference. A particular challenge is that the School has multiple target segments or constituencies: not only students, but also prospective employers, parents, and donors.

3.1. Current profits = ($700 (retail price) – $350 wholesale price for phone) * 20K = $7m

Additional assumptions must be made on the discount rate and on the contribution from service fees in the current arrangement. The analysis below assumes (i) 10% discount rate, (ii) 0 current margin from service fees, and (iii) 20,000 in both arrangements.

Students should recognize that they need to solve the CLV formula for “Z” (annual contribution), such that total profits are equal to current profits. The break-even sets:

Current Profits = Number of customers * Individual CLV over 4 years
Students must show some of the logic (especially important for partial credit answers)

\[
7m = 20,000 * [-$151 + Z/(1.1) + Z/(1.1)2 + 0.6*Z/(1.1)3 + 0.6*Z/(1.1)4 ] \\
7m = 20,000 * [-$151 + Z*(0.909 + 0.826 + 0.451 + 0.410)] \\
7m = -$3,020,000 (total acquisition) + 20,000*Z*(0.909 + 0.826 + 0.451 + 0.410), or, \\
7m = -$3,020,000 (total acquisition) + 20,000*Z*(0.909 + 0.826 + 0.451 + 0.410) + 7m \]

In either case,
\[
Z = -$151 + Z*(0.909 + 0.826 + 0.451 + 0.410) \\
Z = -$151 + Z*(0.909 + 0.826 + 0.451 + 0.410) \]

$350 (average profit per customer) = -$151 + Z*(0.909 + 0.826 + 0.451 + 0.410)

Thus, Airtel must make about $193 per customer per year in order to break-even on the new policy.
3.2. Following the logic above, one has:

\[ 350 = -350 + \frac{Z}{1.1} + \frac{Z}{1.1^2} + 0.6\frac{Z}{1.1^3} + 0.6\frac{Z}{1.1^4} \]

\[ Z = \frac{700}{0.909 + 0.826 + 0.451 + 0.410} = \$269.63\text{ per year} \]

Alternatively, one could simply look at the ratio: Per customer break-even increases by \(1.4\) (\(\$700/\$501\)), hence \(Z\) goes up by \(1.4\).

3.3. Three good reasons are (1) Identifying maximum cost of acquisition, (2) Targeting more valuable customers and shifting resources away from less profitable customers, and (3) Selling the business, or parts of the customer base.

4. There are two parts to a good answer: (1) the effect of reference pricing on evaluations, and (2) the effect of competition on market building. A good answer will have both aspects, but the key is reference pricing. When consumers evaluated the single product they had no way to evaluate whether this is a good price because there was no reference. The second product (MGEC) provided a way to evaluate. The reason it didn’t sell is because it was just slightly better, but 25% more expensive. So while it did not sell, it provided a reference.

The competition-related response will center on market building and might mention the competitor’s marketing communications efforts.

5. Search – product comparison
Because people know the relevant attributes and can assess their quality prior to purchase.

Experience – testimonial
Because people can assess product quality only after using the product, and a testimonial is in essence “experience by proxy”: One relies on other’s experience to assess the quality.

Credence – spokesperson
Because people cannot assess product quality even after using them; product comparison and testimonial are not very effective; One has to rely on the expertise or the status appeal of a spokesperson to establish credibility and perceived quality.

6. High Reach, Low Frequency is appropriate when seeking to make a broad but shallow impact:
Creating awareness or simple reminder advertising

Low Reach, High Frequency is appropriate when seeking to make a deep impact:
Creating persuasion, or educating customers about a rather complex issue.
7.1. Computing the Economic Value to the Customer (EVC) is the key to a sound marketing strategy here.

EVC to the NHS:
\[ \frac{(3 \text{ patients} \times 6 \text{ days} - 1 \text{ patient} \times 3 \text{ days}) \times $100}{100 \text{ patients}} \times 10000 \text{ patient loads per machine} = $150,000 \]

EVC to the Hospital:
\[ \frac{(1 \text{ death} \times $10,000)}{100,000 \text{ patients}} \times 10000 \text{ patient loads per machine} = $1000 \]

It is clear from the EVC analysis that the machine does not make sense for hospitals as the price is higher than the EVC. Hence, GL should target the NHS and price the machine anywhere less than $150,000. Alternatively, they can market to the hospitals but convince the NHS to subsidize the hospitals by the amount they pay for the machine. Several other creative alternatives are also possible.

7.2. A sound decision will be based on a break-even analysis.

Increase in Fixed Cost = $1.5m
Elasticity = \( \frac{\% \text{ change in } Q}{\% \text{ change in } \lambda} \)

Since the % change in \( \lambda \) is 50% ($3m to $4.5m), the change in \( Q \) is \( .32 \times .50 = .16 \). This 16% lift in sales volume is equivalent to an additional $8 in gross margin per unit currently sold ($50 \times 16\% = $8).

So: Increase in gross contribution = 32\% \times 50\% \times $50Q = $8Q

Hence approve if and only if \( Q > 187,500 \text{ units} \) ($1.5m / $8).
Instructions

The exam is open book/open notes and you may use a calculator. We will give points for correct answers, but will not subtract points for incorrect answers, so you should answer all questions.

In order to make your calculations as straightforward as possible, assume that, unless stated otherwise,

1. there are sufficient parts or raw materials so that the initial operation(s) are never starved;
2. processing times have negligible variability, and over time, workers neither speed up nor slow down, but work always at the processing rates given;
3. there are no machine breakdowns;
4. when there are buffers shown, they are large enough to accommodate any amount of inventory that would reside in those buffers under normal operations;
5. travel time and time to transport parts from one operation to the next is negligible;
6. all operations run with 100% yield, i.e., the operations produce no defective units; and
7. all processes are in steady state (e.g., in the middle of the day); thus, you may ignore any start-up effects.
**PART A**

**Mr. K’s Hair Salon**

Mr. K’s is a very popular hair salon. It offers high-quality hair-styling and physical relaxation services at a reasonable price, so it always has unlimited demand. The service process includes five activities that are conducted in the sequence described below. (The time required for each activity is shown in parenthesis):

- **Activity 1:** Welcome a guest and offer homemade herb tea. (10 minutes)
- **Activity 2:** Wash and condition hair. (10 minutes)
- **Activity 3:** Neck, shoulder, and back stress release massage. (10 minutes)
- **Activity 4:** Design the hairstyle and do the hair. (25 minutes)
- **Activity 5:** Check out the guest. (5 minutes)

Three servers (S1, S2, and S3) offer the services in a worker-paced line. The assignment of tasks to servers is the following:

- S1 does Activity 1.
- S2 does Activities 2 and Activity 3.
- S3 does Activities 4 and Activity 5.

1. Which server is the bottleneck of the process?

2. What is the utilization of server 2?

3. What is the average labor utilization of the servers? Assume the process operates at its capacity.

4. Assume a wage rate of $18 per hour. What are the direct labor costs for one guest?

To increase the service rate, Mr. K’s is considering two alternatives:

- **Alternative I:** To hire a new employee to help any one (and only one) of the servers without changing the tasks performed by each server.

- **Alternative II:** To redesign the assignment of tasks to servers. For this, Mr. K’s is evaluating to reassign Activity 5 from S3 to S1.

5. What would be the costs of direct labor of serving one guest under each of the two alternatives? Assume that the system operates at its capacity.
PART B

Penne Pesto

Penne Pesto is a small restaurant in the financial district of San Francisco. Customers order from a variety of pasta dishes. The restaurant has 50 seats and is always full during the four hours in the evening. It is not possible to make reservations at Penne, most guests show up spontaneously on their way home from work. If there is no available seat, guests simply move on to another place.

On average, a guest spends 50 minutes in the restaurant, which includes 5 minutes until the waiter has taken the order, an additional 10 minutes until the food is served, 30 minutes to eat, and 5 minutes to handle the check-out (including waiting for the check, paying, and leaving). It takes the restaurant another 10 minutes to clean the table and have it be ready for the next guests (of which there are always plenty). The average guest leaves $20 at Penne, including food, drink, and tip (all tips are collected by the restaurant, employees get a fixed salary).

