# MATHS

## BOOKS - SHRI BALAJI MATHS (ENGLISH)

## CIRCLE

### Exercise 1 Single Choice Problems

1. The locus of mid-points of the chords of the circle $x^2 - 2x + y^2 - 2y + 1 = 0$ which are of unit length is :

A. $(x-1)^2 + (y-1)^2 = \frac{3}{4}$

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

C. $(x-1)^2 + (y-1)^2 = \frac{1}{4}$

D. $(x-1)^2 + (y-1)^2 = \frac{2}{3}$

**Answer: A**

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**2.** The length of a common internal tangent to two circles is 5 and a common external tangent is 15, then the product of the radii of the two circles is :

A. 25

B. 50

C. 75

D. 30

**Answer: B**

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**3.** A circle with center (2, 2) touches the coordinate axes and a straight line AB where A and B ie on direction of coordinate axes such that the lies between and the line AB be the origin then the locus of circumcenter of $\triangle OAB$ will be:

A. $xy = x + y + \sqrt{x^2 + y^2}$

B. $xy = x + y - \sqrt{x^2 + y^2}$

C. $xy + x + y = \sqrt{x^2 + y^2}$

D. $xy + x + y + \sqrt{x^2 + y^2} = 0$

**Answer: A**

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**4.** Length of chord of contact of point (4,4) with respect to the circle $x^2 + y^2 - 2x - 2y - 7 = 0$ is

A. $\frac{3}{\sqrt{2}}$

B. $3\sqrt{2}$

C. 3

D. 6

**Answer: B**

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**5.** Let P, Q, R, S be the feet of the perpendiculars drawn from a point (1, 1) upon the lines $x + 4y = 12$, $x - 4y + 4 = 0$ and their angle bisectors respectively, then equation of the circle which passes through Q, R, S is :

A. $x^2 + y^2 - 5x + 3y - 6 = 0$

B. $x^2 + y^2 - 5x - 3y + 6 = 0$

C. $x^2 + y^2 - 5x - 3y - 6 = 0$

D. None of these

**Answer: B**

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**6.** From a point "P" on the line $2x + y + 4 = 0$ which is nearest to the circle$x^2 + y^2 - 12y + 35 = 0$ tangents are drawn to give circle. The area of quadrilateral PACB (where 'C' is the center of circle and PA & PB re the tangents.) is

A. 8

B. $\sqrt{110}$

C. $\sqrt{19}$

D. None of these

**Answer: C**

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**7.** The line 2x - y + 1 = 0 is tangent to the circle at the point (2,5) and the centre of the circles lies on x-2y = 4. The radius of the circle is :

A. $3\sqrt{5}$

B. $5\sqrt{3}$

C. $2\sqrt{5}$

D. $5\sqrt{2}$

**Answer: A**

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**8.** If $A(\cos\alpha, \sin\alpha), B(\sin\alpha, -\cos\alpha), C(1, 2)$ are the vertices of a triangle, then as $\alpha$ varies the locus of centroid of the $\Delta ABC$ is a circle whose radius is :

A. $\frac{2\sqrt{2}}{3}$

B. $\sqrt{\frac{4}{3}}$

C. $\frac{2}{3}$

D. $\sqrt{\frac{2}{9}}$

**Answer: D**

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**9.** Tangents drawn to circle $(x-1)^2+(y-1)^2=5$at point P meets the line $2x+y+6=0$ at Q on the x axis. Length PQ is equal to

A. $\sqrt{12}$

B. $\sqrt{10}$

C. 4

D. $\sqrt{15}$

**Answer: A**

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**10.** ABCD is square in which A lies on positive y-axis and B lies on the positive x-axis. If D is the point (12, 17), then co-ordinate of C is

A. (17, 12)

B. (17, 5)

C. (17, 16)

D. (15, 3)

**Answer: B**

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**11.** Statement-1: The lines $y = mx + 1 - m$ for all values of m is a normal to the circle $x^2 + y^2 - 2x - 2y = 0.$

Statement-2: The line L passes through the centre of the circle.

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 the correct explanation for statement-1.

