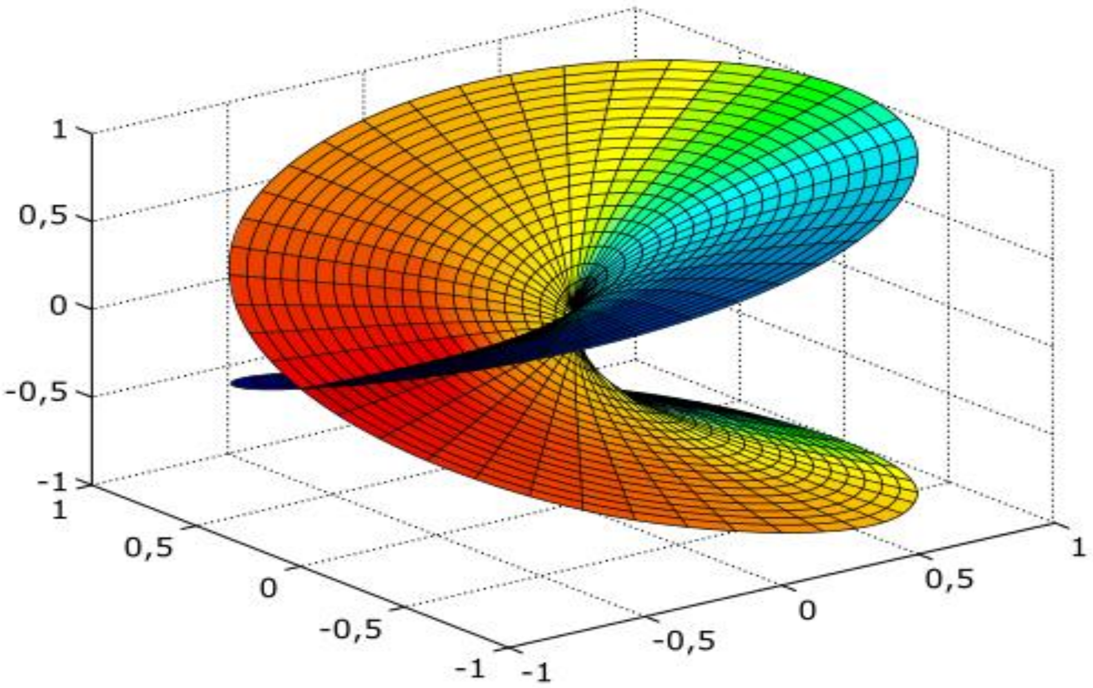


ANALYTICAL GEOMETRY

MATHEMATICS GRADE 12

REVISION PACK (2019)

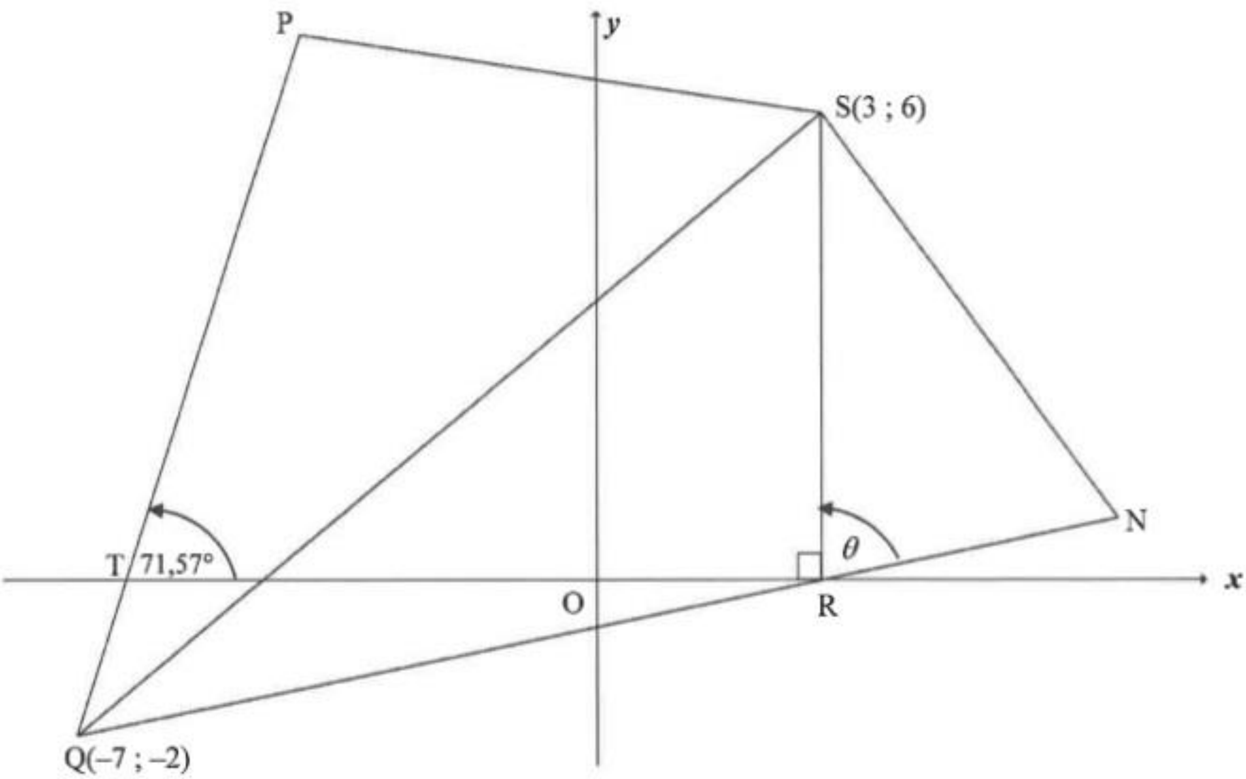
PAST PAPERS

BY AYANDA DLADLA/ 074 994 7970

FEB 18

QUESTION 3

In the diagram, P, Q(–7 ; –2), R and S(3 ; 6) are vertices of a quadrilateral. R is a point on the x-axis. QR is produced to N such that QR = 2RN. SN is drawn. $P\hat{T}O = 71{,}57°$ and $S\hat{R}N = \theta$.

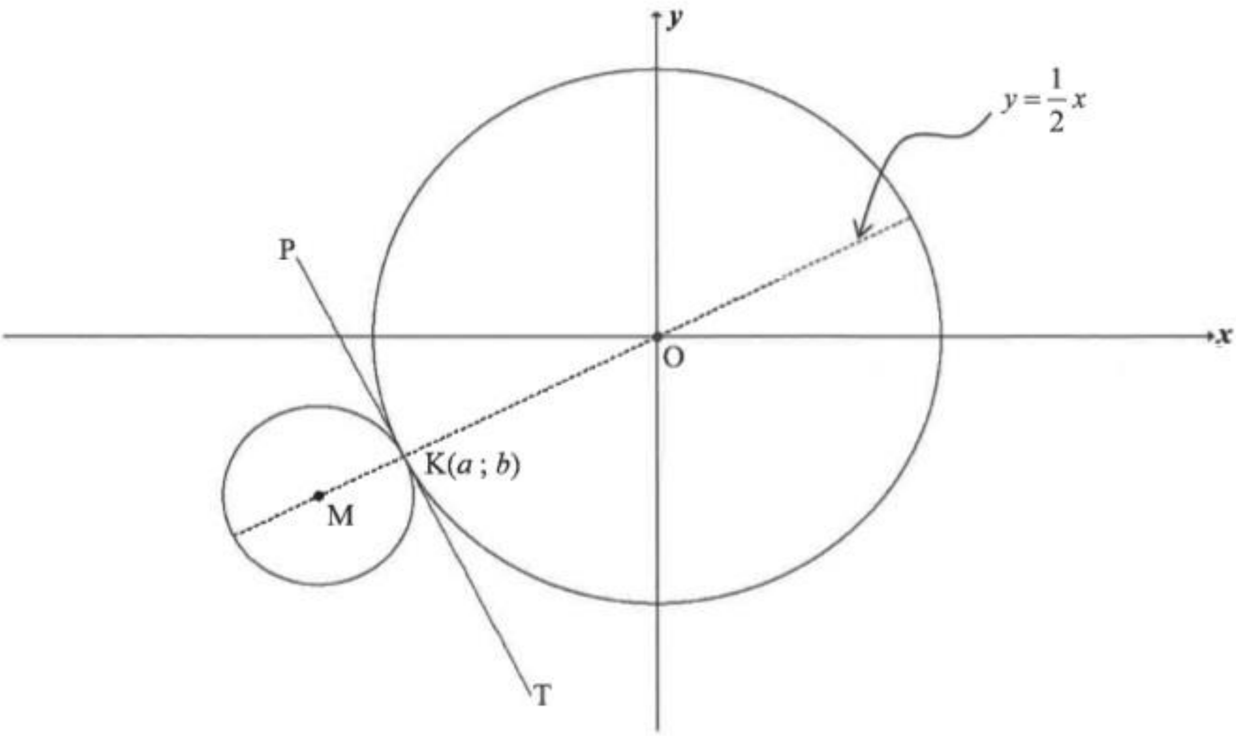


Determine:

3.1	The equation of SR	(1)
3.2	The gradient of QP to the nearest integer	(2)
3.3	The equation of QP in the form $y = mx + c$	(2)
3.4	The length of QR. Leave your answer **in surd form**.	(2)
3.5	$\tan(90° - \theta)$	(3)
3.6	The area of ΔRSN, **without using a calculator**	(6)
		[16]

QUESTION 4

In the diagram, PKT is a common tangent to both circles at K(a ; b). The centres of both circles lie on the line $y = \frac{1}{2}x$. The equation of the circle centred at O is $x^2 + y^2 = 180$. The radius of the circle is three times that of the circle centred at M.



