

REG-EOC-2425-ASM-SET 2-MATH**Suggested solutions****Multiple Choice Questions**

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|-------|-------|-------|-------|-------|
| 1. C | 2. D | 3. C | 4. A | 5. C |
| 6. A | 7. D | 8. A | 9. B | 10. C |
| 11. B | 12. D | 13. A | 14. B | 15. B |
| 16. A | 17. A | 18. B | 19. C | 20. C |
| 21. B | 22. C | 23. C | 24. A | |

1. ☐ CThe coordinates of centre are $(-3, -6)$.

$$\text{Radius} = \sqrt{9} = 3$$

2. ☐ DThe coordinates of the centre are $(2, -1)$.

$$\begin{aligned}\text{Circumference} &= 2\pi(\sqrt{2^2 + 1^2 + 11}) \\ &= 8\pi\end{aligned}$$

3. ☐ C

$$\frac{k}{-2} = 2$$

$$k = -4$$

$$\begin{aligned}\text{Area} &= \pi(\sqrt{1^2 + 2^2 + 11})^2 \\ &= 16\pi\end{aligned}$$

4. ☐ AThe coordinates of the centre are $(-1, 5)$.

$$-1 - 3(5) + 2a = 0$$

$$a = 8$$

5. ☐ CThe coordinates of the centre are $(-1, 6)$.

$$\text{A. } \times. 2(-1) + 6 - 3 = 1 \neq 0$$

$$\text{B. } \times. -1 + 3(6) - 14 = 3 \neq 0$$

$$\text{C. } \checkmark. 2(-1) + 3(6) - 16 = 0$$

$$\text{D. } \times. 2(-1) + 2(6) - 7 = 3 \neq 0$$

6. A

The coordinates of the centre are $\left(-\frac{D}{2}, 5\right)$.

Centre lies on the straight line $5x - 6y + 25 = 0$.

$$5\left(-\frac{D}{2}\right) - 6(5) + 25 = 0$$

$$D = -2$$

7. D

The coordinates of the centre are $(3, -4)$.

$$\text{Radius} = \sqrt{3^2 + 4^2} = 5$$

I. ✓.

II. ✓. Distance from centre to the x -axis is equal to the radius.

III. ✓. Distance from centre to the y -axis is smaller than the radius.

8. A

$$x^2 + 0 - 11x + 0 + 18 = 0 \quad \text{and} \quad 0 + y^2 - 0 + 9y + 18 = 0$$

$$x = 2 \quad \text{or} \quad 9$$

$$y = -3 \quad \text{or} \quad -6$$

$$\begin{aligned} \text{Required area} &= \frac{(9)(6)}{2} - \frac{(2)(3)}{2} \\ &= 24 \end{aligned}$$

9. B

A. ✗. Rewrite the equation as $(x - 2)^2 + (y + 3)^2 = -10$. We have $r^2 = -10 < 0$, which is impossible.

B. ✓.

C. ✗. The coefficients of x^2 and y^2 are different.

D. ✗. The coefficients of x^2 and y^2 are different.

10. C

The coordinates of centre are $(4, -2)$.

$$4^2 + 2^2 + 4k > 0$$

$$k > -5$$

11. B

- A. ✗. $h^2 + k^2 - F = 3^2 + 5^2 - 30 = 4 \neq 0$
 B. ✓. $h^2 + k^2 - F = 4^2 + 1^2 - 17 = 0$
 C. ✗. $h^2 + k^2 - F = 2.5^2 + 2.5^2 + 3.5 = 16 \neq 0$
 D. ✗. $h^2 + k^2 - F = 6^2 + 2^2 - 70 = -30 \neq 0$

12. D

The circle $x^2 + y^2 - 2(k+1)x - 2(k-3)y - 2(k^2 - 9) = 0$ is a real circle.

$$(k+1)^2 + (k-3)^2 + 2(k^2 - 9) > 0$$

$$4k^2 - 4k - 8 > 0$$

$$k < -1 \quad \text{or} \quad k > 2$$

13. A

The coordinates of the centre are $(-1, 6)$.

$$10 = 2\sqrt{1^2 + 6^2 - k}$$

$$k = 12$$

- A. ✓. L.H.S. $= 0^2 + 0^2 + 0 - 0 + 12 = 12 > 0$
 The point $(0, 0)$ lies outside the circle C .
 B. ✗. L.H.S. $= 2^2 + 5^2 + 2(2) - 12(5) + 12 = -15 < 0$
 The point $(2, 5)$ lies inside the circle C .
 C. ✗. L.H.S. $= 1^2 + 6^2 + 2(1) - 12(-6) + 12 = 123 > 0$
 The point $(1, -6)$ lies outside the circle C .
 D. ✗. L.H.S. $= 2^2 + 2^2 + 2(-2) - 12(-2) + 12 = 40 > 0$
 The point $(-2, -2)$ lies inside the circle C .