C. Statement-1 is true, statement-2 is false.

D. Statement-1 is false, statement-2 is true.

**Answer: A**

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**12.** If points $A$ and $B$ are (1, 0) and (0, 1), respectively, and point $C$ is on the circle $x^2 + y^2 = 1$ , then the locus of the orthocentre of triangle $ABC$ is $x^2 + y^2 = 4$ $x^2 + y^2 - x - y = 0$ $x^2 + y^2 - 2x - 2y + 1 = 0$ $x^2 + y^2 + 2x - 2y + 1 = 0$

A. $x^2 + y^2 - 2x - 2y + 1 = 0$

B. $x^2 + y^2 - x - y = 0$

C. $x^2 + y^2 = 4$

D. $x^2 + y^2 + 2x - 2y + 1 = 0$

**Answer: A**

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**13.** Equation of a circle passing through (1, 2) and (2, 1) and for which line $x + y = 2$ is a diameter, is :

A. $x^2 + y^2 + 2x + 2y - 11 = 0$

B. $x^2 + y^2 - 2x - 2y - 1 = 0$

C. $x^2 + y^2 - 2x - 2y + 1 = 0$

D. None of these

**Answer: C**

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**14.** The area of an equilateral triangle inscribed in a circle of radius $4cm$, is

A. $12cm^2$

B. $9\sqrt{3}cm^2$

C. $8\sqrt{3}cm^2$

D. $12\sqrt{3}cm^2$

**Answer: D**

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**15.** let all the points on the curve $x^2 + y^2 - 10x = 0$ are reflected about the line $y = x + 3$. The locus of the reflected points is in the form $x^2 + y^2 + gx + fy + c = 0$.The value of $g + f + c$ is equal to

A. 28

B. -28

C. 38

D. -38

**Answer: C**

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**16.** The shortest distance from the line $3x + 4y = 25$ to the circle $x^2 + y^2 = 6x - 8y$ is equal to :

A. $7/5$

B. $9/5$

C. $11/5$

D. $32/5$

**Answer: A**

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**17.** In the xy-plane, the length of the shortest path from (0,0) to (12,16) that does not go inside the circle$(x-6)^2 + (y-8)^2 = 25$ is

$10\sqrt{3}$

$10\sqrt{5}$

$10\sqrt{3} + \frac{5\pi}{3}$

$10 + 5\pi$

A. $10\sqrt{3}$

B. $10\sqrt{5}$

C. $10\sqrt{3}+\frac{5\pi}{3}$

D. $10+5\pi$

**Answer: C**

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**18.** (c) 103 (d) 10 18. A circle is inscribed in an equilateral triangle with side lengths 6 unit. Another circle is drawn inside the triangle (but outside the first circle), tangent to the first circle and two of the sides of the triangle. The radius of the smaller circle is (b) 2/3 (a) 1/ root3 (c) 2 (d) 1

A. $1/\sqrt{3}$

B. $2/3$

C. $1/2$

D. 1

**Answer: A**

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**19.** The equation of tangent to the circle $x^2 + y^2 - 4x = 0$ which is perpendicular to the normal drawn through the origin can be : (A) $x = 0$ (B) $x = 4$ (C) $x + y = 2$ (D) none of these

A. $x = 1$

B. $x = 2$

C. $x + y = 2$

D. $x = 4$

**Answer: D**

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**20.** the equation of the line parallel to the line $3x + 4y = 0$ and touching the circle $x^2 + y^2 = 9$ in the first quadrant is:

A. $3x + 4y = 15$

B. $3x + 4y = 45$

C. $3x + 4y = 9$

D. $3x + 4y = 12$

**Answer: A**

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**21.** The centres of the three circles $x^2 + y^2 - 10x + 9 = 0, x^2 + y^2 - 6x + 2y + 1 = 0, x^2 + y^2 - 9x - 4y +$

A. lie on the straight line $x - 2y = 5$

B. lie on circle $x^2 + y^2 = 25$

C. do not lie on straight line

D. lie on circle $x^2 + y^2 + x + y - 17 = 0$

**Answer: C**

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**22.** The equation of diameter of a circle $x^2 + y^2 + 2x - 4y = 4$, that is parallel to $3x + 5y = 4$ is

A. $3x + 5y = -7$

B. $3x + 5y = 7$

C. $3x + 5y = 9$

D. $3x + 5y = 1$

**Answer: B**

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**23.** There are two circles passing through points A(-1, 2) and B(2, 3) having radius $\sqrt{5}$ . Then the length of intercept on x-axis of the circle intersecting x-axis is :

