

2 The circle with equation $(x - 3)^2 + (y - 5)^2 = 40$ intersects the y -axis at points A and B .

(a) Find the y -coordinates of A and B , expressing your answers in terms of surds. [2]

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(b) Find the equation of the circle which has AB as its diameter. [2]

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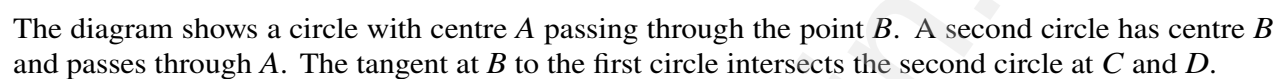
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(a) Find the equation of the tangent CBD . [2]

Blank handwriting practice paper with horizontal lines and a diagonal watermark reading "Pastpaperpen".

- (b) Find an equation of the circle with centre B . [3]

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- (c) Find, by calculation, the x -coordinates of C and D . [3]

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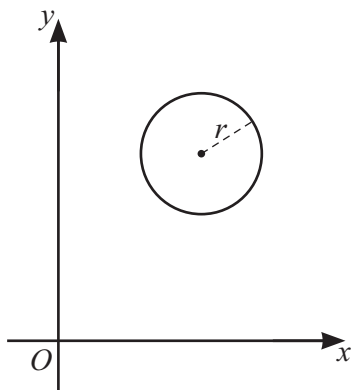
- Show that the equation of the perpendicular bisector of AB is $3x + 2y = 11$.

[4]

[5]

[illegible]

- (a) Find the coordinates of the centre of the circle and the radius. Hence find the coordinates of the lowest point on the circle. [4]



The diagram shows a circle C of radius r , where $x > 0$ and $y > 0$ for all points on C . The least distance between any point on C and the x -axis is 8 units, and the least distance between any point on C and the y -axis is 5 units.

- (a) State the coordinates of the centre of the circle in terms of r . [1]

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- (b) Given that the distance between the origin and the centre of the circle is 15 units, find the value of r . [3]

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- (c) The point on the circle furthest from the origin is denoted by P .
Find the gradient of the tangent to the circle at P . [2]

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- 9 A circle has centre at the point $B(5, 1)$. The point $A(-1, -2)$ lies on the circle.

(a) Find the equation of the circle.

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Point C is such that AC is a diameter of the circle. Point D has coordinates $(5, 16)$.

(b) Show that DC is a tangent to the circle.

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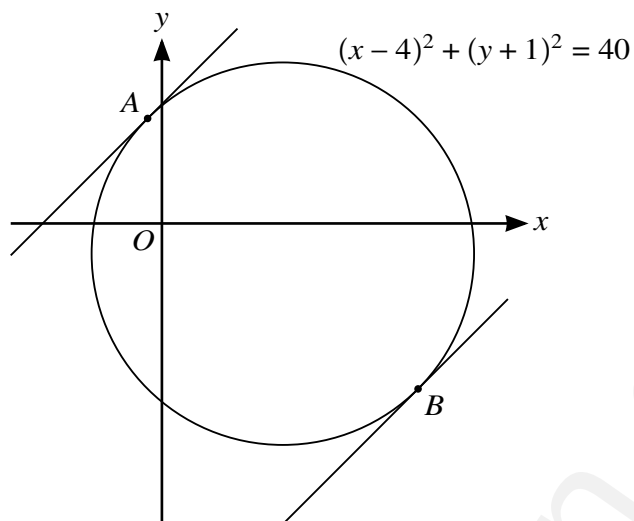
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[2]

[illegible]



(a) Find the equation of the line AB , giving the answer in the form $y = mx + c$. [3]

[illegible]

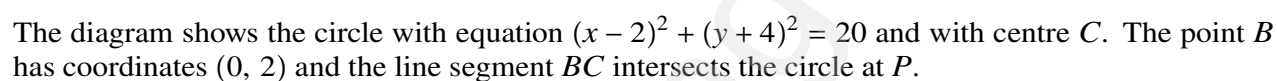
[4]

[illegible]

- (c) Find the equation of the tangent at A , giving the answer in the form $y = mx + c$, where c is in surd form. [2]

[2]

Handwriting practice lines (dotted lines on a solid background).



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- This image shows a blank sheet of white paper designed for handwriting practice. It features ten sets of horizontal ruling lines, each consisting of a solid top line, a dashed middle line, and a solid bottom line. A large, light gray watermark reading "Pastpaper" is oriented diagonally from the bottom-left towards the top-right across the center of the page. The entire sheet is framed by a thin black border.

