Linear Programming Practice

Choose one answer per question. Circle A, B, C, or D.

1. A model uses $P = 4x + 7y$ for a total score. The aim is to make P as large as possible. What is $P = 4x + 7y$ called?
   A. The objective function
   B. A resource constraint
   C. The feasible region
   D. A corner point

2. A display holds x narrow items that take 2 cm each and y wide items that take 5 cm each. The items can use at most 35 cm. Which constraint models the combined width?
   A. $2x + 5y \geq 35$
   B. $5x + 2y \leq 35$
   C. $2x + 5y \leq 35$
   D. $x + y \leq 35$

3. A model accepts only nonnegative plans with $x + y \leq 7$ and $3x + 2y \leq 17$. Which plan (x, y) is feasible?
   A. (5, 2)
   B. (2, 4)
   C. (0, 8)
   D. $(-1, 4)$

4. A feasible plan uses $x = 2$ and $y = 5$. What value does it give the objective $P = 6x + 9y$?
   A. 63
   B. 51
   C. 48
   D. 57

5. A plan has limits $x + y \leq 9$ and $2x + 4y \leq 24$. At (2, 5), which limit is binding, meaning the plan reaches that limit exactly?
   A. Only the limit of 9
   B. Only the limit of 24
   C. Both limits
   D. Neither limit

6. A bounded feasible region has vertices (0, 0), (4, 0), (3, 2), and (0, 5). Which vertex maximizes P = 5x + 4y?

A. (3, 2)
B. (4, 0)
C. (0, 5)
D. (0, 0)

7. An outreach team can make at most 9 visits and use at most 25 staff-hours. Local visits x take 2 hours each and extended visits y take 3. Which plan uses both limits exactly?

A. (5, 5)
B. (7, 2)
C. (0, 8)
D. (2, 7)

8. An event needs at least 5 sessions, with at least 2 guided. A guided session costs 6 credits and an independent one costs 4. Which listed plan (guided, independent) meets the requirements at the lowest cost?

A. (3, 1)
B. (1, 4)
C. (2, 3)
D. (3, 2)

9. Both (2, 2) and (3, 1) are feasible. The objective is P = 8x + 5y. How does P change when a planner switches from (2, 2) to (3, 1)?

A. It increases by 3.
B. It decreases by 3.
C. It increases by 13.
D. It stays the same.

10. A model has $x \geq 0$, $y \geq 0$, and $x + y \geq 4$. Its aim is to maximize P = x + 2y. Why does P have no finite maximum?

A. The largest feasible y is 4, and x can never change.
B. The constraints have no feasible plans.
C. Every feasible plan has a score of 4.
D. At x = 0, y can grow without limit and keep the plan feasible.

11. The feasible region is the polygon with corners (0, 0), (6, 0), (3, 3), and (0, 4), including its edges. Which set gives all the plans that maximize $P = x + y$?

A. The entire segment from (3, 3) to (0, 4)
B. Only the two points (6, 0) and (3, 3)
C. The entire segment from (6, 0) to (3, 3)
D. The entire feasible polygon

12. A media room has up to 10 hours and 35 credits. An hour of audio work uses 2 credits and earns 4 points. An hour of video work uses 5 credits and earns 7 points. With fractional hours allowed, what is the highest score?

A. 49 points
B. 55 points
C. 40 points
D. 70 points

13. A fictional event uses x early and y late support hours, both nonnegative and allowed to be fractional. It must meet $x + 2y \geq 8$ and $3x + y \geq 9$. At $5 per early hour and $4 per late hour, which plan (x, y) minimizes cost?

A. (3, 2)
B. (8, 0)
C. (0, 9)
D. (2, 3)

14. A club chooses nonnegative whole numbers x and y with $3x + 2y \leq 14$ and $x + 2y \leq 8$. It wants to maximize $P = 7x + 6y$. Which plan (x, y) is best?

A. (4, 1)
B. (3, 3)
C. (3, 2)
D. (2, 3)

15. A display uses x and y hours in two modes and scores $P = 5x + 3y$. Hours are nonnegative and can be fractional. The limits are $x + y \leq 10$ and $3x + y \leq 18$. How much does the best score rise if 18 changes to 20?

A. 5 points
B. 4 points
C. 2 points
D. 10 points