Feedback — Pivoting Assignment #1 (Small Problem)

Help Center

You submitted this homework on **Sun 29 Sep 2013 1:38 AM PDT**. You got a score of **45.00** out of **45.00**.

Question 1

Consider the dictionary

$$\begin{array}{l|lll} x_3 & 2 & +3x_1 & -1x_2 \\ x_4 & 11 & & -1x_2 \\ x_5 & 3 & -1x_1 & +1x_2 \\ x_6 & 6 & -1x_1 & \\ \hline z & 0 & +1x_1 & +2x_2 \end{array}$$

Assume x_1, x_2 are original problem variables and $x_3, \ldots, x_6$ are slack variables. Which of the following standard form problems could have given rise to this dictionary?

Your Answer	Score	Explanation
○ $\begin{aligned} \max \quad & -x_1 - 2x_2 \\ \text{s.t.} \quad & 3x_1 - x_2 \leq 2 \\ & -x_2 \leq 11 \\ & -x_1 + x_2 \leq 3 \\ & -x_1 \leq 6 \\ & x_1, x_2 \geq 0 \end{aligned}$		

○ $\max \; x_1$ s.t. $x_2 \leq 11$ $x_1 - x_2 \leq 3$ $x_1 \leq 6$ $x_1, x_2 \geq 0$			
◉ $\max \; x_1 + 2x_2$ s.t. $-3x_1 + x_2 \leq 2$ $x_2 \leq 11$ $x_1 - x_2 \leq 3$ $x_1 \leq 6$ $x_1, x_2 \geq 0$	✔	5.00	This is correct
○ $\min \; x_1 + 2x_2$ s.t. $-3x_1 + x_2 \leq 2$ $x_2 \leq 11$ $x_1 - x_2 \leq 3$ $x_1 \leq 6$ $x_1, x_2 \geq 0$			
○ $\max \; x_1 + 2x_2$ s.t. $3x_1 - x_2 \leq 2$ $-x_2 \leq 11$ $-x_1 + x_2 \leq 3$ $-x_1 \leq 6$ $x_1, x_2 \geq 0$			
Total		5.00 / 5.00	

Question 2

Consider the dictionary

$$\begin{array}{c|lll} x_3 & 2 & +3x_1 & -1x_2 \\ x_4 & 11 & & -1x_2 \\ x_5 & 3 & -1x_1 & +1x_2 \\ x_6 & 6 & -1x_1 & \\ \hline z & 0 & +1x_1 & +2x_2 \end{array}$$

What are all the correct choices entering variables? Choose all the variables that can enter and make sure that wrong options are left unselected.

Your Answer		Score	Explanation
☑ x_1	✔	1.00	yes. because its objective coefficient is $1 > 0$
☐ x_5	✔	1.00	A basic variable cannot enter
☐ x_3	✔	1.00	A basic variable cannot enter
☐ x_4	✔	1.00	A basic variable cannot enter
☑ x_2	✔	1.00	yes. because its objective coefficient is $2 > 0$
Total		5.00 / 5.00	

Question 3

Consider the dictionary

x_3	2	$+3x_1$	$-1x_2$
x_4	11		$-1x_2$
x_5	3	$-1x_1$	$+1x_2$
x_6	6	$-1x_1$	
z	0	$+1x_1$	$+2x_2$

If x_2 enters then select all possible correct choices for the leaving variable. Make sure correct options are all selected and wrong options are not.

Your Answer		Score	Explanation
☐ x_5	✔	1.00	x_5 places no limit on the increase of the entering variable. Therefore, it cannot leave.
☐ x_6	✔	1.00	x_6 places no bound on x_2 s increase.
☐ x_1	✔	1.00	This is nonbasic. It can never leave.
☐ x_4	✔	1.00	Places a bound on x_2 increase, but some other variable places a more stringent bound
☑ x_3	✔	1.00	Places a limit of 2 on the increase of x_2 . Therefore, this is the most stringent bound and corresponds to the leaving variable.
Total		5.00 / 5.00	

Question 4

Consider the dictionary

x_3	2	$+3x_1$	$-1x_2$
x_4	11		$-1x_2$
x_5	3	$-1x_1$	$+1x_2$
x_6	6	$-1x_1$	
z	0	$+1x_1$	$+2x_2$

If x_1 enters and x_5 leaves, then select appropriate values for the missing data in the subsequent dictionary:

x_3	b_3	$-3\ x_5$	$+2x_2$
x_4	b_4		$-1x_2$
x_1	b_1	$-1x_5$	$+1x_2$
x_6	b_6	$+1x_5$	$-1x_2$
z	z_1	$-1x_5$	$+3x_2$

Make sure that all right options are selected and no wrong options are.