[illegible]

pastpaperpenguin.com



[5]

[illegible]

- 7 The point A has coordinates $(1, 5)$ and the line l has gradient $-\frac{2}{3}$ and passes through A . A circle has centre $(5, 11)$ and radius $\sqrt{52}$.

(a) Show that l is the tangent to the circle at A . [2]

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(b) Find the equation of the other circle of radius $\sqrt{52}$ for which l is also the tangent at A . [3]

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12 A diameter of a circle C_1 has end-points at $(-3, -5)$ and $(7, 3)$.

(a) Find an equation of the circle C_1 .

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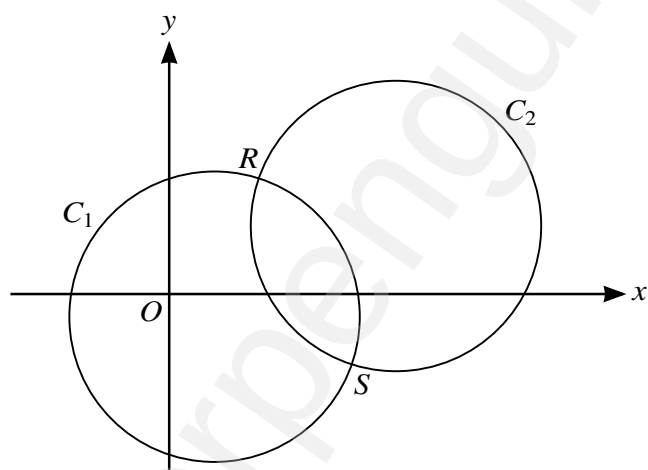
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The circle C_1 is translated by $\begin{pmatrix} 8 \\ 4 \end{pmatrix}$ to give circle C_2 , as shown in the diagram.

(b) Find an equation of the circle C_2 .

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The two circles intersect at points R and S .

- (c) Show that the equation of the line RS is $y = -2x + 13$. [4]

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- (d) Hence show that the x -coordinates of R and S satisfy the equation $5x^2 - 60x + 159 = 0$. [2]

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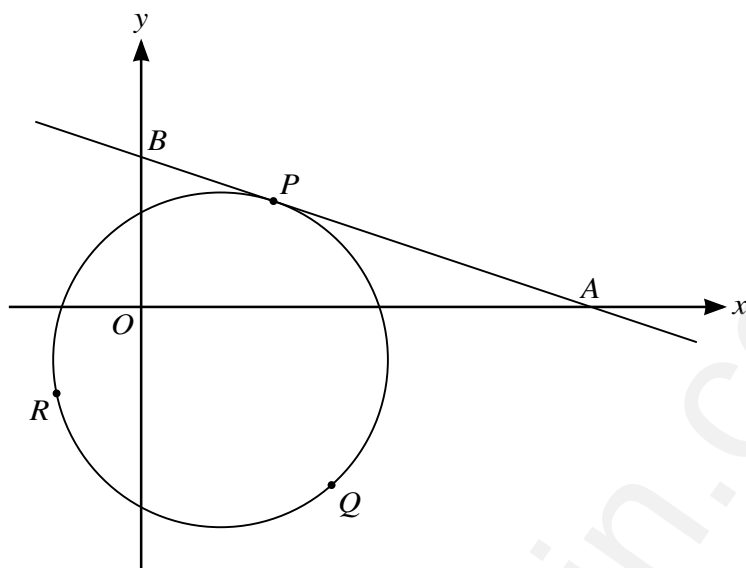
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(a) The tangent to the circle at P meets the x -axis at A and the y -axis at B .

[5]

This image shows a blank sheet of white paper with horizontal ruling lines. A large, light gray watermark reading "Pastpaper" is oriented diagonally from the bottom left towards the top right. The watermark is semi-transparent and covers a significant portion of the page. There are no other markings or text on the page.

[3]

This image shows a blank sheet of white paper designed for handwriting practice. It features multiple sets of horizontal dotted lines spaced evenly down the page. A large, light gray watermark is oriented diagonally from the bottom-left towards the top-right, containing the text "pastpaperpenqu岸.com". The paper is otherwise empty of any other markings or text.

- Find the two possible values of m and, for each value of m , find the coordinates of the point at which the tangent touches the circle. [8]

This image shows a blank sheet of white paper designed for handwriting practice. It features approximately 20 horizontal dashed lines spaced evenly down the page. A large, light gray watermark is oriented diagonally from the bottom-left towards the top-right, displaying the text "pastpaperpenquin.com". The watermark is semi-transparent, allowing the ruled lines to remain visible beneath it. There are no margins, text, or other markings on the page.

