GCSE · Edexcel · Maths

2 hours 29 questions

Exam Questions

Equation of a Circle

Equation of a Circle / Equation of a Tangent

Easy (5 questions)	/6
Medium (9 questions)	/45
Hard (8 questions)	/45
Very Hard (7 questions)	/41
Total Marks	**/137**

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Easy Questions

1 The equation of a circle is $x^2 + y^2 = 11$

Work out the length of the **diameter**.

A. $\sqrt{11}$

B. $2\sqrt{11}$

C. $\sqrt{22}$

D. 22

(1 mark)

2 The equation of a circle is $x^2 + y^2 = 9$

Work out the length of the **diameter**.

A. 3

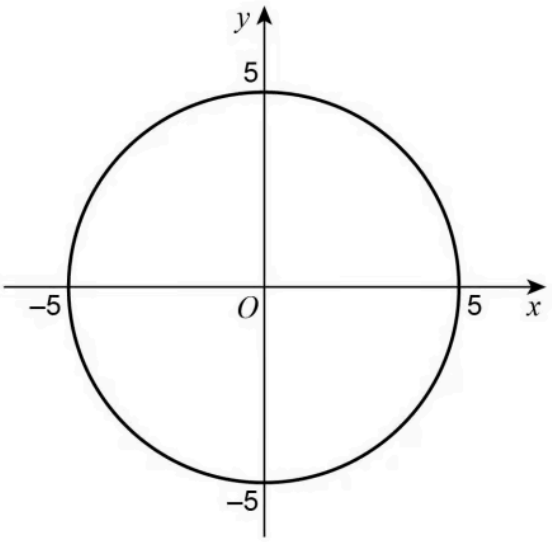
B. 6

C. 9

D. 18

(1 mark)

3 A circle, centre O, passes through (5, 0).



What is the equation of the circle?

A. $x^2 + y^2 = 25$

B. $x^2 + y^2 = 5$

C. $x^2 + y^2 = 10$

D. $x^2 + y^2 = 100$

(1 mark)

4 Work out the diameter of the circle $x^2 + y^2 = 64$

A. 8

B. 16

C. 32

D. 128

(1 mark)

5 Describe fully the graph which has the equation $x^2 + y^2 = 9$.

(2 marks)

Medium Questions

1 The equation of circle $\mathbf{C}$ is $x^2 + y^2 = 16$

The circle $\mathbf{C}$ is translated by the vector $\begin{pmatrix} 3 \\ 0 \end{pmatrix}$ to give circle $\mathbf{B}$.

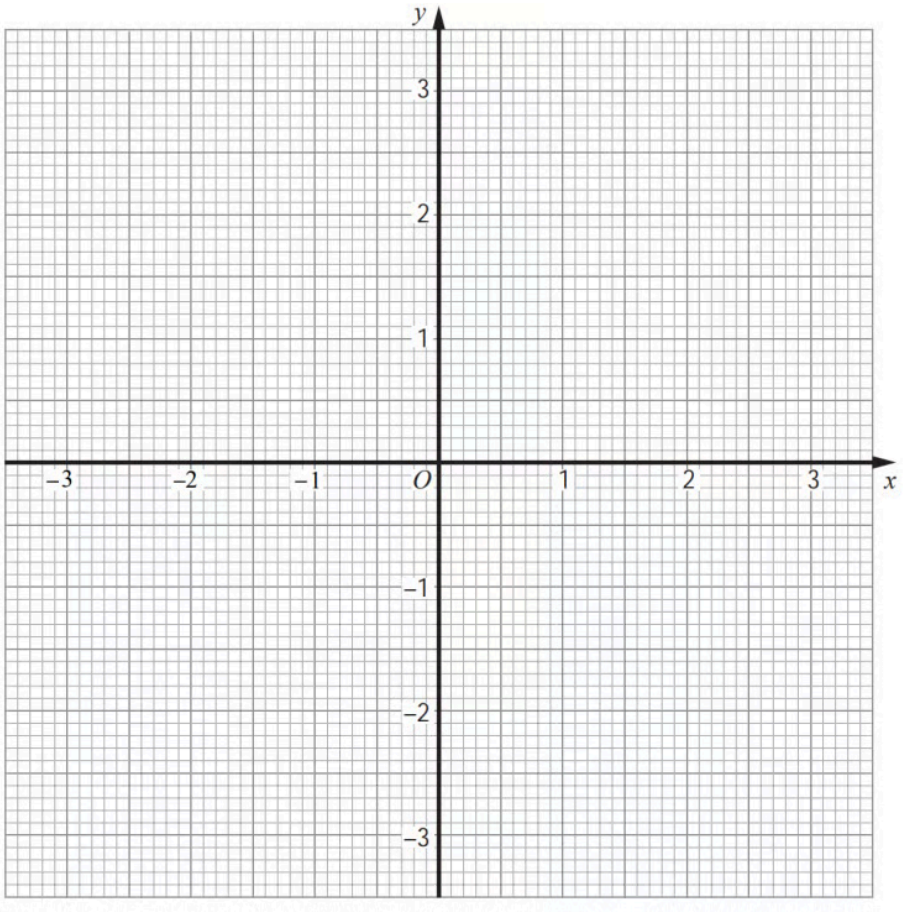
Draw a sketch of circle $\mathbf{B}$.