A. 2

B. 3

C. 4

D. 5

**Answer: C**

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**24.** A square OABC is formed by line pairs $xy = 0$ and $xy + 1 = x + y$ where o is the origin . A circle with circle $C_1$ inside the square is drawn to touch the line pair $xy = 0$ and another circle with centre $C_2$ and radius twice that $C_1$ is drawn touch the circle $C_1$ and the other line .The radius of the circle with centre $C_1$

A. $\frac{\sqrt{2}}{\sqrt{3}\left(\sqrt{2}+1\right)}$

B. $\frac{2\sqrt{2}}{3\left(\sqrt{2}+1\right)}$

C. $\frac{\sqrt{2}}{3\left(\sqrt{2}+1\right)}$

D. $\frac{\sqrt{2}+1}{3\sqrt{2}}$

**Answer: C**

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**25.** The equation of the circle circumscribing the triangle formed by the points (3, 4), (1, 4) and (3, 2) is :

A. $8x^2 + 8y^2 - 16x - 13y = 0$

B. $x^2 + y^2 - 4x - 8y + 19 = 0$

C. $x^2 + y^2 - 4x - 6y + 11 = 0$

D. $x^2 + y^2 - 6x - 6y + 17 = 0$

**Answer: C**

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**26.** The equation of the tangent to circle $x^2 + y^2 + 2gx + 2fy = 0$ at origin is :

A. $fx + gy = 0$

B. $gx + fy = 0$

C. $x = 0$

D. $y = 0$

**Answer: B**

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**27.** The line $y = x$ is tangent at (0, 0) to a circle of radius 1. The centre of the circle is :

A. either $\left(-\frac{1}{2}, \frac{1}{2}\right)$ or $\left(\frac{1}{2}, -\frac{1}{2}\right)$

B. either $\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right.$ or $\left(-\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}\right)$

C. either $\left(\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}\right.$ or $\left(-\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}\right)$

D. either (1, 0) or (-1, 0)

**Answer: C**

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**28.** The circles $x^2 + y^2 + 6x + 6y = 0$ and $x^2 + y^2 - 12x - 12y = 0$

A. cut orthogonally

B. touch each other internally

C. intersect in two points

D. touch each other externally

**Answer: D**

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**29.** In a triangle $ABC,$ right angled at $A,$ on the leg $AC$ as diameter, a semicircle is described. If a chord joins $A$ with the point of intersection $D$ of the hypotenuse and the semicircle, then the length of $AC$ is equal to $\frac{AB\dot{A}D}{\sqrt{AB^2+AD^2}}$ (b) $\frac{AB\dot{A}D}{AB+AD}$ $\sqrt{AB\dot{A}D}$ (d) $\frac{AB\dot{A}D}{\sqrt{AB^2-AD^2}}$

A. $\frac{AB\cdot AB}{\sqrt{AB^2+AB^2}}$

B. $\frac{AB\cdot AD}{AB+AD}$

C. $\sqrt{AB\cdot AD}$

D. $\frac{AB\cdot AD}{\sqrt{AB^2-AD^2}}$

**Answer: D**

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**30.** 30. Radical centre of circles drawn on the sides as a diameter of triangle formed by the lines the $3x-4y+6=0$, $x-y+2=0$ and

$4x + 3y - 17 = 0$ is

A. (3, 2)

B. (3, -2)

C. (2, -3)

D. (2, 3)

**Answer: D**

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**31.** Statement-1: A circle can be inscribed in a quadrilateral whose sides are $3x - 4y = 0, 3x - 4y = 5, 3x + 4y = 0 \text{ and } 3x + 4y = 7$

Statement-2: A circle can be inscribed in a parallelogram if and only if it is a rhombus

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 the correct explanation for statement-1.

