

Maths Questions By Topic:

Coordinate geometry in the (x, y) plane

A-Level Edexcel

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- \square online.expert-tuition.co.uk
- □ enquiries@expert-tuition.co.uk
- $\, igotimes \,$ The Foundry, 77 Fulham Palace Road, W6 8JA

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1. A circle has equation			
$x^2 + y^2 - 10x + 16y = 80$			
(a) Find			
(i) the coordinates of the centre of the circle,			
(ii) the radius of the circle.	(2)		
	(3)		
Given that P is the point on the circle that is furthest away from the origin O ,			
(b) find the exact length <i>OP</i>	(2)		

Question 1 continued	
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(Total for Question 1 is 5 marks)	_
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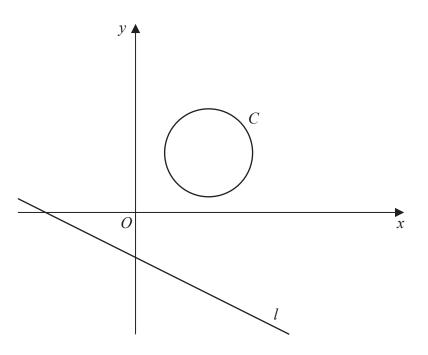


Figure 3

Figure 3 shows the circle C with equation

$$x^2 + y^2 - 10x - 8y + 32 = 0$$

and the line l with equation

$$2y + x + 6 = 0$$

- (a) Find
 - (i) the coordinates of the centre of C,
 - (ii) the radius of *C*.

(3)

(b) Find the shortest distance between C and l.

(5)

Question 2 continued	



Question 2 continued



Question 2 continued	
(To	tal for Question 2 is 8 marks)



3.	The circle C has equation		
	$x^2 + y^2 - 10x + 4y + 11 = 0$		
	(a) Find		
	(i) the coordinates of the centre of C ,		
	(ii) 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.	(4)	
	Given that l is a tangent to C ,		
	(b) find the possible values of k, giving your answers as simplified surds.		
	(b) That the possible values of k, giving your answers as simplified surds.	(5)	
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Question 3 continued



Question 3 continued			



	Question 3 continued
(Total for Question 3 is 9 marks)	(Total for Question 3 is 9 marks)



4. A curve <i>C</i> has parametric	equations			
	$x = \frac{t^2 + 5}{t^2 + 1}$	$y = \frac{4t}{t^2 + 1}$	$t \in \mathbb{R}$	
Show that all points on <i>C</i>	satisfy			
		$(x-3)^2 + y^2 = 4$		
				(3)

Question 4 continued	
	Total for Question 4 is 3 marks)



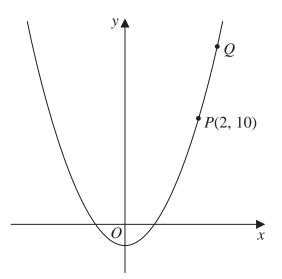


Figure 1

Figure 1 shows part of the curve with equation $y = 3x^2 - 2$

The point P(2, 10) lies on the curve.

(a) Find the gradient of the tangent to the curve at P.

(2)

The point Q with x coordinate 2 + h also lies on the curve.

(b) Find the gradient of the line PQ, giving your answer in terms of h in simplest form.

- (3)

(c) Explain briefly the relationship between part (b) and the answer to part (a).

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Question 5 continued	
	(Total for Question 5 is 6 marks)



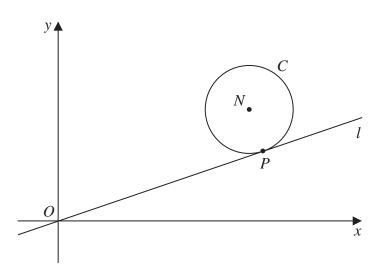


Figure 4

Figure 4 shows a sketch of a circle C with centre N(7, 4)

The line *l* with equation $y = \frac{1}{3}x$ is a tangent to *C* at the point *P*.

Find

- (a) the equation of line PN in the form y = mx + c, where m and c are constants, (2)
- (b) an equation for C. (4)

The line with equation $y = \frac{1}{3}x + k$, where k is a non-zero constant, is also a tangent to C.

(c) Find the value of k.

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Question 6 continued	
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Question 6 continued	



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Question 6 continued	
	(Total for Question 6 is 9 marks)
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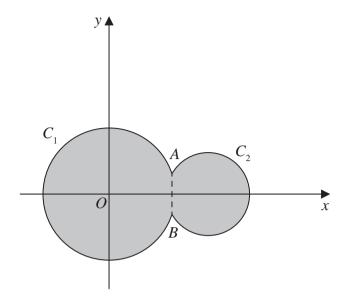


Figure 3

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)	
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Question 7 continued			



Question 7 continued			



Question 7 continued	
	(Total for Question 7 is 8 marks)



8.	In 1997 the average CO ₂ emissions of new cars in the UK was 190 g/km.	
	In 2005 the average CO ₂ emissions of new cars in the UK had fallen to 169 g/km. Given	
	-	
	$A \text{ g/km}$ is the average CO_2 emissions of new cars in the UK n years after 1997 and using	
	a linear model,	
	(a) form an equation linking A with n .	
	(w) 101111 un 04umion immigra wim	(3)
	In 2016 the average CO, emissions of new ears in the LIV was 120 g/km	
	In 2016 the average CO ₂ emissions of new cars in the UK was 120 g/km.	
	(b) Comment on the suitability of your model in light of this information.	(2)
		(3)

Question 8 continued
(Total for Question 8 is 6 marks)



9. (i) A circle C_1 has equation		
$x^2 + y^2 + 18x - 2y + 30 = 0$		
The line l is the tangent to C_1 at the point $P(-5, 7)$.		
Find an equation of l in the form $ax + by + c = 0$, where a , b and c are integers to		
be found.	(5)	
(ii) A different circle C_2 has equation		
$x^2 + y^2 - 8x + 12y + k = 0$		
where k is a constant.		
Given that C_2 lies entirely in the 4th quadrant, find the range of possible values for k .	(4)	