The restaurant has 10 waiters and 10 kitchen employees, each earning $90 per evening (including any preparation, the 4 hours the restaurant is open, and clean-up). The average order costs $5.50 in materials, including $4.50 for the food and $1 for the average drink. In addition to labor costs, fixed costs for the restaurant include $500 per day of rent and $500 per day for other overhead costs.

The restaurant is open 365 days in the year and is full to the last seat even on week-ends and holidays. There are about $200k of capital tied up in the restaurant, largely consisting of furniture, decoration, and equipment.

1. How many guests will the restaurant serve on an evening?

2. What is the Return on Invested Capital for the owner of the restaurant?

3. Assume that you could improve the productivity of the kitchen employees and free up one person who would be helping cleaning up the table. This would reduce the clean-up to 5 minutes instead of 10 minutes. What would be the new ROIC?

4. What would be the new ROIC if overhead charges could be reduced by $100 per day? Answer this question independent of the previous question.
PART C

ProofSmart Inc.

ProofSmart Inc., a supplier of home insulation materials, was burned down in a recent fire. From the remains of what used to be the accounting ledger, the following information was recovered:

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory</td>
<td>$2,367,121</td>
<td>$2,418,257</td>
</tr>
<tr>
<td>Gross Margin</td>
<td>42%</td>
<td>45%</td>
</tr>
<tr>
<td>Inventory Turns</td>
<td>11</td>
<td>[unreadable]</td>
</tr>
</tbody>
</table>

Prior to the fire, ProofSmart saw a sales growth of 48% in 2007, a record performance for the 18 year-old company. (NOTE: Gross margin is defined as 1-(COGS/Sales).)

1. What was the sales for 2007?
   Circle the answer closest to the correct answer.
   a. $318,000
   b. $38,000,000
   c. $43,000,000
   d. $66,000,000
   e. $85,000,000
   f. cannot be determined from the data given

2. What was the inventory turns for 2007?
   Circle the answer closest to the correct answer.
   a. 10
   b. 11
   c. 12
   d. 13
   e. 14
   f. 15
   g. cannot be determined from the data given
   h. none of the above
PART D

Toyota and Capital One Cases

1. In the Toyota Production System, *jidoka* refers to
   a. Level production, where different models are produced along side each other on the assembly line
   b. Continuous improvement, where workers organize meetings to discuss ways of improving the production process
   c. The inventory retrieval system where parts are replenished only when they are needed
   d. The aggressive reduction of changeover and setup times
   e. Continuous line-balancing to maximize utilization
   f. The cross-training of workers for a wide range of skills
   g. None of the above

2. Which of the following statements accurately describe the Toyota Production System?
   I. The entire production is shut down every time the andon cord is pulled
   II. There is zero idle time at each production step
   III. The TPS uses no buffers
   IV. TPS uses buffer inventories between line segments to avoid blocking and starving of the production line
   a. I only
   b. II only
   c. III only
   d. IV only
   e. I, II, III and IV
   f. II and IV
   g. II, III and IV
   h. I and IV

3. In the case of Capital One where is the bottleneck found?
   a. Q&A
   b. Closing
   c. Underwriting
   d. Interviewing
   e. There was no bottleneck
PART E

The Right to Vote (and Not to Wait)

In the previous two presidential elections in the United States, very long wait times have been witnessed at precincts (voting stations) in states that ultimately decided the election (Florida in 2000 and Ohio in 2004).

In Philadelphia as well, some voters complained about the long lines in some precincts, with most complaints coming from precinct A. In 2004, the average number of voters arriving at Precinct A was of 35 per hour and the arrivals of voters was random with inter-arrival times that had a coefficient of variation of 1 (CVa=1).

Philadelphia had deployed 1 voting machine in Precinct A. Suppose that each voter spent on average 100 seconds in the voting booth (this is the time needed to cast her/his vote using a voting machine), with a standard deviation of 120 seconds.

1. How long on average a voter had to wait in line precinct at A in 2004 before entering in a booth to cast her/his vote. Circle the closest answer.
   a. 56 minutes
   b. 58 minutes
   c. 60 minutes
   d. 62 minutes
   e. 71 minutes
   f. 75 minutes
   g. There is not sufficient information to answer the question

Given the long wait times for Precinct A, the city of Philadelphia is thinking of alternative solutions to improve voting conditions. One of the proposed solutions is as follows.

Proposal 1: Deploy an additional voting machine in precinct A. Assume that the voter turnout is expected to have similar characteristics in 2008 as in the previous election.

2. Under Proposal 1, how long on average would a voter have to wait in line in precinct A in 2008 before casting her/his vote. Circle the closest answer.
   a. 1 minute
   b. 5 minutes
   c. 6 minutes
   d. 10 minutes
   e. 11 minutes
   f. There is not sufficient information to answer the question
3. Under Proposal 1, on average, at precinct A, what would be the ratio of the average number of people voting (at a booth) over the average number of people in the line (waiting). Circle the closest answer.
   a. 0.4
   b. 1.4
   c. 2.4
   d. 3.4
   e. 4.4
   f. 5.4
   g. There is not sufficient information to answer the question

4. Suppose Proposal 1 is rejected and that only one machine will be deployed in precinct A. In sign of protest, voters at precinct A decide to adopt the following rule: if the voting machine is busy, the voter will not vote and will leave (and not vote at all). What is the expected number of people who will end up voting on election day in precinct A (assume that the voting station accepts voters for 12 hours from 8:00am to 8:00pm)
   a. Less than 100
   b. Between 100 and 150
   c. Between 150 and 250
   d. More than 250
   e. There is not sufficient information to answer the question
PART F

Airport Massage Station

A small company just opened a new massage station at Philadelphia airport. The company has a stand that offers massages to travelers. Customers can select a length of massage between 5 and 20 minutes and there is a unique rate of $30 independently of the length selected by customers. The average length of massage requested by customers is of 15 minutes with standard deviation of 10 minutes.

There are four employees delivering massages. The average number of potential customers requesting a massage is of 20 per hour. The inter-arrival times are assumed to be exponentially distributed.

If no spot is available when the customer arrives, s/he leaves in order not to risk missing her/his flight.

1. What is average number of customers being serviced per hour at the massage station? Circle the closest answer.
   a. 7
   b. 8
   c. 9
   d. 10
   e. 11
   f. 12
   g. 13
   h. There is not sufficient information to answer the question

2. The station manager is considering the option of hiring additional employees to deliver massages. The hourly wage of an employee is $50/hr. How many ADDITIONAL employees should s/he hire if s/he wants to maximize profits?

   [Profit = revenues from customers – labor cost]

   Suppose that there exists sufficient equipment to accommodate as many new employees as needed.
   a. none
   b. 1 additional employee
   c. 2 additional employees
   d. 3 additional employees
   e. 4 additional employees
   f. There is not sufficient information to answer the question
PART G

Old City Photographics

Located alongside a cobblestoned street in Old City, Old City Photographics (OCP) specializes in the processing of the traditional 35mm negative film, a once dominant photographic medium now in decline due to the popularity of digital photography. OCP offers three packages to their customers. With the standard package, the customer gets a set of 6”x4” prints for $19.99. The deluxe package adds to the standard package a CD-ROM of high resolution scans of the pictures for $29.99. Finally, the $39.99 pro package is similar to the deluxe package in that it comes with a CD-ROM, although the customer gets a contact print rather than a set of prints. (A contact print is an 8”x10” sheet of photographic paper that has all pictures on the roll of film printed next to each other at reduced dimensions and is used as an index.) The workflow for OCP is shown below (s=standard, d=deluxe, p=pro):

OCP is operated by one person at every station.