Label with coordinates

- the centre of circle $\mathbf{B}$
- and any points of intersection with the x-axis.

(3 marks)

2 (a) Construct the graph of $x^2 + y^2 = 9$



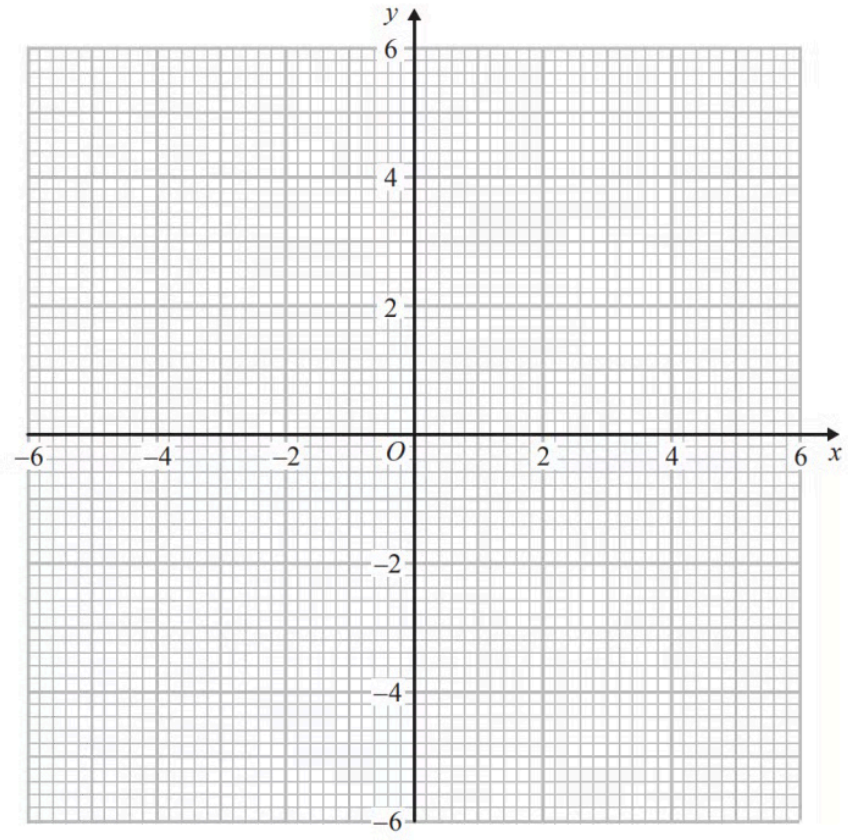
(2 marks)

(b) By drawing the line $x + y = 1$ on the grid, solve the equations

$$x^2 + y^2 = 9$$
$$x + y = 1$$

(3 marks)

3 (a) On the grid, construct the graph of $x^2 + y^2 = 16$



(2 marks)

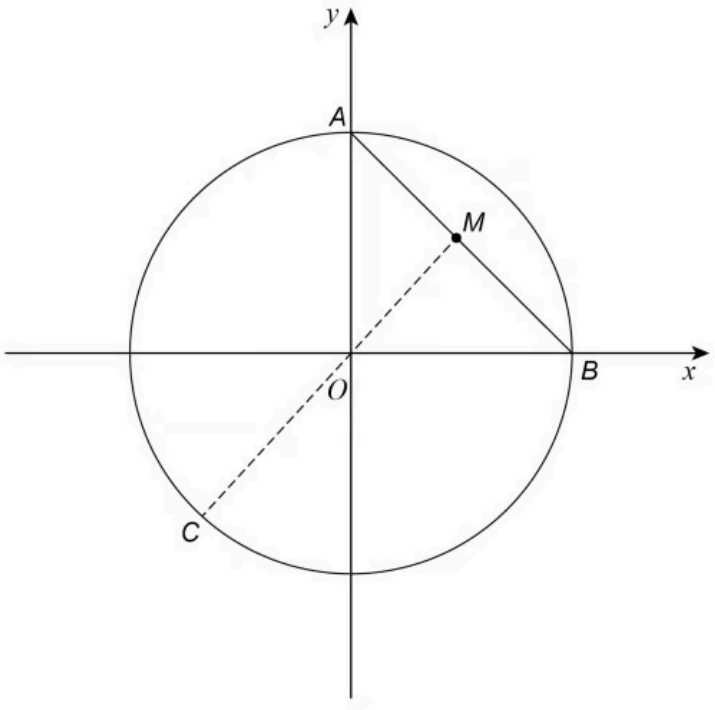
(b) Find estimates for the solutions of the simultaneous equations

$$x^2 + y^2 = 16$$
$$y = 2x + 1$$

(3 marks)

4 (a) A, B and C are points on the circle $x^2 + y^2 = 36$ as shown.