Question 9 continued		



Question 9 continued		



Question 9 continued
(Total for Question 9 is 9 marks)



10.	The line l_1 has equation $2x + 4y - 3 = 0$	
	The line l_2 has equation $y = mx + 7$, where m is a constant.	
	Given that l_1 and l_2 are perpendicular,	
	(a) find the value of m .	(2)
	The lines I and I must at the point D	(-)
	The lines l_1 and l_2 meet at the point P .	
	(b) Find the <i>x</i> coordinate of <i>P</i> .	(2)
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Question 10 continued	
	(Total for Question 10 is 4 marks)
	Total for Question to is 4 marks)



11.	A tree was planted in the ground. Its height, <i>H</i> metres, was measured <i>t</i> years after planting.	
	Exactly 3 years after planting, the height of the tree was 2.35 metres. Exactly 6 years after planting, the height of the tree was 3.28 metres.	
	Using a linear model,	
	(a) find an equation linking H with t .	(3)
	The height of the tree was approximately 140 cm when it was planted.	
	(b) Explain whether or not this fact supports the use of the linear model in part (a).	(2)

Question 11 continued	
	otal for Question 11 is 5 marks)
	tai ioi Question II is 5 marks)



12.	A circle C has equation		
	$x^2 + y^2 - 4x + 8y - 8 = 0$		
	(a) Find		
	(i) the coordinates of the centre of C ,		
	(ii) the exact radius of C .	(2)	
		(3)	
	The straight line with equation $x = k$, where k is a constant, is a tangent to C .		
	(b) Find the possible values for k .	(2)	

Question 12 continued	
	(Total for Question 12 is 5 marks)
	(10tal lol Question 12 is 5 marks)



13.

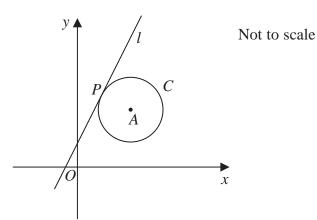


Figure 3

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.

(a) Show that an equation of the line PA is 2y + x = 17

(3)

(b) Find an equation for *C*.

(4)

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

(c) Find the value of the constant k.

(3)

Question 13 continued	



Question 13 continued



Question 13 continued	
(Total for Qu	nestion 13 is 10 marks)



14.

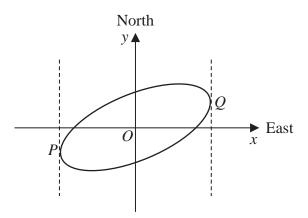


Figure 4

Figure 4 shows a sketch of the curve with equation $x^2 - 2xy + 3y^2 = 50$

(a) Show that
$$\frac{dy}{dx} = \frac{y - x}{3y - x}$$
 (4)

The curve is used to model the shape of a cycle track with both x and y measured in km.

The points P and Q represent points that are furthest west and furthest east of the origin O, as shown in Figure 4.

Using part (a),

(b) find the exact coordinates of the point P.

(5)

(c) Explain briefly how to find the coordinates of the point that is furthest north of the origin *O*. (You **do not** need to carry out this calculation).

(1)

Question 14 continued



Question 14 continued



Question 14 continued	
	(Total for Question 14 is 10 marks)



15. A curve C has parametric equations

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

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

(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 15 continued



Question 15 continued	
	(Total for Question 15 is 10 marks)



etermine, giving full reasons for your answer, whether lines l_1 and l_2 are parallel, expendicular or neither. (4)	The line l_2 passes through the points $(5, -1)$ and $(-1, 8)$.	
	Determine, giving full reasons for your answer, whether lines l_1 are expendicular or neither.	and l_2 are parallel,
		(4)

Question 16 continued	
	-4-16 O
	otal for Question 16 is 4 marks)



17. The circle C has equation	
$x^2 + y^2 - 6x + 10y + 9 = 0$	
(a) Find	
(i) the coordinates of the centre of C	
(ii) the radius of C	(3)
The line with equation $y = kx$, where k is a constant, cuts C at two distinct points	
(b) Find the range of values for <i>k</i> .	
	(6)

Question 17 continued	



Question 17 continued



Question 17 continued	
(T	otal for Question 17 is 9 marks)



18.	A tank, which contained water, started to leak from a hole in its base.	
	The volume of water in the tank 24 minutes after the leak started was 4 m ³	
	The volume of water in the tank 60 minutes after the leak started was 2.8 m ³	
	The volume of water, $V \mathrm{m}^3$, in the tank t minutes after the leak started, can be described by a linear model between V and t .	
	(a) Find an equation linking V with t .	(4)
	Use this model to find	
	(b) (i) the initial volume of water in the tank,	
	(ii) the time taken for the tank to empty.	(3)
	(c) Suggest a reason why this linear model may not be suitable.	(1)

Question 18 continued	
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(Total for Question 18 is 8 marks)	_



19.	A circle C has centre $(2, 5)$. Given that the point $P(-2, 3)$ lies on C .	
	(a) find an equation for C.	(3)
	The line l is the tangent to C at the point P . The point $Q(2, k)$ lies on l .	
	(b) Find the value of k.	(5)

Question 19 continued	
	(Total for Question 19 is 8 marks)



20.

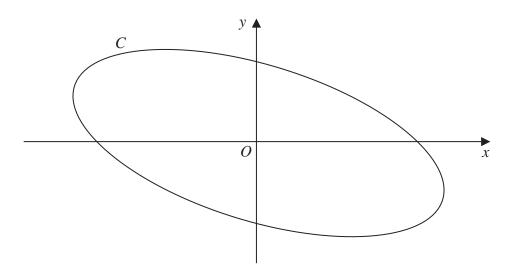


Figure 6

Figure 6 shows a sketch of the curve C with parametric equations

$$x = 4\cos\left(t + \frac{\pi}{6}\right), \ y = 2\sin t, \qquad 0 < t \leqslant 2\pi$$

Show that a Cartesian equation of C can be written in the form

$$(x+y)^2 + ay^2 = b$$

where a and b are integers to be found.

