**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)

(b)

(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 (, – 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

Qtag Mathematics

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

+ = 1 is

(a) ab

(b)

(c) 2ab

(d)

L1Difficulty1

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**Solutions**

S1. Ans. (a)

Sol.

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

m = , , ,

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 ,

The slope of the incident ray =

Since tan + tan ( = 0

13 – 5a = 0

a =

Thus the coordinates of A are

S3. Ans. (b)

Sol.

If the line cuts off the axes at A and B, then area of triangle is × OA × OB = T

= T

, 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 = =

m = 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 =

S6. Ans. (a)

Sol.

Taking co-ordinates as ; (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

= 1 (– 16 + 21) – 2(2) – 3(1) 0

Hence neither concurrent.

S9. Ans. (d)

Sol.

M1 = 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 = (Perpendicular) × (base) = ab.

**Circle**

Q1. Locus of the point given by the equations x = , y =

(–1 t 1) is a

(a) Straight line

(b) Circle

(c) Ellipse

(d) Hyperbola

L3Difficulty3

Qtag Mathematics

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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)

(d)

L3Difficulty3

Qtag Mathematics

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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)

(b)

(c)

(d) None of these

L3Difficulty3

Qtag Mathematics

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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(–) making an angle of 135° with the x – axis cuts the circle x = 5 Cos , y = 5 Sin at points A and B, then the length of AB is

(a) 3

(b) 7

(c) 10

(d) None of these

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

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 = and y =

Squaring ad adding both,

we get x2 + y2 = a2

S2. Ans. (d)

Sol.

Centre (0, 0), radius = 3a × = 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. = 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 = , k = or = x1

= 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 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 =

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.