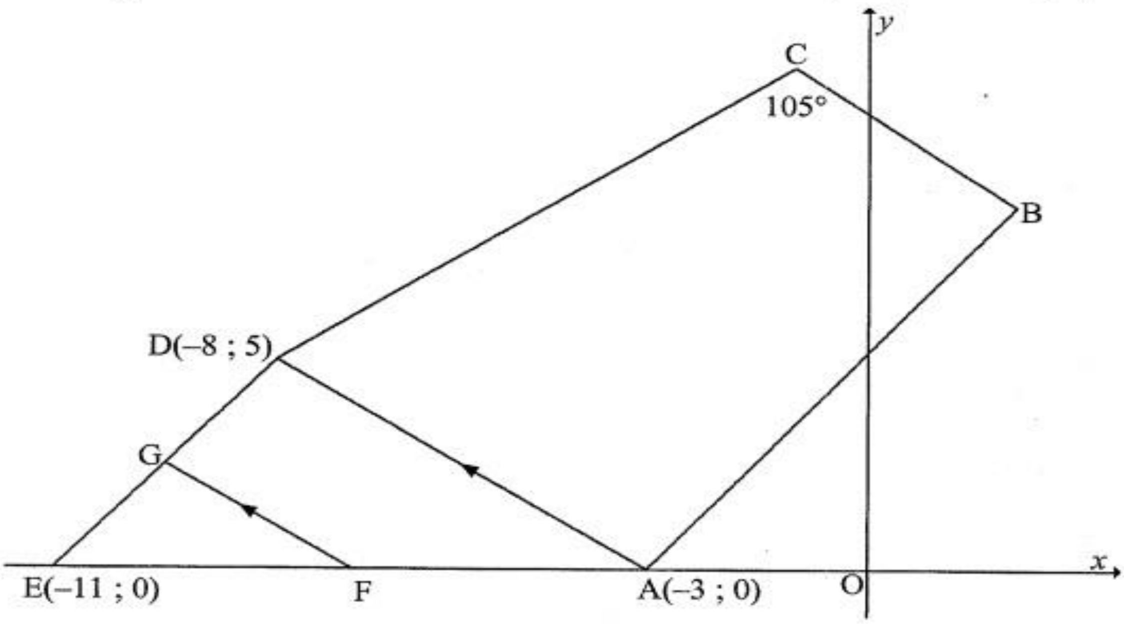
4.1	Write down the length of OK **in surd form**.		(1)
4.2	Show that K is the point (–12 ; –6).		(4)
4.3	Determine:		
	4.3.1	The equation of the common tangent, PKT, in the form $y = mx + c$	(3)
	4.3.2	The coordinates of M	(6)
	4.3.3	The equation of the smaller circle in the form $(x-a)^2 + (y-b)^2 = r^2$	(2)
4.4	For which value(s) of r will another circle, with equation $x^2 + y^2 = r^2$, intersect the circle centred at M at two distinct points?		(3)
4.5	Another circle, $x^2 + y^2 + 32x + 16y + 240 = 0$, is drawn. Prove by calculation that this circle does NOT cut the circle with centre M(–16 ; –8).		(5)

[24]

SEPT 18 NW

QUESTION 3

In the diagram below, A(–3 ; 0), B, C and D(–8 ; 5) are the vertices of a quadrilateral with $B\hat{C}D = 105°$. E(–11 ; 0) and F are points on the x-axis. ED is a straight line. FG || AD with G on ED.



3.1 Prove that the perimeter of ΔADE, rounded off to TWO decimal places, is 20,90 units. (5)

3.2 It is given that F is the midpoint of AE.

3.2.1 Give a reason why G is the midpoint of DE. (1)

3.2.2 Hence, determine the coordinates of G. (3)

3.2.3 Write down the length of FG. (1)

3.2.4 Determine the equation of FG. (4)

3.3 Calculate the size of $D\hat{A}O$. (2)

3.4 It is given that ABCD is a cyclic quadrilateral and that the equation of CB is $y = \frac{-12+5\sqrt{3}}{3}x + \frac{24+5\sqrt{3}}{3}$.

Determine the coordinates of B. (7)

[23]

BY: AYANDA DLADLA CELL NO: 074 9947970

QUESTION 4

4.1 Determine the equation of a circle with its centre at the origin in the Cartesian plane and with a radius of $2\sqrt{3}$ units. (2)

4.2 A circle is defined by the equation $x^2-6x+y^2-2y=6$.

4.2.1 Rewrite the equation of the circle in the form $(x-a)^2+(y-b)^2=r^2$ (2)

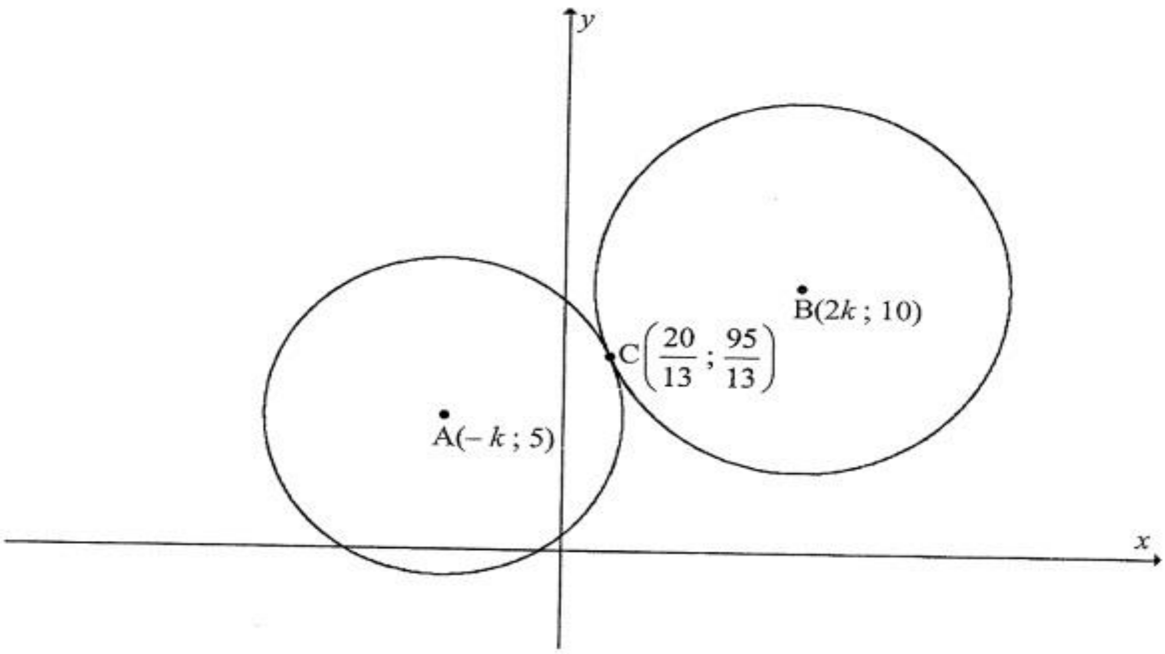
4.2.2 Write down the coordinates of M, the centre of the circle. (2)

4.2.3 Write down the length of the radius of the circle. (1)

4.2.4 A tangent PQ is drawn from the point P(6 ; –2) to the circle, with Q the point of contact. Calculate the length of the tangent PQ. (4)

4.3 In the diagram below are two circles that touch each other externally in the point $C(\frac{20}{13};\frac{95}{13})$.

The radius of circle A with centre $A(-k\,;5)$ is 6 units.
The radius of circle B with centre $B(2k\,;10)$ is 7 units.
ACB is a straight line.



