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

Multiple Choice Questions

1. B

$3x - 4(0) - 24 = 0$

$x = 8$

The coordinates of P are $(8,\ 0)$.

2. D

$4x + 7(0) + 56 = 0$ and $4(0) + 7y + 56 = 0$

$x = -14$ $\quad$ $y = -8$

The coordinates of A and B are $(-14,\ 0)$ and $(0,\ -8)$ respectively.

The coordinates of the midpoint of AB are $(-7,\ -4)$.

3. C

$5(0) - 8y - 40 = 0$ and $5x - 8(0) - 40 = 0$

$y = -5$ $\quad$ $x = 8$

The coordinates of A and B are $(8,\ 0)$ and $(0,\ -5)$ respectively.

The coordinates of M are $(4,\ 0)$.

Slope of $L_2 = \frac{0+5}{4-0} = \frac{5}{4}$

Required equation is

$$y + 5 = \frac{5}{4}(x - 0)$$

$$5x - 4y - 20 = 0$$

4. B

$A\ (0,\ 2)$ and $B\ (-6,\ 0)$.

Area $= \frac{(2)(6)}{2} = 6$

5. A

$2(5) - 5(3) - k = 0$

$k = -5$

$2(0) - 5y + 5 = 0$

$y = 1$

y-intercept $= 1$

6. B

Slope of $L = -\frac{1}{4} \div \frac{-1}{6} = \frac{3}{2}$.

I. ✓. Slope of $2x + 3y - 4 = 0$ is $-\frac{2}{3}$. Product of slopes $= -1$.

II. ✓. Slope of $3x - 2y + 1 = 0$ is $\frac{3}{2}$, equal to slope of L.

III. ✗. $\frac{0}{4} - \frac{y}{6} = 1$

$y = -6 \neq 6$

7. B

Slope $= -1$ and y-intercept $= 5$

The answer is B.

8. D

Slope $= -1$ and y-intercept $= -5$

The answer is D.

9. C

Slope $= m = \frac{3-0}{0+6} = \frac{1}{2}$

y-intercept $= c = 3$

10. C

Slope $= a\frac{-2-0}{0-4} = \frac{1}{2}$

y-intercept $= b = -2$

11. C

$2x - y - 3 = 0$

$y = 2x - 3$

Slope $= 2$ and y-intercept $= -3$.

The answer is C.

12. C

$x + by + c = 0$

$y = -\frac{x}{b} - \frac{c}{b}$

Slope $= -\frac{1}{b} > 0$

$b < 0$

y-intercept $= -\frac{c}{b} < 0$

$-c > 0$

$c < 0$

13. $\boxed{\text{A}}$

$2(0) + 5(-4) - k = 0$

$k = -20$

14. $\boxed{\text{D}}$

Consider the x-intercept of two straight lines,

$$\frac{-4}{2} = -\frac{2}{m}$$

$$m = 1$$

Two straight lines are perpendicular to each other,

$$2 \times \frac{-1}{n} = -1$$

$$n = 2$$

15. $\boxed{\text{D}}$

Consider the y-intercepts.

$$-\frac{14}{n} = \frac{7}{5}$$

$$n = -10$$

Two lines are perpendicular.

$$\left(\frac{-m}{-10}\right)\left(\frac{-2}{5}\right) = -1$$

$$m = 25$$

16. $\boxed{\text{C}}$

Consider the y-intercepts.

$$\frac{15}{k} = \frac{5}{8}$$

$$k = 24$$

Consider the slopes.

$$\frac{h}{k} \times \frac{-3}{8} = -1$$

$$h = 64$$

$h - k = 64 - 24 = 40$

17. $\boxed{\text{A}}$

$$\frac{-3}{2} \times \frac{-k}{12} = -1$$

$$k = -8$$

18. D

$$\left(-\frac{a}{b}\right)\left(-\frac{d}{e}\right) = -1$$

$$\frac{ad}{be} = -1$$

$$ad = -be$$

$$ad + be = 0$$

19. D

$$\left(-\frac{k}{4}\right)\left(\frac{1}{4}\right) = -1$$

$$k = 16$$

20. B

$$\left(-\frac{3}{k-2}\right)\left(\frac{4}{k+2}\right) = -1$$

$$12 = k^2 - 4$$

$$k = 4 \quad \text{or} \quad -4 \text{ (rejected)}$$

$$4(0) - 6y - 3 = 0$$

$$y = -\frac{1}{2}$$

y-intercept $= -\frac{1}{2}$

21. B

$$(\text{slope of } L_1)(\text{slope of } L_2) = -1$$

$$(3)\left(\frac{a}{9}\right) = -1$$

$$a = -3$$

22. B

The equation is in the form $3x - 2y + k = 0$, where k is a constant.

$$3(-1) - 2(2) + k = 0$$

$$k = 7$$

Required equation is $3x - 2y + 7 = 0$.

23. B

The equation is in the form $x + 2y + k = 0$, where k is a constant.

$$2 + 2(-1) + k = 0$$

$$k = 0$$

Required equation is $x + 2y = 0$.

24. A

Slope of the line = $\frac{9}{5}$

Slope of $L = -\frac{5}{9}$

Equation of L is

$$y - 3 = -\frac{5}{9}(x + 3)$$

$$5x + 9y + 15 = 0$$

25. C

Slope of $L = \frac{2}{5}$

Slope of required line is $-\frac{5}{2}$.

