

Solve the following linear programming problem and answer the following questions:

$$\begin{aligned} &Max \{3x_1 + 4x_2\} \\ &s.t. \\ & \quad x_1 + 2x_2 \leq 8 \\ & \quad 2x_1 + x_2 \leq 10 \\ & \quad 2x_1 + 2x_2 \geq 11 \\ & \quad x_1, x_2 \geq 0 \end{aligned}$$

1. What is the maximal value of the objective function?  
a. 19   b. 19.5   \*c. 20   d. 20.5   e. none of the above
2. What is the value of  $x_1$  at maximum?  
a. 3   b. 3.5   \*c. 4   d. 4.5   e. none of the above
3. What is the value of  $x_2$  at maximum?  
a. 1   b. 1.5   \*c. 2   d. 2.5   e. none of the above
4. What is the minimal value of the objective function?  
a. 0   b. 16   c. 17   \*d. 17.5   e. none of the above
5. What is the value of  $x_1$  at minimum?  
a. 0   b. 3.5   c. 4   \*d. 4.5   e. none of the above
6. What is the value of  $x_2$  at minimum?  
a. 0   \*b. 1   c. 1.5   d. 2.5   e. none of the above

Now change the third constraint of the problem to  $2x_1 + 2x_2 \geq 9$ . Resolve the problem, and answer the following questions:

7. What is the maximal value of the objective function?  
a. 19   b. 19.5   \*c. 20   d. 20.5   e. none of the above
8. What is the value of  $x_1$  at maximum?  
a. 3   b. 3.5   \*c. 4   d. 4.5   e. none of the above
9. What is the value of  $x_2$  at maximum?  
a. 1   b. 1.5   \*c. 2   d. 2.5   e. none of the above
10. What is the minimal value of the objective function?  
a. 0   \*b. 13.5   c. 17.5   d. 18   e. none of the above
11. What is the value of  $x_1$  at minimum?  
a. 0   b. 3.5   c. 4   \*d. 4.5   e. none of the above
12. What is the value of  $x_2$  at minimum?  
\*a. 0   b. 1   c. 1.5   d. 2.5   e. none of the above

Solve the following linear programming problem and answer the following questions:

$$\begin{aligned} &min \{6x_1 + 2x_2\} \\ & \\ & \text{Subject to:} \\ & \quad 2x_1 + 5x_2 \leq 20 \\ & \quad 3x_1 + 2x_2 \leq 18 \\ & \quad 5x_1 + 2x_2 \geq 10 \\ & \quad x_1, x_2 \geq 0 \end{aligned}$$

13. What is the maximal value of the objective function?  
a. 22.37   b. 23.82   c. 31.66   \*d. 36   e. none of the above
14. What is the value of  $x_1$  at maximum?  
a. 0.48   b. 2   c. 4.55   \*d. 6   e. none of the above
15. What is the value of  $x_2$  at maximum?  
\*a. 0   b. 2.18   c. 3.81   d. 4.72   e. none of the above
16. What is the minimal value of the objective function?  
a. 0   b. 4   c. 6   \*d. 10.5   e. none of the above
17. What is the value of  $x_1$  at minimum?  
\*a. 0.48   b. 2   c. 4.55   d. 6   e. none of the above
18. What is the value of  $x_2$  at minimum?  
a. 0   b. 2.18   \*c. 3.81   d. 4.72   e. none of the above  
Now *add* a constraint to the problem  $x_1 - x_2 \leq 0$ . Resolve the problem, and answer the following questions:
19. What is the maximal value of the objective function?  
a. 20   b. 20.5   \*c. 22.88   d. 23.82   e. none of the above
20. What is the value of  $x_1$  at maximum?  
a. 0.48   b. 1.43   \*c. 2.86   d. 6   e. none of the above
21. What is the value of  $x_2$  at maximum?  
a. 1.43   \*b. 2.86   c. 3.81   d. 6   e. none of the above
22. What is the minimal value of the objective function?  
a. 8   b. 10   \*c. 10.5   d. 11.44   e. none of the above
23. What is the value of  $x_1$  at minimum?  
\*a. 0.48   b. 1.43   c. 2.86   d. 6   e. none of the above
24. What is the value of  $x_2$  at minimum?  
a. 1.43   b. 2.86   \*c. 3.81   d. 6   e. none of the above