A is on the y-axis.
B is on the x-axis.
M is the midpoint of AB.
COM is a straight line.



Show that the coordinates of A are (0, 6)

(1 mark)

(b) Work out the coordinates of B.

(1 mark)

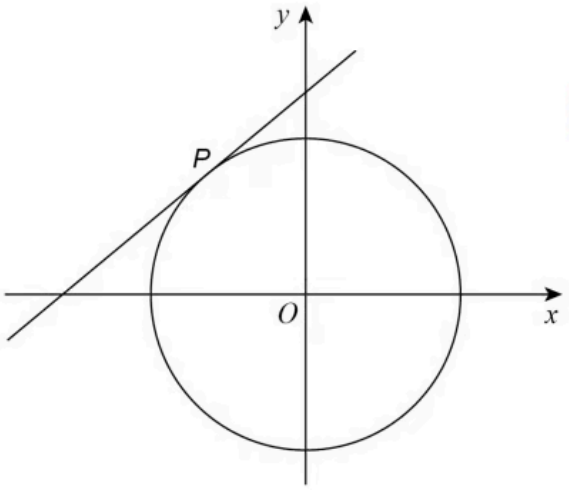
(c) Show that the equation of the straight line passing through C, O and M is $y = x$

(2 marks)

(d) Work out the coordinates of C. Give your answers in surd form.

(3 marks)

5 $P(-1, 4)$ is a point on a circle, centre O

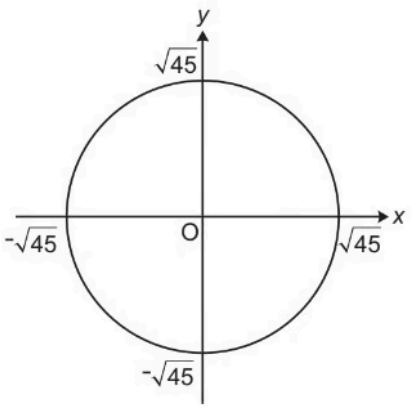


Work out the equation of the tangent to the circle at P.

Give your answer in the form $y = mx + c$

(4 marks)

6 (a) Here is a sketch of the circle $x^2 + y^2 = 45$



Show that the tangent to this circle at the point (-3, 6) has a gradient of $\frac{1}{2}$

(2 marks)

(b) Find the equation of the tangent at the point (-3, 6).

(2 marks)

7 (a) The point (-5, 2) lies on the circumference of a circle, centre (0, 0).

Find the equation of the circle.

(4 marks)

(b) Work out the gradient of the tangent to the circle at (-5, 2).

(2 marks)

8 (a) In this question all units are in cm. A circle has equation $x^2 + y^2 = 36$

Write down the radius and centre of the circle.

radius: ..... cm

centre: (....., ...)

(2 marks)

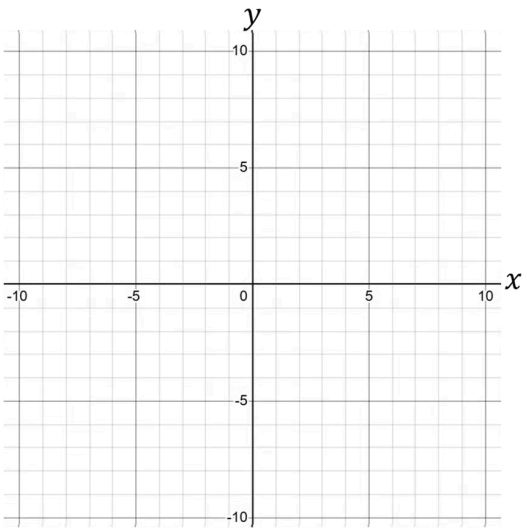
(b) The distinct points A (a, $\sqrt{11}$) and B (b, $\sqrt{11}$) lie on the circumference of the circle.

Work out the length AB.

..... cm

(4 marks)

9 (a) On the grid, draw the graph of $x^2 + y^2 = 64$



(2 marks)

(b) Use your graph to find estimates for the solutions of the simultaneous equations