4.3.1 If $k>0$, prove that the gradient of AB is $\frac{5}{12}$ (5)

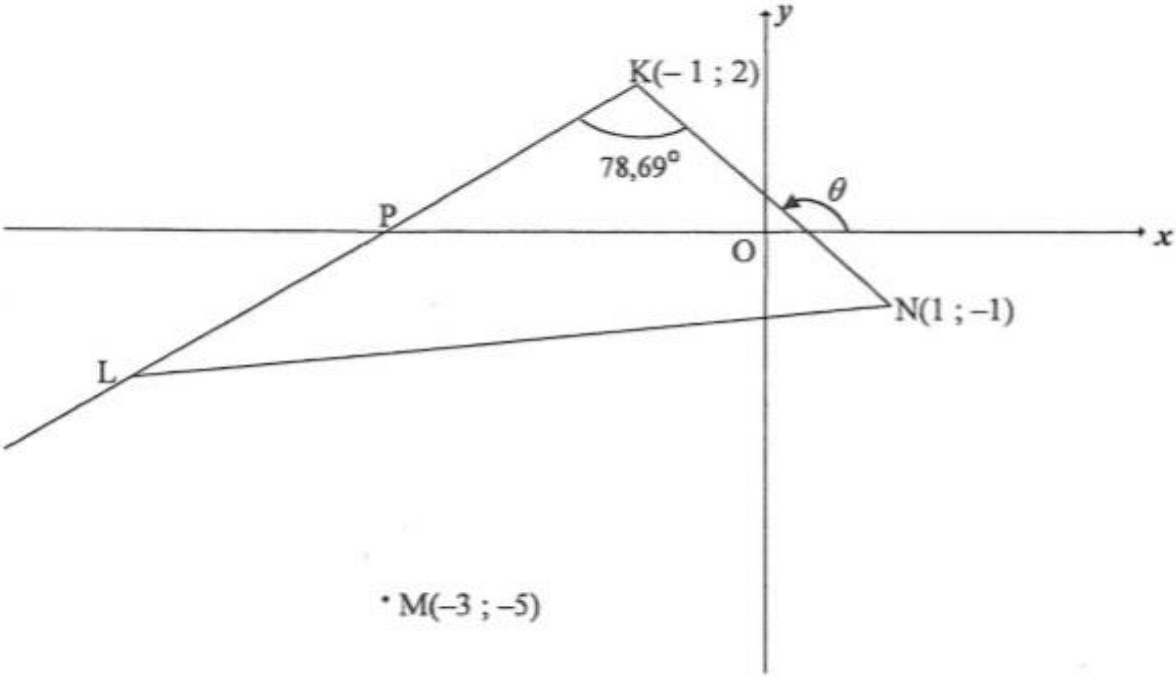
4.3.2 Hence, or otherwise, determine the equation of the common tangent to the circles A and B. (3)

[19]

NOV18

QUESTION 3

In the diagram, K(– 1 ; 2), L and N(1 ; – 1) are vertices of ΔKLN such that $L\hat{K}N = 78{,}69°$. KL intersects the x-axis at P. KL is produced. The inclination of KN is θ. The coordinates of M are (–3 ; –5).



3.1 Calculate:

3.1.1 The gradient of KN (2)

3.1.2 The size of θ, the inclination of KN (2)

3.2 Show that the gradient of KL is equal to 1. (2)

3.3 Determine the equation of the straight line KL in the form $y = mx + c$. (2)

3.4 Calculate the length of KN. (2)

3.5 It is further given that KN = LM.

3.5.1 Calculate the possible coordinates of L. (5)

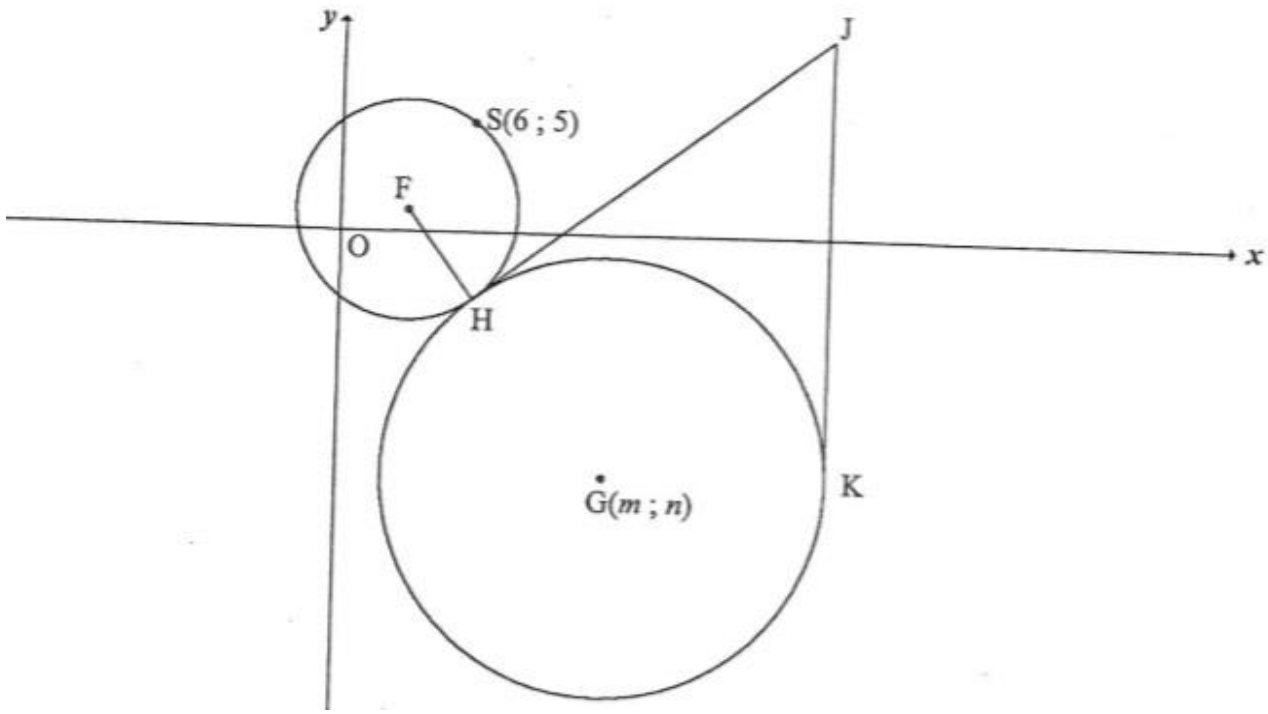
3.5.2 Determine the coordinates of L if it is given that KLMN is a parallelogram. (3)

3.6 T is a point on KL produced. TM is drawn such that TM = LM. Calculate the area of ΔKTN. (4)

[22]

QUESTION 4

In the diagram, the equation of the circle with centre F is $(x-3)^2+(y-1)^2=r^2$. S(6 ; 5) is a point on the circle with centre F. Another circle with centre G(m ; n) in the 4[th] quadrant touches the circle with centre F, at H such that FH : HG = 1 : 2. The point J lies in the first quadrant such that HJ is a common tangent to both these circles. JK is a tangent to the larger circle at K.



