REG-LP-2223-ASM-SET 2-MATH
Suggested solutions

Multiple Choice Questions

1. C

Greatest value of $x + 3y + 4$ occurs at top right corner.
Compare points A, B and C:

$(x,\ y)$	$(4,\ 0)$	$(3,\ 2)$	$(0,\ 4)$
$x + 3y + 4$	8	13	16

Required value is 16.

2. A

$3x + y - 1$ is smaller when x and y are smaller.
$3x + y - 1$ attains its minimum at the bottom left corner.
Coordinates of the bottom left corners are $(2,\ 3)$ and $(3,\ 1)$.

$(x,\ y)$	$(2,\ 3)$	$(3,\ 1)$
$3x + y - 1$	8	9

Required value is 8.

3. C

$x - 2y + 10$ is greater when x is larger and y is smaller.
$x - 2y + 10$ attains its greatest value at the bottom right corner.
Coordinates of the bottom right corner (A) are $(40,\ 0)$.
Required value = $(40) - 2(0) + 10$

$= 50$

4. D

The value of $7y - 5x + 3$ is larger when x is small and y is large, i.e., top left corner S.

5. A

We have $P\ (0,\ 9)$, $Q\ (9,\ 6)$ and $R\ (12,\ 0)$.

$(x,\ y)$	$(0,\ 9)$	$(9,\ 6)$	$(12,\ 0)$	$(0,\ 0)$
$x + 2y - 5$	13	16	7	-5

Required value is 16.

6. D

Maximum value of $3x - 2y + 15$ occurs at the bottom right corners, $B\ (3,\ 3)$ or $C\ (2,\ 0)$.

$(x,\ y)$	$B\ (3,\ 3)$	$C\ (2,\ 0)$
$3x - 2y + 15$	18	21

Maximum value = 21

7. A

$x + 3y$ is larger when x and y are larger.

$x + 3y$ attains its greatest value at the top right corners.

Coordinates of the top right corners are $(3,\ 4)$ and $(5,\ 3)$.

$(x,\ y)$	$(3,\ 4)$	$(5,\ 3)$
$x + 3y$	15	14

Required value is 15.

8. B

$(x,\ y)$	$(-4,\ 3)$	$(-1,\ 2)$	$(2,\ -1)$	$(3,\ -3)$
$2x + 3y + 5$	6	9	6	2

Required value is 9.

9. A

The value of $2x - 3y + 35$ is larger when x is large and y is small, i.e., bottom right corners $P\ (0,\ -7)$ or $Q\ (6,\ -1)$.

$(x,\ y)$	$P\ (0,\ -7)$	$Q\ (6,\ -1)$
$2x - 3y + 35$	56	50

Required point is P.

10. C

$3x + 2y$ is larger when x and y are larger.

$3x + 2y$ attains its greatest value at the top right corners.

Coordinates of the top right corners are $(0,\ 4)$ and $(4,\ 1)$.

$(x,\ y)$	$(0,\ 4)$	$(4,\ 1)$
$3x + 2y$	8	14

Required value is 14.

11. B

$2x - y + 10$ is smaller when x is smaller and y is larger.

$2x - y + 10$ attains its least value at the top left corners.

Coordinates of the top left corners are $C\ (0,\ 30)$.

Required value $= 2(0) - (30) + 10$

$= -20$

12. B

$32 - 2x - 3y$ is smaller when x and y are larger.

$32 - 2x - 3y$ attains its least value at the top right corners.

Coordinates of the top right corners are $B\ (6,\ 6)$.

Required value $= 32 - 2(6) - 3(6)$

$= 2$

13. C

The value of $3x - y + 16$ is larger when x is large and y is small, i.e., bottom right corner $C\ (8,\ 0)$.

Required value $= 3(8) - 0 + 16 = 40$

14. B

$2x - y + 4$ is larger when x is larger and y is smaller.

$2x - y + 4$ attains its greatest value at the bottom right corners.

Coordinates of the bottom right corners are $X\ (9,\ -2)$ and $Y\ (3,\ -4)$.

