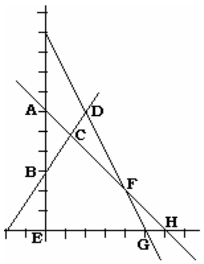
Section A or B (circle) Name __________________________

56:171 Operations Research
Quiz #1 – 6 September 2002

Consider the following LP:



Minimize $3X_1 + 2X_2$
subject to
(1) $2X_1 + X_2 \geq 10$
(2) $-3X_1 + 2X_2 \leq 6$
(3) $X_1 + X_2 \geq 6$
$X_1 \geq 0 \;\&\; X_2 \geq 0$

1. The feasible region has ___ corner points, namely ______________________.
2. At point **F**, the slack (or surplus) variable for constraint # _____ is positive. *(If more than one such variable is positive, only one is required.)*
3. The optimal solution is at point ________

Note: For your convenience, the (X_1, X_2) coordinates of the points labeled above are:

Point	A	B	C	D	E	F	G	H
X_1	0	0	4	2	0	1.2	5	6
X_2	6	3	2	6	0	4.8	0	0

4. Which of the three matrices below (each of which are *row-equivalent* to A) is the result of a "pivot" in matrix A? *(If more than one answer is correct, only one answer is required.)* ________

$$A = \begin{bmatrix} 1 & 1 & -1 \\ 1 & 2 & 1 \\ -2 & -1 & 1 \end{bmatrix}, B = \begin{bmatrix} 0 & -1 & -2 \\ 1 & 2 & 1 \\ 0 & 3 & 3 \end{bmatrix}, C = \begin{bmatrix} 1/2 & 0 & -1/2 \\ 1/2 & 1 & 1/2 \\ -1 & 0 & 0 \end{bmatrix}, D = \begin{bmatrix} -1 & 0 & 0 \\ 1 & 2 & 1 \\ -3 & -3 & 0 \end{bmatrix}$$

___5. Which method of solving a system of linear equations requires more row operations?
a. Gauss elimination b. Gauss-Jordan elimination c. Both require same number

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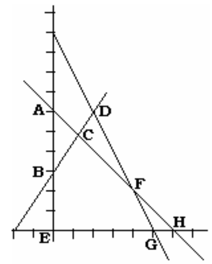
Consider the following LP:



Minimize $3X_1 + 2X_2$
subject to
(1) $2X_1 + X_2 \geq 10$
(2) $-3X_1 + 2X_2 \leq 6$
(3) $X_1 + X_2 \geq 6$
$X_1 \geq 0 \;\&\; X_2 \geq 0$

1. The feasible region has _3_ corner points, namely _D, F, & H____.
2. At point **F**, the slack (or surplus) variable for constraint # __2___ is positive. *(If more than one such variable is positive, only one is required.)*
3. The optimal solution is at point __F______

Note: For your convenience, the (X_1, X_2) coordinates of the points labeled above are:

Point	A	B	C	D	E	F	G	H
X_1	0	0	4	2	0	1.2	5	6
X_2	6	3	2	6	0	4.8	0	0
Obj.				18		13.2		18

4. Which of the three matrices below (each of which are *row-equivalent* to A) is the result of a "pivot" in matrix A? *(If more than one answer is correct, only one answer is required.)* __B__

$$A = \begin{bmatrix} 1 & 1 & -1 \\ 1 & 2 & 1 \\ -2 & -1 & 1 \end{bmatrix}, B = \begin{bmatrix} 0 & -1 & -2 \\ 1 & 2 & 1 \\ 0 & 3 & 3 \end{bmatrix}, C = \begin{bmatrix} 1/2 & 0 & -1/2 \\ 1/2 & 1 & 1 \\ -1 & 0 & 0 \end{bmatrix}, D = \begin{bmatrix} -1 & 0 & 0 \\ 1 & 2 & 1 \\ -3 & -3 & 0 \end{bmatrix}$$