(5)		
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Question 20 continued

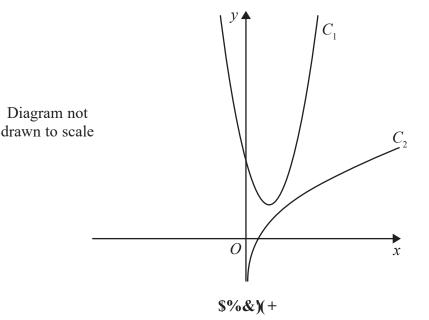


Question 20 continued	
	(Total for Question 20 is 5 marks)
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27. The line <i>l</i> passes through the points $A(3, 1)$ and $B(4, -2)$).	
Find an equation for <i>l</i> .	00	
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22#



The curve C_1 , shown in Figure 3, has equation $y = 4x^2 - 6x + 4$.

The point $P\left(\frac{1}{2}, 2\right)$ lies on C_1

The curve C_2 , also shown in Figure 3, has equation $y = \frac{1}{2}x + \ln(2x)$.

The normal to C_1 at the point P meets C_2 at the point Q.

Find the exact coordinates of Q.

(Solutions based entirely on graphical or numerical methods are not acceptable.)

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23 #A circle C with centre at $(-2, 6)$ passes through the point $(10, 11)$.	
(a) Show that the circle C also passes through the point $(10, 1)$.	00/0
The tangent to the circle C at the point (10, 11) meets the y axis at the point P and the	\$%&
tangent to the circle C at the point (10, 11) meets the y axis at the point T and the tangent to the circle C at the point (10, 1) meets the y axis at the point Q .	
(b) Show that the distance PQ is 58 explaining your method clearly.	\$"&
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24" A circle C has equation		
$x^2 + y^2 - 4x + 10y = k$		
where k is a constant.		
(a) Find the coordinates of the centre of C.	U.D.D./	
(b) State the range of possible values for k .	#\$%	
	#\$%	
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2!" A curve C has parametric equations

$$x = 2t - 1$$
, $y = 4t - 7 + \frac{3}{t}$, $t \neq 0$

Show that the Cartesian equation of the curve C can be written in the form

$$y = \frac{2x^2 + ax + b}{x + 1}, \quad x \neq -1$$

where a and b are integers to be found.

#\$%

#&()* ,'/01(2'3 2! 21\$ 4)-51%

26#The curve C has parametric equations

$$x = 2\cos t$$
, $y = \sqrt{3}\cos 2t$, $0 \leqslant t \leqslant \pi$

(a) Find an expression for $\frac{dy}{dx}$ in terms of t.

\$%&

The point *P* lies on *C* where $t = \frac{2\pi}{3}$

The line l is the normal to C at P.

(b) Show that an equation for l is

$$2x - 2\sqrt{3}y - 1 = 0$$

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The line l intersects the curve C again at the point Q.

(c) Find the exact coordinates of Q.

You must show clearly how you obtained your answers.

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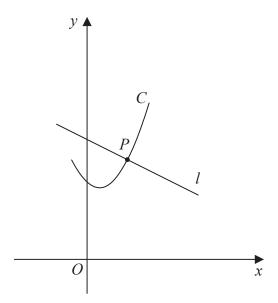


Figure 6

Figure 6 shows a sketch of the curve C with parametric equations

$$x = 2\tan t + 1 \qquad \qquad y = 2\sec^2 t + 3 \qquad \qquad -\frac{\pi}{4} \leqslant t \leqslant \frac{\pi}{3}$$

The line *l* is the normal to *C* at the point *P* where $t = \frac{\pi}{4}$

(a) Using parametric differentiation, show that an equation for l is

$$y = -\frac{1}{2}x + \frac{17}{2} \tag{5}$$

(b) Show that all points on C satisfy the equation

$$y = \frac{1}{2} (x - 1)^2 + 5$$
 (2)

The straight line with equation

$$y = -\frac{1}{2}x + k$$
 where k is a constant

intersects C at two distinct points.

(c) Find the range of possible values for k.

(5)

Question 27 continued



Question 27 continued	



Question 27 continued



Question 27 continued	
	(Total for Question 27 is 12 marks)



28. A circle <i>C</i> with radius <i>r</i>	
• lies only in the 1st quadrant	
• touches the <i>x</i> -axis and touches the <i>y</i> -axis	
The line <i>l</i> has equation $2x + y = 12$	
(a) Show that the x coordinates of the points of intersection of l with C satisfy	
$5x^2 + (2r - 48)x + (r^2 - 24r + 144) = 0$	
	(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 28 continued



Question 28 continued



Question 28 continued	
	(Total for Question 28 is 7 marks)



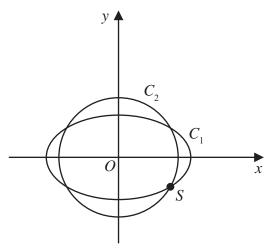


Figure 2

The curve C_1 with parametric equations

$$x = 10\cos t, \quad y = 4\sqrt{2}\sin t, \quad 0 \leqslant t < 2\pi$$

meets the circle C_2 with equation

$$x^2 + y^2 = 66$$

at four distinct points as shown in Figure 2.

Given that one of these points, S, lies in the 4th quadrant, find the Cartesian coordinates of S.