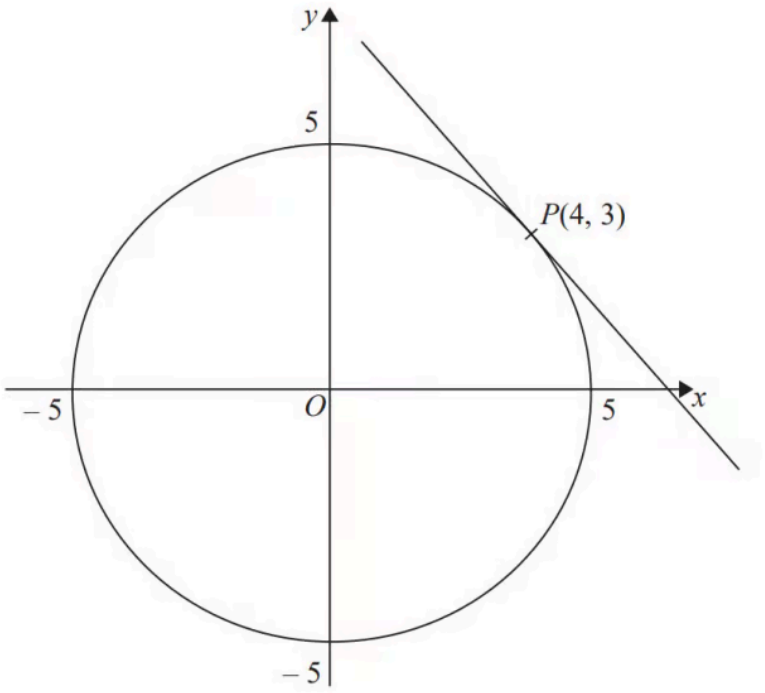
$$x^2 + y^2 = 64$$

$$2x = y + 8$$

(3 marks)

Hard Questions

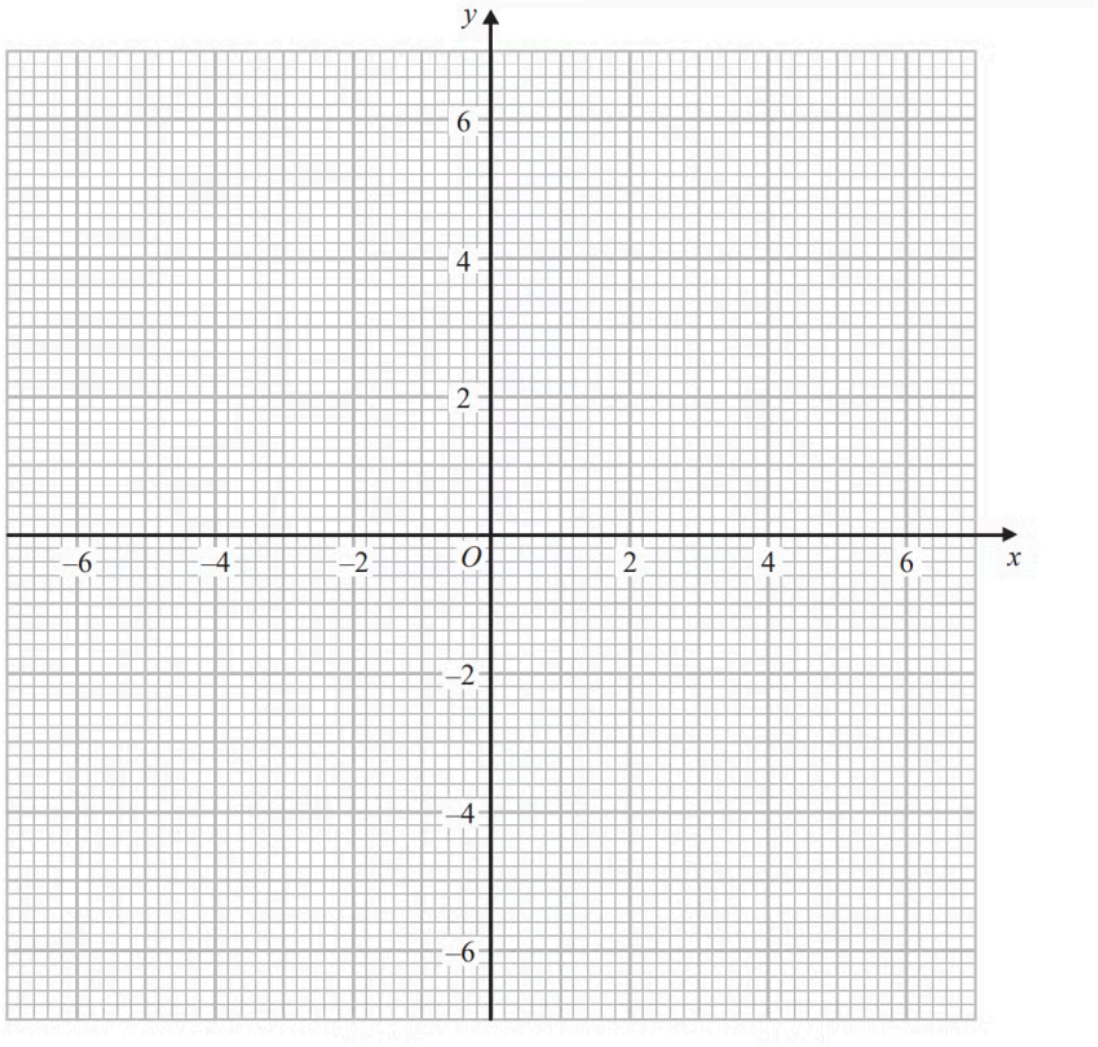
1 Here is a circle, centre O, and the tangent to the circle at the point $P(4, 3)$ on the circle.



Find an equation of the tangent at the point P.

