REG-EOSL-2223-ASM-SET 1-MATH
Suggested solutions

Multiple Choice Questions

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

   Let the coordinates of P be $(h,\ k)$.
   Since P lies on $2x - y - 1 = 0$, we have $2h - k - 1 = 0$.

$$\begin{aligned} AP &= PB \\ \sqrt{(h+5)^2 + (k+1)^2} &= \sqrt{(h-3)^2 + (k-3)^2} \\ (h+5)^2 + [(2h-1)+1]^2 &= (h-3)^2 + [(2h-1)-3]^2 \\ 5h^2 + 10h + 25 &= 5h^2 - 22h + 25 \\ h &= 0 \end{aligned}$$

   The coordinates of P are $(0,\ -1)$.

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

   $(4) + 2y + 4 = 0$ and $x + 2(-1) + 4 = 0$

   $y = -4$ $x = -2$

   The coordinates of P and R are $(-2,\ -1)$ and $(4,\ -4)$ respectively.
   Required distance $= \sqrt{(4+2)^2 + (-1+4)^2}$
   $= \sqrt{45}$

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

   The coordinates of A and B are $(-6,\ 0)$ and $(0,\ 2)$ respectively.
   Let the coordinates of P be $(h,\ k)$.
   Since P lies on L_2, we have $k = 2h + 2$.

$$\begin{aligned} PA &= PB \\ \sqrt{(h+6)^2 + k^2} &= \sqrt{h^2 + (k-2)^2} \\ h^2 + k^2 + 12h + 36 &= h^2 + k^2 - 4k + 4 \\ 12h + 4k &= -32 \end{aligned}$$

   Solving, we have $h = -2$ and $k = -2$.
   The coordinates of P are $(-2,\ -2)$.

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

   A. ✗. $2(-3) + 3(2) + 12 = 12 \neq 0$

   B. ✓. $2(0) + 3(-4) + 12 = 0$

   C. ✓. $2(3) + 3(-6) + 12 = 0$

   D. ✓. $2(6) + 3(-8) + 12 = 0$

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

$5 = m(2) + 3$

$m = 1$

6. $\boxed{\text{B}}$

Let the coordinates of P be $(p,\ p+1)$ such that P lies on $y = x + 1$.

$$\begin{aligned} AP &= PB \\ \sqrt{(p-3)^2 + (p+1-9)^2} &= \sqrt{(p-7)^2 + (p+1-1)^2} \\ 2p^2 - 22p + 73 &= 2p^2 - 14p + 49 \\ p &= 3 \end{aligned}$$

The coordinates of P are $(3,\ 4)$.

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

Let the coordinates of P be $(p,\ p)$ such that P lies on the straight line $x = y$.

$$\begin{aligned} AP &= PB \\ \sqrt{(p-2)^2 + (p-5)^2} &= \sqrt{(p-6)^2 + (p+3)^2} \\ 2p^2 - 14p + 29 &= 2p^2 - 6p + 45 \\ p &= -2 \end{aligned}$$

The coordinates of P are $(-2,\ -2)$.

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

Let $A\ (a,\ 1)$ and $B\ (2,\ b)$. Substitute them into $y = 2x + 3$, we have $a = -1$ and $b = 7$.
Distance between A and $B = \sqrt{(2+1)^2 + (7-1)^2} = \sqrt{45} = 3\sqrt{5}$

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

Slope of $L_1 = \dfrac{1+2}{0+3} = 1$

Slope of $L_2 = \dfrac{-1}{1} = -1$

Required equation is

$$\begin{aligned} y + 2 &= -1(x+3) \\ x + y + 5 &= 0 \end{aligned}$$

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

Slope $= \dfrac{7-3}{0+2} = 2$

Required equation is

$$\begin{aligned} y - 7 &= 2(x - 0) \\ y &= 2x + 7 \end{aligned}$$

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

Slope $= \dfrac{4+7}{-6+2} = -\dfrac{11}{4}$

Required equation is

$$y - 4 = -\frac{11}{4}(x+6)$$

$$11x + 4y + 50 = 0$$

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

Slope of $L_1 = \dfrac{4-0}{-1-0} = -4$

Slope of $L_2 = \dfrac{1}{4}$

Required equation is

$$y - 4 = \frac{1}{4}(x+1)$$

$$x - 4y + 17 = 0$$

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

The coordinates of midpoint of BD are $(4,\ 6)$.

Slope of $BD = \dfrac{9-3}{5-3} = 3$

Required equation is

$$y - 6 = -\frac{1}{3}(x-4)$$

$$x + 3y - 22 = 0$$

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

The coordinates of the midpoint of AB are $\left(-1,\ \dfrac{11}{2}\right)$.

Slope of $AB = \dfrac{8-3}{-4-2} = -\dfrac{5}{6}$

Required equation is

$$y - \frac{11}{2} = \frac{6}{5}(x+1)$$

$$12x - 10y + 67 = 0$$

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

Since $OA = AB$, we have $\angle AOB = \angle ABO$ and slope of OA is $-m$.