1. On average, OCP receive 13 jobs per hour consisted of 44% standard, 37% deluxe and 19% pro. Which of the following statement best describes OCP’s process?
   a. The process is demand-constrained
   b. The process is capacity-constrained and “process film” is the bottleneck
   c. The process is capacity-constrained and “scan film” is the bottleneck
   d. The process is capacity-constrained and “make 6”x4” prints” is the bottleneck
   e. The process is capacity-constrained and “make contact print” is the bottleneck
2. What is the implied utilization (ratio of workload relative to capacity) at “Scan Film”
   a. less than 50%
   b. 50% to 60%
   c. 60% to 70%
   d. 80% to 90%
   e. 90% to 100%
   f. more than 100%

3. Fixing the relative proportions of job types, what is the largest number of jobs per hour that OCP can handle? Circle the answer closest to the correct answer.
   a. 10
   b. 11
   c. 12
   d. 13
   e. 14
   f. 15
   g. 16
   h. 17
   i. 18
TaxInc

TaxInc is a small company that offers tax advice by phone. Customers call to ask questions when filling their tax returns.

The calls can be classified into two types: simple and complex. Simple calls have to go only through Agent 1 while complex calls have to go through both Agent 1 and Agent 2. 2/3 of the total incoming calls are simple.

When a customer calls, s/he waits in line until Agent 1 becomes available. After receiving service from Agent 1, two cases can occur. If the call is a simple case, the customer leaves. If the call is complex, the customer joins a queue in front of Agent 2 until the latter becomes available. All calls are processed in the order of their arrival (FCFS: First Come First Serve)

The following data is available:

The average number of calls waiting for Agent 1 is 5 and is the average number of calls waiting for Agent 2 is 3.

The average number of incoming calls (including simple and complex ones) is 30 per hour. The service time at both agents is assumed to have a coefficient of variation of CVp=1.

1. How long does a customer with a simple call waits, on average, before speaking to Agent 1?
   a. 5 minutes
   b. 10 minutes
   c. 15 minutes
   d. 30 minutes
   e. 35 minutes
   f. 40 minutes
   g. There is not sufficient information to answer the question
2. Consider a customer with a complex case (i.e., that goes through Agent 1 and 2). How long would s/he spend waiting on the line between the time s/he calls and the time s/he hangs up (this time does not include the time spent speaking to Agents 1 and 2)
   a. 16 minutes
   b. 20 minutes
   c. 22 minutes
   d. 28 minutes
   e. 34 minutes
   f. 45 minutes
   g. There is not sufficient information to answer the question

PART I
Kick Scooters

Metal frames for kick scooters are manufactured in two steps: stamping and assembly. Each frame is made up of three pieces: one unit of part A and two units of part B.

The parts are fabricated by a single stamping machine that requires a setup time of 90 minutes switching between two part types. Once the machine is set up, the activity time for parts, regardless of type, is 30 seconds each piece. Currently, the stamping machine rotates its production between one batch of 120 part A's and 240 part B's. Completed parts move only when the entire batch is produced.

At assembly, parts are assembled manually to form the finished products. The three parts and a number of small purchased components are required for each unit of final product. Each product requires 30 minutes of labor time to assemble. There are 12 workers in assembly. There is sufficient demand to sell every scooter the system can make.

1. At the current batch sizes, the bottleneck of the system is
   a. Stamping
   b. Assembly
   c. They both have the same capacity
   d. Cannot be determined
2. At the current batch sizes, what is the process capacity in units per hour? Circle the answer below that is closest to the correct answer. A unit refers to a complete scooter frame (i.e. one part A and two parts B).
   a. 1 units/hour
   b. 5 units/hour
   c. 10 units/hour
   d. 20 units/hour
   e. 30 units/hour
   f. 40 units/hour

3. One way to increase process capacity is to
   a. increase the batch size at the Stamping step
   b. decrease the batch size at the Stamping step
   c. add more workers at Assembly
   d. none of the above

4. Which batch size for the stamping machine would minimize inventory without decreasing the current flow rate? Circle the answer below that is closest to the correct answer.
   a. 60 sets
   b. 120 sets
   c. 180 sets
   d. 240 sets
   e. 300 sets
APPENDIX

The Erlang Loss Function Table contains the probability that a process step consisting of \( m \) parallel resources contains \( m \) flow units, i.e. all \( m \) resources are utilized. Inter-arrival times of flow units (e.g., customers or data packets, etc.) are exponentially distributed with mean \( a \), and service times have a mean \( p \) (service times do not have to follow an exponential distribution).

Because there is no buffer space, if a flow unit arrives and all \( m \) servers are busy, then that arriving flow unit leaves the system unserved (i.e., the flow unit is lost). The columns in the table correspond to the number of resources, \( m \), and the rows in the table correspond to \( r = p/a \), i.e. the ratio between the service time and the interarrival time. The following two pages include two tables, one for small values of \( r \) and one for larger values of \( r \).

**Example:** Find the probability, \( P_m(r) \), that a process step consisting of 3 parallel resources must deny access to newly arriving units. Flow units arrive one every \( a = 3 \) minutes with exponential interarrival times and take \( p = 2 \) minutes to serve. First, define \( r = p/a = 2/3 = 0.67 \) and find the corresponding row heading. Second, find the column heading for \( m = 3 \). The intersection of that row with that column is \( P_m(r) = 0.0255 \).

Note that \( P_m(r) \) can be computed directly based on the following formula

\[
\text{Probability \{all } m \text{ servers busy\}} = P_m(r) = \frac{r^m}{m!} \left( \frac{1}{1!} + \frac{r^1}{2!} + \frac{r^2}{3!} + ... + \frac{r^m}{m!} \right) \quad \text{(Erlang loss formula)}
\]

The exclamation mark ("!") in the equation refers to the factorial of an integer number. To compute the factorial of an integer number \( x \), write down all numbers from 1 to \( x \) and then multiply them with each other. For example, \( 4! = 1 \times 2 \times 3 \times 4 = 24 \). This calculation can be done with the Excel function FACT(x).
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\[ r = \frac{p}{a} \]
## Erlang Loss Table

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*Note: The table continues with similar entries.*
Final Exam Answers OPIM611

PART A

Mr. K’s Hair Salon

1. S1 can process 1/10 customers per minute.
   S2 can process 1/20 customers per minute.
   S3 can process 1/30 customers per minute.
   S3 has the lowest capacity and is hence the bottleneck.

2. Since we assume that there is unlimited demand, the flow rate is equal to the capacity of the process, i.e., 2 customers per hour.
   The capacity of S2 is 3 customers per hour.
   The utilization at S2 is 2/3 = 66.7%.

3. labor content = 10+20+30 = 60 min.
   total idle time = 20+10 = 30 min.
   Average labor utilization = 60/(60+30) = 2/3 = 66.7%

4. Direct labor costs = (Total wages) / (flow rate)
   There are three employees with a wage of $18/hr implying that the total wages per hour are given by 18x3 = $54/hr.
   We deduce that direct labor costs = 54/2 = $27

5. What would be the costs of direct labor of serving one guest under each of the two alternatives? Assume that the system operates at its capacity.

   Under Alternative I, the additional worker would help S3 and under this case the bottleneck would become S2 with a capacity of 3 customers/hr.
   Direct labor costs = (18*4)/3 = $24

   Under Alternative II, S3 would still be the bottleneck but the new capacity of S3 will be of 60/25=2.4 customers/hr.
   Direct labor costs = (18*3)/2.4 = $22.5

PART B

Penne Pesto

1. The service time per customer is given by 50+10 = 60 minutes = 1hr.
   Hence, the number of guests served per hour (using Little’s Law) is given by 50 customers.
   In an evening (4 hours), the number of guests served will be 200.
2. ROIC = Return/(Invested Capital) = (Return/Sales) x (Sales/Invested Capital)

Sales (per evening) = 200*20 = $4000
Sales (per year) = 4000*365 = 1,460,000
Return = Sales – [(labor costs) + (material costs) + rent + overhead]
= 4000 – [20*90 + 200*5.50 + 500 + 00]
= 4000 – [1800 + 1100 + 500 + 500]
= 100

Invested Capital = 200,000
Sales (per year) = 4000*365 = 1,460,000

Plugging in,
ROIC = 0.025*7.3 = 18.25%

3. The service time per guest decreases to 50+5 = 55 minutes.
The flow rate is now 60*50/55 = 54.54 customers/hour, which implies that we serve 54.54*4 = 218 guests in one evening.