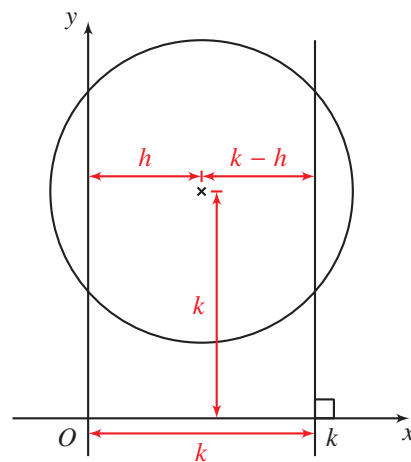
14. B

- A. L.H.S. $= 0 + 6^2 - 0 - 10(6) - 35 = -59$
 A $(0, 6)$ lies inside the circle.
 B. L.H.S. $= 6^2 + 6^2 - 4(-6) - 10(6) - 35 = 1 > 0$
 B $(-6, 6)$ lies outside the circle.
 C. L.H.S. $= 4^2 + 2^2 - 4(4) - 10(-2) - 35 = -11 < 0$
 C $(4, -2)$ lies inside the circle.
 D. L.H.S. $= 1^2 + 2^2 - 4(-1) - 10(-2) - 35 = -6 < 0$
 D $(-1, -2)$ lies inside the circle.

15. **B**

The centre lies in the first quadrant. Therefore, $h > 0$ and $k > 0$.

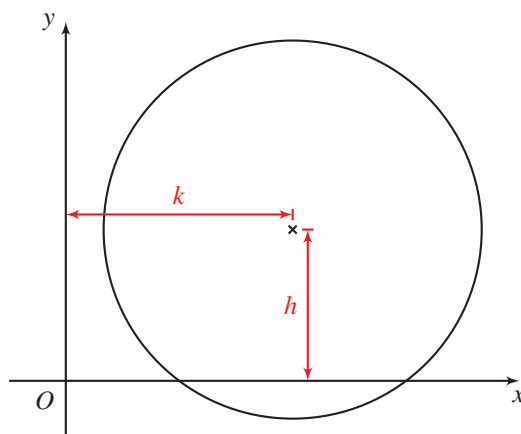
- I. ✓. We have $h < r$, and therefore $h - r < 0$.
- II. ✗. We have $k > r$, and therefore $k - r > 0$.
- III. ✓. We have $k - h < r$.



16. **A**

The centre lies in the first quadrant. We have $h > 0$ and $k > 0$.

- I. ✓. We have $h < k$, and therefore $h - k < 0$.
- II. ✓. We have $h < r$, and therefore $h - r < 0$.
- III. ✗. We have $k > r$, and therefore $k - r > 0$.



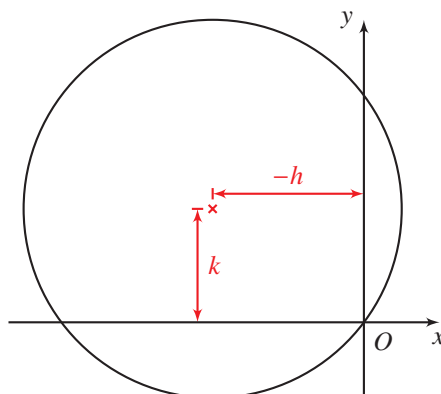
17. **A**

The centre lies in quadrant II. We have $h < 0$ and $k > 0$.

- I. ✓.
- II. ✓. We have $r > -h$, and therefore $r + h > 0$.
- III. ✗. Consider the distance between centre and the origin.

$$r > \sqrt{h^2 + k^2}$$

$$r^2 > h^2 + k^2$$



18. B

The coordinates of centre of C_1 are (3, 4).

$$\text{Radius of } C_1 = \sqrt{3^2 + 4^2 + 9} = \sqrt{34}$$

The coordinates of centre of C_2 are (6, 6).

$$\text{Radius of } C_2 = \sqrt{6^2 + 6^2 - 67} = \sqrt{5}$$

$$\text{Distance between centres} = \sqrt{(6-3)^2 + (6-4)^2} = \sqrt{13}$$

The centre of C_2 lies in circle C_1 .

The answer is B.

19. C

The coordinates of the centre are (3, 2).

$$\text{Radius} = \sqrt{3^2 + 2^2 - 4} = 3$$

$$\text{Distance between A and the centre} = \sqrt{(3+3)^2 + (2+6)^2} = 10$$

$$\text{Required distance} = 10 - 3 = 7$$

20. C

$$\text{Centre (1, -2); radius} = \sqrt{1^2 + 2^2 - 4} = 1$$

$$\text{Distance from A to centre} = \sqrt{(5-1)^2 + (-5+2)^2} = 5$$

$$\text{Required distance} = 5 - 1$$

$$= 4$$

21. B

I. ✓.

$$\text{II. ✗. Radius} = \sqrt{3^2 + 6^2 + 4} = 7 \neq 49$$

$$\text{III. ✓. L.H.S.} = 0^2 + 0^2 - 0 + 0 - 4 < 0$$

The origin lies inside the circle.