$(x,\ y)$	$(9,\ -2)$	$(3,\ -4)$
$2x - y + 4$	24	14

Required point is X.

15. C

The value of $x + 3y + 4$ is larger when x and y are large, i.e., top right corners A, B or C.

The coordinates of A, B and C are $(4,\ 0)$, $(3,\ 2)$ and $(0,\ 4)$ respectively.

$(x,\ y)$	$A\ (4,\ 0)$	$B\ (3,\ 2)$	$C\ (0,\ 4)$
$x + 3y + 4$	8	13	16

Required value = 16

16. D

Note that $q > p > 0$.

$px - qy$ is smaller when x is smaller and y is larger.

$px - qy$ attains its least value at the top left corner.

Coordinates of the top left corners are $(-p,\ q)$ and $(-q,\ -p)$.

$(x,\ y)$	$(-p,\ q)$	$(-q,\ -p)$
$px - qy$	$-p^2 - q^2$	0

Since $-p^2 - q^2 < 0$, required point is $(-p,\ q)$.

17. D

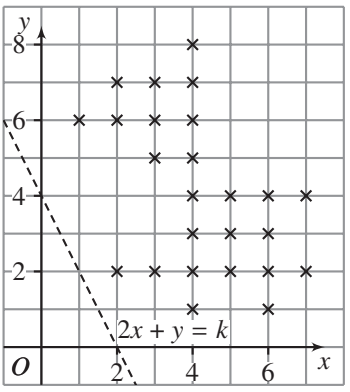
From the graph, we have $b > a > 0$.

The value of $bx - ay + 3$ is larger when x is large and y is small, i.e., bottom right corner $(b,\ -a)$.

18. D

Draw the line $2x + y = k$, where k is a constant.

$2x + y + 4$ attains its maximum at $(7,\ 4)$.

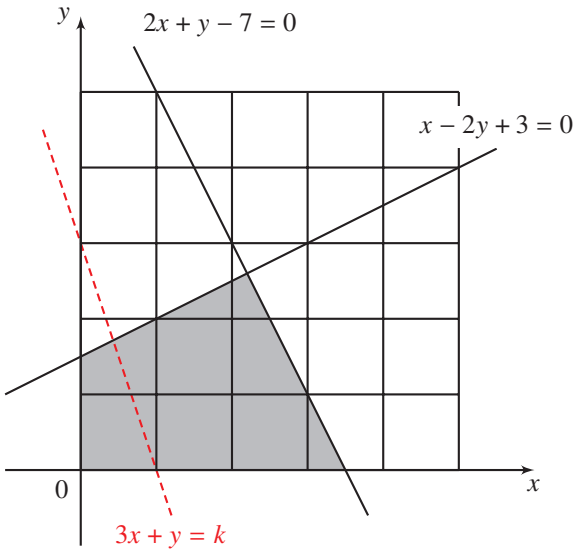


19. D

Draw the line $3x + y = k$, where k is a constant.

The value of $3x + y$ is maximum at $(3,\ 1)$.

Required value $= 3(3) + 1 = 10$



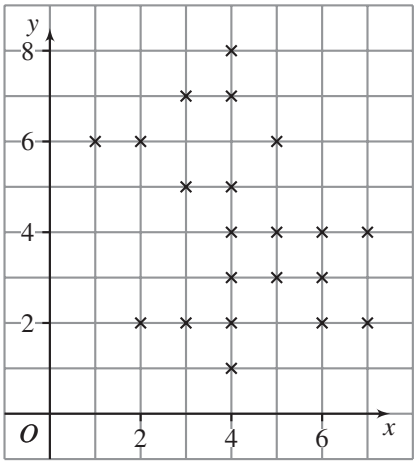
20. D

Draw the straight lines $x + y = k_1$, $x - y = k_2$ and $5x + y = k_3$, where k_1, k_2 and k_3 are constants.