(3 marks)

2 (a) On the grid, draw the graph of $x^2 + y^2 = 12.25$



(2 marks)

(b) Hence find estimates for the solutions of the simultaneous equation

$$x^2 + y^2 = 12.25$$
$$2x + y = 1$$

(3 marks)

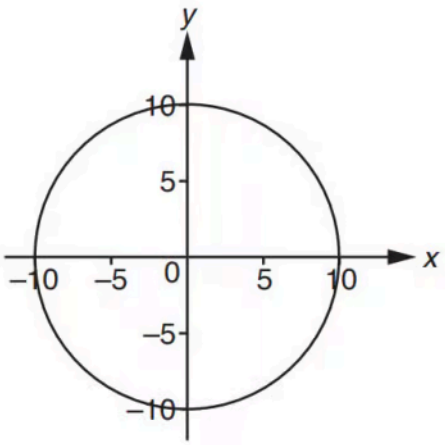
3 $\mathbf{L}$ is the circle with equation $x^2 + y^2 = 4$

$P\left(\frac{3}{2}, \frac{\sqrt{7}}{2}\right)$ is a point on $\mathbf{L}$.

Find an equation of the tangent to $\mathbf{L}$ at the point P.

(3 marks)

4 (a) The diagram shows a circle, centre the origin.



Write down the equation of the circle.

(1 mark)

(b) Point P has coordinates (8, —6).
Show that point P lies on the circle.

(2 marks)

(c) Find the equation of the tangent to the circle at point P.

(5 marks)

5 (a) A circle has equation $x^2 + y^2 = 80$.

Calculate the diameter of the circle.
Give your answer as a surd in its simplest form.

(3 marks)

(b) Colin says that the point (5, 7) lies outside the circle.

Is Colin correct?
Show your reasoning.

(2 marks)

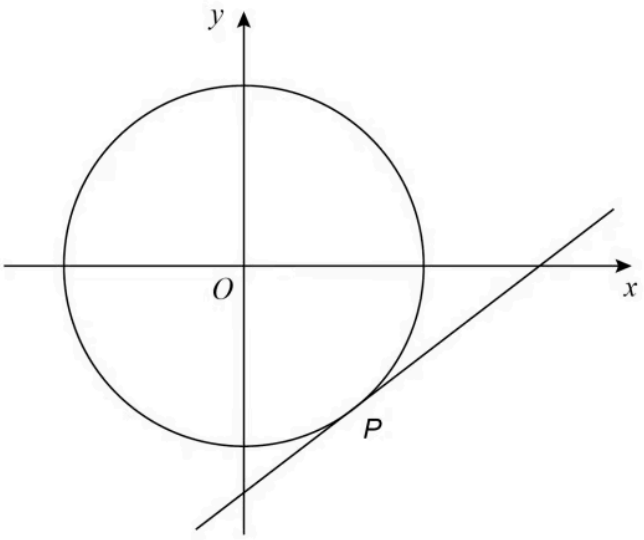
(c) Show that the line with equation $y = \frac{1}{2}x + 10$ is a tangent to the circle.

(6 marks)

6 P is a point on the circle with equation $x^2 + y^2 = 80$

P has x-coordinate 4 and is below the x-axis.

Not drawn accurately

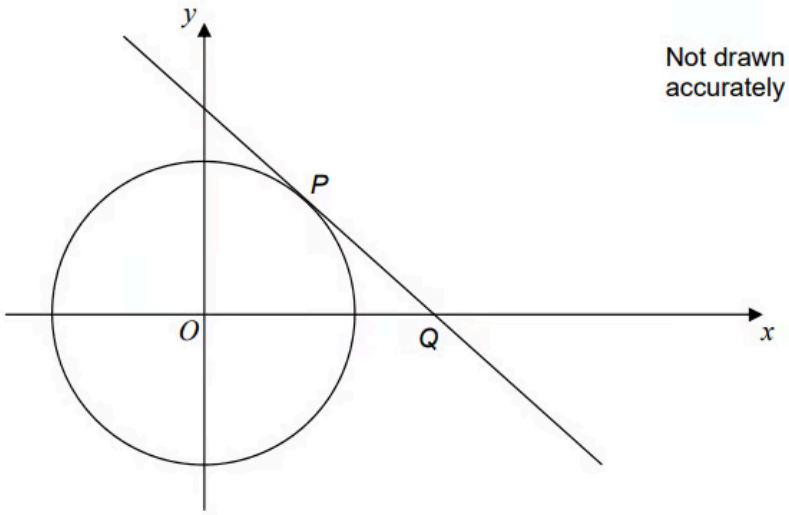


Work out the equation of the tangent to the circle at P.

