Supplement to Appendix 3.1:

More About LINGO.

See Appendix I for documentation of the software.

## PROBLEMS

The symbols to the left of some of the problems (or their parts) have the following meaning:

D: The demonstration example listed above may be helpful.

I: You may find it helpful to use the corresponding procedure in IOR Tutorial (the printout records your work).

C: Use the computer to solve the problem by applying the simplex method. The available software options for doing this include the Excel Solver or Premium Solver (Sec. 3.6), MPL/CPLEX (Sec. 3.7), LINGO (Appendix 3.1), and LINDO (Appendix 4.1), but follow any instructions given by your instructor regarding the option to use.

An asterisk on the problem number indicates that at least a partial answer is given in the back of the book.

### 3.1-1.

For each of the following constraints, draw a separate graph to show the nonnegative solutions that satisfy this constraint.

- (a) \( x_1 + 3x_2 \leq 6 \)
- (b) \( 4x_1 + 3x_2 \leq 12 \)
- (c) \( 4x_1 + x_2 \leq 8 \)
- (d) Now combine these constraints into a single graph to show the feasible region for the entire set of functional constraints plus nonnegativity constraints.

### 3.1-2.

Consider the following objective function for a linear programming model:

Maximize \( Z = 2x_1 + 3x_2 \)

- (a) Draw a graph that shows the corresponding objective function lines for \( Z = 6, Z = 12 \), and \( Z = 18 \).
- (b) Find the slope-intercept form of the equation for each of these three objective function lines. Compare the slope for these three lines. Also compare the intercept with the \( x_2 \) axis.

### 3.1-3.

Consider the following equation of a line:

\[ 20x_1 + 40x_2 = 400 \]

- (a) Find the slope-intercept form of this equation.
- (b) Use this form to identify the slope and the intercept with the \( x_2 \) axis for this line.
- (c) Use the information from part (b) to draw a graph of this line.

### 3.1-4.

Use the graphical method to solve the problem:

Maximize \( Z = 2x_1 + x_2 \),

subject to

\( x_2 \leq 10 \)
\( 2x_1 + 5x_2 \leq 60 \)

### 3.1-5.

Use the graphical method to solve the problem:

Maximize \( Z = 10x_1 + 20x_2 \),

subject to

\( x_1 \geq 0, x_2 \geq 0 \).

### 3.1-6.

The Whitt Window Company is a company with only three employees which makes two different kinds of hand-crafted windows: a wood-framed and an aluminum-framed window. They earn $60 profit for each wood-framed window and $30 profit for each aluminum-framed window. Doug makes the wood frames, and can make 6 per day. Linda makes the aluminum frames, and can make 4 per day. Bob forms and cuts the glass, and can make 48 square feet of glass per day. Each wood-framed window uses 6 square feet of glass and each aluminum-framed window uses 8 square feet of glass.

The company wishes to determine how many windows of each type to produce per day to maximize total profit.

- (a) Describe the analogy between this problem and the Wyand Glass Co. problem discussed in Sec. 3.1. Then construct and fill in a table like Table 3.1 for this problem, identifying both the activities and the resources.

- (b) Formulate a linear programming model for this problem.

- (c) Use the graphical method to solve this model.

- (d) A new competitor in town has started making wood-framed windows as well. This may force the company to lower the price they charge and so lower the profit made for each wood-framed window. How would the optimal solution change (if at all) if the profit per wood-framed window decreases from $60 to $40? From $60 to $20? (You may find it helpful to use the Graphical Analysis and Sensitivity Analysis procedure in IOR Tutorial.)

- (e) Doug is considering lowering his working hours, which would decrease the number of wood frames he makes per day. How would the optimal solution change if he makes only 5 wood frames per day? (You may find it helpful to use the Graphical Analysis and Sensitivity Analysis procedure in IOR Tutorial.)
AMS-CMPS-TIM TA Request Form – Winter 2012

Return to the SoE Graduate Office – Tracie Tucker E2-298J or fax to (831) 459-4482 by Nov. 7, 2011 @ 4:00 PM

Name: **BRAD ERIC HOLLISTER**  SOE Email: behl115@soe.ucsc.edu

Department: **CMPS**  Degree objective: ☑ PhD  ☐ MS

Quarter/Year Began: **FALL 2010**  Advisor: **ALEX PANG**

1. Have you taken and passed AMS 200, BME 200, CMPS 200 or CMPE 200? ☑ Yes  ☐ No  ☑ Currently enrolled

2. List all UCSC courses for which you have been a Teaching Assistant:

<table>
<thead>
<tr>
<th>Course #</th>
<th>Quarter/Year</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMPS 5J</td>
<td>WINTER 2011</td>
<td>McDowell</td>
</tr>
<tr>
<td>CMPS 25</td>
<td>SPRING 2011</td>
<td>Yong-e</td>
</tr>
<tr>
<td>CMPS 25</td>
<td>FALL 2011</td>
<td>Yong-e</td>
</tr>
</tbody>
</table>

3. Will you be a part-time student next quarter? ☑ Yes  ☐ No

4. Will you be a California resident next quarter? ☑ Yes  ☐ No

5. Are you likely to be supported as a GSR, a Fellow, or by any other paid jobs on campus during the quarter for which you are applying for TAship? ☑ Yes  ☐ No  ☐ Maybe

If Yes or Maybe, please provide details:

Preferences: List at least 5 from the list of Winter 2012 classes that might need TAs.

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Background/Qualifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMPS 25</td>
<td>TA ed before, worked in games industry</td>
</tr>
<tr>
<td>CMPS 20</td>
<td>Worked at Zynga and Aspyr Media as professional software engineer</td>
</tr>
<tr>
<td>CMPS 5J</td>
<td>TA ed this course before</td>
</tr>
<tr>
<td>CMPS 10</td>
<td></td>
</tr>
<tr>
<td>CMPS 12A</td>
<td></td>
</tr>
</tbody>
</table>

Please rate your expertise in the following areas as Confident (C), Satisfactory (S), Not Comfortable (NC) – Please circle one:

- C Language: ☑ S NC
- Java: ☑ S NC
- Unix Shell: ☑ S NC
- Other Languages/OS: ☑ JavaScript, Perl, etc.

Signature: **Brendan E. Hollister**  Date: 10/25/2011

10/21/2011