(6)

Question 29 continued	
	Total for Question 29 is 6 marks)
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30.	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	
	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)
		(2)

Question 30 continued



Question 30 continued	



Question 30 continued	
	Total for Question 30 is 7 marks)
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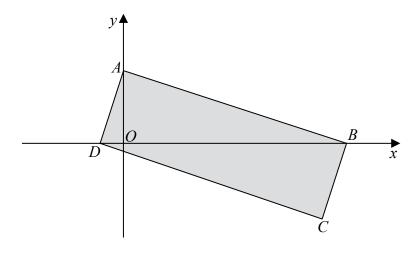


31.	A circle with centre $A(3,-1)$ passes through the point $P(-9,8)$ and the point $Q(15,-10)$	
	(a) Show that PQ is a diameter of the circle.	(2)
	(b) Find an equation for the circle.	(2)
	(b) I ma un equation for the effect.	(3)
	A point <i>R</i> also lies on the circle. Given that the length of the chord <i>PR</i> is 20 units,	
	(c) find the length of the shortest distance from <i>A</i> to the chord <i>PR</i> . Give your answer as a surd in its simplest form.	
	Give your answer as a sure in its simplest form.	(2)
	(d) Find the size of angle ARQ, giving your answer to the nearest 0.1 of a degree.	(2)

Question 31 continued
(Total for Question 31 is 9 marks)



32"



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Figure 1 shows a rectangle ABCD.

The point A lies on the y-axis and the points B and D lie on the x-axis as shown in Figure 1.

Given that the straight line through the points A and B has equation 5y + 2x = 10

(a) show that the straight line through the points A and D has equation 2y - 5x = 4

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(b) find the area of the rectangle ABCD.

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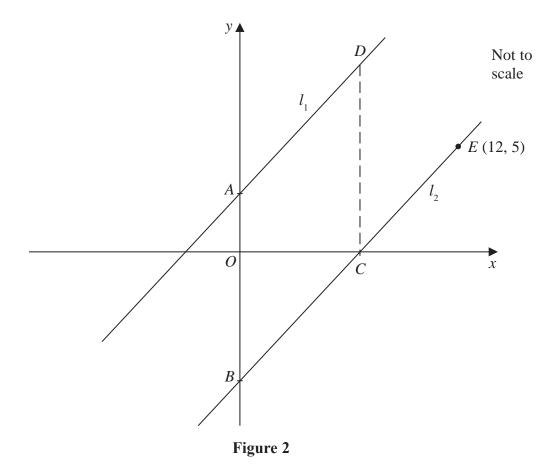


Figure 2 shows the straight line l_1 with equation 4y = 5x + 12

(a) State the gradient of l_1 (1)

The line l_2 is parallel to l_1 and passes through the point E (12, 5), as shown in Figure 2.

(b) Find the equation of l_2 . Write your answer in the form y = mx + c, where m and c are constants to be determined. (3)

The line l_2 cuts the x-axis at the point C and the y-axis at the point B.

- (c) Find the coordinates of
 - (i) the point B,
 - (ii) the point C. (2)

The line l_1 cuts the y-axis at the point A.

The point D lies on l_1 such that ABCD is a parallelogram, as shown in Figure 2.

(d) Find the area of *ABCD*.

(2)

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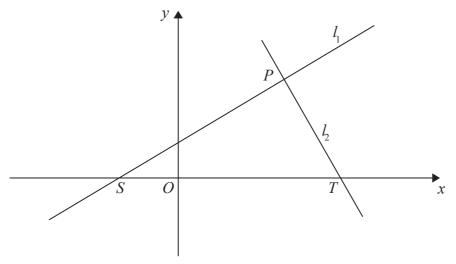


Question 33 continued	Leav blan



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Figure 1

The straight line l_1 , shown in Figure 1, has equation 5y = 4x + 10

The point P with x coordinate 5 lies on l_1

The straight line l_2 is perpendicular to l_1 and passes through P.

(a) Find an equation for l_2 , writing your answer in the form ax + by + c = 0 where a, b and c are integers.

(4)

The lines l_1 and l_2 cut the x-axis at the points S and T respectively, as shown in Figure 1.

(b) Calculate the area of triangle SPT.

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Question 34 continued	



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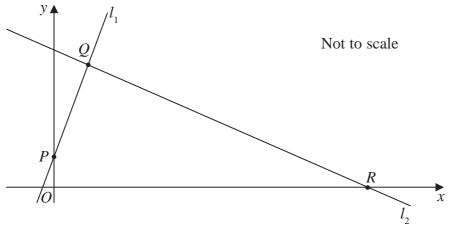


Figure 2

The points P(0, 2) and Q(3, 7) lie on the line l_1 , as shown in Figure 2.

The line l_2 is perpendicular to l_1 , passes through Q and crosses the x-axis at the point R, as shown in Figure 2.

Find

(a) an equation for l_2 , giving your answer in the form ax + by + c = 0, where a, b and c are integers,

(5)

(b) the exact coordinates of R,

(2)

(c) the exact area of the quadrilateral ORQP, where O is the origin.

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(3)

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Question 35 continued		
	(Total 12 marks)	



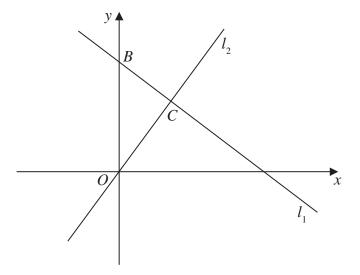


Figure 2

The line l_1 , shown in Figure 2 has equation 2x + 3y = 26

The line $l_{\scriptscriptstyle 2}$ passes through the origin O and is perpendicular to $l_{\scriptscriptstyle 1}$

(a) Find an equation for the line $l_{\scriptscriptstyle 2}$

(4)

The line l_2 intersects the line l_1 at the point C.

Line l_1 crosses the y-axis at the point B as shown in Figure 2.

(b) Find the area of triangle OBC.

