MgS 4120 Exam Spring 2006  Print your name in the boxes above, one letter per box.

Answer Part 1 based on the “Overtime” printout, answer the following questions:
1. Suppose Seasick has the opportunity to use as much overtime as they choose, but in only one department. For each hour of overtime, they have to pay all the regular hourly costs plus an additional $10 per hour overtime compensation.

   a. Cutting, Assembly Finishing None  Circle the department they should order overtime in:

   b. ______ How many hours of overtime should they order?

   c. ____________ What would their new total contribution be? (Zero points if you give the right answer to a different question here, even if it’s a related question!)

   d. Show the calculations for your answer to question B using numbers from the printout below.

   d. Briefly explain why your decision in question A is better than any other alternative. Do NOT include any information that would require re-running Solver. Including such information will make your answer incorrect!

Answer Part 2 based on the three pages of the "Goal" printout:
5. For each of the following question about Seasick Waterbeds, give the sheet number (1, 2, or 3), the column letter, and the row number of the cell that contains the answer. Note Seasick's fixed costs are $10,000 per week.

<table>
<thead>
<tr>
<th>Sheet (1, 2, or 3)</th>
<th>Column Letter</th>
<th>Row Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td>The highest contribution per week to profit &amp; overhead you can make</td>
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<td></td>
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<td>The number of Caribbean frames per week when you maximize contribution to profit &amp; overhead regardless of employment</td>
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<td>The total number of unused hours per week when you maximize (short term) employment if profit/loss is of no concern</td>
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<td></td>
<td></td>
<td></td>
<td>The number of Caribbean frames per week when you maximize (short term) employment if profit/loss is of no concern</td>
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<td></td>
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<td></td>
<td>The total number of unused hours per week when you maximize sustained employment and just break even.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>The number of Caribbean frames per week when you maximize sustained employment and just break even.</td>
</tr>
</tbody>
</table>

Work Individually! Don’t attach any other pages!
Answer Part 3 based on the "Pet Food" printout.

3. In the space to the left of each line of constraints at the bottom of this page, put the letters (a-i indicating which sentences from the problem statement correspond in whole or in part to that constraint. Some sentences contribute to more than one constraint (such sentences tend to have the word "and" in them). Some constraint lines correspond to all or parts of more than one sentence, but never more than two sentences.

The Petty Larceny Company makes catfood and dogfood out of three ingredients: fish, liver, and soy.

a. They sell dogfood for $1.00 per pound and catfood for $1.50 per pound.

b. They have on hand 500 pounds of fish and 600 pounds of liver.

c. They can get all the soy they need.

d. Replenishing their stock will cost $1.50 per pound of fish and $1.25 per pound of liver.

e. Soy costs $0.50 per pound.

f. Catfood must contain at least 25% fish and no more than 50% soy.

g. Dogfood must contain at most 10% fish and at most 60% soy.

h. Dogfood and catfood must each be at least 35% of the total production.

i. They have committed to produce at least 500 pounds of catfood and 600 pounds of dogfood.

For each line shown in the constraints box, give the business meaning in plain English. Use short complete sentences. For some of the questions, the ideal answer is just a word for word copy of one of the sentences above.

<table>
<thead>
<tr>
<th>Sentence(s)</th>
<th>Constraint Lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>=$B$2&lt;=$B$13</td>
<td></td>
</tr>
<tr>
<td>=$B$6:$C$6&gt;=$B$7:$C$7</td>
<td></td>
</tr>
<tr>
<td>=$B$4:$C$4&lt;=$B$14:$C$14</td>
<td></td>
</tr>
<tr>
<td>=$C$2&gt;=$C$13</td>
<td></td>
</tr>
<tr>
<td>=$E$2:$E$3&lt;=$F$2:$F$3</td>
<td></td>
</tr>
<tr>
<td>=$B$6:$C$6&gt;=$B$16:$C$16</td>
<td></td>
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</tbody>
</table>
Answer Part 4 based on the sensitivity report for the variant on California Chemical in the data handout. (Do not use the original version!) Note that only long distance costs are calculated; local costs are ignored.

4. True or False:

T  F  California Chemical should ship 250,000 tons of fertilizer from the Bakersfield plant to the Bakersfield farmers.
T  F  California Chemical must pay $300,000 to ship fertilizer from the Bakersfield plant to the Imperial farmers.
T  F  California Chemical could have shipped fertilizer from the Bakersfield plant to the Napa/North Coast farmers, but other routings were more economical.
T  F  California Chemical can't ship fertilizer from the Sacramento warehouse to the Imperial farmers.
T  F  California Chemical could have shipped fertilizer from the Sacramento warehouse to the Napa/North Coast farmers, but other routings were more economical.
T  F  California Chemical can't ship fertilizer from the Visalia Warehouse to the Sacramento farmers.
T  F  The optimal solution reduces the cost of shipping fertilizer from the Bakersfield plant to the Napa/North Coast farmers by 6 dollars.
T  F  The optimal solution reduces the cost of shipping fertilizer from the Bakersfield plant to the Napa/North Coast farmers to 6 dollars.
T  F  Shipping one ton of fertilizer from the Bakersfield plant to the Napa/North Coast farmers would increase total cost by 6 dollars.
T  F  Since California Chemical's isn't shipping anything from the Bakersfield plant to the Napa/North Coast farmers anyway, they wouldn't change their decision if that route became more expensive.
T  F  California Chemical's is only allowed to increase the amount they ship from the Red Bluff plant to the Sacramento warehouse by 1 ton.
T  F  If the cost of shipping fertilizer from the Red Bluff plant to the Sacramento warehouse goes above $3.20, the decision will change.
T  F  All of the fertilizer shipped to Napa-North Coast farmers was manufactured in Red Bluff.
T  F  All of the fertilizer shipped to Salinas farmers was manufactured in Red Bluff.
5. Answer part 5 based on the sensitivity report for the variant on California Chemical in the data handout (same printout as part 3). (Do not use the original version!)

Use the fact that the total cost currently is $10,760,000.00 to answer each of the following questions about changes in the inputs to the California Chemical problem.

If the total cost cannot be determined from THE SENSITIVITY REPORT you must write "unpredictable." If you rerun the model and write the correct dollar amount it will be considered incorrect!

A. The cost of moving a ton of fertilizer from the Bakersfield plant to the Visalia farmers becomes $5.

   Does this change the decision? Yes  No

   After the change the total cost is ________________ (dollar amount or the word unpredictable)

B. The cost of moving a ton of fertilizer from the Bakersfield plant to the Visalia farmers becomes $1.

   Does this change the decision? Yes  No

   After the change the total cost is ________________ (dollar amount or the word unpredictable)

C. Red Bluff plant capacity increases by 200,000 tons.

   Does this change the decision? Yes  No

   After the change the total cost is ________________ (dollar amount or the word unpredictable)

D. Red Bluff plant capacity decreases by 200,000 tons.

   Does this change the decision? Yes  No

   After the change the total cost is ________________ (dollar amount or the word unpredictable)

E. Sacramento warehouse capacity doubles.

   Does this change the decision? Yes  No

   After the change the total cost is ________________ (dollar amount or the word unpredictable)

F. Sacramento warehouse capacity is cut in half.

   Does this change the decision? Yes  No

   After the change the total cost is ________________ (dollar amount or the word unpredictable)

G. Red Bluff farmers don't want any fertilizer.

   Does this change the decision? Yes  No

   After the change the total cost is ________________ (dollar amount or the word unpredictable)

H. Red Bluff farmers want twice as much fertilizer.

   Does this change the decision? Yes  No

   After the change the total cost is ________________ (dollar amount or the word unpredictable).