22. C

$$C: x^2 + y^2 - 6x + 2y + \frac{3}{2} = 0$$

The coordinates of the centre are (3, -1).

$$\text{Radius} = \sqrt{3^2 + 1^2 - \frac{3}{2}} = \sqrt{8.5}.$$

I. ✗.

II. ✓. The coordinates of the mid-point of PQ are (2, 2).

$$\text{L.H.S.} = 2^2 + 2^2 - 6(2) + 2(2) + \frac{3}{2} = 1.5 > 0$$

The mid-point of PQ lies outside C .

$$\begin{aligned} \text{III. ✓. (slope of } PG)(\text{slope of } QG) &= \frac{1+1}{-1-3} \times \frac{3+1}{5-3} \\ &= -1 \end{aligned}$$

Thus, $\angle PGQ = 90^\circ$.

23. C

$$x^2 + y^2 + 4x - 6y - 12 = 0$$

The coordinates of the centre are $(-2, 3)$.

$$\text{Radius} = \sqrt{2^2 + 3^2 + 12} = 5$$

A. ✗.

B. ✓.

C. ✓. L.H.S. $= 0^2 + 0^2 + 0 - 0 - 12 = -12 < 0$

The origin lies inside the circle.

24. A

$$x^2 + y^2 + 4x + 8y - 5 = 0$$

The coordinates of the centre are $(-2, -4)$.

$$\text{Radius} = \sqrt{2^2 + 4^2 + 5} = 5$$

I. ✓.

II. ✗. The coordinates of the mid-point of AB are $(2, 0)$.

$$\text{L.H.S.} = 2^2 + 0 + 4(2) + 0 - 5 = 7 \neq 0$$

The mid-point of AB does not lie on the circle.

$$\begin{aligned} \text{III. } \text{✗. } (\text{slope of } AG)(\text{slope of } BG) &= \frac{2+4}{3+2} \times \frac{-2+4}{1+2} \\ &= \frac{4}{5} \neq -1 \end{aligned}$$

AG and BG are not perpendicular to each other.

Conventional Questions

25. (a) Coordinates of centres of C_1 and C_2 are $(5, -3)$ and $(2, -4)$ respectively. 1M
 Required distance $= \sqrt{(5-2)^2 + (-3+4)^2} = \sqrt{10}$ 1A
- (b) The radius of C_1 and C_2 are 2 and 3 respectively.
 Since $(3-2) < \text{distance between two centres} < (3+2)$, 1M
 the two circles intersect at two points. 1A
26. (a) Coordinates of centres of C_1 and C_2 are $(2, -1)$ and $(-2, -3)$ respectively. 1M
 Required distance $= \sqrt{(2+2)^2 + (-1+3)^2} = 2\sqrt{5}$ 1A
- (b) $\sqrt{2^2 + (-1)^2} + \sqrt{(-2)^2 + (-3)^2} - k = 2\sqrt{5}$ 1M
 $\sqrt{13-k} = \sqrt{5}$
 $k = 8$ 1A
27. (a) The coordinates of M are $(4, 7)$. 1A
 Radius $= \sqrt{4^2 + 7^2 - 61} = 2$ 1A
- (b) Slope of L is $-\frac{4}{3}$.
 Slope of $MN = \frac{3}{4}$ 1M
 Required equation is
 $y - 7 = \frac{3}{4}(x - 4)$ 1M
 $3x - 4y + 16 = 0$ 1A
- (c) (i) Solve $\begin{cases} 3x - 4y + 16 = 0 \\ 4x + 3y - 62 = 0 \end{cases}$, 1M
 we have $x = 8$ and $y = 10$.
 The coordinates of N are $(8, 10)$. 1A
- (ii) $MN = \sqrt{(8-4)^2 + (10-7)^2} = 5$
 Required distance $= 5 - 2$ 1M
 $= 3$ 1A
28. (a) $(2, 3)$ 1A
- (b) (i) Let the coordinates of P be (a, b) .
 We have $3a - 2b - 13 = 0$.
 Slope of $PA = \frac{3-b}{2-a}$
 $\frac{3-b}{2-a} \times \frac{3}{2} = -1$ 1M
 $2a + 3b - 13 = 0$

Solving, we have $a = 5$ and $b = 1$. 1A

$$\begin{aligned}\text{Required length} &= \sqrt{(5-2)^2 + (1-3)^2} \\ &= \sqrt{13}\end{aligned}$$

1A

(ii) (1) P , A and Q are collinear. 1A

$$\begin{aligned}\text{(2) Radius} &= \sqrt{2^2 + 3^2 - 9} \\ &= 2\end{aligned}$$

Required ratio = $AQ : AP$ 1M

$$= 2 : \sqrt{13}$$

1A