Required equation is

$$y = -mx$$

$$mx + y = 0$$

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

Slope $= \dfrac{2+2}{-1-3} = -1$
Required equation is

$$y - 2 = -1(x + 1)$$
$$x + y - 1 = 0$$

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

Slope $= \dfrac{4-0}{0+3} = \dfrac{4}{3}$
Required equation is

$$y - 4 = \frac{4}{3}(x - 0)$$
$$4x - 3y + 12 = 0$$

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

The coordinates of the midpoint of AB are $\left(\dfrac{3}{2},\ \dfrac{9}{2}\right)$.

Slope of $AB = \dfrac{3-6}{4+1} = -\dfrac{3}{5}$
Required equation is

$$y - \frac{9}{2} = \frac{5}{3}\left(x - \frac{3}{2}\right)$$
$$5x - 3y + 6 = 0$$

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

Midpoint of BC is at $(7,\ 5)$. Required straight line passes through A and $(7,\ 5)$.
Slope of the line $= \dfrac{5-3}{7-3} = \dfrac{1}{2}$.
Only the line in option A has slope $\dfrac{1}{2}$.

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

Slope of $L_2 = \dfrac{4}{2} = 2$
Slope of $L_1 = -\dfrac{1}{2}$
Required equations is

$$y - 4 = -\frac{1}{2}(x - 2)$$
$$x + 2y = 10$$

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

Slope of $L_1 = -\tan 30° = -\dfrac{1}{\sqrt{3}}$

Slope of $L_2 = \sqrt{3}$

Required equation is

$$y - 0 = \sqrt{3}(x+1)$$
$$\sqrt{3}x - y + \sqrt{3} = 0$$

22. $\boxed{\text{B}}$

$\angle OAB = 45°$

$\tan 45° = \dfrac{OB}{OA}$

$OB = OA$

$OA^2 + OB^2 = AB^2$

$OA = OB = 8$

Slope $= -\tan 45° = -1$

Required equation is

$$y - 8 = -1(x - 0)$$
$$x + y - 8 = 0$$

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

Slope $= \tan 30° = \dfrac{1}{\sqrt{3}}$

Required equation is

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

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

Slope of $L_2 = \tan(180° - 90° - 60°) = \dfrac{1}{\sqrt{3}}$

Required equation is

$$y - 0 = \frac{1}{\sqrt{3}}(x - 0)$$
$$x - \sqrt{3}y = 0$$

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

Slope $= -\tan 180° - 90° - 60° = -\dfrac{1}{\sqrt{3}}$

Required equation is

$$y - 0 = -\frac{1}{\sqrt{3}}(x - 3)$$

$$x + \sqrt{3}y - 3 = 0$$

26. $\boxed{\text{B}}$

Slope $= \tan 45° = 1$

Required equation is

$$y - 0 = 1(x - 3)$$

$$x - y - 3 = 0$$

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

Slope of the line $= \tan(180° - 45°) = -1$

Required equation is

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

$$x + y + 2 = 0$$

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

Slope of $L = \tan(180° - 45°) = -1$

Required equation is

$$y - 0 = -(x - 4)$$

$$x + y = 4$$

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

Slope of $L_1 = \tan 30° = \dfrac{1}{\sqrt{3}}$

Slope of $L_2 = -\sqrt{3}$

Equation of L_2 is

$$y = -\sqrt{3}x$$

$$\sqrt{3}x + y = 0$$

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

Slope $= a < 0$ and y-intercept $= b > 0$.

Only option D satisfies this.

Conventional Questions

31. (a) Slope of $AB = \frac{-1-3}{3+3} = -\frac{2}{3}$.

The equation of AB is

$$y - 3 = -\frac{2}{3}(x+3) \qquad \text{1M}$$

$$y = -\frac{2}{3}x + 1 \qquad \text{1A}$$

(b) Put $x = 7$ into $y = -\frac{2}{3}x + 1$,

$$y = -\frac{2}{3}(7) + 1 \qquad \text{1M}$$

$$= -\frac{11}{3} \neq -4 \qquad \text{1M}$$

Thus, A, B and C are not collinear. 1A

32. (a) The equation of L is

$$y + 3 = \frac{5}{4}(x+2) \qquad \text{1M}$$

$$5x - 4y - 2 = 0 \qquad \text{1A}$$

(b) Sub $(6,\ 7)$ into $5x - 4y - 2 = 0$, we have

$$\text{L.H.S.} = 5(6) - 4(7) - 2 \qquad \text{1M}$$

$$= 0 = \text{R.H.S.}$$

Thus, L passes through the point $(6,\ 7)$. 1A

33. (a) $\frac{3k+1}{k+12} = \frac{3k-2k}{k+k}$ 1M

$$6k + 2 = k + 12$$

$$k = 2 \qquad \text{1A}$$

(b) (i) The coordinates of A are $(2,\ 6)$. The coordinates of A' are $(2,\ -6)$. 1A

Slope of $AB = \frac{6+1}{2+12} = \frac{1}{2}$. Slope of $L = -1 \div \frac{1}{2} = -2$. 1A

The equation of L is

$$y + 6 = -2(x-2) \qquad \text{1M}$$

$$y = -2x - 2 \qquad \text{1A}$$

(ii) The coordinates of C are $(-2,\ 4)$.

Put $x = -2$ into $y = -2x - 2$, $y = -2(-2) - 2 = 2 \neq 4$. 1M

Thus, C does not lie on L and AC is not perpendicular to $A'C$.

$\angle ACA'$ is not a right angle. 1A

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