The Sales per evening are now 218*20 = $4363
The material costs are now 218*5.5 = $1199
Plugging in the formula for the ROIC, one obtains
ROIC = 66%

4. What would be the new ROIC if over-head charges could be reduced by $100 per day? Answer this question independent of the previous question.

Going back to PP2., The return is now
Return = 4000 – [20*90 + 200*5.50 + 500 + 400]
= 200
ROIC = (200/4000) * 7.3 = 36.5%

PART C
ProoSmart Inc.

1. d. $66,000,000
   2006 COGS = 2,367,121 * 11 = $26,038,331
   2006 Sales = 26,038,331 / (1-42%) = $44,893,674
   2007 Sales = 44,893,674 * 148% = $66,442,638

2. f. 15
   2007 COGS = 66,442,638 * (1-45%) = $36,543,451
   2007 Inventory Turns = 36,543,451/2,418,257 = 15
PART D
Toyota and Capital One Cases

1. g. None of the above
2. d. IV only
3. c. Underwriting

PART E
The right to vote (and not to wait)

1. e. 71 minutes
m=1;
average activity time: p = 1.71 min.
average inter-arrival time: a = 60/35 = 1.67 min.
utilization = p/(a*m) = 0.97
CVa = 1
CVp = 1.2
T_q = 71.7 minutes

2. a. 1 minute
m=2;
average activity time: p = 1.71 min.
average inter-arrival time: a = 60/35 = 1.67 min.
utilization = p/(a*m) = 0.49
CVa = 1
CVp = 1.2
T_q = 0.7 minutes

3. c. 2.4
Ip = m*u = 0.97
Iq = Tq/a = 0.41
Ip/Iq = 0.98/0.41 = 2.39

4. c. Between 150 and 250
This is a loss system with m=1 r=p/a = 0.97. Going to the Erlang table, one finds that the probability of a voter finding the server busy is approximately \( P_m = 0.5 \).

The number of people voting is equal to half of those showing up at the voting station, i.e., given by 0.5*35*12=210.
**PART F**

**Airport Massage Station**

1. **f. 12**
   
   - \( m = 4 \)
   - \( p = 15 \) minutes
   - \( a = \frac{60}{20} = 3 \) minutes
   - \( r = \frac{p}{a} = \frac{15}{4} = 5 \)
   - \( P_m = 0.3983 \)
   
   Average number of customers serviced per hour = \( 20*(1-P_m) = 12.034 \)

2. **c. 2 additional employees**
   
   With no hire, the profit rate \([$/hr]\) is \( 30*20*(1-P_m) - 4*50 = 161 \)
   
   If one adds one employee: \( m = 5, P_m = 0.2849 \), and the profit can be compute as before and is given by 179
   
   If one adds two employees: \( m = 6, P_m = 0.1918 \), and the profit can be compute as before and is given by 185
   
   If one adds three employees: \( m = 7, P_m = 0.1205 \), and the profit can be compute as before and is given by 178
   
   The profit rate is maximized when hiring two additional employees.

**PART G**

**Old City Photographics**

1. **a. The process is demand-constrained**
   
   Implied utilization is:
   
   - \( (100\% \times 13 \text{ jobs/hr } \times 2\text{ min/job}) / (60\text{ min/hr}) = 0.43 \) at “process film”
   - \( ((37\% + 19\%) \times 13 \text{ jobs/hr } \times 5\text{ min/job}) / (60\text{ min/hr}) = 0.61 \) at “scan film”
   - \( ((44\% + 37\%) \times 13 \text{ jobs/hr } \times 4\text{ min/job}) / (60\text{ min/hr}) = 0.70 \) at “make 6”x4” prints”
   - \( (19\% \times 13 \text{ jobs/hr } \times 10\text{ min/job}) / (60\text{ min/hr}) = 0.41 \) at “make contact print”
   
   As implied utilization is less than 1.0 at all steps, the process is demand-constrained.

2. **c. 60% to 70%**

3. **i. 18**

   From the calculations for OCP1, we know that “make 6”x4” prints” will become the bottleneck once the process is capacity-constrained (if the mix of jobs does not change). The answer to our present question is thus given by the solution \( X \) to the equation
   
   \[ ((44\% + 37\%) \times X \text{ jobs/hr } \times 4\text{ min/job}) / (60\text{ min/hr}) = 1.00. \]
   
   Re-arranging the equation yields
   
   \[ X = (60\text{ min/hr}) / (81\% \times 4\text{ min/job}) = 18.5 \text{ jobs/hr}. \]
PART H

TaxInc

1. b. 10 minutes
   Arrival rate at Agent 1: \( R_1 = 30 \) customers/hour
   Average Inventory in buffer in front of Agent 1: \( I_1 = 5 \)

   Use Little's Law to get
   Average time spent waiting in front of Agent 1:
   \( T_1 = \frac{I_1}{R_1} = \frac{5}{30} = \frac{1}{6} \) hr = 10 minutes

2. d. 28 minutes
   We already know the time spent waiting for Agent 1, \( T_1 = 10 \) minutes.
   Let us compute the time spent waiting in front of Agent 2 after having spoken to Agent 1.

   Arrival rate at Agent 2: \( R_2 = \frac{30 \times 1}{3} = 10 \) customers/hour
   Average Inventory in buffer in front of Agent 2: \( I_2 = 3 \)

   Use Little's Law to get
   Average time spent waiting in front of Agent 2:
   \( T_2 = \frac{I_2}{R_2} = \frac{3}{10} = 0.3 \) hr = 18 minutes

   Average total time spent waiting = \( T_1 + T_2 = 28 \) minutes.

PART I

Kick Scooters

1. a. Stamping
   The capacity at stamping is \( \frac{120}{(90+120 \times 0.5+9+240 \times 0.5) \times 60} = 20 \) units per hour. The capacity at assembly is \( \frac{1}{30 \times 12 \times 60} = 24 \) units per hour. Therefore, stamping is the bottleneck.

2. d. 20 units/hour
   Since stamping is the bottleneck, its capacity is also the process capacity.

3. a. increase the batch size at the Stamping step
   At a batch-producing step, increasing the batch size increases the capacity at the step.

4. c. 180 sets
   At a batch size of 180, the capacity at stamping is:
   \( \frac{180}{(90+180 \times 0.5+90+360 \times 0.5) \times 60} = 24 \) units per hour.
Instructions

On the answer sheet…

- Use a #2 pencil. Erase changes completely.
- Fill in your name and student id number.
- Mark the “bubbles” under the letters of your name and student id number on the form. Failure to do so will lead to a score of zero.
- Choose the one best answer for each question.

Turn in the solution page only; keep the test. Mark your choices on your copy of the exam. The solutions will be posted in webCafé in several days, and you can use the “Gradebook” feature to check your results.

You may consult 1 textbook and 2 pages of notes during the exam. No laptops or other computers are allowed. No other reference materials are permitted.

You have two hours for the exam. The computer output associated with one or more items should be considered an essential part of the questions.

The multiple-choice questions are equally weighted. Your score is the number of correct answers given to questions that are scored. Some questions may be dropped and not counted as part of the overall score. There is no deduction for incorrect answers.

STOP

Do not turn the page until you are instructed.
A student interested in purchasing a used Honda Accord collected the asking price for 4-door, 4-cylinder used Accords from a newspaper. The paper listed the price of 30 comparable models of various ages (in years). A new car has age 0; a car that has been used for 2 years has age 2. The price is listed in thousands of dollars.

**SUMMARY OF FIT**

- RSquare: 0.913
- Root Mean Square Error: 1.215
- Mean of Response: 6.610
- Observations (or Sum Wgts): 30

**PARAMETER ESTIMATES**

| Term    | Estimate | Std Error | t Ratio | Prob>|t| |
|---------|----------|-----------|---------|-----|
| Intercept | 15.29    | 0.55      | 27.69   | <.0001 |
| Age      | -1.29    | 0.08      | -17.17  | <.0001 |
1. The fitted model implies that the expected price of a brand new Honda Accord is  
   a. About $6,610.  
   b. About $9,130.  
   c. About $12,900.  
   d. About $15,300.  
   e. More than $20,000.