4.1 Write down the coordinates of F. (2)

4.2 Calculate the length of FS. (2)

4.3 Write down the length of HG. (1)

4.4 Give a reason why JH = JK. (1)

4.5 Determine:

4.5.1 The distance FJ, with reasons, if it is given that JK = 20 (4)

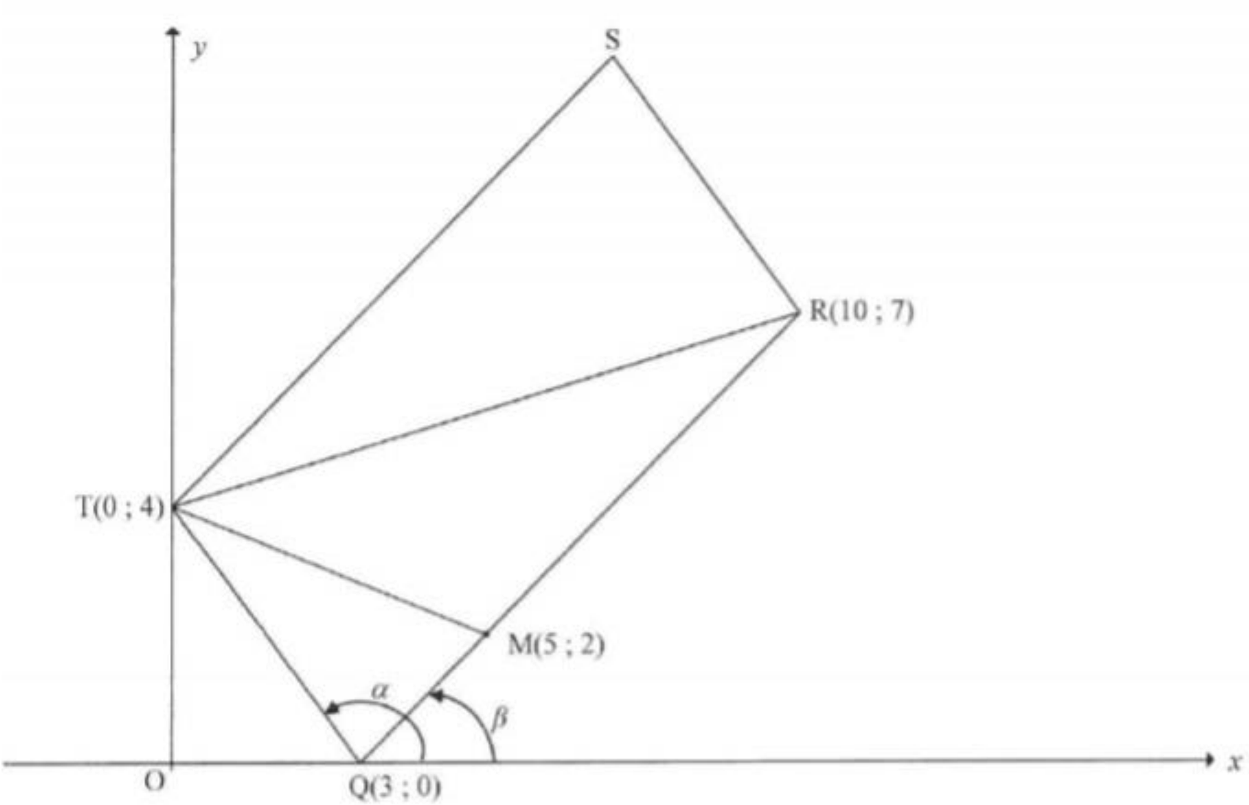
4.5.2 The equation of the circle with centre G in terms of m and n in the form $(x-a)^2+(y-b)^2=r^2$ (1)

4.5.3 The coordinates of G, if it is further given that the equation of tangent JK is $x=22$ (7)

[18]

FEB 17

In the diagram, Q(3 ; 0), R(10 ; 7), S and T(0 ; 4) are the vertices of parallelogram QRST. From T a straight line is drawn to meet QR at M(5 ; 2). The angles of inclination of TQ and RQ are α and β respectively.



3.1	Calculate the gradient of TQ.	(1)
3.2	Calculate the length of RQ. Leave your answer in surd form.	(2)
3.3	F(k ; –8) is a point in the Cartesian plane such that T, Q and F are collinear. Calculate the value of k.	(4)
3.4	Calculate the coordinates of S.	(4)
3.5	Calculate the size of $T\hat{S}R$.	(6)
3.6	Calculate, in the simplest form, the ratio of:	

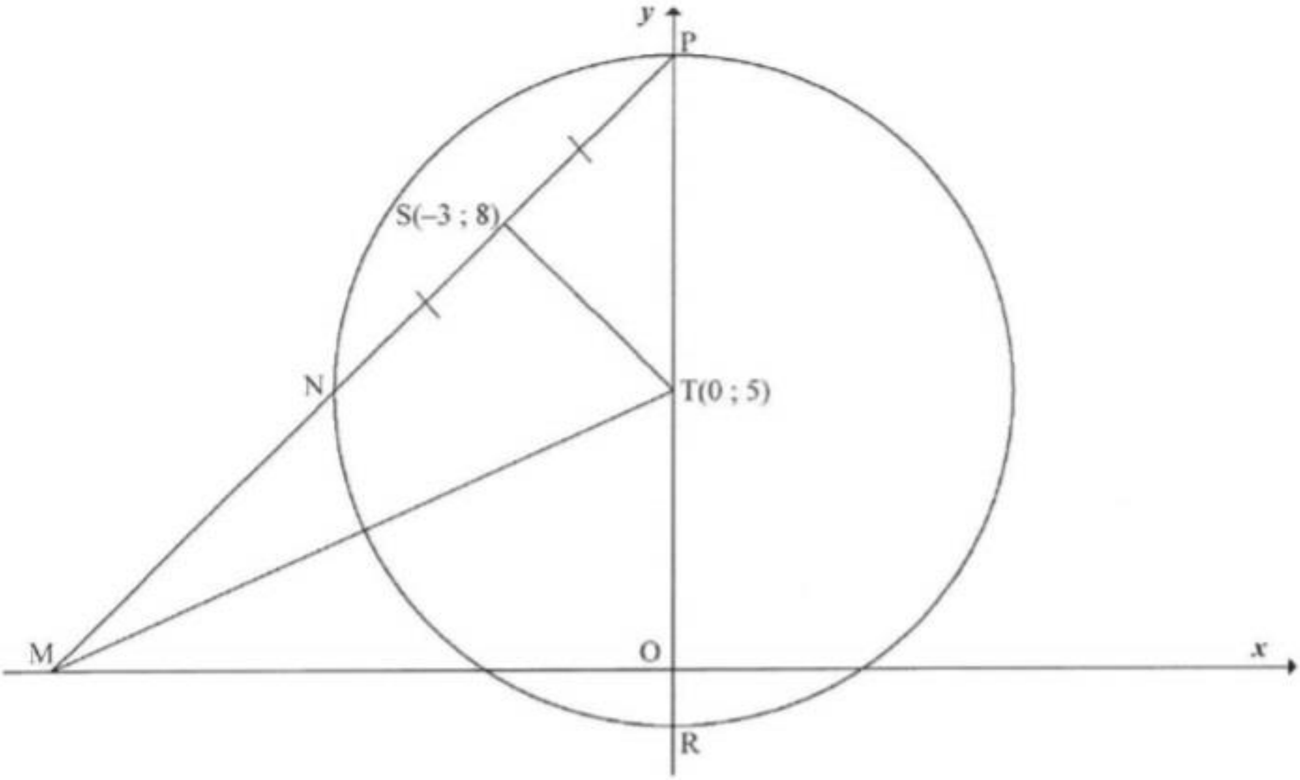
3.6.1 $\dfrac{MQ}{RQ}$ (3)

3.6.2 $\dfrac{\text{area of } \Delta TQM}{\text{area of parallelogram } RQTS}$ (3)

[23]

QUESTION 4

In the diagram, the circle, having centre T(0 ; 5), cuts the y-axis at P and R. The line through P and S(–3 ; 8) intersects the circle at N and the x-axis at M. NS = PS. MT is drawn.



4.1 Give a reason why TS $\perp$ NP. (1)

4.2 Determine the equation of the line passing through N and P in the form $y = mx + c$. (5)

4.3 Determine the equations of the tangents to the circle that are parallel to the x-axis. (4)

4.4 Determine the length of MT. (4)

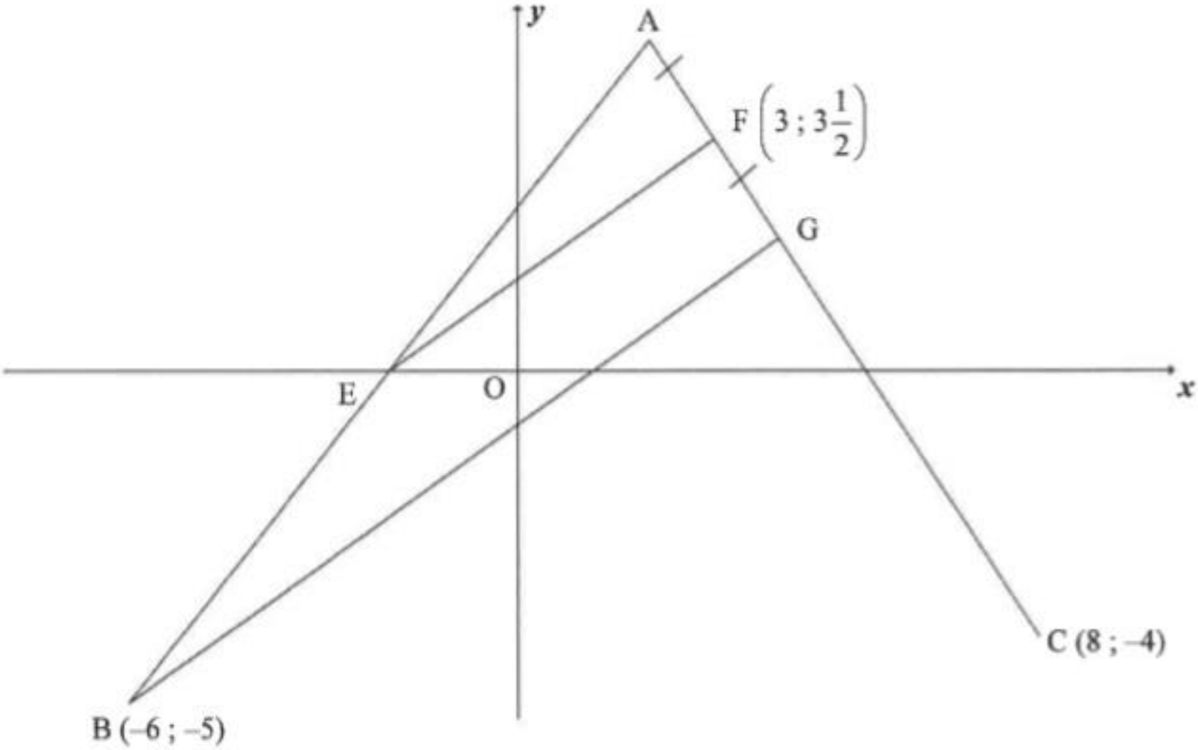
4.5 Another circle is drawn through the points S, T and M. Determine, with reasons, the equation of this circle STM in the form $(x-a)^2 + (y-b)^2 = r^2$. (5)

