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PURE MATH

ALGEBRA AND FUNCTION

Level & Board	EDEXCEL (A-LEVEL)
TOPIC:	CIRCLES
PAPER TYPE:	SOLUTION - 1
TOTAL QUESTIONS	8
TOTAL MARKS	54

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Q.1

(a) Given that circle C with center (-2,6) passes through the point (10,11)
Let's denoted the radius of the circle as r.
We know that

$$(x-h)^2+(y-k)^2=r^2$$

$$(x+2)^2+(y-6)^2=r^2$$

Now,

$$p(10{,}11)=p(x,y)$$

$$(10+2)^2+(11-6)^2=r^2$$

$$\Rightarrow \quad r^2=144+25$$

$$\Rightarrow \quad r^2=169$$

So, the circle C indeed passes through the point (10,1)

(b) Let's denote the points P and Q as the point where the tangent lines at (10,11) and (10,1) respectively, intersect the y-axis .
Let m_1 and m_2 be the slope of the tangent at(10,11) and (10,1)
Now, The equation of the tangent in point – slope form are:

$$\Rightarrow \quad y-y_1=m_1(x-x_1)$$

$$\Rightarrow \quad y-11=m_1(x-10)$$

$$\Rightarrow \quad y-y_1=m_2(x-10)$$

To find the y – intercepts (P and Q)

For P: $y_P=11-10m_1$

For Q: $y_Q=1-10m_2$

I am Sorry !!!!

Using distance formula

$$|pq|=d=\sqrt{(0-0)^2+(y_Q-y_P)^2}$$

Now, Substitute the values into the formula for PQ and simplify.

If done correctly, you should obtain PQ = 58

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Q.2

(a) Using distance formula

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$d = \sqrt{((-3)^2 - 5)^2 + (4 - (-2))^2}$$

$$d = \sqrt{64 + 36}$$

$$d = \sqrt{100}$$

$$d = 10$$

Thus, the distance of xy is 10

(b) Using mid-point formula

$$m = \left(\frac{x_2 - x_1}{2}, \frac{y_2 - y_1}{2}\right)$$

$$m = \left(\frac{-3+5}{2}, \frac{4+(-2)}{2}\right)$$

$$m = (1,1)$$

The slope of the hypoteneouse xy is given by:

$$m_{xy} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2-4}{5+3}$$

$$m_{xy} = \frac{-3}{4}$$

$\Longrightarrow$ The slope of the perpendicular bisector is $\frac{4}{3}$

$\Longrightarrow$ $y - y_1 = m(x - x_1)$

$$y - 1 = \frac{4}{3}(x - 1)$$

$$3(y - 1) = 4(x - 1)$$

$$3y - 3 = 4x - 4$$

$$3y = 4x - 4 + 3$$

$$3y = 4x - 1$$

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This is the equation of the perpendicular bisector.

(c) The perpendicular bisector has the equation $3y = 4x - 1$

Put $m(1,1)\ of\ xy$

$\Longrightarrow \quad 3(1) = 4(1) - 1$

$\Longrightarrow \quad 3 = 4 - 1$

$\Longrightarrow \quad 3 = 3$

The coordinates of the circumcenter are $m(1,1)$

Q.3

Solution:

We know that

The slope (m) of a line passing through two points $(x_1, y_1)\ and\ (x_2, y_2)$

Given by:

$\Longrightarrow \quad \frac{y_2 - y_1}{x_2 - x_1}$

$\Longrightarrow \quad m_{ab} = \frac{8-3}{7-2} = \frac{5}{5} = 1$

$\Longrightarrow \quad m_{cd} = \frac{4-(-1)}{-1-4} = \frac{5}{5} = 1$

Since, $m_{ab} = m_{cd}$

The opposite sides AB and CD are parallel

Q.4

Solution

The distance between two points x_1, y_1 and x_2, y_2 in a plane is given by the Distance formula

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$d = |PQ| = \sqrt{(8-3)^2 + (4-2)^2}$

$PQ = \sqrt{25 + 4}$

$PQ = \sqrt{29}$

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Q.5

Solution:

The mid – point m of QR is given by:

$$M = \left(\frac{x_Q+x_R}{2}, \frac{y_Q+y_R}{2}\right)$$

Similarly,

find the midpoints N and O for RP and PQ respectively.

The equation of the line passing through two points

(x_1, y_1) and (x_2, y_2) is given by

$$y - y_1 = \frac{y_2-y_1}{x_2-x_1}\,(x - x_1)$$

For Pm , QN and RO

Substitute the mid – point coordinates to find the equation

Q.6

Solution:

The distance (d) from a point (x_0, y_0) to a line $Ax + By + c = 0$

Is given by the formula,

$$d = \frac{|Ax_0+By_0+c|}{\sqrt{A^2+B^2}}$$

For this line AC: $y = -2x + 7$ and the point $B(7,8)$

$$\Longrightarrow \quad d = \frac{|-2(7)+1(8)-7|}{\sqrt{(-2)^2+(1)^2}}$$

$$\Longrightarrow \quad d = \frac{|-14+8-7|}{\sqrt{4+1}}$$

$$\Longrightarrow \quad d = \frac{|-13|}{\sqrt{5}}$$

$\therefore$ *Rationalize*

$$\Longrightarrow \quad d = \frac{13}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$$

$$\Longrightarrow \quad d = \frac{13\sqrt{5}}{5}$$

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Q.7

Solution:

(a) Using the equation of circle

$\Longrightarrow \quad (x-h)^2+(y-k)^2=r^2$

$\Longrightarrow \quad (x+3)^2+(y-5)^2=r^2$

(b) Since point A(4,2) lines on the circle, we can substitute these coordinates

Into the equation of the circle and solve for r:

$(4+3)^2+(2-5)^2=r^2$

$(7)^2+(-3)^2=r^2$

$49+9=r^2$

$r^2=58$

$r=\sqrt{58}$

Q.8

Solution:

The equation of a line passing through two points (x_1, y_1) and (x_2, y_2)

is given by:

$\Longrightarrow \quad y-y_1=m(x-x_1)$

$\Longrightarrow \quad y-y_1=\frac{y_2-y_1}{x_2-x_1}(x-x_1)$

$\Longrightarrow \quad y-3=\frac{(-1-3)}{(4-2)}(x-2)$

$\Longrightarrow \quad y-3=\frac{-4}{2}(x-2)$

$\Longrightarrow \quad y-3=-2(x-2)$

$\Longrightarrow \quad y-3=-2x+4$

$\Longrightarrow \quad y=-2x+4+3$

$\Longrightarrow \quad y=-2x+7$

So, the equation of the line containing the diagonal A is $y=2x+7$

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