I. ✗. $x + y$ attains its minimum at $(2,\ 2)$.

II. ✓.

III. ✓.



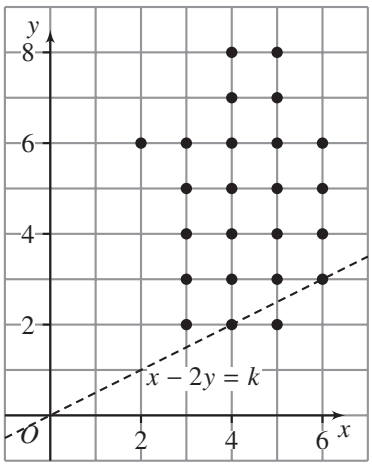
21. C

Draw the line $x - 2y = k$, where k is a constant.

$x - 2y$ attains its maximum at $(5,\ 2)$.

Required value $= 5 - 2(2)$

$= 1$



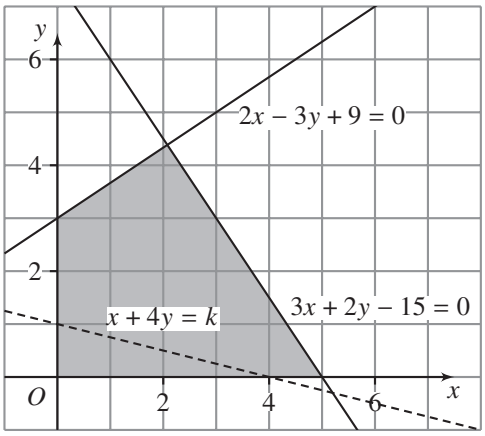
22. C

Draw the line $x + 4y = k$, where k is a constant.

$x + 4y$ attains its maximum at $(2,\ 4)$.

Required value $= 2 + 4(4)$

$= 18$



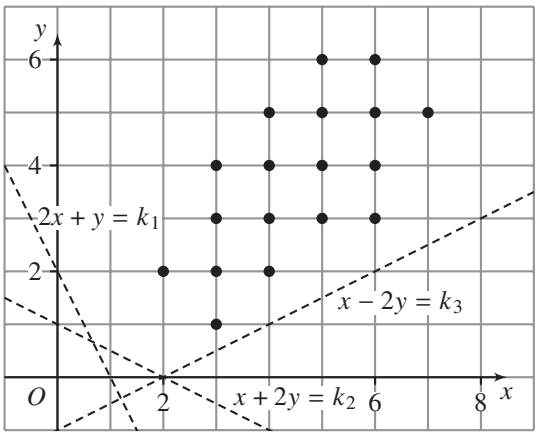
23. B

Draw the lines $2x + y = k_1$, $x + 2y = k_2$ and $x - 2y = k_3$, where k_1, k_2 and k_3 are constants.

I. ✗. $2x + y$ attains its least value at $(2,\ 2)$.

II. ✓.

III. ✗. $x - 2y$ attains its least value at $(5,\ 6)$.



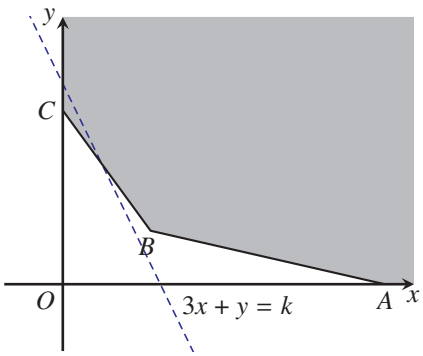
24. B

Draw the line $3x + y = k$, where k is a constant.

$3x + y$ attains its least value at $C\ (0,\ 26)$.

Required value $= 3(0) + 26$

$= 26$



Conventional Questions

25. (a) Slope of $L_2 = \dfrac{1-0}{2-0} = \dfrac{1}{2}$. 1M

The equation of L_2 is $y = \dfrac{x}{2}$. 1A

(b) Consider the line $x + y = 9$. When $x = 2$, $y = 7$. 1M

The coordinates of B are $(2,\ 7)$. 1A

Solving $\begin{cases} y = 2x \\ x + y = 9 \end{cases}$, we have $x = 6$ and $y = 3$. 1M

The coordinates of C are $(6,\ 3)$. 1A

(c)

$(x,\ y)$	$(2,\ 1)$	$(2,\ 7)$	$(6,\ 3)$
P	1	-41	3

1M

Thus, the least value of P is -41. 1A

26. (a) Solve $\begin{cases} 4x + y - 5 = 0 \\ x - 2y + 7 = 0 \end{cases}$,

we have $x = \dfrac{1}{3}$ and $y = \dfrac{11}{3}$.