(5 marks)

7 The diagram shows the circle $x^2 + y^2 = 10$

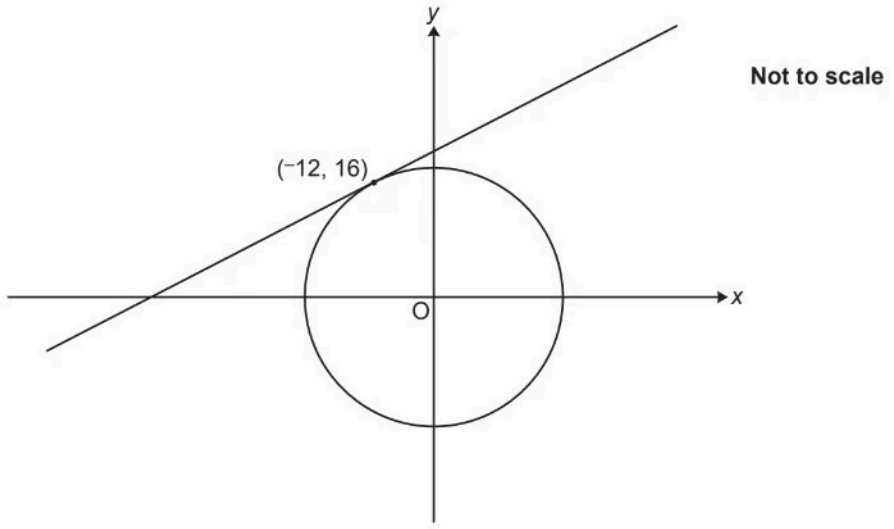
P lies on the circle and has x-coordinate 1 The tangent at P intersects the x-axis at Q.



Work out the coordinates of Q.

(5 marks)

8 The diagram shows a circle with centre (0, 0) and a tangent at the point (–12, 16).



The tangent crosses the y-axis at the point (0, p).

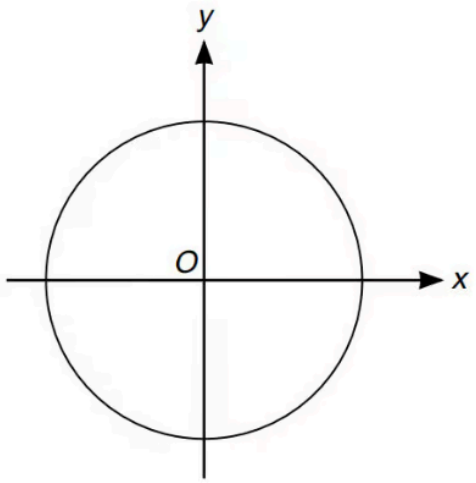
Find the value of p.

p = ...

(5 marks)

Very Hard Questions

1 (a) The diagram shows a circle, centre O.



The circumference of the circle is 20π cm. Find the equation of the circle.

(4 marks)

(b) The line $10x + py = q$ is a tangent at the point (5, 4) in another circle with centre (0, 0).

Find the value of p and the value of q.

(4 marks)

2 The line l is a tangent to the circle $x^2 + y^2 = 40$ at the point A.

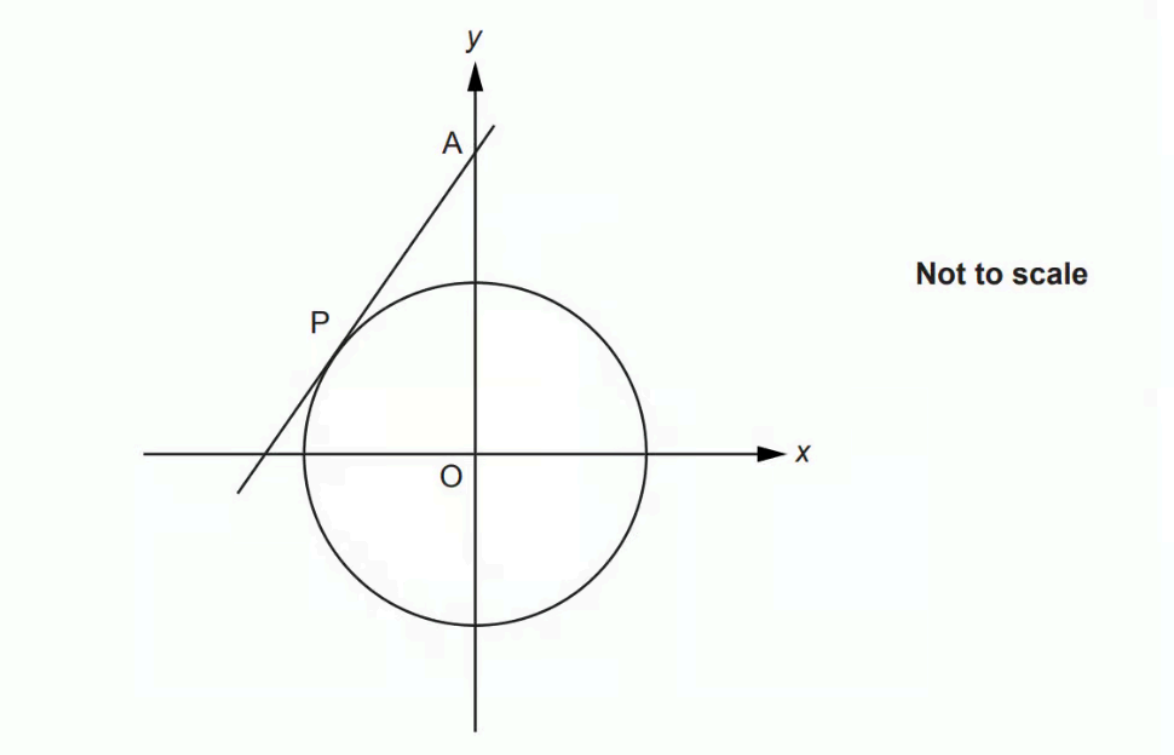
A is the point (2, 6).

