Core 2

Circles Challenge

Complete each question, see if you can beat the expected time limit suggested

1. The point A has coordinates (2, 5) and the point B has coordinates (–2, 8).
Find, in cartesian form, an equation of the circle with diameter AB.

5 minutes

2. The points A and B have coordinates (5, –1) and (13, 11) respectively.
(a) Find the coordinates of the mid-point of AB.

2 minutes

Given that AB is a diameter of the circle C,
(b) find an equation for C.

4 minutes

Key words : circle, diameter, radius, Cartesian, coordinates

3. Two circles C_1 and C_2 have equations

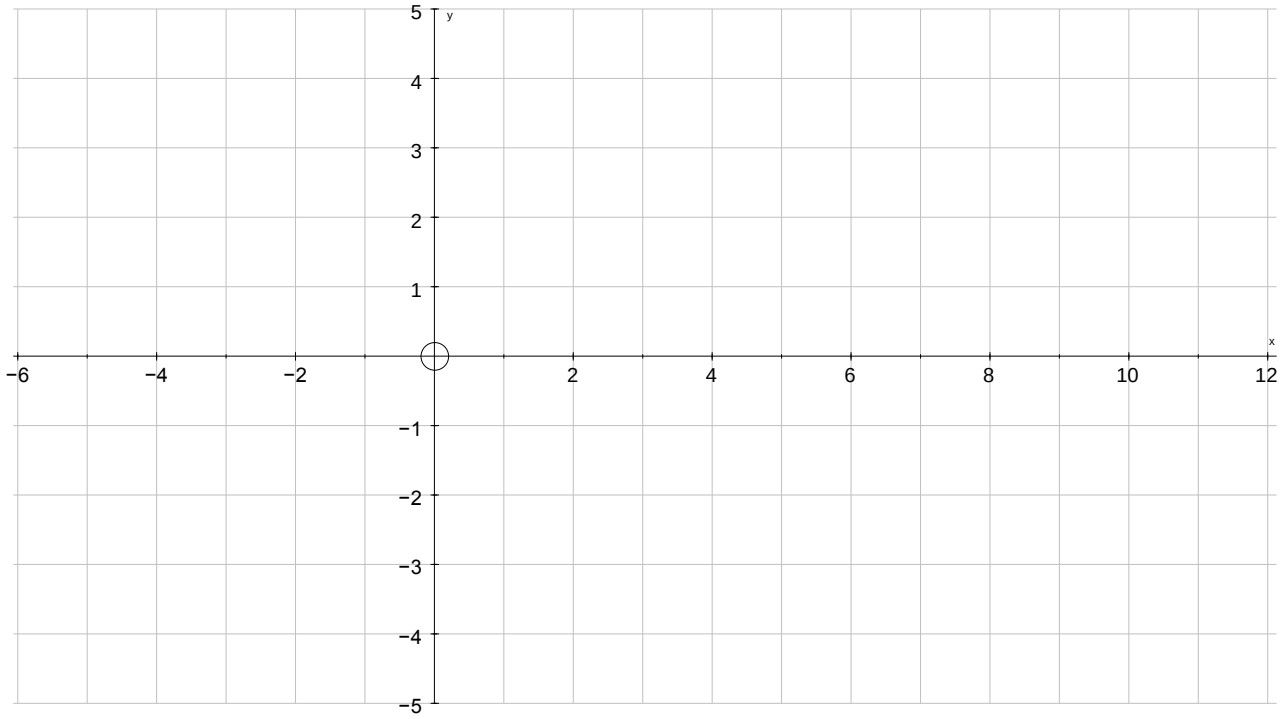
$$(x-2)^2 + y^2 = 9 \text{ and } (x-5)^2 + y^2 = 9$$

respectively.

(a) For each of these circles state the radius and the coordinates of the centre.

1 minutes	**1 minute**

(b) Sketch the circles C_1 and C_2 on the same diagram.



3 minutes

(c) Find the exact distance between the points of intersection of C_1 and C_2.

4 minutes

Key words : sketch, equation, intersection

4. The circle C, with centre at the point A, has equation $x^2 + y^2 - 10x + 9 = 0$.
Find

(a) the coordinates of A,

1 minutes

(b) the radius of C,

2 minutes

(c) the coordinates of the points at which C crosses the x-axis.

2 minutes

Given that the line l with gradient $\frac{7}{2}$ is a tangent to C, and that l touches C at the point T,

(d) find an equation of the line which passes through A and T.

5 minutes

Key word : tangent

Answers

1. **Either**

Obtains centre (0, 6.5) B1

Finds radius or diameter by Pythagoras Theorem, to obtain

$r = 2.5$ or $r^2 = 6.25$ M1, A1

$x^2 + (y - 6.5)^2 = 2.5^2$ or $x^2 + y^2 - 13y + 36 = 0$ B1 4

[4]

2. (a) $(\frac{5+13}{2}, \frac{-1+11}{2}), = \underline{\underline{(9,5)}}$ M1, A1 2

(b) $r^2 = (9-5)^2 + (5--1^2)$ (=52) or $r^2 = (13-9)^2 + (11-5)^2$ (=52) (or equiv.)M1

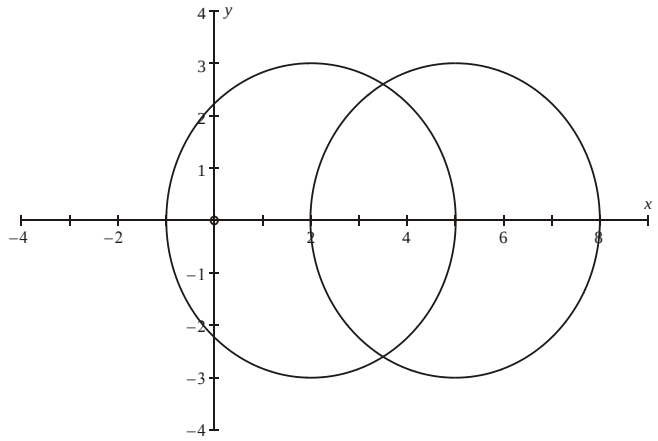
Equation of circle: $(x-9)^2 + (y-5)^2 = 52$ (or equiv.) M1 A1ft A1 4

[6]

3. (a) $r = 3$ (both circles) B1

Centres are at (2, 0) and (5, 0) B1, B1 3

(b)



1st circle correct quadrants centre on x axis B1

2nd circle correct quadrants centre on x axis B1

circles same size and passing through centres of other circle B1 3

(c) Finds circles meet at $x = 3.5$, by mid point of centres or by solving algebraically M1

Establishes $y = \pm\frac{3\sqrt{3}}{2}$, and thus distance is $3\sqrt{3}$. M1, A1 3

[12]

4. (a) Centre (5, 0) (or $x = 5$, $y = 0$) B1 B1 2

(b) $(x \pm a)^2 \pm b \pm 9 + (y \pm c)^2 = 0 \Rightarrow r^2 = \ldots$ or $r = \ldots$, Radius = 4 M1 A1 2

(c) (1, 0), (9, 0) B1ft, B1ft 2

(d) Gradient of $AT = -\frac{2}{7}$ B1

$y = -\frac{2}{7}(x - 5)$ m1 A1ft 3

[9]