**MATHEMATICS**

**PAPERMAKER10**

**Straight Line**

Q1. The number of integral values of m, for which the x - co ordinate of the point of intersection of the lines 3x + 4y = 9 and y = mx + 1 is also integer is

(a) 2

(b) 0

(c) 4

(d) 1

L1Difficulty1

Qtag Mathematics

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Q2. A ray of light coming from the point (1, 2) is reflected at a point A on the x axis and then passes through the point (5, 3). The coordinates of the point A are

(a) $\left(\frac{13}{5}, 0\right)$

(b) $\left(\frac{5}{13}, 0\right)$

(c) (–7, 0)

(d) None of these

L1Difficulty1

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Q3. The equation of straight line passing through (–a, 0) and making the triangle with axes of area ‘T’ is

(a) 2Tx + a2y + 2aT = 0

(b) 2Tx – a2y + 2aT = 0

(c) 2Tx – a2y – 2at = 0

(d) None of these

L1Difficulty1

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Q4. The equations of two equal sides of an isosceles triangle are 7x – y + 3 = 0 and x + y – 3 = 0 and the third side passes through the point (1, -10). The equation of the third side is

(a) x – 3y – 31 = 0 but not 3x + y + 7 = 0

(b) 3x + y + 7 = 0 but not x – 3y – 31 = 0

(c) 3x + y + 7 = 0 or x – 3y – 31 = 0

(d) Neither 3x + y + 7 = 0 nor x – 3y – 31 = 0

L1Difficulty1

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Q5. The graph of function Cos x cos(x + 2) – Cos2(x + 3) is

(a) A straight line passing through (0, – Sin21) with slope 2.

(b) A straight line passing through (0, 0)

(c) A parabola with vertex (1, – Sin21)

(d) A straight line passing through the point ($\frac{π}{2}$, – Sin2 1) and parallel to the x – axis.

L1Difficulty1

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Q6. If x1, x2, x3 and y1, y2, y3 are both in GP with the same common ratio, then the points (x1, y1), x­2, y2) and (x3, y3)

(a) lie on straight line

(b) lie on an ellipse

(c) lie on a circle

(d) Are vertices of a triangle

L1Difficulty1

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Q7. The sides AB, BC, CD and DA of a quadrilateral ax x + 2y = 3, x = 1, x – 3y = 4, 5x + y + 12 = 0, respectively. The angle between diagonals AC and BD is

(a) 45°

(b) 60°

(c) 90°

(d) 30°

L1Difficulty1

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Q8. Given the four lines with equations x + 2y = 3, 3x + y = 7, 2x + 3y = 4 and 4x + 5y = 6 then the lines are

(a) Concurrent

(b) Perpendicular

(c) The side of Rectangle

(d) None of these

L1Difficulty1

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Q9. The diagonals of a parallelogram PQRS are along the lines x + 3y = 4 and 6x – 2y = 7, then PQRS must be a

(a) Rectangle

(b) Square

(c) Cyclic Quadrilateral

(d) Rhombus

L1Difficulty1

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Q10. The area of triangle formed by the lines x = 0, y = 0 and

$\frac{x}{a}$ + $\frac{y}{b}$ = 1 is

(a) ab

(b) $\frac{ab}{2}$

(c) 2ab

(d) $\frac{ab}{3}$

L1Difficulty1

Qtag Mathematics

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**Solutions**

S1. Ans. (a)

Sol.

Solving 3x + 4y = 9, y = mx + 1 we get x = $\frac{5}{3+4m}$ x is an integer if 3 + 4m = 1, –1, 5, –5

$∴$ m = $\frac{-2}{4}$, $\frac{-4}{4}$, $\frac{2}{4}$, $\frac{-8}{4}$

So m has two integral values.

S2. Ans. (a)

Sol.

Let the coordinates of A be (a, 0), then the slope of the reflected ray is $\frac{3-0}{5-a}=tanθ$,

The slope of the incident ray = $\frac{2-0}{1-a}=tan⁡(π-θ)$

Since tan$θ$ + tan ($π-θ)$ = 0

$⇒$ $\frac{3}{5-a}+\frac{2}{1-a}=0$

$⇒$ 13 – 5a = 0

$⇒$ a = $\frac{13}{5}$

Thus the coordinates of A are $\left(\frac{13}{5}, 0\right)$

S3. Ans. (b)

Sol.