The coordinates of C are $\left(\dfrac{1}{3},\ \dfrac{11}{3}\right)$. 1A

(b) $4x + y - 5 \leq 0$ 1A

$3x + 2y + 5 \geq 0$ 1A

$x - 2y + 7 \geq 0$ 1A

(c) Coordinates of the corners are $(3,\ -7)$, $(-3,\ 2)$ and $\left(\dfrac{1}{3},\ \dfrac{11}{3}\right)$.

$(x,\ y)$	$(3,\ -7)$	$(-3,\ 2)$	$\left(\dfrac{1}{3},\ \dfrac{11}{3}\right)$
$3x - 12y + 7$	100	-26	-36

1M

Required value is -36. 1A

27. (a) Equation of L_2 is

$$y - 0 = 2(x - 3)$$

$$2x - y - 6 = 0$$ 1A

Equation of L_3 is

$$y - 6 = \frac{0 - 6}{6 - 0}(x - 0)$$

$$x + y - 6 = 0$$ 1A

(b) $y \leq 6$ 1A

$2x - y \leq 6$ 1A

$x + y \geq 6$ 1A

(c) (i) Coordinates of the vertices are $(0,\ 6)$, $(4,\ 2)$ and $(6,\ 6)$.

$(x,\ y)$	$(0,\ 6)$	$(4,\ 2)$	$(6,\ 6)$
$x - 5y + 10$	-20	4	-14

1M

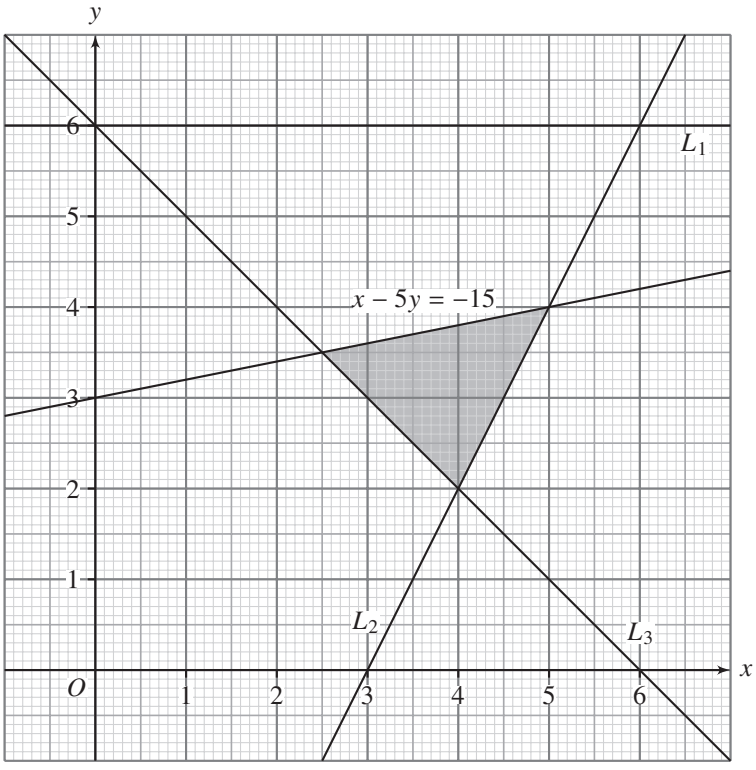
P attains its greatest value at $(4,\ 2)$. 1A

Greatest value of P is 4. 1A

(ii) $P = x - 5y + 10 \geq -5$

$$x - 5y \geq -15$$ 1A

Draw the line $x - 5y = -15$.



1A

We have $2.5 \leq x \leq 5$. 1A

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