_b_5. Which method of solving a system of linear equations requires more row operations?
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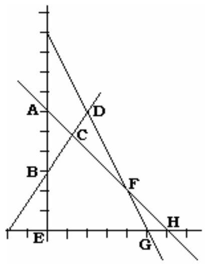

Maximize $3X_1 + 2X_2$

subject to (1) $2X_1 + X_2 \le 10$

(2) $-3X_1 + 2X_2 \le 6$

(3) $X_1 + X_2 \ge 6$

$X_1 \ge 0 \,\&\, X_2 \ge 0$

1. The feasible region has ___ corner points, namely ______________________.
2. At point **F**, the slack (or surplus) variable for constraint # _____ is positive. *(If more than one such variable is positive, only one is required.)*
3. The optimal solution is at point ________

Note: For your convenience, the (X_1, X_2) coordinates of the points labeled above are:

Point	A	B	C	D	E	F	G	H
X_1	0	0	4	2	0	1.2	5	6
X_2	6	3	2	6	0	4.8	0	0

4. Which of the three matrices below (each of which are *row-equivalent* to A) is the result of a "pivot" in matrix A? *(If more than one answer is correct, only one answer is required.)* ________

$$A=\begin{bmatrix}1 & 1 & -1\\ -1 & 2 & 1\\ -2 & 1 & 1\end{bmatrix},\ B=\begin{bmatrix}0 & 3 & 0\\ 1 & -2 & -1\\ 0 & 3 & -1\end{bmatrix},\ C=\begin{bmatrix}3/2 & 0 & -3/2\\ -1/2 & 1 & 1/2\\ -3/2 & 0 & 1/2\end{bmatrix},\ D=\begin{bmatrix}-1 & 2 & 0\\ -1 & 2 & 1\\ -1 & -1 & 0\end{bmatrix}$$

___5. Which method of solving a system of linear equations requires more row operations?
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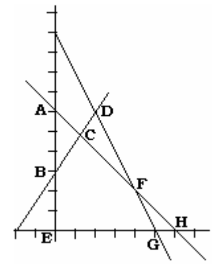

Maximize $3X_1 + 2X_2$

subject to (1) $2X_1 + X_2 \le 10$

(2) $-3X_1 + 2X_2 \le 6$

(3) $X_1 + X_2 \ge 6$

$X_1 \ge 0 \,\&\, X_2 \ge 0$

1. The feasible region has _3__ corner points, namely __C, D, & F____.
2. At point **F**, the slack (or surplus) variable for constraint # __2___ is positive. *(If more than one such variable is positive, only one is required.)*
3. The optimal solution is at point __D___

Note: For your convenience, the (X_1, X_2) coordinates of the points labeled above are:

Point	A	B	C	D	E	F	G	H
X_1	0	0	4	2	0	1.2	5	6
X_2	6	3	2	6	0	4.8	0	0
Obj.			16	18		13.2		

4. Which of the three matrices below (each of which are *row-equivalent* to A) is the result of a "pivot" in matrix A? *(If more than one answer is correct, only one answer is required.)* __C___

$$A=\begin{bmatrix}1 & 1 & -1\\ -1 & 2 & 1\\ -2 & 1 & 1\end{bmatrix},\ B=\begin{bmatrix}0 & 3 & 0\\ 1 & -2 & -1\\ 0 & 3 & -1\end{bmatrix},\ C=\begin{bmatrix}3/2 & 0 & -3/2\\ -1/2 & 1 & 1/2\\ -3/2 & 0 & 1/2\end{bmatrix},\ D=\begin{bmatrix}-1 & 2 & 0\\ -1 & 2 & 1\\ -1 & -1 & 0\end{bmatrix}$$