C. Statement-1 is true, statement-2 is false.

D. Statement-1 is false, statement-2 is true.

**Answer: D**

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**32.** If $x = 3$ is the chord of the contact of the circle $x^2 + y^2 = 81$, then the equation of the corresponding pair of tangents, is

A. $x^2 - 8y^2 + 54x + 729 = 0$

B. $x^2 - 8y^2 - 54x + 729 = 0$

C. $x^2 - 8y^2 - 54x - 729 = 0$

D. $x^2 - 8y^2 = 729$

**Answer: B**

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**33.** The shortest distance from the line $3x+4y=25$ to the circle $x^2+y^2=6x-8y$ is equal to :

A. $\frac{7}{3}$

B. $\frac{9}{5}$

C. $\frac{11}{5}$

D. $\frac{7}{5}$

**Answer: D**

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**34.** The circle with equation $x^2+y^2=1$ intersects the line $y=7x+5$ at two distinct points A and B. Let C be the point at which the positive x-axis intersects the circle. The angle ACB is

A. $\tan^{-1}\frac{4}{3}$

B. $\cot^{-1}(-1)$

C. $\tan^{-1}1$

D. $\cot^{-1}\frac{4}{3}$

**Answer: C**

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**35.** The abscissa of the two points A and B are the roots of the equation $x^2 + 2ax - b^2 = 0$ and their ordinates are the roots of the equation $x^2 + 2px - q^2 = 0$. Find the equation of the circle with AB as diameter. Also, find its radius.

A. $\sqrt{a^2 + b^2 + p^2 + q^2}$

B. $\sqrt{a^2 + p^2}$

C. $\sqrt{b^2 + q^2}$

D. $\sqrt{a^2 + b^2 + p^2 + 1}$

**Answer: A**

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**36.** Let C be the circle of unit radius centred at the origin. If two positive numbers $x_1$ and $x_2$ are such that the line passing through $(x_1, -1)$ and $(x_2, 1)$ is tangent to C then

A. $x_1 x_2 = 1$

B. $x_1 x_2 = -1$

C. $x_1 + x_2 = 1$

D. $4x_1 x_2 = 1$

**Answer: A**

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**37.** A circle bisects the circumference of the circle $x^2 + y^2 + 2y - 3 = 0$ and touches the line $x = y$ at the point $(1, 1)$. Its radius is

A. $\frac{3}{\sqrt{2}}$

B. $\frac{9}{\sqrt{2}}$

C. $4\sqrt{2}$

D. $3\sqrt{2}$

**Answer: B**

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**38.** about to only mathematics

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. $\frac{\sqrt{g^2+f^2+c}}{2\sqrt{g^2+f^2}}$

**Answer: C**

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**39.** If the tangents AB and AQ are drawn from the point A(3, -1) to the circle $x^2+y^2-3x+2y-7=0$ and C is the centre of circle, then the area of quadrilateral APCQ is :

A. 9

B. 4

C. 2

D. non-existent

**Answer: D**

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**40.** Number of integral value(s) of k for which no tangent can be drawn from the point $(k, k+2)$ to the circle $x^2 + y^2 = 4$ is :

A. 0

B. 1

C. 2

D. 3

**Answer: B**

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**41.** If the length of the normal for each point on a curve to equal to the radius vector, then the curve :

A. is a circle passing through origin

B. is a circle having centre at origin and radius gt 0

C. is a circle having centre on x-axis and touching y-axis

D. is a circle having centre on y-axis and touching x-axis

**Answer: B**

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**42.** about to only mathematics

A. (1, 0)

B. (0, 1)

C. (0, -1)

D. (-1, 0)

**Answer: D**

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**43.** A variable circle is drawn to touch the x-axis at the origin. The locus of the pole of the straight line $lx+my+n=0$ w.r.t the variable circle has the equation:

A. $x(my-n)-ly^2=0$

B. $x(my+n)-ly^2=0$

C. $x(my-n)+ly^2=0$

D. None of these

**Answer: A**

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**44.** The minimum length of the chord of the circle $x^2+y^2+2x+2y-7=0$ which is passing (1,0) is :

A. 2

B. 4

C. $2\sqrt{2}$

D. $\sqrt{5}$

**Answer: B**

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**45.** Three concentric circles of which the biggest is $x^2 + y^2 = 1$, have their radii in A.P If the line $y = x + 1$ cuts all the circles in real and distinct points. The interval in which the common difference of the A.P will lie is:

A. $\left(0, \frac{1}{4}\right)$

B. $\left(0, \frac{1}{2\sqrt{2}}\right)$

C. $\left(0, \frac{2-\sqrt{2}}{4}\right)$

D. none

**Answer: C**

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**46.** The locus of the point of intersection of the tangent to the circle $x^2 + y^2 = a^2$ ,which include an angle of 45 is the curve $(x^2 + y^2)^2 = \lambda(a^2)(x^2 + y^2 - a^2)$. the value of lambda(λ) is : (a) 2 (b) 4 (c)8 (d) 16

A. 2

B. 4

C. 8

D. 16

**Answer: C**

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**47.** A circle touches the line $y = x$ at point $(4, 4)$ on it. The length of the chord on the line $x + y = 0$ is $6\sqrt{2}$. Then one of the possible equation of the circle is

A. $x^2 + y^2 + x - y + 30 = 0$

B. $x^2 + y^2 + 2x - 18y + 32 = 0$

C. $x^2 + y^2 + 2x + 18y + 32 = 0$

D. $x^2 + y^2 - 2x - 22y + 32 = 0$

**Answer: B**

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**48.** Point on the circle $x^2 + y^2 - 2x + 4y - 4 = 0$ which is nearest to the line $y = 2x + 11$ is :

A. $\left(1 - \frac{6}{\sqrt{5}}, \ -2 + \frac{3}{\sqrt{5}}\right)$

B. $\left(1 + \frac{6}{\sqrt{5}}, 2 - \frac{3}{\sqrt{5}}\right)$

C. $\left(1 - \frac{6}{\sqrt{5}}, \ -2 - \frac{3}{\sqrt{5}}\right)$

D. None of these

**Answer: A**

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**49.** A foot of the normal from the point (4, 3) to a circle is (2, 1) and a diameter of the circle has the equation $2x - y - 2 = 0$. Then the equation of the circle is :

A. $x^2 + y^2 - 4y + 2 = 0$

B. $x^2 + y^2 - 4y + 1 = 0$

C. $x^2 + y^2 - 2x - 1 = 0$

D. $x^2 + y^2 - 2x + 1 = 0$

**Answer: C**

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**50.** 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) $2$

A. 4

B. $1/4$

C. 1

D. 16

**Answer: C**

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## Exercise 2 One Or More Than One Answer Is Are Correct

**1.** Number of circle touching both the axes and the line $x+y=4$ is greater than or equal to : (a) 1 (b) 2 (c) 3 (d) 4

A. 1

B. 2

C. 3

D. 4

**Answer: A::B::C::D**

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**2.** Which of the following is/are true ? The circles $x^2 + y^2 - 6x + 6y + 9 = 0$ and $x^2 + y^2 + 6x + 6y + 9 = 0$ are such that :

A. They do not intersect

B. They touch each other

C. Their exterior common tangents are parallel

D. Their interior common tangents are perpendicular

**Answer: A::C::D**

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**3.** Let $\alpha$ be a variable parameter, then the length of the chord of the curve: $(x - \sin^{-1}\alpha)(x - \cos^{-1}\alpha) + (y - \sin^{-1}\alpha)(y + \cos^{-1}\alpha) = 0$ along the line $x = \frac{\pi}{4}$ can not be equal to

A. $\frac{\pi}{3}$

B. $\frac{\pi}{6}$

C. $\frac{\pi}{4}$

D. $\frac{\pi}{2}$

**Answer: A::B::C**

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**4.** The point $(1, 4)$ are inside the circle $S: x^2 + y^2 - 6x - 10y + k = 0$. What are the possible values of $k$ if the circle S neither touches the axes nor cut them

A. $p < 29$

B. $p > 25$

C. $p > 27$

D. $p < 27$

**Answer: A::B**

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**5.** The equation of a circle $C_1$ is $x^2 + y^2 = 4$. The locus of the intersection of orthogonal tangents to the circle is the curve $C_2$ and the locus of the intersection of perpendicular tangents to the curve $C_2$ is the curve $C_3$. Then,

A. $C_2$ is a circle

B. $C_1, C_2$ are circles having different centres

C. $C_1, C_2$ are circles having same centres

D. area enclosed between $C_1$ and $C_2$ is $8\pi$

**Answer: A::C::D**

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**6.** If two distinct chords, drawn from the point (p, q) on the circle $x^2 + y^2 = px + qy$ (where $pq \neq q$) are bisected by the x-axis, then $p^2 = q^2$ (b) $p^2 = 8q^2$ $p^2 < 8q^2$ (d) $p^2 > 8q^2$