If the line cuts off the axes at A and B, then area of triangle is $\frac{1}{2}$ × OA × OB = T

$⇒$ $\frac{1}{2}∙a∙OB$ = T

$⇒$ $OB=\frac{2T}{a} $, Hence the equation of line is x/–a + y/2T/a = 1

$⇒$ 2Tx – a2y + 2aT = 0

S4. Ans. (c)

Sol.

Any line through (1 – 10) is given by y + 10 = m(x – 1), Since it makes equal angle. Say ‘a’ with the given lines 7x – y + 3 = 0 and x + y – 3 = 0 therefore,

tan$ α$ = $\frac{m-7}{1+7m}$ = $\frac{m-(-1)}{1+m\left(-1\right)}$

m = $\frac{1}{3}$ or – 3

Hence the two possible equations of third side are 3x + y + 7 = 0, x – 3y – 31 = 0

S5. Ans. (d)

Sol.

y = Cos (x + 1 – 1) Cos (x + 1 + 1) – Cos2 (x + 1)

= Cos2 (x + 1) – Sin21 – Cos2 (x + 1) = – Sin21

Which represents a straight line parallel to the x – axis with y = – Sin21 for all –x and so also for x = $\frac{π}{2}$

S6. Ans. (a)

Sol.

Taking co-ordinates as $\left(\frac{x}{r}, \frac{y}{r}\right)$; (x, y) and (xr, yr)

Above co-ordinates satisfy the relation y = mx, so lie on a straight line.

S7. Ans. (c)

Sol.

The four vertices on solving are (A (–3, 3), B(1, 1), C(1, –1) and D(–2, –2).

m1 = Slope of AC = –1

m2 = Slope of BD = 1

$∴$ m1m2 = –1

S8. Ans. (d)

Sol.

These lines cannot be the sides of a rectangle as none of these are parallel nor they are perpendicular. Now check concurrency

$\left|\begin{matrix}1&2&-3\\3&4&-7\\2&3&-4\end{matrix}\right|$ = 1 (– 16 + 21) – 2(2) – 3(1) $\ne $ 0

Hence neither concurrent.

S9. Ans. (d)

Sol.

M1 = $-\frac{1}{3}$ and m2 = 3

Hence lines x + 3y = 4 and

6x – 2y = 7 are perpendicular to each other, therefore the parallelograms is rhombus.

S10. Ans. (b)

Sol.

Area of the right angled triangle is = $\frac{1}{2}$ (Perpendicular) × (base) = $\frac{1}{2}$ ab.

**Circle**

Q1. Locus of the point given by the equations x = $\frac{2at}{1+t^{2}}$ , y = $\frac{a(1-t^{2})}{1+t^{2}}$

(–1 $\leq $ t $\leq $ 1) is a

(a) Straight line

(b) Circle

(c) Ellipse

(d) Hyperbola

L3Difficulty3

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Q2. The equation of the circle with origin as centre passing through the vertices of an equilateral triangle whose median m of length 3a is

(a) x2 + y2 = 9a2

(b) x2 + y2 = 16a2

(c) x2 + y2 = a2

(d) None of these

L3Difficulty3

Qtag Mathematics

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Q3. If the line 3x + 4y – 1 = 0, touches the circle (x – 1)2 + (y – 2)2 = r2, then the value of r will be

(a) 2

(b) 5

(c) $\frac{12}{5}$

(d) $\frac{2}{5}$

L3Difficulty3

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Q4. The locus of a point which divides the join of A(–1, 1) and a variable point P on the circle x2 + y2 = 4 in the ratio 3:2 is :

(a) 25(x2 + y2) + 20(x – y) + 28 = 0

(b) 25(x2 + y2) + 20(x – y) – 28 = 0

(c) 20(x2 + y2) + 25(x – y) + 28 = 0

(d) None of these

L3Difficulty3

Qtag Mathematics

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Q5. The abscissa of A and B are the roots of the equation x2 + 2ax – b2 = 0, and their ordinates are the roots of the equation y2 + 2py – q2 = 0. The equation of the circle with AB as diameter.