Your Answer		Score	Explanation
☑ $b_3 = 11$	✔	1.11	
☑ $b_1 = 3$	✔	1.11	
☑ $b_4 = 11$	✔	1.11	
☐ $b_1 = -1$	✔	1.11	
☐ $z_1 = 0$	✔	1.11	
☐ $b_6 = 1$	✔	1.11	
☐ $b_3 = 2$	✔	1.11	
☑ $b_6 = 3$	✔	1.11	
☑ $z_1 = 3$	✔	1.11	

Total	10.00 / 10.00

Question 5

Consider the dictionary below:

$$\begin{array}{c|ccc} x_3 & 17 & -1x_5 & -2x_6 \\ x_4 & 8 & -1x_5 & +1x_6 \\ x_1 & 6 & & -1x_6 \\ x_2 & 3 & +1x_5 & -1x_6 \\ \hline z & 12 & +2x_5 & -3x_6 \end{array}$$

Which of the following hold when we pivot this dictionary? To answer, we suggest that you pivot the dictionary and compute the next dictionary.

Your Answer		Score	Explanation
☑ x_5 is the only entering variable	✔	0.50	Correct
☐ The dictionary is alredy final	✔	1.00	Wrong. It clearly is not as you can find an entering variable.
☐ The dictionary corresponds to an unbounded problem	✔	1.00	Again, no. There is just one choice of entering variable corresponding to which a leaving variable exists.
☐ The objective row of the subsequent dictionary when x_5 enters and x_4 leaves is $z = 19 - x_4 - x_5$	✔	1.00	This cannot be since x_5 enters, it cannot be non-basic in the subsequent dictionary.
☐ The objective value in the subsequent dictionary when x_5 enters and x_4 leaves is 19	✔	1.00	Maybe you made a mistake in your computation. Please check again.

☑ When x_5 enters, x_4 leaves	✔	0.50	Correct
☑ The objective value in the subsequent dictionary when x_5 enters and x_4 leaves is 28	✔	1.00	Correct
☐ The subsequent dictionary when x_5 enters and x_4 leaves is unbounded for some valid choice of an entering variable.	✔	1.00	Wrong. Perhaps you made a mistake while computing it.
☑ The value of x_3 in the subsequent dictionary is 9	✔	1.00	Correct
☐ The value of x_3 in the subsequent dictionary when x_5 enters and x_4 leaves is 17	✔	1.00	That is the value in this dictionary, not the subsequent one.
☑ The subsequent dictionary when x_5 enters and x_4 leaves is final	✔	1.00	Correct
Total		10.00 / 10.00	

Question Explanation

To pivot: 1. Find out the entering variable (Hint: only one choice exists) 2. Leaving variable corr. the entering var (Hint: only one choice exists) 3. Perform the pivoting steps and compute the next dictionary

Question 6

Consider three dictionaries A, B, C below. Which of them are unbounded for an appropriate choice of an entering variable?

A :

x_3	9	$+1x_4$	$+3x_6$
x_5	8	$-1x_4$	$+1x_6$
x_1	6		$+1x_6$
x_2	11	$-1x_4$	
z	28	$-2x_4$	$-1x_6$

B :

x_3	9	$+1x_4$	$+3x_6$
x_5	8	$-1x_4$	$+1x_6$
x_1	6		$+1x_6$
x_2	11	$-1x_4$	
z	28	$-2x_4$	$+x_6$

C :

x_3	9	$+1x_4$	
x_5	8	$-1x_4$	
x_1	6		
x_2	11	$-1x_4$	
z	28	$+2x_4$	$+x_6$

Your Answer		Score	Explanation
○ A is unbounded			
◉ B and C are unbounded but A is not.	✔	5.00	yes. Note: C is unbouned when we choose x_6 to enter but not when we choose x_4 to enter.
○ All are bounded.			
○ All are unbounded.			
○ B only			
○ C only			
Total		5.00 /	

5.00

Question 7

Which of the following facts about the Simplex algorithm are true during the optimization phase?

Your Answer		Score	Explanation
If the original problem is unbounded, then the first feasible dictionary we encounter is also unbounded for some choice of an entering variable.			
The act of pivoting can decrease the objective but just once in a run of Simplex.			
The number of variables in the basis increases by one in each iteration			
The algorithm maintains feasibility: i.e, if the current dictionary is feasible the next one will be as well.	✔	5.00	Right
The objective value strictly increases in each iteration			
Total		5.00 / 5.00	