A. $p^2 = q^2$

B. $p^2 > q^2$

C. $p^2 < 8q^2$

D. $p^2 > 8q^2$

**Answer: B::D**

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7. If

$a = \max\left\{(x+2)^2 + (y-3)^2\right\}$ and $b = \min\left\{(x+2)^2 + (y-3)^2\right\}$

where x, y satisfying $x^2 + y^2 + 8x - 10y - 40 = 0$ then :

A. $a + b = 18$

B. $a + b = 158$

C. $a - b = 4\sqrt{2}$

D. $a - b = 72\sqrt{2}$

**Answer: B::D**

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**8.** The locus of points of intersection of the tangents to $x^2 + y^2 = a^2$ at the extremeties of a chord of circle $x^2 + y^2 = a^2$ which touches the circle $x^2 + y^2 - 2ax = 0$ is/are :

A. $y^2 = a(a - 2x)$

B. $x^2 = a(a - 2y)$

C. $x^2 + y^2 = (x - a)^2$

D. $x^2 + y^2 = (y - a)^2$

**Answer: A::C**

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**9.** A circle passes through the points (-1, 1), (0, 6) and (5, 5). The point(s) on this circle, the tangent(s) at which is/are parallel to the straight line joining the origin to its centre is/are

A. (1, -5)

B. (5, 1)

C. (-5, -1)

D. (-1, 5)

**Answer: B::D**

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**10.** A square is inscribed in the circle $x^2 + y^2 - 2x + 4y - 93 = 0$ with its sides parallel to the coordinate axes. The coordinates of its vertices are $(-6, -9), (-6, 5), (8, -9), (8, 5)$

$(-6, -9), (-6, -5), (8, -9), (8, 5)$

$(-6, -9), (-6, 5), (8, 9), (8, 5)$

$(-6, -9), (-6, 5), (8, -9), (8, -5)$

A. (8, 5)

B. (8, 9)

C. (-6, 5)

D. (-6, -9)

**Answer: A::C**

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## Exercise 3 Comprehension Type Problems

**1.** Let the circles

$S_1 \equiv x^2 + y^2 + 4y - 1 = 0$

$S_2 \equiv x^2 + y^2 + 6x + y + 8 = 0$

touch each other . Also, let $P_1$ be the point of contact of $S_1$ and $S_2$, $C_1$ and $C_2$ are the centres of $S_1$ and $S_2$ respectively.

The coordinates of $P_1$ are

A. (2, -1)

B. (2, 1)

C. (-2, 1)

D. (-2, -1)

**Answer: D**

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**2.** Let each of the circles

$S_1 \equiv x^2 + y^2 + 4y - 1 = 0$

$S_1 \equiv x^2 + y^2 + 6x + y + 8 = 0$

$S_3 \equiv x^2 + y^2 - 4x - 4y - 37 = 0$

touch the other two. Also, let $P_1$, $P_2$ and $P_3$ be the points of contact of $S_1$ and $S_2$, $S_2$ and $S_3$, and $S_3$ , respectively, $C_1$, $C_2$ and $C_3$ are the centres of $S_1$, $S_2$ and $S_3$ respectively.

The ratio $\dfrac{\text{area}(\Delta P_1 P_2 P_3)}{\text{area}(\Delta C_1 C_2 C_3)}$ is equal to

A. $3:2$

B. $2:5$

C. $5:3$

D. $2:3$

**Answer: B**

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**3.** Let each of the circles

$S_1 \equiv x^2 + y^2 + 4y - 1 = 0$

$S_1 \equiv x^2 + y^2 + 6x + y + 8 = 0$

$S_3 \equiv x^2 + y^2 - 4x - 4y - 37 = 0$

touch the other two. Also, let $P_1$, $P_2$ and $P_3$ be the points of contact of $S_1$ and $S_2$, $S_2$ and $S_3$, and $S_3$ , respectively, $C_1$, $C_2$ and $C_3$ are the centres of $S_1$, $S_2$ and $S_3$ respectively.