Give your answer in the form $\frac{a}{b}$, where a and b are integers to be determined.	(6)



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Question 36 continued		
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	(Total 10 marks))



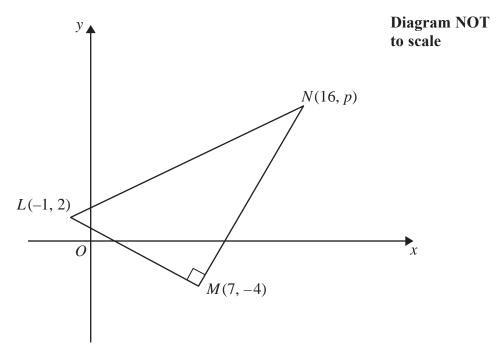


Figure 2

Figure 2 shows a right angled triangle LMN.

The points L and M have coordinates (-1, 2) and (7, -4) respectively.

Give your answer in the form ax + by + c = 0, where a, b and c are integers. (4)

Given that the coordinates of point N are (16, p), where p is a constant, and angle $LMN = 90^{\circ}$,

(a) Find an equation for the straight line passing through the points L and M.

(b) find the value of p.

(3)

Given that there is a point K such that the points L, M, N, and K form a rectangle,

(c) find the y coordinate of K.

(2)

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Question 37 continued		blank
	(Total 9 marks	6)

3. The straight line L_1 passes through the points $(-1,3)$ and $(11,12)$.	
(a) Find an equation for L_1 in the form $ax + by + c = 0$,	
where a , b and c are integers.	(4)
The line L_2 has equation $3y + 4x - 30 = 0$.	
(b) Find the coordinates of the point of intersection of ${\cal L}_1$ and ${\cal L}_2$.	(3)

(a) Find the gradient of L_1 .	(2)
The line L_2 is perpendicular to L_1 and passes through the point $(2, 5)$.	
(b) Find the equation of L_2 in the form $y = mx + c$, where m and c are constants.	(3)

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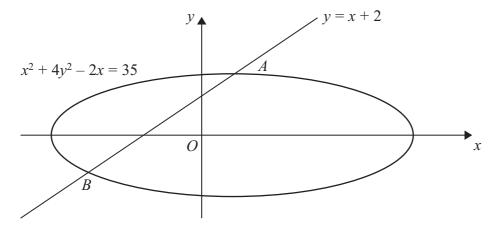


Figure 2

The line y = x + 2 meets the curve $x^2 + 4y^2 - 2x = 35$ at the points A and B as shown in Figure 2.

(a) Find the coordinates of A and the coordinates of B.

(6)

(b) Find the distance AB in the form $r\sqrt{2}$ where r is a rational number.

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puestion 40 continued		1
	(Total 9 marks)	



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Question 41 continued	
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42. The line L_1 has equation $4y + 3 = 2x$	
The point $A(p, 4)$ lies on L_1	
(a) Find the value of the constant p.	(1)
The line L_2 passes through the point $C\left(2,4\right)$ and is perpendicular to L_1	
(b) Find an equation for L_2 giving your answer in the form $ax + by + c$ where a, b and c are integers.	
	(5)
The line L_1 and the line L_2 intersect at the point D .	
(c) Find the coordinates of the point D .	(3)
(d) Show that the length of <i>CD</i> is $\frac{3}{2}\sqrt{5}$	
2	(3)
A point B lies on L_1 and the length of $AB = \sqrt{80}$	
The point E lies on L_2 such that the length of the line $CDE = 3$ times the length of $CDE = 3$	CD.
() 71 14 24 24 24 25	
(e) Find the area of the quadrilateral <i>ACBE</i> .	
(e) Find the area of the quadrilateral <i>ACBE</i> .	(3)
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Question 42 continued	



43.

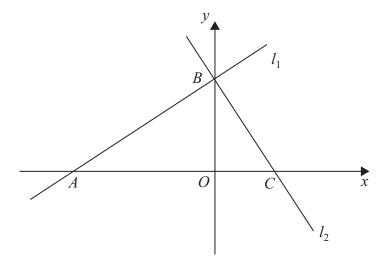


Figure 1

The line l_1 has equation 2x - 3y + 12 = 0

(a) Find the gradient of l_1 .

(1)

The line l_1 crosses the x-axis at the point A and the y-axis at the point B, as shown in Figure 1.

The line l_2 is perpendicular to l_1 and passes through B.

(b) Find an equation of l_2 .

(3)

The line l_2 crosses the x-axis at the point C.

(c) Find the area of triangle ABC.

(4)

	Leave blank
Question 43 continued	Jank
(Total 8 marks))



The line l is perpendicular to PQ and passes through the mid-po	oint of PQ .
Find an equation for l , giving your answer in the form $ax + by + c = 0$, where a , b and c are integers.	
	(5)

5. The line L_1 has	as equation $2y-3x-k=0$, where k is a constant.	
Given that the	point A (1,4) lies on L_1 , find	
(a) the value of	of k,	(1)
(b) the gradier	nt of L_1 .	(2)
The line L_2 pas	asses through A and is perpendicular to L_1 .	
(c) Find an equal c are integrated	quation of L_2 giving your answer in the form $ax + by + c = 0$, vegers.	where a , b and (4)
The line L_2 cro	osses the x -axis at the point B .	(+)
	coordinates of B .	(2)
(e) Find the ex	exact length of AB.	(2)

Question 45 continued	Leave blank
(Total 11 mark	ve)



(a) Find an equation of the line joining $A(7, 4)$ and $B(2, 0)$, giving yo form $ax+by+c=0$, where a , b and c are integers.	ur answer in the
form $ax + by + c = 0$, where a, b and c are integers.	(3)
4) F: 1d 1 d CAD 1 : 10	
(b) Find the length of AB , leaving your answer in surd form.	(2)
	(-)
The point C has coordinates $(2, t)$, where $t > 0$, and $AC = AB$.	
(c) Find the value of <i>t</i> .	
	(1)
(d) Find the area of triangle <i>ABC</i> .	
(2)	(2)



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Question 46 continued	
(Total 8 marks)	



a) Find the gradient of l_1 .	(2)
The line l_2 is perpendicular to l_1 and passes through the point $(3, 1)$.	
b) Find the equation of l_2 in the form $y = mx + c$, where m and c are cons	stants.