[19]

NOV 17

QUESTION 3

In the diagram, A, B(–6 ; –5) and C(8 ; –4) are points in the Cartesian plane. $F\left(3; 3\frac{1}{2}\right)$ and G are points on line AC such that AF = FG. E is the x-intercept of AB.



3.1 Calculate:

3.1.1 The equation of AC in the form $y = mx + c$ (4)

3.1.2 The coordinates of G if the equation of BG is $7x - 10y = 8$ (3)

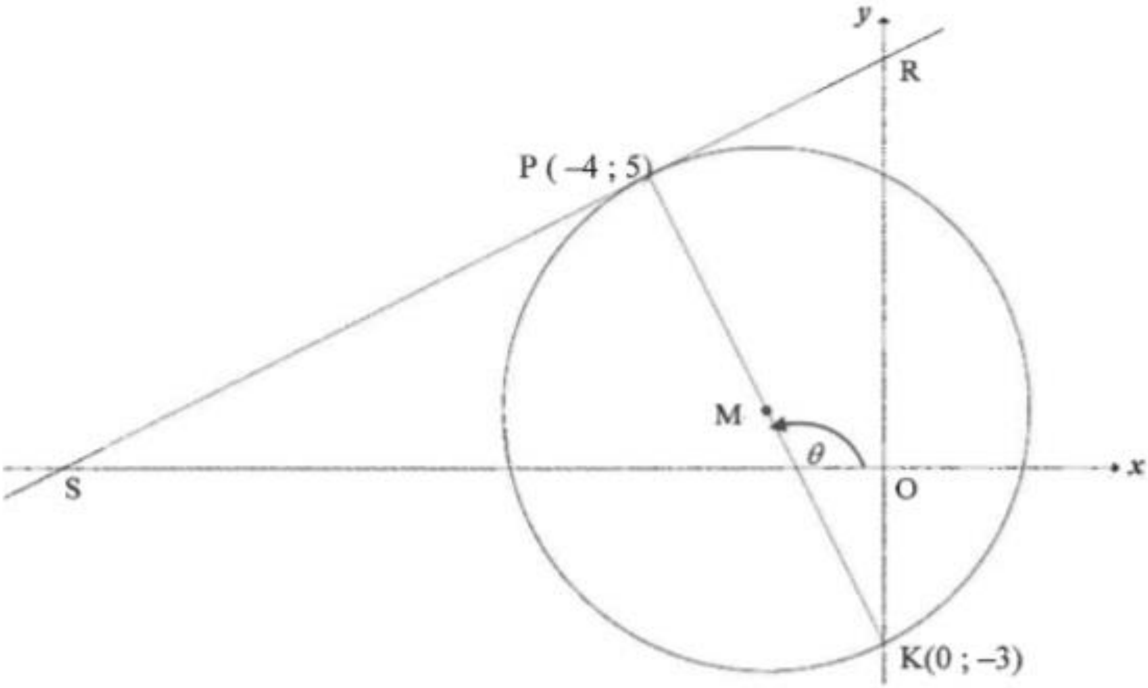
3.2 Show by calculation that the coordinates of A is (2 ; 5). (2)

3.3 Prove that EF || BG. (4)

3.4 ABCD is a parallelogram with D in the first quadrant. Calculate the coordinates of D. (4)
[17]

QUESTION 4

In the diagram, P(–4 ; 5) and K(0 ; –3) are the end points of the diameter of a circle with centre M. S and R are respectively the x- and y-intercept of the tangent to the circle at P. θ is the inclination of PK with the positive x-axis.



4.1 Determine:

4.1.1 The gradient of SR (4)

4.1.2 The equation of SR in the form $y = mx + c$ (2)

4.1.3 The equation of the circle in the form $(x-a)^2 + (y-b)^2 = r^2$ (4)

4.1.4 The size of $P\hat{K}R$ (3)

4.1.5 The equation of the tangent to the circle at K in the form $y = mx + c$ (2)

4.2 Determine the values of t such that the line $y = \frac{1}{2}x + t$ cuts the circle at two different points. (3)

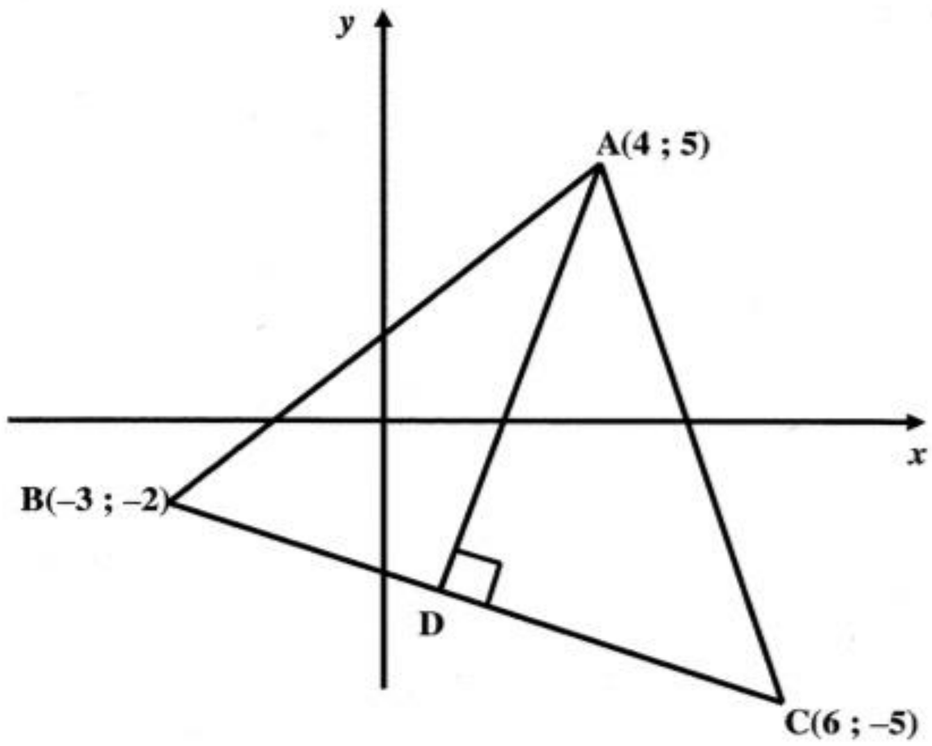
4.3 Calculate the area of ΔSMK. (5)

[23]

SEPT 16 NW

QUESTION 3

In the diagram below, A(4 ; 5) , B(–3 ; –2) and C(6 ; –5) are the vertices of ΔABC. AD is drawn perpendicular to BC.