11 The equation of a circle with centre C is $x^2 + y^2 - 8x + 4y - 5 = 0$.

- (a)** Find the radius of the circle and the coordinates of C . [3]

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The point $P(1, 2)$ lies on the circle.

- (b)** Show that the equation of the tangent to the circle at P is $4y = 3x + 5$. [3]

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The point Q also lies on the circle and PQ is parallel to the x -axis.

- (c) Write down the coordinates of Q . [2]

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The tangents to the circle at P and Q meet at T .

- (d) Find the coordinates of T . [3]

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11 The coordinates of points A , B and C are $A(5, -2)$, $B(10, 3)$ and $C(2p, p)$, where p is a constant.

- (a)** Given that AC and BC are equal in length, find the value of the fraction p . [3]

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- (b)** It is now given instead that AC is perpendicular to BC and that p is an integer.

- (i)** Find the value of p . [4]

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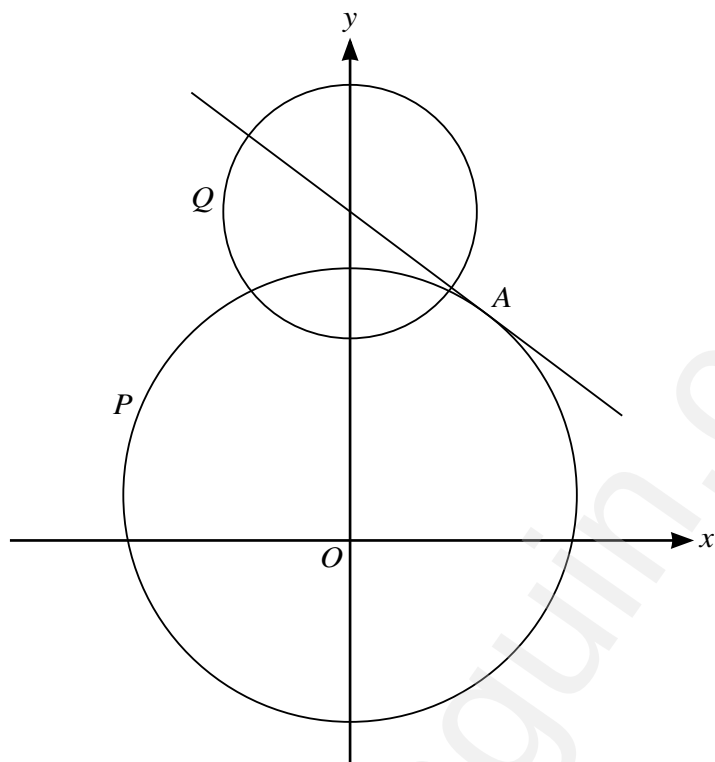
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- (ii) Find the equation of the circle which passes through A , B and C , giving your answer in the form $x^2 + y^2 + ax + by + c = 0$, where a , b and c are constants. [4]



The diagram shows a circle P with centre $(0, 2)$ and radius 10 and the tangent to the circle at the point A with coordinates $(6, 10)$. It also shows a second circle Q with centre at the point where this tangent meets the y -axis and with radius $\frac{5}{2}\sqrt{5}$.

- (a) Write down the equation of circle P . [1]

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- (b) Find the equation of the tangent to the circle P at A . [2]

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- (c) Find the equation of circle Q and hence verify that the y -coordinates of both of the points of intersection of the two circles are 11. [3]

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- (d) Find the coordinates of the points of intersection of the tangent and circle Q , giving the answers in surd form. [3]

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11 A circle with centre C has equation $(x - 8)^2 + (y - 4)^2 = 100$.

- (a)** Show that the point $T(-6, 6)$ is outside the circle. [3]

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Two tangents from T to the circle are drawn.

- (b)** Show that the angle between one of the tangents and CT is exactly 45° . [2]

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The two tangents touch the circle at A and B .

- (c) Find the equation of the line AB , giving your answer in the form $y = mx + c$. [4]

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- (d) Find the x -coordinates of A and B . [3]

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- (a) Show that one possible value of a is 4 and find the other possible value. [5]

- (b) For $a = 4$, find the equation of the normal to the circle at P .

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- (c) For $a = 4$, find the equations of the two tangents to the circle which are parallel to the normal found in (b).

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