The ratio $\dfrac{\text{area}(\Delta P_1 P_2 P_3)}{\text{area}(\Delta C_1 C_2 C_3)}$ is equal to

A. $y = x + 1$

B. $y = -x$

C. $y = x$

D. $y = -x + 2$

**Answer: C**

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**4.** Consider a family of circle passing thorugh two fixed points A(3,7) and B(6,5) . Show that the chords in which the circle $x^2 + y^2 - 4x - 6y - 3 = 0.$ Cuts the members of the family are concurrent at a point. Find the coordinates of this point.

A. (2, 3)

B. $\left(2, \frac{23}{3}\right)$

C. $\left(3, \frac{23}{2}\right)$

D. (3, 2)

**Answer: B**

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**5.** Let A(3, 7) and B(6, 5) are two points. $C: x^2 + y^2 - 4x - 6y - 3 = 0$ is a circle.

Q. If O is the origin and P is the center of C, then absolute value of difference of the squares of the lengths of the tangents from A and B to the circle C is equal to :

A. $(AB)^2$

B. $(OP)^2$

C. $\left|(AP)^2 - (BP)^2\right|$

D. $(AP)^2 + (BP)^2$

**Answer: C**

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**6.** Let the diameter of a subset S of the plane be defined as the maximum of the distance between arbitrary pairs of points of S.

Q. Let $S = \{(x, y) : (y - x) \leq 0, x + y \geq 0, x^2 + y^2 \leq 2\}$ then the diameter of S is :

A. 2

B. 4

C. $\sqrt{2}$

D. $2\sqrt{2}$

**Answer: A**

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**7.** Let the diameter of a subset S of the plane be defined as the maximum of the distance between arbitrary pairs of points of S.

Q. Let

$$S = \left\{(x, y) : \left(\sqrt{5} - 1\right)x - \sqrt{10 + 2\sqrt{5}}y \geq 0, \left(\sqrt{5} - 1\right)x + \sqrt{10 + 12\sqrt{5}}y\right.$$

then the diameter of S is :

A. $\frac{3}{2}\left(\sqrt{5} - 1\right)$

B. $3(\sqrt{5}-1)$

C. $3\sqrt{2}$

D. 3

**Answer: D**

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**8.** $t_1, t_2, t_3$ are lengths of tangents drawn from a point (h,k) to the circles $x^2+y^2=4$, $x^2+y^2-4x=0$ and $x^2+y^2-4y=0$ respectively further, $t_1^4=t_2^2 \quad t_3^2+16$. Locus of the point (h,k) consist of a straight line $L_1$ and a circle $C_1$ passing through origin. A circle $C_2$ , which is equal to circle $C_1$ is drawn touching the line $L_1$ and the circle $C_1$ externally.

Equation of $C_1$ is

A. (1, 1)

B. (0, 0)

C. (-1, -1)

D. (2, 2)

**Answer: B**

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## Exercise 4 Matching Type Problems

1.

| | Column-I | | Column-II |
|---|---|---|---|
| (A) | The triangle $PQR$ is inscribed in the circle $x^2+y^2=169$. If $Q(5, 12)$ and $R(-12, 5)$ then $\angle QPR$ is | (P) | $\pi/6$ |
| (B) | The angle between the lines joining the origin to the points of intersection of the line $4x+3y=24$ with circle $(x-3)^2+(y-4)^2=25$ | (Q) | $\pi/4$ |
| (C) | Two parallel tangents drawn to given circle are cut by a third tangent. The angle subtended by the portion of third tangent between the given tangents at the centre is | (R) | $\pi/3$ |
| (D) | A chord is drawn joining the point of contact of tangents drawn from a point $P$ to the circle. If the chord subtends an angle $\pi/2$ at the centre then the angle included between the tangents at $P$ is | (S) | $\pi/2$ |
| | | (T) | $\pi$ |