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48.

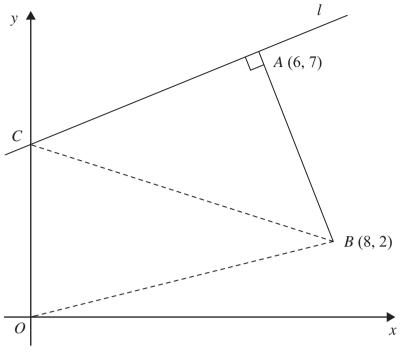


Figure 1

The points A and B have coordinates (6, 7) and (8, 2) respectively.

The line l passes through the point A and is perpendicular to the line AB, as shown in Figure 1.

(a) Find an equation for l in the form ax + by + c = 0, where a, b and c are integers.

(4)

Given that l intersects the y-axis at the point C, find

(b) the coordinates of C,

(2)

(c) the area of $\triangle OCB$, where O is the origin.

(2)

Question 48 continued	Leave blank
(Total 8 marks)	



49.	The line l_1 passes through the point A (2, 5) and has gradient $-\frac{1}{2}$.	
	(a) Find an equation of l_1 , giving your answer in the form $y = mx + c$.	(3)
	The point B has coordinates $(-2, 7)$.	
	(b) Show that B lies on l_1 .	(1)
	(c) Find the length of AB , giving your answer in the form $k\sqrt{5}$, where k is an integer.	(3)
	The point C lies on l_1 and has x -coordinate equal to p .	
	The length of AC is 5 units.	
	(d) Show that p satisfies $p^2 - 4p - 16 = 0.$	(4)

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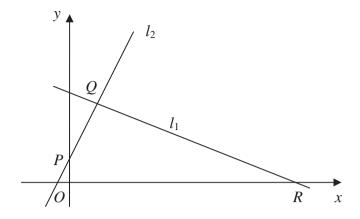


Figure 2

The points Q(1, 3) and R(7, 0) lie on the line l_1 , as shown in Figure 2.

The length of QR is $a\sqrt{5}$.

(a) Find the value of a.

(3)

The line l_2 is perpendicular to l_1 , passes through Q and crosses the y-axis at the point P, as shown in Figure 2.

Find

(b) an equation for l_2 ,

(5)

(c) the coordinates of P,

(1)

(d) the area of ΔPQR .

(4)

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Question 50 continued	blank
Question 30 continued	
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(Total 7 marks)

52.	The	circle	C	has	ec	uation

$$x^2 + y^2 - 2x + 14y = 0$$

Find

(a) the coordinates of the centre of C,

(2)

(b) the exact value of the radius of C,

(2)

(c) the y coordinates of the points where the circle C crosses the y-axis.

(2)

(d) Find an equation of the tangent to C at the point (2, 0), giving your answer in the form ax + by + c = 0, where a, b and c are integers.

(4)

uestion 52 continued	



Question 52 continued	bl



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Question 52 continued	
(Total 10 marks)	



53.	The circle	C has	equation
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$$x^2 + y^2 - 10x + 6y + 30 = 0$$

Find

(a) the coordinates of the centre of C,

(2)

(b) the radius of C,

(2)

(c) the y coordinates of the points where the circle C crosses the line with equation x = 4, giving your answers as simplified surds.

(3)

uestion 53 continued	



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54.

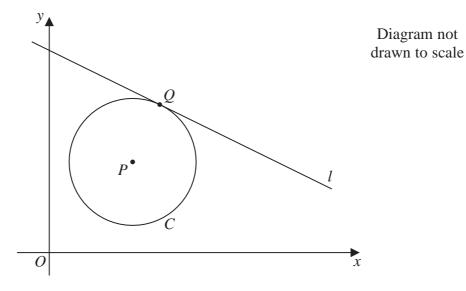


Figure 2

The circle C has centre P(7,8) and passes through the point Q(10,13), as shown in Figure 2.

(a) Find the length PQ, giving your answer as an exact value.

(2)

(b) Hence write down an equation for C.

(2)

The line l is a tangent to C at the point Q, as shown in Figure 2.

(c) Find an equation for l, giving your answer in the form ax + by + c = 0, where a, b and c are integers.

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estion 54 continued	



(a)	Find an equation for the circle C .	
		3)
(b)	Find an equation of the tangent to the circle C at the point A , giving your answer the form $ax + by + c = 0$, where a , b and c are integers.	in
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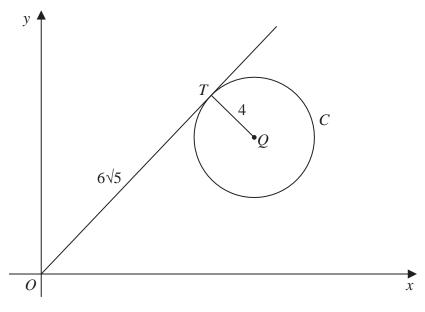


Figure 3

Figure 3 shows a circle C with centre Q and radius 4 and the point T which lies on C. The tangent to C at the point T passes through the origin O and $OT = 6\sqrt{5}$

Given that the coordinates of Q are (11, k), where k is a positive constant,

(a) find the exact value of k,

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(b)	find	an	equation	for	<i>C</i> .
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Question 56 continued	
(Total 5 marks)	



The circle C , with centre A , passes through the point P with coordinates $(-9, 8)$ and the point Q with coordinates $(15, -10)$.	
Given that PQ is a diameter of the circle C ,	
(a) find the coordinates of A ,	(2)
(b) find an equation for <i>C</i> .	(3)
A point R also lies on the circle C . Given that the length of the chord PR is 20 units,	
(c) find the length of the shortest distance from <i>A</i> to the chord <i>PR</i> . Give your answer as a surd in its simplest form.	(2)
	(2)
(d) Find the size of the angle ARQ , giving your answer to the nearest 0.1 of a degree.	(2)



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Question 57 continued	
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Leave blank **58.** Figure 4 The circle C has radius 5 and touches the y-axis at the point (0, 9), as shown in Figure 4. (a) Write down an equation for the circle C, that is shown in Figure 4. **(3)** A line through the point P(8, -7) is a tangent to the circle C at the point T. (b) Find the length of PT. **(3)**

Question 58 continued (Total 6 marks)		Leav
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59.	The	circle	C has	equation

$$x^2 + y^2 - 20x - 24y + 195 = 0$$

The centre of C is at the point M.