2. According to the fitted model, the asking price for a 2000 Honda Accord on average is  
   a. About $2,600 more than the price of a 2002 Accord.  
   b. About $1,300 more than the price of a 2002 Accord.  
   c. About the same as the price of a 2002 Accord.  
   d. About $1,300 less than the price of a 2002 Accord.  
   e. About $2,600 less than the price of a 2002 Accord.

3. This model predicts the asking price for a 10-year old used Honda Accord to be  
   a. $15,290  
   b. $6,610  
   c. $2,390  
   d. $1,529  
   e. $1,290

4. A buyer with $5,000 seeks a used Accord. What is the chance of the buyer having enough money to purchase an 8-year-old Accord? (Use the fitted model and assume the usual regression conditions.)  
   a. 16%  
   b. 33%  
   c. 50%  
   d. 84%  
   e. 95%

5. A different newspaper contained a larger listing of 60 used Accords of similar ages. Had this model been fit to the larger sample then we can be sure that  
   a. The $R^2$ of the model would have been larger.  
   b. The RMSE of the model would have been smaller.  
   c. The standard error of the slope would have been smaller.  
   d. The standard deviation of the residuals would have been smaller.  
   e. All of the above would have occurred.
6. The plot of the residuals from this model suggests that
   a. The fitted model should be non-linear.
   b. The errors underlying the model are autocorrelated.
   c. The errors underlying the model lack constant variance.
   d. The errors underlying the model are not normally distributed.
   e. The fitted model meets the usual assumptions.

7. A national study by Honda claimed that five-year-old Accords depreciate about $1,400 during the year. Based on this regression, the claimed level of depreciation is
   a. Larger than that of the fitted model, but not by a statistically significant margin.
   b. Larger than that of the fitted model, by a statistically significant margin.
   c. Essentially the same as the value suggested by this model.
   d. Much smaller (closer to zero) than the value implied by this model.
   e. The fitted model does not offer a value for comparison.

8. A friend of the buyer playing with the JMP modeling software accidentally told the software to treat the variable Age as categorical (rather than continuous). If Price is regressed on Age as a categorical variable then
   a. The slope in the alternative model will be steeper.
   b. The intercept in the alternative model will be smaller.
   c. The RMSE of the alternative model will be larger.
   d. The R² of the alternative model will be larger.
   e. The software will indicate an error and not produce an alternative model.

9. Which of the following additional data would produce the most precise estimate in this model of the effects of aging on the asking price of a used Honda Accord?
   a. Adding the prices and ages of 10 one-year-old cars.
   b. Adding the prices and ages of 10 three-year-old cars.
   c. Adding the prices and ages of 10 six-year-old cars.
   d. Adding the prices and ages of 10 nine-year-old cars.
   e. All of these additions would be expected to offer the same improvement.

A friend of the student who is majoring in economics fit the following different model to prices and ages of these 30 cars. She regressed the log of the price on the log of the age of the car, and obtained the following results. She used logs to base e.
10. Compared to the initial linear model, her model using logs
   a. Explains statistically significantly more variation.
   b. Explains more variation, but not by a statistically significant margin.
   c. Corrects for problems caused by autocorrelation in the data.
   d. Captures nonlinear patterns missed by the linear model.
   e. Cannot be interpreted because of the use of logs for the response.

11. Based on the shown summary of her log-log model,
   b. Predicted prices are within $330 of asking prices with 95% confidence.
   c. The price of a used Accord drops about $1000 for each additional year of aging.
   d. The price of a used Accord drops about 1% for each 1% increase in age.
   e. The price of a used Accord drops about 1% for each additional year of age.

12. Using the model with logs and accepting the usual assumptions, an asking price of $12,000 for a 4 year old Accord is
   a. Much higher than predicted by this model, suggesting the car is over-priced.
   b. Higher than predicted by this model, but within typical variation.
   c. Close to the predicted value from this model.
   d. Lower than predicted by this model, but within typical variation.
   e. Much lower than predicted by this model, suggesting the car is a bargain.
Several years ago, a magazine printed an article that claimed taller executives were higher paid than their shorter counterparts. A rival magazine gathered a sample to see whether this claim was plausible. The rival collected a survey of 250 mid-level executives with comparable experience and qualifications. The shown fitted model regresses the reported income (in thousands of dollars) on the height (in inches).

**SUMMARY OF FIT**

- RSquare: 0.05
- Root Mean Square Error: 8.3
- Mean of Response: 121.6
- Observations (or Sum Wgts): 250

**PARAMETER ESTIMATES**

| Term  | Estimate | Std Error | t Ratio | Prob>|t| |
|-------|----------|-----------|---------|-----|
| Intercept | 79.93    | 11.48     | 6.97    | <.0001 |
| Height   | 0.60     | 0.17      | 3.63    | 0.0003 |

13. The results show that, given the usual assumptions of linear regression, that Height
   a. Has statistically significant positive association with Income.
   b. Has a small, insignificant relationship with Income.
   c. and Income are independent.
   d. and Income are uncorrelated.
   e. and Income are Normally distributed.
14. Based on the fitted model and usual assumptions, with 95% confidence, a manager who is 75 inches tall would make on average how much more than a manager who is 65 inches tall?
   a. Between $4,340 and $7,660 more.
   b. Between $2,600 and $9,400 more.
   c. Between $4,300 and $7,700 more.
   d. Between $5,966 and $6,034 more.
   e. They would earn about the same income.

15. Based on the fitted model and usual assumptions, you can predict that 2/3 of the managers who are 70 inches tall make between
   a. $104,930 to $138,930
   b. $110,000 to $135,000
   c. $105,330 to $138,530
   d. $113,630 to $130,230.
   e. $121,760 to $122,100.

16. The residual plot (shown above) for this model implies that
   a. The data are not independent.
   b. The errors are autocorrelated.
   c. The errors are heteroscedastic.
   d. The errors are not normally distributed.
   e. The heights have been rounded to inches.
17. The p-value shown for the slope of Height in the fitted model implies, given the usual assumptions, that
   a. There is a 3% chance that the true slope for Height is zero.
   b. There is a 0.03% chance that the true slope for Height is zero.
   c. There is a 0.03% chance that the true slope for Height is 0.60.
   d. The true slope for Height lies within 2 x 0.0003 of 0.60 with probability 0.95.
   e. It is unlikely to estimate a slope for Height this large if the true slope is zero.

18. If the heights of the managers had been measured in centimeters rather than inches, then (2.54 cm = 1 inch)
   a. The $R^2$ of the model would have been larger.
   b. The RMSE of the fitted model would have been smaller.
   c. The RMSE of the fitted model would have been larger.
   d. The value of the fitted slope would be about 0.236.
   e. The value of the fitted slope would be about 1.524.

19. It was later discovered that some of these managers were men, and some were women. To investigate whether height has a larger effect on income for women than for men, we should
   a. Add a lagged variable for last year’s height.
   b. Check the assumption of equal variance using boxplots grouped by sex.
   c. Add a categorical variable indicating the sex of the manager.
   d. Add the interaction between a categorical variable for sex with height.
   e. Do both “c” and “d.”

20. In order to produce a statistically significant improvement in the fit of this model, one added variable would have to increase the shown $R^2$ to be at least (that is, choose the smallest value that would produce a significant improvement)
   a. 7.5%
   b. 10%
   c. 15%
   d. 25%
   e. 50%
A national motel chain has a model for the operating margin of its franchises. The operating margin is defined to be the ratio of net profit to total revenue (as a percentage). The company plans to use this model to help it identify new profitable sites. The following analysis considers data from 100 motels operated by this chain. The variables are:

- **Margin**: 100 times the ratio of net profit to revenue.
- **Num rooms**: Number of hotel rooms and motel rooms within 3 miles of the site.
- **Office space**: Number of square feet (in 1000’s) of surrounding office.
- **Enrollment**: Number enrolled (in 1000’s) in nearby colleges and universities.