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| | Column-I | | Column-II |
|---|---|---|---|
| (A) | A ray of light coming from the point $(1, 2)$ is reflected at a point $A$ on the $x$-axis then passes through the point $(5, 3)$. The coordinates of the point $A$ are : | (P) | $\left(\frac{13}{5}, 0\right)$ |
| (B) | The equation of three sides of triangle $ABC$ are $x+y=3$, $x-y=5$ and $3x+y=4$. Considering the sides as diameter, three circles $S_1$, $S_2$, $S_3$ are drawn whose radical centre is at : | (Q) | $(4, -1)$ |
| (C) | If the straight line $x-2y+1=0$ intersects the circle $x^2+y^2=25$ at the points $P$ and $Q$, then the coordinate of the point of intersection of tangents drawn at $P$ and $Q$ to the circle is | (R) | $(-25, 50)$ |
| (D) | The equation of three sides of a triangle are $4x+3y+9=0$, $2x+3=0$ and $3y-4=0$. The circum centre of the triangle is : | (S) | $\left(\frac{-19}{8}, \frac{1}{6}\right)$ |
| | | (T) | $(-1, 2)$ |

**2.**

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## Exercise 5 Subjective Type Problems

**1.** Tangents are drawn to circle $x^2+y^2=1$ at its iontersection points (distinct) with the circle $x^2+y^2+(\lambda-3)x+(2\lambda+2)y+2=0$. The locus of intersection of tangents is a straight line, then the slope of that straight line is .

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2. The radical centre of the three circles is at the origin. The equations of the two of the circles are $x^2 + y^2 = 1$ and $x^2 + y^2 + 4x + 4y - 1 = 0.$ If the third circle passes through the points (1, 1) and (-2, 1), and its radius can be expressed in the form of $\frac{p}{q}$, where p and q are relatively prime positive integers. Find the value of $(p + q)$.

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3. Let $S = \{(x, y) \mid x, y \in R, x^2 + y^2 - 10x + 16 = 0\}$. The largest value of $\frac{y}{x}$ can be put in the form of $\frac{m}{n}$ where m, n are relatively prime natural numbers, then $m^2 + n^2 =$

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4. In the above problem, the complete range of the expression $x^2 + y^2 - 26x + 12y + 210$ is [a, b], then $b - 2a =$

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**5.** If the line y=2-x is tangent to the circle S at the point P(1,1) and circle S is orthogonal to the circle $x^2 + y^2 + 2x + 2y - 2 = 0$ then find the length of tangent drawn from the point (2,2) to the circle S

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**6.** Two circles having radii $r_1$ and $r_2$ passing through vertex A of triangle ABC. One of the circle touches the side BC at B and the other circle touches the side BC at C. If a =5cm and $A = 30^\circ$ find $\sqrt{r_1 r_2}$

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**7.** A circle $S$ of radius $'a'$ is the director circle of another circle $S_1$, $S_1$ is the director circle of circle $S_2$ and so on. If the sum of the radii of all these circle is 2, then the value of $'a'$ is (a) $2 + \sqrt{2}$ (b) $2 - \frac{1}{\sqrt{2}}$ (c) $2 - \sqrt{2}$ (d) $2 + \frac{1}{\sqrt{2}}$

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**8.** If $r_1$ and $r_2$ be the maximum and minimum radius of the circle which pass through the point (4, 3) and touch the circle $x^2 + y^2 = 49$, then $\frac{r_1}{r_2}$ is .......

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**9.** Let C be the circle $x^2 + y^2 - 4x - 4y - 1 = 0$. The number oof points common to C and the sides of the rectangle determined by the lines $x = 2, x = 5, y = -1$ and $y = 5$ equal to

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**10.** Two congruent circles with centered at (2, 3) and (5, 6) which intersect at right angles, have radius equal to (a) 2 $\sqrt{3}$ (b) 3 (c) 4 (d) none of these

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**11.** The sum of abscissa and ordinate of a point on the circle $x^2 + y^2 - 4x + 2y - 20 = 0$ which is nearest to $\left(2, \frac{3}{2}\right)$ is :

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**12.** AB is any chord of the circle $x^2 + y^2 - 6x - 8y - 11 = 0$ which subtends an angle $\frac{\pi}{2}$ at $(1, 2)$. If locus of midpoint of AB is a circle $x^2 + y^2 - 2ax - 2by - c = 0$; then find the value of $(a + b + c)$.

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**13.** If circles $x^2 + y^2 = c$ with radius $\sqrt{3}$ and $x^2 + y^2 + ax + by + c = 0$ with radius $\sqrt{6}$ intersect at two points A and B. If length of $AB = \sqrt{l}$. Find $l$.

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