The answer is C.

26. B

The equation of L_1 is $5x - 4y + k = 0$, where k is a constant.

$5(-2) - 4(2) + k = 0$

$k = 18$

Required equation is $5x - 4y + 18 = 0$.

27. D

Equation of L is in the form $x - 2y + k = 0$.

Put $(0,\ 4)$ into $x - 2y + k = 0$.

$$0 - 2(4) + k = 0$$

$$k = 8$$

Required equation is $x - 2y + 8 = 0$.

28. C

L_1: x-intercept = 9 and y-intercept = 12.

Suppose L_2 intersect the x-axis at $(h,\ 0)$. Since $L_1 \perp L_2$,

$$\frac{12-0}{0-h} \times \left(\frac{-4}{3}\right) = -1$$

$$h = -16$$

Required area = $\frac{(16+9)(12)}{2} = 150$

29. D

Equation of straight line perpendicular to L_2 is in the form $\frac{x}{2}+\frac{y}{5}+k=0$, where k is a constant.

$$\frac{6}{2}+\frac{-2}{5}+k=0$$
$$k=-\frac{13}{5}$$

Required equation is

$$\frac{x}{2}+\frac{y}{5}-\frac{13}{5}=0$$
$$5x+2y-26=0$$

30. A

Equation of L is in the form $5x+2y+C=0$, where C is a constant.

Put $(2,\ 0)$ into $L \quad \Rightarrow \quad C=-10$

The equation of L is $5x+2y-10=0$.

Conventional Questions

31. Slope of $2x + y - 3 = 0$ is -2. 1A

Slope of the required line $= \frac{1}{2}$.

Required equation is

$$y + 2 = \frac{1}{2}(x - 1) \quad \text{1M}$$

$$y = \frac{x}{2} - \frac{5}{2} \quad \text{1A}$$

32. The coordinates of B are $(10,\ 0)$. 1A

The coordinates of A $(-4,\ 0)$. 1A

Solve $\begin{cases} 2x - 5y + 8 = 0 \\ x + y - 10 = 0 \end{cases}$, we have $x = 6$ and $y = 4$. 1M

The coordinates of C are $(6,\ 4)$. 1A

Required area $= \frac{1}{2}(10 + 4)(4) = 28$ 1A

33. (a) The slope of $L_1 = \frac{4p - 0}{0 - 3p} = -\frac{4}{3}$. 1M

The slope of $L_2 = \frac{3}{4}$.

Since the product of the slope of L_1 and L_2 is $-\frac{4}{3} \times \frac{3}{4} = -1$, $L_1 \perp L_2$. 1M+1

(b) The coordinates of C are $(5,\ 0)$.

$$\left(\frac{AC}{AB}\right)^2 = \frac{16}{81} \quad \text{1M}$$

$$\frac{3p - 5}{\sqrt{(4p)^2 + (3p)^2}} = \frac{4}{9} \quad \text{1M}$$

$$27p - 45 = 20p$$

$$p = \frac{45}{7} \quad \text{1A}$$

34. (a) Slope of $L_1 = 2$

Slope of $L_2 = -\frac{1}{2}$ 1A

The equation of L_2 is

$$y - 13 = -\frac{1}{2}(x - 2)$$ 1M

$$x + 2y - 28 = 0$$ 1A

(b) Solving $\begin{cases} 2x - y - 6 = 0 \\ x + 2y - 28 = 0 \end{cases}$, we have $x = 8$ and $y = 10$. 1M

The coordinates of B are $(8,\ 10)$. 1A

(c) Coordinates of P and Q are $(3,\ 0)$ and $(0,\ 14)$ respectively. 1A

$$\frac{r}{1} = \frac{\frac{1}{2}(14)(8)}{\frac{1}{2}(3)(10)}$$ 1M

$$r = \frac{56}{15}$$ 1A

35. (a) $e + 3(6) - 15 = 0$ 1M

$$e = -3$$ 1A

(b) Slope of $L_1 = -\frac{1}{3}$ 1A

(c) (i) Slope of $L_2 = -\frac{1}{3}$. The equation of L_2 is

$$y - 0 = -\frac{1}{3}(x + 10)$$ 1M

$$y = -\frac{1}{3}x - \frac{10}{3}$$ 1A

(ii) Let $(h,\ k)$ be the coordinates of S.

Since S lies on L_2, $k = -\frac{1}{3}h - \frac{10}{3}$ 1A

The coordinates of S are $\left(h,\ -\frac{1}{3}h - \frac{10}{3}\right)$.

$$PS = SQ$$

$$\sqrt{(h+3)^2 + \left(-\frac{h+10}{3} - 6\right)^2} = \sqrt{(h-4)^2 + \left(-\frac{h+10}{3} + 1\right)^2}$$ 1M

$$(h+3)^2 + \left(-\frac{h}{3} - \frac{28}{3}\right)^2 = (h-4)^2 + \left(-\frac{h}{3} - \frac{7}{3}\right)^2$$

$$\frac{56h}{3} + \frac{224}{3} = 0$$

$$h = -4$$ 1A

When $h = -4$, $k = -\frac{1}{3}(-4) - \frac{10}{3} = -2$.

The coordinates of S are $(-4,\ -2)$. 1A

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