- (a) Find
 - (i) the coordinates of the point M,
 - (ii) the radius of the circle C.

(5)

N is the point with coordinates (25, 32).

(b) Find the length of the line MN.

(2)

The tangent to C at a point P on the circle passes through point N.

((c)) Find	the	length	of the	line	NP

(2)

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Question 59 continued	
(Total 9 marks))



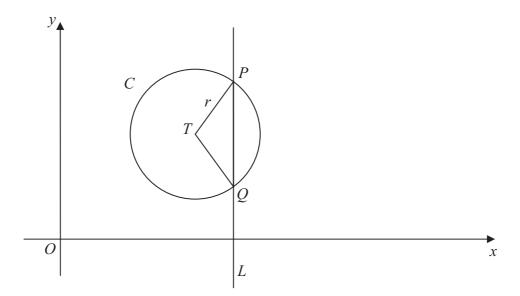


Figure 1

The circle C with centre T and radius r has equation

$$x^2 + y^2 - 20x - 16y + 139 = 0$$

(a) Find the coordinates of the centre of C.

(3)

(b) Show that r = 5

(2)

The line L has equation x = 13 and crosses C at the points P and Q as shown in Figure 1.

(c) Find the y coordinate of P and the y coordinate of Q.

(3)

Given that, to 3 decimal places, the angle PTQ is 1.855 radians,

(d) find the perimeter of the sector PTQ.

(3)

		Leave
Question 60 continued		
	(Total 11 marks)	





(Total 4 marks)

$x^2 + y^2 + 4x - 2y - 11 = 0$	
Find	
(a) the coordinates of the centre of C ,	(2)
(h) the making of C	(2)
(b) the radius of C ,	(2)
(c) the coordinates of the points where C crosses the y -axis, giving	ng your answers as
simplified surds.	(4)

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63.	The points A and B have coordinates $(-2, 11)$ and $(8, 1)$ respectively.		Ulai
	Given that AB is a diameter of the circle C ,		
	(a) show that the centre of C has coordinates $(3, 6)$,		
	(a) show that the centre of C has coordinates (5, 0),	(1)	
	(b) find an equation for C.		
		(4)	
	(c) Verify that the point (10, 7) lies on C.	4	
		(1)	
	(d) Find an equation of the tangent to C at the point (10, 7), giving your answer in form $y = mx + c$, where m and c are constants.	the	
	form $y = mx + c$, where m and c are constants.	(4)	
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Question 63 continued	Leave blank
(Total 10 marks	s)



The circle C has centre $A(2,1)$ and passes through the point $B(10,7)$.	
(a) Find an equation for <i>C</i> .	(4)
	(4)
The line l_1 is the tangent to C at the point B .	
(b) Find an equation for l_1 .	(4)
The line l_2 is parallel to l_1 and passes through the mid-point of AB .	
Given that l_2 intersects C at the points P and Q ,	
(c) find the length of PQ , giving your answer in its simplest surd form.	
	(3)



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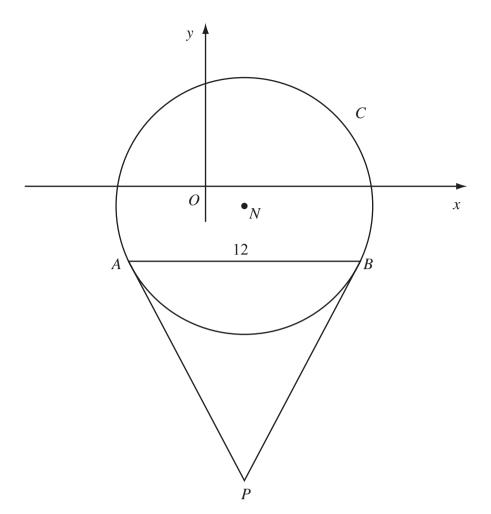


Figure 3

Figure 3 shows a sketch of the circle C with centre N and equation

$$(x-2)^2 + (y+1)^2 = \frac{169}{4}$$

(a) Write down the coordinates of N.

(2)

(b) Find the radius of *C*.

(1)

The chord AB of C is parallel to the x-axis, lies below the x-axis and is of length 12 units as shown in Figure 3.

(c) Find the coordinates of A and the coordinates of B.

(5)

(d) Show that angle $ANB = 134.8^{\circ}$, to the nearest 0.1 of a degree.

(2)

The tangents to C at the points A and B meet at the point P.

(e) Find the length AP, giving your answer to 3 significant figures.

(2)

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Question 65 continued	blank
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(Total 12 marks)	



66.	The circle	C has	equation
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$$x^2 + y^2 - 6x + 4y = 12$$

(a) Find the centre and the radius of C.

(5)

The point P(-1, 1) and the point Q(7, -5) both lie on C.

(b) Show that PQ is a diameter of C.

(2)

The point *R* lies on the positive *y*-axis and the angle $PRQ = 90^{\circ}$.

(c) Find the coordinates of R.

(4)

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Question 66 continued	
(Total 11 marks)	



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67.

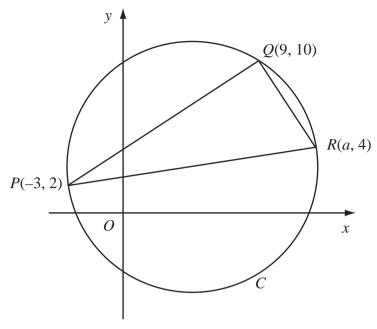


Figure 2

The points P(-3, 2), Q(9, 10) and R(a, 4) lie on the circle C, as shown in Figure 2. Given that PR is a diameter of C,

(a) show that a = 13,

(3)

(b) find an equation for C.