The line l crosses the x-axis at the point P.

Work out the area of triangle OAP.

(5 marks)

3 (a) The diagram shows the circle $x^2 + y^2 = 5$.



Mandy says that the point (2, 1.5) lies inside the circle.

Is she correct?
Show how you decide.

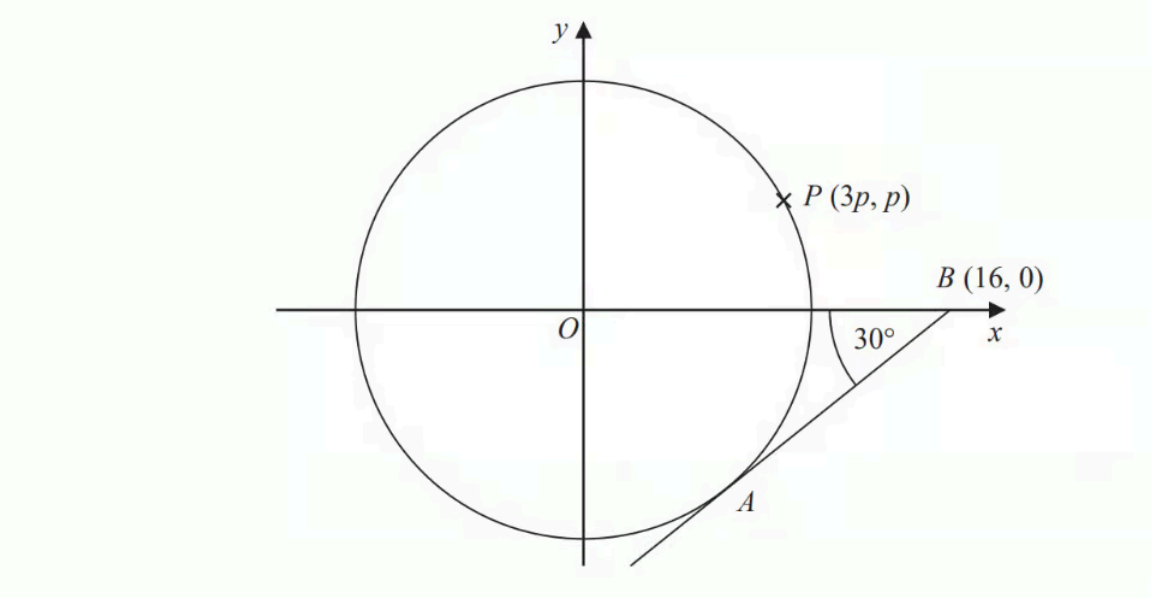
(2 marks)

(b) The tangent to the circle at the point P (-2, 1) intersects the *y*-axis at A.

Show that the area of the triangle APO is 5 square units.

(6 marks)

4 The diagram shows a circle, centre O.



AB is the tangent to the circle at the point A. Angle $OBA = 30°$

Point B has coordinates (16, 0)
Point P has coordinates (3*p*, *p*)

Find the value of *p*.
Give your answer correct to 1 decimal place.
You must show all your working.

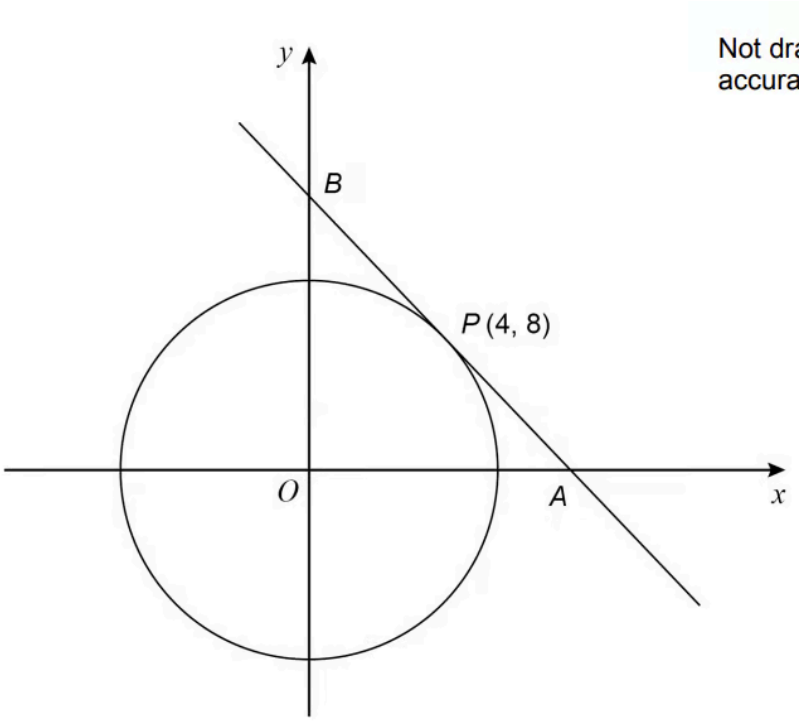
(4 marks)