_b_5. Which method of solving a system of linear equations requires more row operations?
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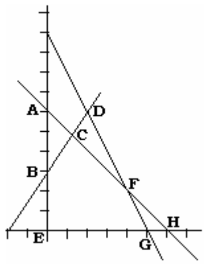

$$\begin{aligned} &\text{Maximize } 3X_1 + 2X_2 \\ &\text{subject to } \quad (1) \quad 2X_1 + X_2 \le 10 \\ &\qquad (2) \quad -3X_1 + 2X_2 \le 6 \\ &\qquad (3) \quad X_1 + X_2 \le 6 \\ &\qquad X_1 \ge 0 \,\&\, X_2 \ge 0 \end{aligned}$$

1. The feasible region has ___ corner points, namely _____________________.
2. At point **C**, the slack (or surplus) variable for constraint # _____ is positive. *(If more than one such variable is positive, only one is required.)*
3. The optimal solution is at point ________

Note: For your convenience, the (X_1, X_2) coordinates of the points labeled above are:

Point	A	B	C	D	E	F	G	H
X_1	0	0	4	2	0	1.2	5	6
X_2	6	3	2	6	0	4.8	0	0

4. Which of the three matrices below (each of which are *row-equivalent* to A) is the result of a "pivot" in matrix A? *(If more than one answer is correct, only one answer is required.)* ________

$$A = \begin{bmatrix} 2 & 1 & -1 \\ -1 & 2 & 1 \\ -2 & 1 & 1 \end{bmatrix}, B = \begin{bmatrix} 0 & 2 & 0 \\ 1 & -2 & -1 \\ 0 & -3 & -1 \end{bmatrix}, C = \begin{bmatrix} 5/2 & 0 & -3/2 \\ -1/2 & 1 & 1/2 \\ -4 & 0 & 2 \end{bmatrix}, D = \begin{bmatrix} 1 & 3 & 0 \\ -1 & 2 & 1 \\ -1 & -1 & 0 \end{bmatrix}$$

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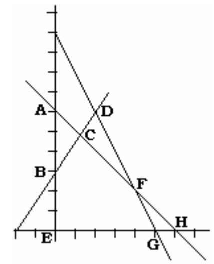

$$\begin{aligned} &\text{Maximize } 3X_1 + 2X_2 \\ &\text{subject to } \quad (1) \quad 2X_1 + X_2 \le 10 \\ &\qquad (2) \quad -3X_1 + 2X_2 \le 6 \\ &\qquad (3) \quad X_1 + X_2 \le 6 \\ &\qquad X_1 \ge 0 \,\&\, X_2 \ge 0 \end{aligned}$$

1. The feasible region has _5_ corner points, namely _B, C, E, F & G ____
2. At point **C**, the slack (or surplus) variable for constraint # __1_ is positive. *(If more than one such variable is positive, only one is required.)*
3. The optimal solution is at point ___C___

Note: For your convenience, the (X_1, X_2) coordinates of the points labeled above are:

Point	A	B	C	D	E	F	G	H
X_1	0	0	4	2	0	1.2	5	6
X_2	6	3	2	6	0	4.8	0	0
Obj.		6	16		0	13.2	15	

4. Which of the three matrices below (each of which are *row-equivalent* to A) is the result of a "pivot" in matrix A? *(If more than one answer is correct, only one answer is required.)* ___D___

$$A = \begin{bmatrix} 2 & 1 & -1 \\ -1 & 2 & 1 \\ -2 & 1 & 1 \end{bmatrix}, B = \begin{bmatrix} 0 & 2 & 0 \\ 1 & -2 & -1 \\ 0 & -3 & -1 \end{bmatrix}, C = \begin{bmatrix} 5/2 & 0 & -3/2 \\ -1/2 & 1 & 1/2 \\ -4 & 0 & 2 \end{bmatrix}, D = \begin{bmatrix} 1 & 3 & 0 \\ -1 & 2 & 1 \\ -1 & -1 & 0 \end{bmatrix}$$

_b_5. Which method of solving a system of linear equations requires more row operations?
a. Gauss elimination b. Gauss-Jordan elimination c. Both require same number