### CORRELATIONS

<table>
<thead>
<tr>
<th></th>
<th>Margin</th>
<th>Num Rooms</th>
<th>Office Space</th>
<th>Enrollment</th>
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<tbody>
<tr>
<td>Margin</td>
<td>1.000</td>
<td>-0.470</td>
<td>0.500</td>
<td>0.123</td>
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<tr>
<td>Num Rooms</td>
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<td>-0.064</td>
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<tr>
<td>Enrollment</td>
<td>0.123</td>
<td>-0.064</td>
<td>-0.001</td>
<td>1.000</td>
</tr>
</tbody>
</table>
21. The scatterplot matrix and correlations among these variables imply that
   
a. A regression of Margin on these 3 predictors explains more than $\frac{1}{2}$ of the variation.
   
b. More students are enrolled in locations with more office space.
   
c. No one predictor can explain more than $\frac{1}{4}$ of the variation in Margin.
   
d. Outliers will distort the multiple regression of Margin on these 3 predictors.
   
e. High collinearity will complicate the interpretation of a multiple regression for Margin on these predictors.

![Scatterplot Matrix and Correlations]

### ANALYSIS OF VARIANCE

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F Ratio</th>
<th>Prob &gt; F</th>
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</thead>
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<td>34.605</td>
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<td>C. Total</td>
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<td>5949.46</td>
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<td></td>
</tr>
</tbody>
</table>

### PARAMETER ESTIMATES

| Term          | Estimate | Std Error | t Ratio | Prob>|t| |
|---------------|----------|-----------|---------|------|
| Intercept     | 53.9826  | 5.1777    | 10.43   | <.0001|
| Num Rooms     | -0.0073  | 0.0013    | -5.48   | <.0001|
| Office Space  | 0.0216   | 0.0036    | 6.03    | <.0001|
| Enrollment    | 0.1776   | 0.1406    | 1.26    | 0.2094|

22. Two motels operated by this chain reside in similar communities, with the exception that one is located near a business office complex with 300,000 square feet of office space. The other is not near any offices. We should expect (based on this model) the average operating margin of the motel near the business complex to be
   
a. About the same as the margin of the motel that is not near offices.
   
b. $6 \frac{1}{2}$ % higher than the margin of the motel that is not near offices.
   
c. 54%.
   
d. 2.2% higher than the margin of the motel that is not near the offices.
   
e. Near 100%.
23. A consultant offered the management of the motel chain an accounting model fit to the same data that she claims captures 35% of the variation in operating margins. The results for the shown model imply that
   a. Predictions from her model will be more accurate than those from this model.
   b. Predictions from her model have comparable accuracy to those from this model.
   c. Predictions from her model will be less accurate than those from this model.
   d. Her model has been over-fit to the data and is not reliable.
   e. The shown model has omitted important predictors that should be added to improve the fit.

24. The shown summary of this regression model implies that this model
   a. Explains a statistically significant proportion of the variation in Margin.
   b. Does not explain a statistically significant proportion of the variation in Margin.
   c. Should be fit to a smaller sample to save degrees of freedom in testing.
   d. Requires a larger sample size to obtain a statistically significant fit.
   e. Explains more than half of the variation in operating margin.

25. If we use this model to predict the operating margin of a motel in a location with 255,200 square feet of nearby office space, 22,600 students enrolled in a nearby college and 2500 competing motel rooms, then
   a. With 95% confidence, the predicted margin would be accurate to ±6%.
   b. With 95% confidence, the predicted margin would be accurate to ±12%.
   c. With 95% confidence, the predicted margin would be accurate to ±24%.
   d. The prediction would be unreliable due to the lack of constant variation.
   e. The prediction would be unreliable because we were extrapolating too far from the data used to construct the model.

26. The following plot of the residuals from this model implies that
a. The model omits important predictors.
b. The errors of the underlying model are dependent.
c. The errors of the underlying model lack constant variance.
d. The errors of the underlying model have constant variance.
e. The errors of the underlying model appear normally distributed.

27. The leverage plot for the effect of Num Rooms in the regression (shown above) implies that
   a. Leveraged outliers have increased the standard error of the slope for this predictor.
   b. Leveraged outliers have decreased the slope for this predictor.
   c. Collinearity has increased the standard error of the slope for this predictor.
   d. The motel chain should build more motels with about 1500 to 2000 rooms.
   e. There appear to be no problems in the estimation of this slope.

28. To obtain a model that is capable of producing substantially more accurate predictions of operating margin, the motel chain is most likely to achieve the greatest success by
   a. Increasing the sample size and refitting the current model.
   b. Transforming the variables to capture the evident increasing returns to scale.
   c. Adjusting for time series factors that have been ignored.
   d. Adding other predictors such as the distance to the nearest competitor.
   e. Removing Enrollment from this model.
A resort hotel in Jamaica would like to predict the level of occupancy in coming seasons in order to better schedule its staff. To help the resort, a consultant used quarterly occupancy rates during the 5 years 1999-2003 to build the following model. The response in this model is Occupancy, defined as the ratio (number of occupied rooms)/(number of available rooms). The variable Year is coded in order as 1999, 1999, 1999, 1999, 2000, 2000, 2000, 2001, ..., 2003 and the variable Quarter is coded as “Q1,” “Q2,” “Q3,” and “Q4.” The data was put in the JMP spreadsheet in time order.

\[
\text{RSquare} = 0.892 \\
\text{Root Mean Square Error} = 0.038 \\
\text{Mean of Response} = 0.695 \\
\text{Observations} = 20
\]

**PARAMETER ESTIMATES**

| Term          | Estimate | Std Error | t Ratio | Prob>|t| |
|---------------|----------|-----------|---------|------|
| Intercept     | -39.415  | 11.953    | -3.30   | 0.0049 |
| Quarter[Q1]   | -0.092   | 0.015     | -6.28   | <.0001|
| Quarter[Q2]   | 0.023    | 0.015     | 1.49    | 0.1582|
| Quarter[Q3]   | 0.122    | 0.015     | 8.30    | <.0001|
| Quarter[Q4]   | -0.080   | 0.015     | -5.43   | <.0001|
| Year          | 0.020    | 0.006     | 3.36    | 0.0043|

**EFFECT TESTS**

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<th>Source</th>
<th>Nparm</th>
<th>DF</th>
<th>Sum of Squares</th>
<th>F Ratio</th>
<th>Prob &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quarter</td>
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<td>3</td>
<td>0.1604</td>
<td>37.355</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Year</td>
<td>1</td>
<td>1</td>
<td>0.0161</td>
<td>11.260</td>
<td>0.0043</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Durbin-Watson</th>
<th>Number of Obs.</th>
<th>AutoCorrelation</th>
<th>Prob&lt;DW</th>
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<tbody>
<tr>
<td>1.3278658</td>
<td>20</td>
<td>0.3310</td>
<td>0.0715</td>
</tr>
</tbody>
</table>
29. Based on the fit of this model, the predicted level of occupancy at the resort for the first quarter of 2004 is approximately
   a. Less than 50%
   b. 60%
   c. 70%
   d. 80%
   e. 100%

30. Accepting the model with the usual assumptions, we can conclude that occupancy rates at this resort in Quarter 4 are, on average,
   a. About the same as the rate in the prior Quarter 3.
   b. Significantly lower than the rate in the prior Quarter 3.
   c. Significantly higher than the rate in the prior Quarter 3.
   d. About 31%.
   e. Unchanged over these 5 years of data.

31. The resort used a new advertising campaign that promised to raise occupancy rates in a future quarter by 5% (e.g., from 80% to 85%). If we accept the usual assumptions, can this model be used to judge whether the campaign achieved its goal?
   a. No.
   b. Yes.
   c. Yes, but only if we know the quarter being predicted.
   d. Yes, but only if the campaign achieves a higher gain (say 10%) than promised.
   e. We cannot answer this question without knowing the predicted occupancy rate.

