1. If $\left(a, \frac{1}{a}\right), \left(b, \frac{1}{b}\right), \left(c, \frac{1}{c}\right)$ & $\left(d, \frac{1}{d}\right)$ are four distinct points on a circle of radius 4 units, then abcd is equal to:

(A) 4 (B) 16 (C) 1 (D) 2

2. From the point A (0, 3) on the circle $x^2 + 4x + (y-3)^2 = 0$ a chord AB is drawn & extended to a point M such that AM = 2 AB. The equation of the locus of M is: **[15JM110346]**

(A) $x^2 + 8x + y^2 = 0$ (B) $x^2 + 8x + (y-3)^2 = 0$

(C) $(x-3)^2 + 8x + y^2 = 0$ (D) $x^2 + 8x + 8y^2 = 0$

3. If tangent at (1, 2) to the circle c_1: $x^2 + y^2 = 5$ intersects the circle c_2: $x^2 + y^2 = 9$ at A & B and tangents at A & B to the second circle meet at point C, then the co-ordinates of C is

(A) (4, 5) (B) $\left(\frac{9}{15}, \frac{18}{5}\right)$ (C) (4, – 5) (D) $\left(\frac{9}{5}, \frac{18}{5}\right)$

4. A circle passes through point $\left(3, \sqrt{\frac{7}{2}}\right)$ touches the line pair $x^2 - y^2 - 2x + 1 = 0$. Centre of circle lies inside the circle $x^2 + y^2 - 8x + 10y + 15 = 0$. Co-ordinate of centre of circle is **[16JM110511]**

(A) (4, 0) (B) (5, 0) (C) (6, 0) (D) (0, 4)

5. The length of the tangents from any point on the circle $15x^2 + 15y^2 - 48x + 64y = 0$ to the two circles $5x^2 + 5y^2 - 24x + 32y + 75 = 0$ and $5x^2 + 5y^2 - 48x + 64y + 300 = 0$ are in the ratio

(A) 1 : 2 (B) 2 : 3 (C) 3 : 4 (D) 2 : 1

6. The distance between the chords of contact of tangents to the circle; $x^2 + y^2 + 2gx + 2fy + c = 0$ from the origin & the point (g, f) is: **[15JM110350]**

(A) $\sqrt{g^2+f^2}$ (B) $\frac{\sqrt{g^2+f^2-c}}{2}$ (C) $\frac{g^2+f^2-c}{2\sqrt{g^2+f^2}}$ (D) $\frac{\sqrt{g^2+f^2+c}}{2\sqrt{g^2+f^2}}$

7. If from any point P on the circle $x^2 + y^2 + 2gx + 2fy + c = 0$, tangents are drawn to the circle $x^2 + y^2 + 2gx + 2fy + c\sin^2\alpha + (g^2 + f^2)\cos^2\alpha = 0$ then the angle between the tangents is:

(A) α (B) 2α (C) $\frac{\alpha}{2}$ (D) $\frac{\alpha}{3}$

8. The locus of the mid points of the chords of the circle $x^2 + y^2 + 4x - 6y - 12 = 0$ which subtend an angle of $\frac{\pi}{3}$ radians at its circumference is: **[15JM110352]**

(A) $(x-2)^2 + (y+3)^2 = 6.25$ (B) $(x+2)^2 + (y-3)^2 = 6.25$

(C) $(x+2)^2 + (y-3)^2 = 18.75$ (D) $(x+2)^2 + (y+3)^2 = 18.75$

9. If the two circles, $x^2 + y^2 + 2g_1x + 2f_1y = 0$ & $x^2 + y^2 + 2g_2x + 2f_2y = 0$ touch each other then:

(A) $f_1g_1 = f_2g_2$ (B) $\frac{f_1}{g_1} = \frac{f_2}{g_2}$ (C) $f_1f_2 = g_1g_2$ (D) $f_1 + f_2 = g_1 + g_2$

10. A circle touches a straight line $lx + my + n = 0$ & cuts the circle $x^2 + y^2 = 9$ orthogonally. The locus of centres of such circles is: **[16JM110512]**

(A) $(lx + my + n)^2 = (l^2 + m^2)(x^2 + y^2 - 9)$ (B) $(lx + my - n)^2 = (l^2 + m^2)(x^2 + y^2 - 9)$

(C) $(lx + my + n)^2 = (l^2 + m^2)(x^2 + y^2 + 9)$ (D) $(lx + my - n)^2 = (l^2 + m^2)(x^2 + y^2 - 9)$

11. The locus of the point at which two given unequal circles subtend equal angles is:

(A) a straight line (B) a circle (C) a parabola (D) an ellipse

12. A circle is given by $x^2 + (y - 1)^2 = 1$. Another circle C touches it externally and also the x-axis, then the locus of its centre is **[16JM110513]**

(A) $\{(x, y) : x^2 = 4y\} \cup \{(x, y) : y \le 0\}$ (B) $\{(x, y) : x^2 + (y - 1)^2 = 4\} \cup \{(x, y) : y \le 0\}$

(C) $\{(x, y) : x^2 = y\} \cup \{(0, y) : y \le 0\}$ (D) $\{(x, y) : x^2 = 4y\} \cup \{(0, y) : y \le 0\}$

13. The locus of the centre of a circle touching the circle $x^2 + y^2 - 4y - 2x = 4$ internally and tangent on which from (1, 2) is making a 60° angle with each other. **[15JM110353]**

(A) $(x - 1)^2 + (y - 2)^2 = 2$ (B) $(x - 1)^2 + (y - 2)^2 = 4$

(C) $(x + 1)^2 + (y - 2)^2 = 4$ (D) $(x + 1)^2 + (y + 2)^2 = 4$

14. **STATEMENT-1 :** If three circles which are such that their centres are non-collinear, then exactly one circle exists which cuts the three circles orthogonally. **[16JM110514]**

STATEMENT-2 : Radical axis for two intersecting circles is the common chord.

(A) STATEMENT-1 is true, STATEMENT-2 is true and STATEMENT-2 is correct explanation for STATEMENT-1

(B) STATEMENT-1 is true, STATEMENT-2 is true and STATEMENT-2 is not correct explanation for STATEMENT-1

(C) STATEMENT-1 is true, STATEMENT-2 is false

(D) STATEMENT-1 is false, STATEMENT-2 is true

15. The centre of family of circles cutting the family of circles

$x^2 + y^2 + 4x\left(\lambda - \frac{3}{2}\right) + 3y\left(\lambda - \frac{4}{3}\right) - 6(\lambda + 2) = 0$ orthogonally, lies on

(A) $x - y - 1 = 0$ (B) $4x + 3y - 6 = 0$ (C) $4x + 3y + 7 = 0$ (D) $3x - 4y - 1 = 0$

16. The circle $x^2 + y^2 = 4$ cuts the circle $x^2 + y^2 + 2x + 3y - 5 = 0$ in A & B. Then the equation of the circle on AB as a diameter is: **[16JM110515]**

(A) $13(x^2 + y^2) - 4x - 6y - 50 = 0$ (B) $9(x^2 + y^2) + 8x - 4y + 25 = 0$

(C) $x^2 + y^2 - 5x + 2y + 72 = 0$ (D) $13(x^2 + y^2) - 4x - 6y + 50 = 0$