3.1 Calculate the length of BC. (2)

3.2 Determine the equation of BC. (3)

3.3 Determine the equation of AD. (3)

3.4 Determine the coordinates of D. (3)

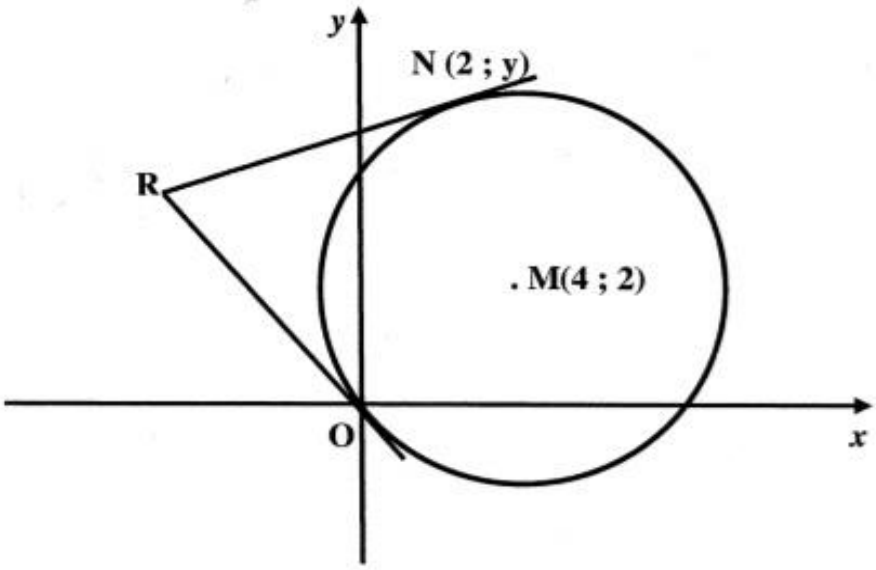
3.5 Calculate the size of $B\hat{A}D$. (5)

3.6 Calculate the coordinates of a point E if the area of ΔEBC = area of ΔABC and E is a point on the positive x axis. (4)

[20]

QUESTION 4

In the diagram below, O(0; 0) and N(2; y) are two points on the circumference of a circle with centre M(4 ; 2). The tangents at O and N meet at R.

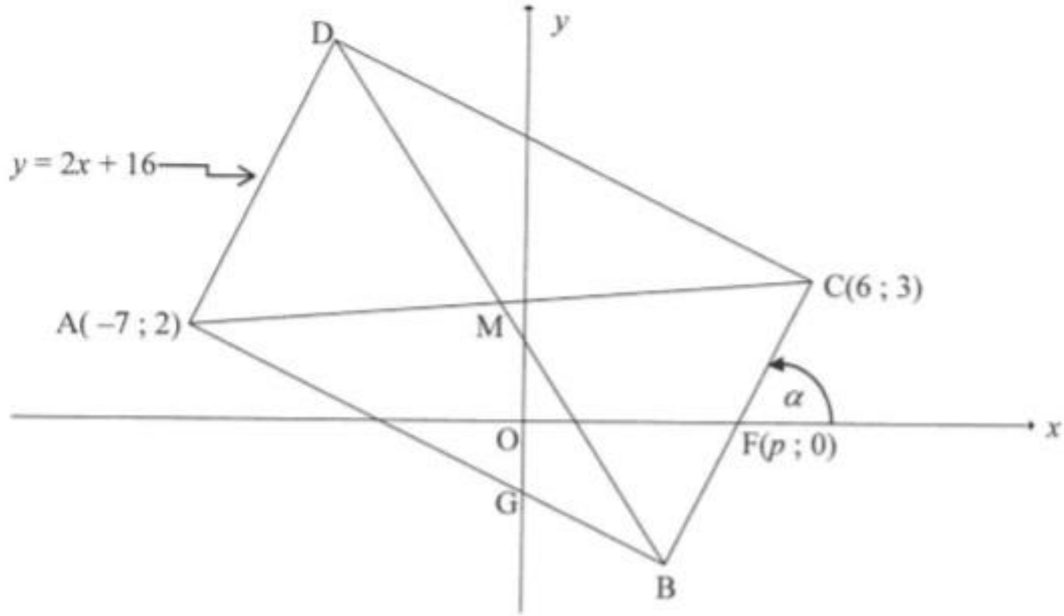


4.1	Determine the equation of the circle.	(3)
4.2	Calculate the value of y	(4)
4.3	Determine the equation of OR.	(3)
4.4	Calculate the coordinates of R.	(6)
4.5	Determine, with a reason, the type of quadrilateral represented by MNRO.	(2)
		[18]

NOV 16

QUESTION 3

In the diagram, A(–7 ; 2), B, C(6 ; 3) and D are the vertices of rectangle ABCD. The equation of AD is $y = 2x + 16$. Line AB cuts the y-axis at G. The x-intercept of line BC is F(p ; 0) and the angle of inclination of BC with the positive x-axis is α. The diagonals of the rectangle intersect at M.



3.1 Calculate the coordinates of M. (2)

3.2 Write down the gradient of BC in terms of p. (1)

3.3 Hence, calculate the value of p. (3)

3.4 Calculate the length of DB. (3)

3.5 Calculate the size of α (2)

3.6 Calculate the size of $O\hat{G}B$. (3)

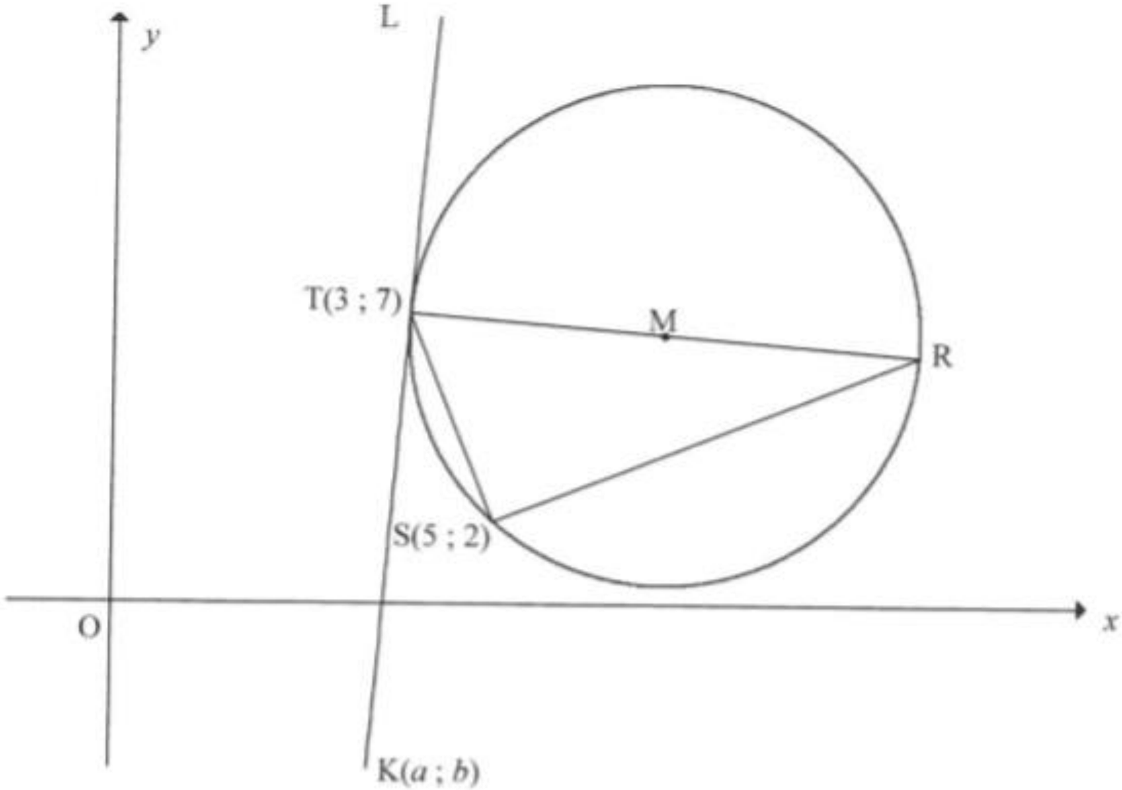
3.7 Determine the equation of the circle passing through points D, B and C in the form $(x-a)^2+(y-b)^2=r^2$. (3)

3.8 If AD is shifted so that ABCD becomes a square, will BC be a tangent to the circle passing through points A, M and B, where M is now the intersection of the diagonals of the square ABCD? Motivate your answer. (2)

[19]

QUESTION 4

In the diagram, M is the centre of the circle passing through T(3 ; 7), R and S(5 ; 2). RT is a diameter of the circle. K(a ; b) is a point in the 4[th] quadrant such that KTL is a tangent to the circle at T.