32. It has been conjectured that the rate of occupancy has been growing slower during the 4th quarter than other quarters. According to this model (and accepting the usual conditions), we can see that
   a. Growth is slower in Q4 than Q3, but not by a significant margin.
   b. Growth is slower in Q4 than Q3, by a statistically significant margin.
   c. A longer time series of data would be necessary to address this conjecture.
   d. Equivalent standard errors for the quarter effects show that growth is similar in all.
   e. The model does not address this conjecture.
33. During this time period, the occupancy rates of resorts like this one in Jamaica grew by 3% per year. Compared to this rate, the fit of this model (along with the usual assumptions) implies that the occupancy rate at this resort is
   a. Statistically significantly lower.
   b. Lower, but not by a significant margin.
   c. About the same.
   d. Higher, but not by a significant margin.
   e. Statistically significantly higher.

34. A useful next step in the use of this model would be to
   a. Remove the insignificant indicator for Q2.
   b. Use a partial-F test to assess the overall effect of differences in quarters.
   c. Convert the two predictors Quarter and Year into a simple time sequence.
   d. Discover why results for Q3 are so variable over these years.
   e. Use any of the above actions to improve the model.

QUESTIONS 35-45

Absenteeism is a problem for some companies. Two economists collected data from a sample of 100 companies in order to explore how various characteristics of these companies affect the rate of absenteeism. The response variable in the following models is Absent, the average number of days that employees are absent during the year (i.e., total number of days missed due to absence divided by the number of full time equivalent employees). The predictors considered in this analysis are

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wage</td>
<td>Average employee wage, in 1,000’s of dollars.</td>
</tr>
<tr>
<td>Union %</td>
<td>Percentage of the work force in a union (0 – 100).</td>
</tr>
<tr>
<td>Part-time %</td>
<td>Percentage of the work force who work part time (0 – 100).</td>
</tr>
<tr>
<td>Union relations</td>
<td>Indicator of good/bad relationship between the union and mgmt</td>
</tr>
<tr>
<td>Shift work avail</td>
<td>Indicator of whether shift work is available.</td>
</tr>
</tbody>
</table>

Shift work allows employees to alter their schedule to different times during the week rather than work a fixed schedule, such as 9-5 during the week. The following results summarize the fit of a multiple regression model.

**SUMMARY OF FIT**

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>RSquare</td>
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</tr>
<tr>
<td>Root Mean Square Error</td>
<td>2.618</td>
</tr>
<tr>
<td>Mean of Response</td>
<td>6.332</td>
</tr>
<tr>
<td>Observations (or Sum Wgts)</td>
<td>100,000</td>
</tr>
</tbody>
</table>
35. Suppose that two companies both pay an average wage of $50,000 with 35% part-time workers, 50% union participation, and no shift work available. If one company has good relations with the employee union whereas the other has poor relations, then this model predicts that absenteeism at the company with good relations will be

a. Lower by about 1.23 days per year.
b. Lower by about 2.46 days per year.
c. Lower by less than 1 day per year.
d. Higher by about 1.23 days per year.
e. Higher by about 2.46 days per year.

36. If the predictor Union% were removed from this model, then

a. The RMSE of the model would increase by a statistically significant amount.
b. The RMSE of the model would decrease, but not by a statistically significant amount.
c. The $R^2$ of the model would drop by less than 0.01%.
d. The slopes of the other predictors would be unchanged.
e. The F-ratio of the model would be unchanged.

37. Based on this model, do companies offering shift work have more absenteeism than comparable companies that do not offer shift work?

a. Yes, by a statistically significant amount.
b. Yes, but not by a statistically significant amount.
c. No, they have statistically significantly lower absenteeism.
d. No, they have lower absenteeism.
e. The effect of union relations is too small to be meaningful.
38. If an interaction between Shift Work and Union Relations was added to the model, then the model could answer which of the following questions that it cannot as shown?
   a. Is more variation in absenteeism explained by Shift Work or Union Relations?
   b. Does the effect on absenteeism of having shift work available depend on the quality of union relations?
   c. Does the elasticity of absenteeism with respect to the percentage in the union depend upon the quality of union relations?
   d. Do Shift Work and Union Relations jointly explain significant variation in absenteeism?
   e. Has collinearity affected the accuracy of the slopes of Shift Work or Union Relations?

39. In order to check the assumption of equal error variation, which of the following plots should be viewed?
   a. A plot of absenteeism on the predicted values from the model.
   b. A plot of absenteeism on each predictor.
   c. The scatterplot matrix of all of the variables in this analysis.
   d. Comparison boxplots of the residuals grouped by Shift Work or Union Relations.
   e. A normal quantile plot of the residuals.

40. If the point marked with an “x” in the shown leverage plot were excluded from this analysis, then
   a. The estimated slope for wage would no longer be significant.
   b. The estimated slope for wage would become more negative.
   c. The estimated slope for wage would become closer to zero.
   d. The RMSE of the fitted model would increase.
   e. The standard error for the slope of Wage would increase.
The previous fitted model was expanded by adding two additional predictors. A summary of the expanded model follows.

### SUMMARY OF FIT

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>RSquare</td>
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<tr>
<td>Root Mean Square Error</td>
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### ANALYSIS OF VARIANCE

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<th>Source</th>
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<th>Mean Square</th>
<th>F Ratio</th>
<th>Prob &gt; F</th>
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### PARAMETER ESTIMATES

| Term                                | Estimate | Std Error | t Ratio | Prb>|t| |
|-------------------------------------|----------|-----------|---------|-----|
| Intercept                           | 11.97    | 2.06      | 5.80    | <.0001 |
| Wage                                | -0.14    | 0.04      | -3.41   | 0.0010 |
| Part-time %                         | -0.12    | 0.03      | -3.65   | 0.0004 |
| Union %                             | 0.06     | 0.01      | 4.38    | <.0001 |
| Shift Work Available[No]            | -0.60    | 0.26      | -2.28   | 0.0248 |
| Shift Work Available[Yes]           | 0.60     | 0.26      | 2.28    | 0.0248 |
| Union Relations[Good]               | -1.27    | 0.26      | -4.95   | <.0001 |
| Union Relations[Poor]               | 1.27     | 0.26      | 4.95    | <.0001 |
| (Wage-48)*Shift Work Avail[No]      | 0.11     | 0.04      | 2.60    | 0.0109 |
| (Wage-48)*Shift Work Avail[Yes]     | -0.11    | 0.04      | -2.60   | 0.0109 |
| (Wage-48)*Union Relations[Good]     | 0.09     | 0.04      | 2.43    | 0.0172 |
| (Wage-48)*Union Relations[Poor]     | -0.09    | 0.04      | -2.43   | 0.0172 |

41. The fit of this model implies that if a company with average wages $40,000 increases the average wage to $41,000 without affecting its other characteristics (50% part-time, 40% union, no shift work, good union relations), then it can expect that the average level of absenteeism will

a. Decrease by 1.4 days per year.
b. Decrease by 0.14 days per year.
c. Decrease by 0.25 days per year.
d. Decrease by 0.34 days per year.
e. Increase by 0.06 days per year.

42. The fit of the expanded model

a. Explains about the same amount of variation in absenteeism as the first model.
b. Significantly more variation in absenteeism than the first model.
c. Cannot be directly compared to that of the original model without Effect Tests.
d. Suffers from over-fitting due to the addition of so many more predictors.
e. Is inferior to the first model because the overall F-ratio has decreased.
43. The slope for the predictor Wage changes from -0.16 in the original model to -0.14 in the expanded model because
   a. The added predictors are correlated with Wage.
   b. The added predictors are interactions.
   c. The added predictors are correlated with both Wage and Absent.
   d. The expanded model has a larger $R^2$ than the original model.
   e. The added predictors introduce outliers that alter the slopes of the original model.

44. The coefficient of $(Wage-48)*\text{Union Relations}[\text{Good}]$ implies that, on average in companies with similar other characteristics and some shift work available, those with good union relationships
   a. Have statistically significantly lower rates of absenteeism.
   b. Have about the same rates of absenteeism as those with poor relationships.
   c. Achieve smaller decreases in absenteeism as wages increase.
   d. Pay about the same wages as those with poor relationships.
   e. Pay statistically significantly higher wages than those with poor relationships.

