

Topic Test

Summer 2022

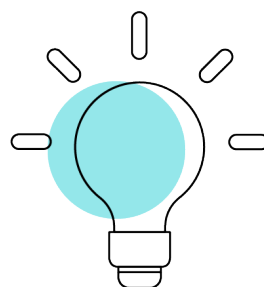
Pearson Edexcel GCE Mathematics (9MA0)

Paper 1 and Paper 2

Topic 3: Coordinate geometry in the (x,y) plane

Contents

<u>General guidance to Topic Tests</u>	<u>3</u>
<u>Revise Revision Guide content coverage</u>	<u>4</u>
<u>Questions</u>	<u>5</u>
<u>Mark Scheme</u>	<u>28</u>



Question T3_Q1

Not to scale

The circle C has centre A with coordinates $(7, 5)$.

The line l , with equation $y = 2x + 1$, is the tangent to C at the point P , as shown in Figure 3.

- (b) Find an equation for C . (4)

The line with equation $y = 2x + k$, $k \neq 1$ is also a tangent to C .

- (c) Find the value of the constant k . (3)

Question T3_Q2

14. A curve C has parametric equations

$$x = 3 + 2\sin t, \quad y = 4 + 2\cos 2t, \quad 0 \leq t < 2\pi$$

- (a) Show that all points on C satisfy $y = 6 - (x - 3)^2$

- (b) (i) Sketch the curve C .
- (ii) Explain briefly why C does not include all points of $y = 6 - (x - 3)^2$, $x \in \mathbb{R}$
- (3)**

The line with equation $x + y = k$, where k is a constant, intersects C at two distinct points.

- (c) State the range of values of k , writing your answer in set notation. (5)

Question 14 continued

Question T3_Q3

7. A small factory makes bars of soap.

On any day, the total cost to the factory, $\pounds y$, of making x bars of soap is modelled to be the sum of two separate elements:

- a fixed cost
- a cost that is proportional to the number of bars of soap that are made that day

(a) Write down a general equation linking y with x , for this model.

(1)

The bars of soap are sold for £2 each.

On a day when 800 bars of soap are made and sold, the factory makes a profit of £500

On a day when 300 bars of soap are made and sold, the factory makes a loss of £80

Using the above information,

(b) show that $y = 0.84x + 428$

(3)

(c) With reference to the model, interpret the significance of the value 0.84 in the equation.

(1)

Assuming that each bar of soap is sold on the day it is made,

(d) find the least number of bars of soap that must be made on any given day for the factory to make a profit that day.

(2)

Question T3_Q4

11.

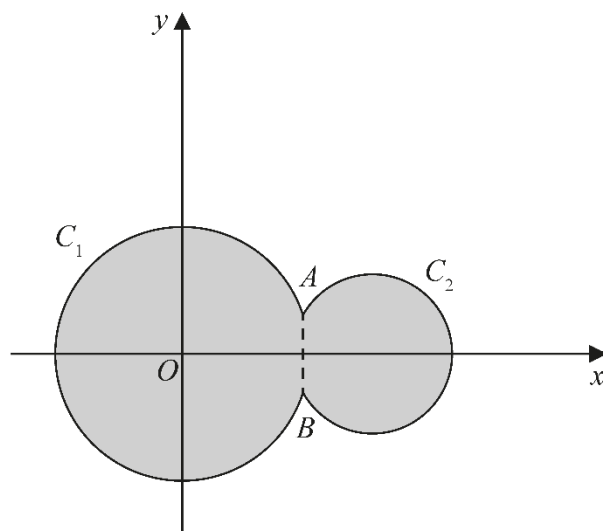


Figure 3

Circle C_1 has equation $x^2 + y^2 = 100$

Circle C_2 has equation $(x - 15)^2 + y^2 = 40$

The circles meet at points A and B as shown in Figure 3.

(a) Show that angle $AOB = 0.635$ radians to 3 significant figures, where O is the origin.

(4)

The region shown shaded in Figure 3 is bounded by C_1 and C_2

(b) Find the perimeter of the shaded region, giving your answer to one decimal place.

(4)

Question T3_Q5

14. A circle C with radius r

- lies only in the 1st quadrant
- touches the x -axis and touches the y -axis

The line l has equation $2x + y = 12$

(a) Show that the x coordinates of the points of intersection of l with C satisfy

$$5x^2 + (2r - 48)x + (r^2 - 24r + 144) = 0 \quad (3)$$

Given also that l is a tangent to C ,

(b) find the two possible values of r , giving your answers as fully simplified surds. (4)

Question T3_Q6

7. The circle C has equation

$$x^2 + y^2 - 10x + 4y + 11 = 0$$

(a) Find

- the coordinates of the centre of C ,
- the exact radius of C , giving your answer as a simplified surd.

(4)

The line l has equation $y = 3x + k$ where k is a constant.

Given that l is a tangent to C ,

- (b) find the possible values of k , giving your answers as simplified surds.

(5)