4.1 Give a reason why $T\hat{S}R = 90°$. (1)

4.2 Calculate the gradient of TS. (2)

4.3 Determine the equation of the line SR in the form $y = mx + c$. (3)

4.4 The equation of the circle above is $(x-9)^2 + \left(y - 6\frac{1}{2}\right)^2 = 36\frac{1}{4}$.

4.4.1 Calculate the length of TR in surd form. (2)

4.4.2 Calculate the coordinates of R. (3)

4.4.3 Calculate $\sin R$. (3)

4.4.4 Show that $b = 12a - 29$. (3)

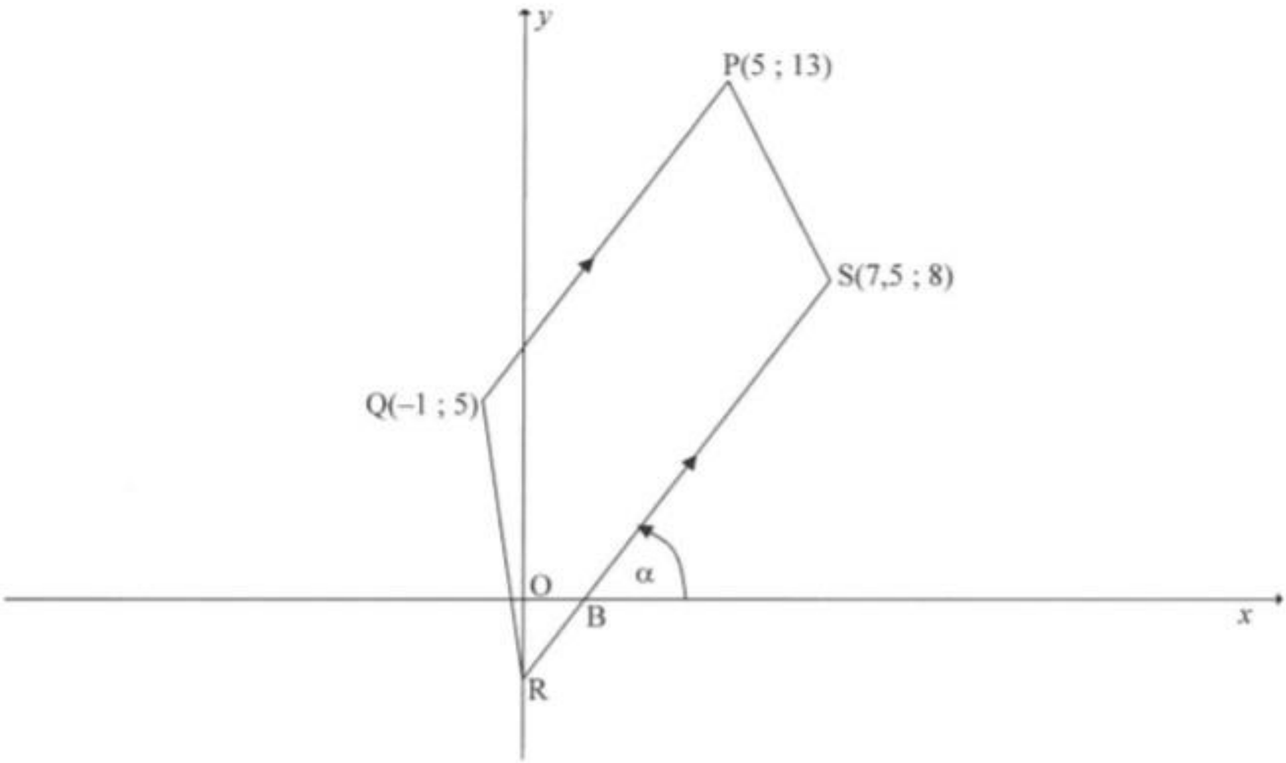
4.4.5 If TK = TR, calculate the coordinates of K. (6)

[23]

FEB 15

QUESTION 3

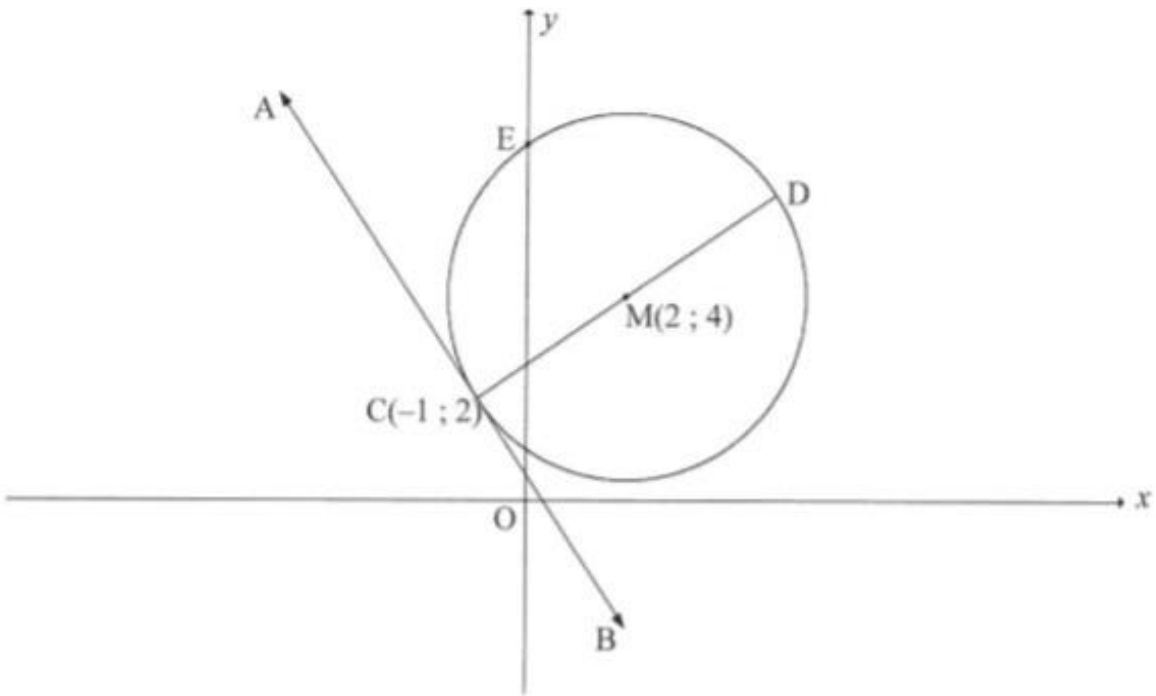
In the diagram below points P(5 ; 13), Q(–1 ; 5) and S(7,5 ; 8) are given. SR || PQ where R is the y-intercept of SR. The x-intercept of SR is B. QR is joined.



3.1	Calculate the length of PQ.	(3)
3.2	Calculate the gradient of PQ.	(2)
3.3	Determine the equation of line RS in the form $ax + by + c = 0$.	(4)
3.4	Determine the x-coordinate of B.	(2)
3.5	Calculate the size of $O\hat{R}B$.	(3)
3.6	Prove that QBSP is a parallelogram.	(4)
		[18]

QUESTION 4

4.1 In the diagram below, the circle centred at M(2 ; 4) passes through C(–1 ; 2) and cuts the y-axis at E. The diameter CMD is drawn and ACB is a tangent to the circle.