(5)

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Question 67 continued	blank
Question 67 continued	
(Total 8 marks)	1



8. The circle C has centre $(3, 1)$ and passes through the point $P(8, 3)$.	
(a) Find an equation for <i>C</i> .	
	(4)
(b) Find an equation for the tangent to C at P , giving your answer in the form	
ax + by + c = 0, where a, b and c are integers.	(5)
	(3)

- **69.** A circle C has centre M (6, 4) and radius 3.
 - (a) Write down the equation of the circle in the form

$$(x-a)^2 + (y-b)^2 = r^2.$$
 (2)

Figure 3

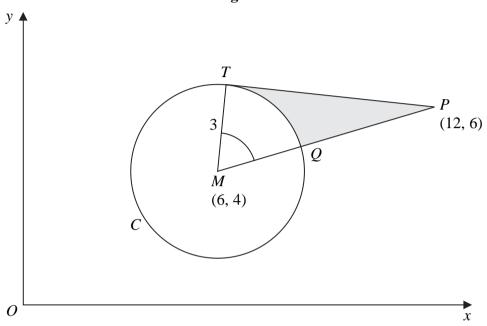


Figure 3 shows the circle C. The point T lies on the circle and the tangent at T passes through the point P (12, 6). The line MP cuts the circle at Q.

(b) Show that the angle TMQ is 1.0766 radians to 4 decimal places. (4)

The shaded region TPQ is bounded by the straight lines TP, QP and the arc TQ, as shown in Figure 3.

(c) Find the area of the shaded region *TPQ*. Give your answer to 3 decimal places. (5)

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Question 69 continued		
	(Total 11 marks)	



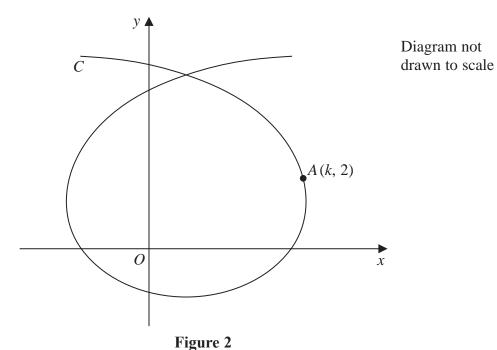


Figure 2 shows a sketch of the curve C with parametric equations

$$x = 1 + t - 5\sin t$$
, $y = 2 - 4\cos t$, $-\pi \leqslant t \leqslant \pi$

The point A lies on the curve C.

Given that the coordinates of A are (k, 2), where k > 0

(a) find the exact value of k, giving your answer in a fully simplified form.

(2)

(b) Find the equation of the tangent to C at the point A. Give your answer in the form y = px + q, where p and q are exact real values.

(5)

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estion 70 continued		



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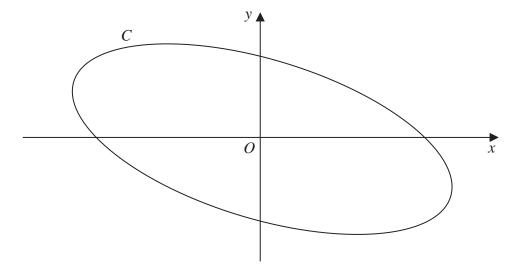


Figure 3

Figure 3 shows a sketch of the curve C with parametric equations

$$x = 4\cos\left(t + \frac{\pi}{6}\right), \quad y = 2\sin t, \quad 0 \leqslant t < 2\pi$$

(a) Show that

$$x + y = 2\sqrt{3} \cos t$$

(3)

(b) Show that a cartesian equation of C is

$$(x+y)^2 + ay^2 = b$$

where a and b are integers to be determined.

(2)

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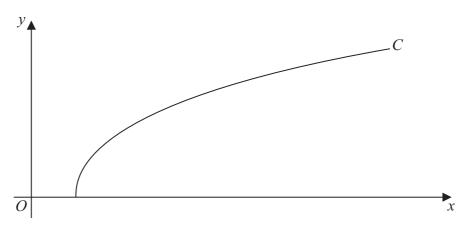


Figure 2

Figure 2 shows a sketch of the curve C with parametric equations

$$x = 27 \sec^3 t, \ y = 3 \tan t, \qquad 0 \le t \le \frac{\pi}{3}$$

Show that the cartesian equation of C may be written in the form

$$y = (x^{\frac{2}{3}} - 9)^{\frac{1}{2}},$$
 $a \le x \le b$

stating the values of a and b.

(3)

Overtion 72 continued		Leave blank
Question 72 continued		
	(Total 3 marks)	



$x = \ln t$, $y = t^2 - 2$, $t > 0$	
Find	
(a) an equation of the normal to C at the point where $t = 3$,	(6)
(b) a cartesian equation of C.	(3)

(Total 9 marks)

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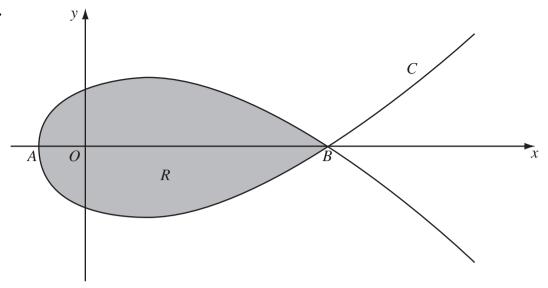


Figure 2

Figure 2 shows a sketch of the curve C with parametric equations

$$x = 5t^2 - 4$$
, $y = t(9 - t^2)$

The curve C cuts the x-axis at the points A and B.

Find the <i>x</i> -coordinate at the	point A and the x-coordinate at the	point B .	3)	ļ
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(Total 3 marks)