45. A company with 100 employees has an average wage of $50,000 with 35% part-time workers, 50% union participation, good union relations, and no shift work available. Given the usual regression assumptions, the total number of absent days in the next near is predicted to fall
   a. Between 0 to 720 days, with 95% probability.
   b. Between 225 to 235 days, with 95% probability.
   c. Between 0 and 475 days, with 95% probability.
   d. Between 0 and 877 days, with 95% probability.
   e. Fewer than 100 days, with 95% probability.
1. **d.** The intercept of the fitted model is the expected price for Age zero.

2. **e.** The 2000 model Accord is two years older than a 2002 model, so the expected difference in price is twice the estimated slope in the model.

3. **c.** Plugging 10 into the equation of the fitted model gives $15.29 - 10 \times 1.29 = 2.39$.

4. **c.** An 8-year-old Accord is expected to cost $15.29 - 8 \times 1.29 = 4.97$ thousand dollars. That’s basically how much money the buyer has, so we’d expect the buyer to be able to afford about $\frac{1}{2}$ of these models.

5. **c.** The standard error would be smaller because of the increase in the sample size, but the other statements are not necessarily true. The $R^2$, for example, might be larger or smaller, depending on the true relationship between age and cost.

6. **a.** The model requires a transformation (such as logs for both the predictor and response) to capture the bend that is particularly evident in the plot of the residuals.

7. **a.** The confidence interval for the annual depreciation in this model is $-1.29 \pm 2 \times 0.08$, or a range of -1.53 to -0.05 thousand dollars per year. The claimed depreciation of $1,400$ lies inside this interval.

8. **d.** If Age is treated as categorical, then the model will fit an average to the data for each age. You cannot get a higher explained sum of squares than fitting an average to each group.

9. **a.** Adding observations that add the most variation to the predictor produce the largest reduction in the standard error of the slope, and hence yield a more accurate estimate.

10. **d.** The linear model is incorrectly specified. Note that you should not compare $R^2$’s between models with different responses. Explaining variation in cost is not the same as explaining variation in the log of cost.

11. **d.** The slope in a log(Y) on log(X) model is the elasticity of Y with respect to X.

12. **a.** The estimated log price from the log-log model is $\log(\text{price}) = 3.536 - 1.025 \times \log(4) = -2.115$. Now add in $\pm 2\text{RMSE}$ to capture the uncertainty (on the log scale) to get a range of $2.115 \pm 2 \times 0.165 = 1.785$ to 2.445. Now “unlog” by exponentiating each endpoint to get the 95% prediction interval $\exp(1.785) = 5.96$ to $\exp(2.445) = 11.53$. 

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**Sample Exam Answers STAT613**
13. **a.** The p-value for the slope is far below the usual 0.05 threshold.

14. **b.** The confidence interval for the slope is $0.60 \pm 2 \times 0.17$, or a range of 0.26 to 0.94 thousand dollars per inch of height. Multiply this range by 10.

15. **d.** The fit for a man who is 70 inches tall is $79.93 + 70 \times 0.60 = 121.93$ thousand dollars. Plus or minus one RMSE gives the range $121.93 \pm 8.3 = 113.63$ to 130.23.

16. **e.** The data align in columns over the integer-valued heights.

17. **e.** The p-value is the probability of a slope as large or larger assuming the null hypothesis of slope zero is true.

18. **d.** The given slope is 0.60 thousand $ per inch. Each inch is 2.54 cm, so the slope using cm would be smaller, $0.60/2.54 = 0.2362$. Because this change of scale only affects the predictor, not the response, the RMSE would be unchanged. $R^2$ is not affected by changes of scale.

19. **e.** To see if the effect of Height varies for men and women, both a categorical variable for Sex and its interaction with Height would be needed. Adding only a categorical variable would force the slopes for both groups to be the same, and adding only an intercept would force both fits to have a common intercept.

20. **a.** Try the partial F-test. If you use the smallest value, the partial F-test gives a very significant result:

$$F = \frac{(7.5 - 5)/1}{(100 - 7.5)/247} = 6.68$$

This is statistically significant because the associated t-statistic would be the square root of this value, or about 2.6.

21. **c.** The square of the correlation is the $R^2$ in a regression, and the largest correlation with the response is 0.5. The scatterplot matrix and correlations suggest little correlation among the predictors, so collinearity is not an issue.

22. **b.** The partial slope is appropriate, and we find a difference of $300 \times 0.0216 = 6.48$.

23. **c.** From the Anova summary of the shown model, its $R^2 = 2627.4/5949.46 = 0.4416$.

24. **a.** The overall F-ratio from the Anova table is statistically significant.
25. **b.** From the Anova summary, the RMSE of this model is \(\sqrt{34.605} = 5.883\), or about 6%. To have 95% confidence, we have to use \(\pm 2\)RMSE. From the scatterplot matrix, the values of all of these predictors lie well within experience.

26. **e.** This is the normal quantile plot, and the residuals lie within the confidence bands.

27. **e.** No particular leveraged outliers are apparent, and the points at the edges increase the slope. There is no sign of the narrowing associated with collinearity.

28. **d.** Only adding other reasonable predictors will generate an improvement in accuracy. Adding more data will reduce the error in slope estimates, but does offer the chance for substantial improvement in the accuracy.

29. **b.** Plugging into the fitted model gives a prediction \(-39.415 - 0.092 + 0.02\times 2004 = 0.573\). You need only use the term for Q1, ignoring the others associated with quarter.

30. **b.** The difference in rates between two quarters in the same year is the difference between the corresponding Quarter terms. The coefficient for Q3 is 0.122 (SE = 0.015) and for Q4 is -0.08 (SE = 0.015). The associated confidence intervals do not overlap and are quite distinct.

31. **a.** The RMSE of this model is 0.038, so a 5% shift is less than 2 RMSE’s away from the predicted value of the model.

32. **e.** This model does not address the conjecture, which would require an interaction between year and quarter.

33. **b.** The confidence interval for the slope is 0.02 \(\pm 2 \times 0.006\), and so includes 0.03.

34. **d.** The residual plot shows points with large predicted occupancy (Q3) have large variance. We should not pick apart the several terms added by the categorical factor, and we can tell by the significance of 3 of the 4 terms that the partial F for this effect is significant.

35. **b.** The effect for union relations is the difference between the two coefficients for this factor, or \(2 \times 1.23\).

36. **a.** The RMSE would increase significantly because a significant predictor would have been removed, leaving substantial extra variation in the residuals.

37. **b.** The categorical variable for Shift[Yes] is positive (indicating more days absent), but this effect is not significant.
38. **b.** An interaction measures whether the effect of one predictor (Shift) depends upon the levels of another (Union yes or no).

39. **d.** Comparison boxplots are particularly useful in models with categorical predictors for checking whether the variance of the residuals is comparable in the different groups.

40. **b.** The outlier is pulling the slope for Wage closer to zero. Removing this point would also reduce the RMSE of the model since it has a large residual. It’s hard to say what will happen to the SE of the slope because this point contributes variance to the predictor, but also inflates the RMSE of the model.

41. **e.** The slope for Wage for a company with no shift work and poor union relations is

\[-0.14 + 0.11 + 0.09 = 0.06\]

The added terms come from the interactions between Wage and the indicated levels of the categorical terms.

42. **b.** The fit is significantly better as both added features are statistically significant.

43. **a.** Collinearity is correlation among the predictors, regardless how constructed.

44. **c.** The interaction shows that the slope for wages increases in companies with good relations. Adding a positive value to the negative overall slope for Wage slows the reductions obtained by raising wages.

45. **a.** Plugging into the equation, the predicted average level of absenteeism is

\[11.97 - 0.14*50 - 0.12*35 + 0.06*50 - 1.27 - 0.6 + (50-48)*0.11 + (50-48)*0.09\]

which is 2.3. Adding ± 2 RMSE gives a 95% prediction interval

\[2.3 \pm 2 \times 2.456 = -2.612 \text{ to } 7.212\]

The negative lower value should be set to zero because you cannot have negative days absent (the model is flawed and needs a transformation). Multiplying this range by 100 gives the indicated range.