5 Prove algebraically that the straight line with equation $x - 2y = 10$ is a tangent to the circle with equation $x^2 + y^2 = 20$

(5 marks)

6 (a) P (4, 8) is a point on a circle, centre O.

The tangent at P intersects the axes at points A and B.



Show that the gradient of the tangent is $-\frac{1}{2}$

(2 marks)

(b) Work out the length AB.

Give your answer in the form $a\sqrt{5}$ where a is an integer.

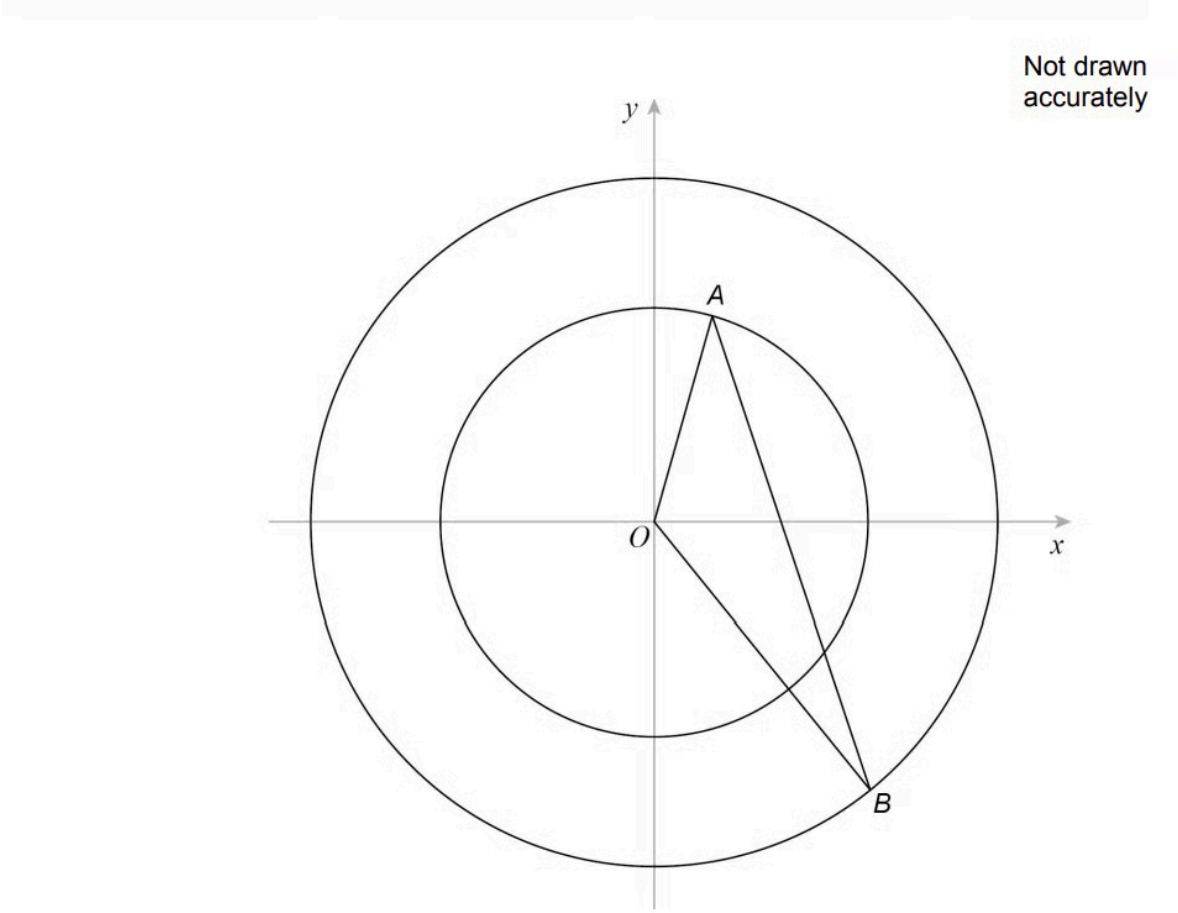
You **must** show your working.

.....units

(4 marks)

7 In this question, all lengths are in centimetres.

A is a point on a circle, centre O.
B is a point on a different circle, centre O.
$AB = 20$



The equation of the larger circle is $x^2 + y^2 = 144$
radius of smaller circle : radius of larger circle = 4 : 5

Work out the size of angle AOB

..... degrees

(5 marks)