(a) x2 + y2 + 2ax + 2py – b2 – q2 = 0

(b) x2 + y2 + 2ax + py – b2 – q2 = 0

(c) x2 + y2+ 2ax + 2py + b2 + q2 = 0

(d) None of these

L3Difficulty3

Qtag Mathematics

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Q6. Chord of contact of the point (3, 2) w.r.t. the circle x2 + y2 = 25 meets the coordinate axes in A and B. The circumcentre of triangle OAB is

(a) $\left(\frac{25}{4}, \frac{25}{6}\right)$

(b) $\left(\frac{2}{50}, \frac{3}{50}\right)$

(c) $\left(\frac{25}{6}, \frac{25}{4}\right)$

(d) None of these

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q7. The normal at the point (3, 4) on a circle cuts at the point (–1, –2). Then the equation of the circle is

(a) x2 + y2 + 2x – 2y – 13 = 0

(b) x2 + y2 – 2x – 2y – 11 = 0

(c) x2 + y2 – 2x + 2y + 12 = 0

(d) x2 + y2 – 2x – 2y + 14 = 0

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q8. The tangents are drawn from the points (4, 5) to the circle x2 + y2 – 4x – 2y – 11 = 0. The area of quadrilateral formed by these tangents and radii, is

(a) 15 sq. units

(b) 75 sq. units

(c) 8 sq. units

(d) 4 sq. units

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q9. If a straight line through C(–$\sqrt{8}, \sqrt{8}$) making an angle of 135° with the x – axis cuts the circle x = 5 Cos $θ$, y = 5 Sin $θ$ at points A and B, then the length of AB is

(a) 3

(b) 7

(c) 10

(d) None of these

L3Difficulty3

Qtag Mathematics

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Q10. The number of common tangents to the circles x2 + y2 = 4 and x2 + y2 = 4 and x2 + y2 – 6x – 8y = 24 is

(a) 0

(b) 1

(c) 3

(d) 4

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

**Solutions**

S1. Ans. (b)

Sol.

Suppose x = $\frac{2at}{1+t^{2}}$ and y = $\frac{a(1-t^{2})}{1+t^{2}}$

Squaring ad adding both,

we get x2 + y2 = a2

S2. Ans. (d)

Sol.

Centre (0, 0), radius = 3a × $\frac{2}{3}$ = 2a

Hence circle x2 + y2 = 4a2 as centroid divides median is the ratio of 2:1.

S3. Ans. (a)

Sol.

If the line 3x + 4y – 1 = 0 touches the circle (x – 1)2 + (y – 2)2 = r2, then the perpendicular from centre of circle on line is equal to the radius of circle i.e. $\left[\frac{3+8-1}{5}\right]$ = r or r = 2

S4. Ans. (b)

Sol.

Suppose a point on circle is B(x1, y1) and that which divides A and B, in 3:2 is P given by

h = $\frac{-2+3x\_{1}}{5}$, k = $\frac{2+3y\_{1}}{5}$ or $\frac{5h+2}{3}$ = x1

$\frac{5k-2}{2}$ = y1

As (x1 y1) lies on circle x2 + y2 = 4, we get on substituting, 25(x2 + y2) + 20(x – y) – 28 = 0

S5. Ans. (a)

Sol.

Let A (x1, y1) and B (x2, y2), then

x1 + x2 = –2a

x1x2 = –b2

y1 + y2 = 2p

y1 y2 = –q2

Now find centre and radius and hence the equation of circle.

S6. Ans. (d)

Sol.

Since S(3, 2) = 9 + 4 – 25 < 0, therefore (3, 2) lies inside the circle. So these exists no chord of contact and hence $Δ$OAB does not exist.

S7. Ans. (b)

Sol.

Since normal passes through the centre of the circle.

$∴$ the required circle is the circle with ends of diameter as (3, 4) and (–1, –2)

$∴$ Its equations is (x – 3) (x + 1) + (y – 4) (y + 2) = 0

$⇒$ x2 + y2 – 2x – 2y – 11 = 0

S8. Ans. (c)

Sol.

Length of each tangent

L2 = (4)2 + (5)2 – (4 × 4) – (2 × 5) – 11

L = 2

r = $\sqrt{2^{2}+1^{2}-(-11)}$

r = 4

Area = L × r = 8 sq. units

S9. Ans. (c)

Sol.

Line AB is x + y = 0, which is diameter of the circle x2 + y2 = 25. Its length = 2r = 10

S10. Ans. (b)

Sol.

Circles S1 = x2 + y2 = 22, S2 = (x – 3)2 + (y – 4)2 – 72

$∴$ Centre C1 = (0, 0), C2 = (3, 4)

and radii r1 = 2; r2 = 7, $∴$ C1 C2 = 5, r2 – r1 = 5

i.e. Circles touch internally, Hence there is only one common tangent.