4.1.1 Determine the equation of the circle in the form $(x-a)^2+(y-b)^2=r^2$. (3)

4.1.2 Write down the coordinates of D. (2)

4.1.3 Determine the equation of AB in the form $y = mx + c$. (5)

4.1.4 Calculate the coordinates of E. (4)

4.1.5 Show that EM is parallel to AB. (2)

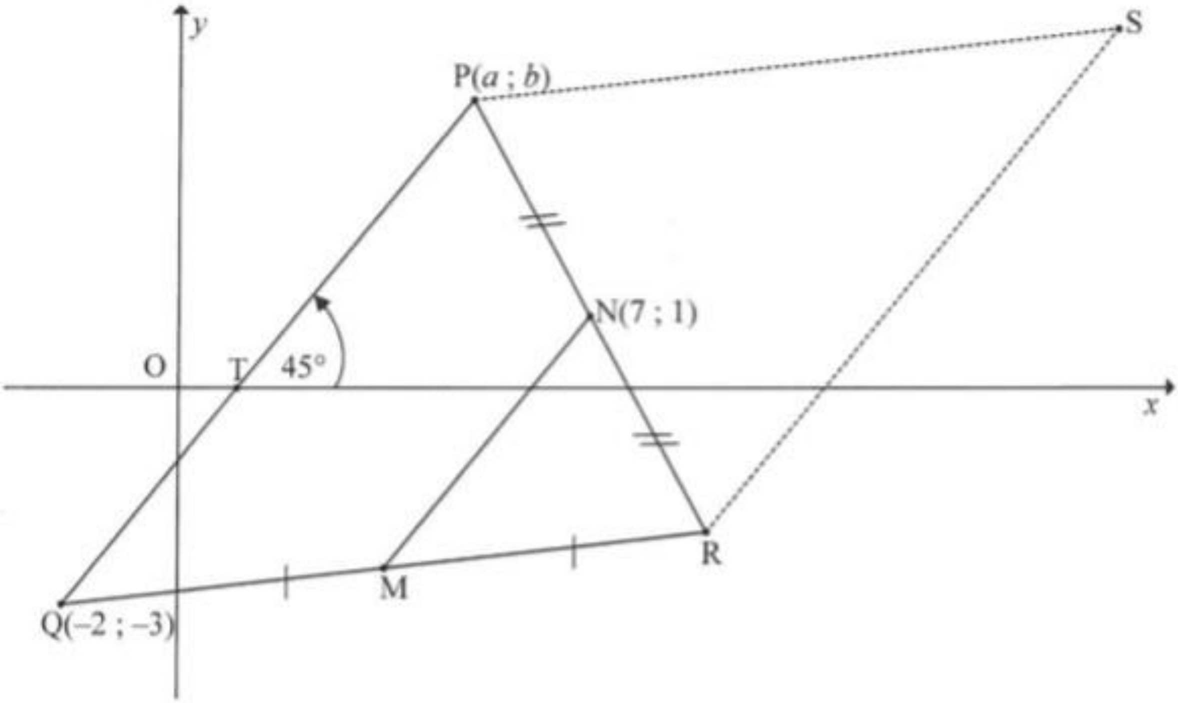
4.2 Determine whether or not the circles having equations $(x+2)^2+(y-4)^2=25$ and $(x-5)^2+(y+1)^2=9$ will intersect. Show ALL calculations. (6)

[22]

NOV 15

QUESTION 3

In the diagram below, the line joining Q(–2 ; –3) and P(a ; b), a and $b > 0$, makes an angle of 45° with the positive x-axis. QP = $7\sqrt{2}$ units. N(7 ; 1) is the midpoint of PR and M is the midpoint of QR.

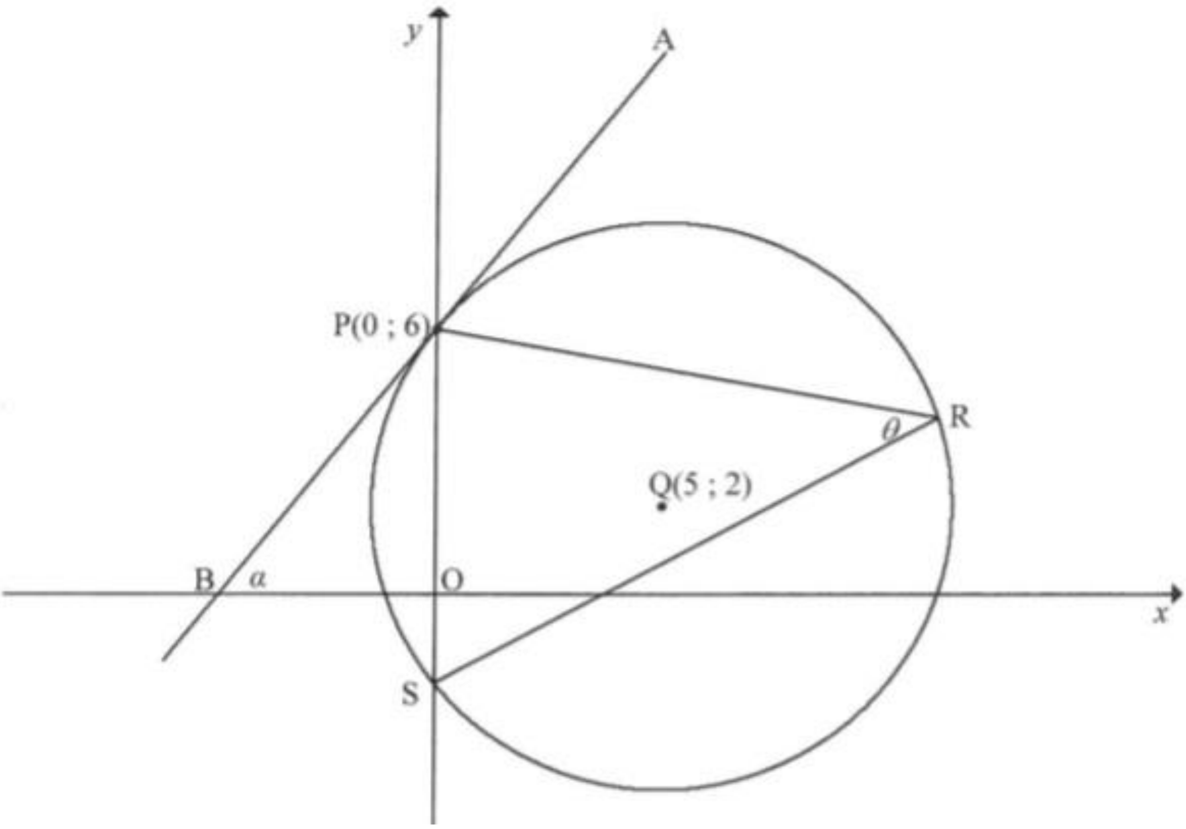


Determine:

3.1	The gradient of PQ	(2)
3.2	The equation of MN in the form $y = mx + c$ and give reasons	(4)
3.3	The length of MN	(2)
3.4	The length of RS	(1)
3.5	The coordinates of S such that PQRS, in this order, is a parallelogram	(3)
3.6	The coordinates of P	(6)
		[18]

QUESTION 4

In the diagram below, Q(5 ; 2) is the centre of a circle that intersects the y-axis at P(0 ; 6) and S. The tangent APB at P intersects the x-axis at B and makes the angle α with the positive x-axis. R is a point on the circle and $P\hat{R}S = \theta$.



4.1 Determine the equation of the circle in the form $(x-a)^2 + (y-b)^2 = r^2$. (3)

4.2 Calculate the coordinates of S. (3)

4.3 Determine the equation of the tangent APB in the form $y = mx + c$. (4)

4.4 Calculate the size of α. (2)

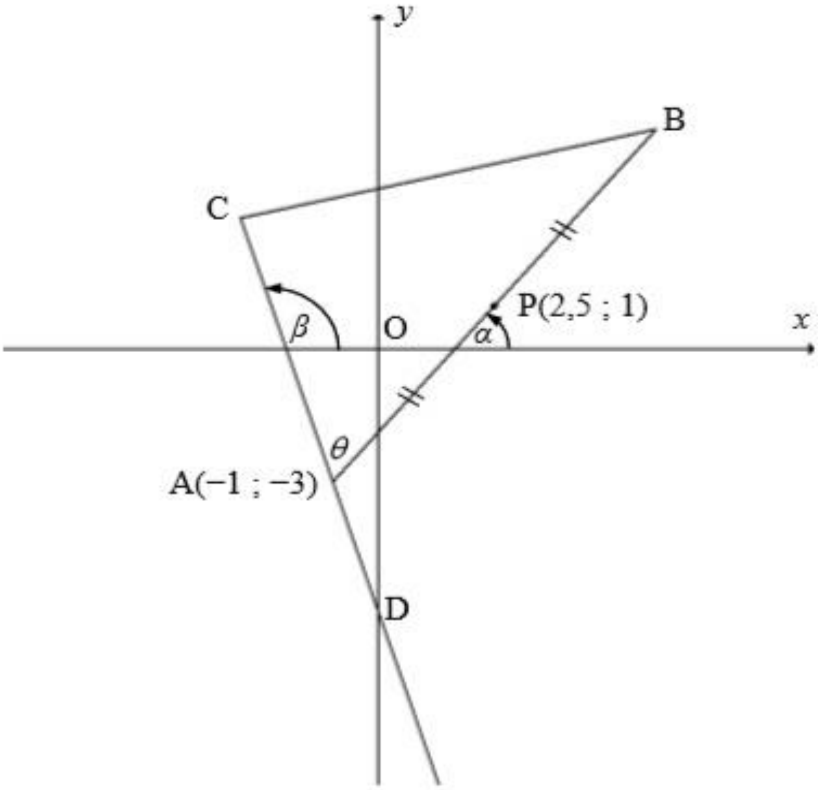
4.5 Calculate, with reasons, the size of θ. (4)

4.6 Calculate the area of ΔPQS. (4)
[20]

FEB 14

QUESTION 4

In the diagram below, A(−1 ; −3), B and C are the vertices of a triangle.
P(2,5 ; 1) is the midpoint of AB. CA extended cuts the y-axis at D.
The equation of CD is $y = -3x + k$. $C\hat{A}B = \theta$.
α and β are the angles that AB and AC respectively make with the x-axis.

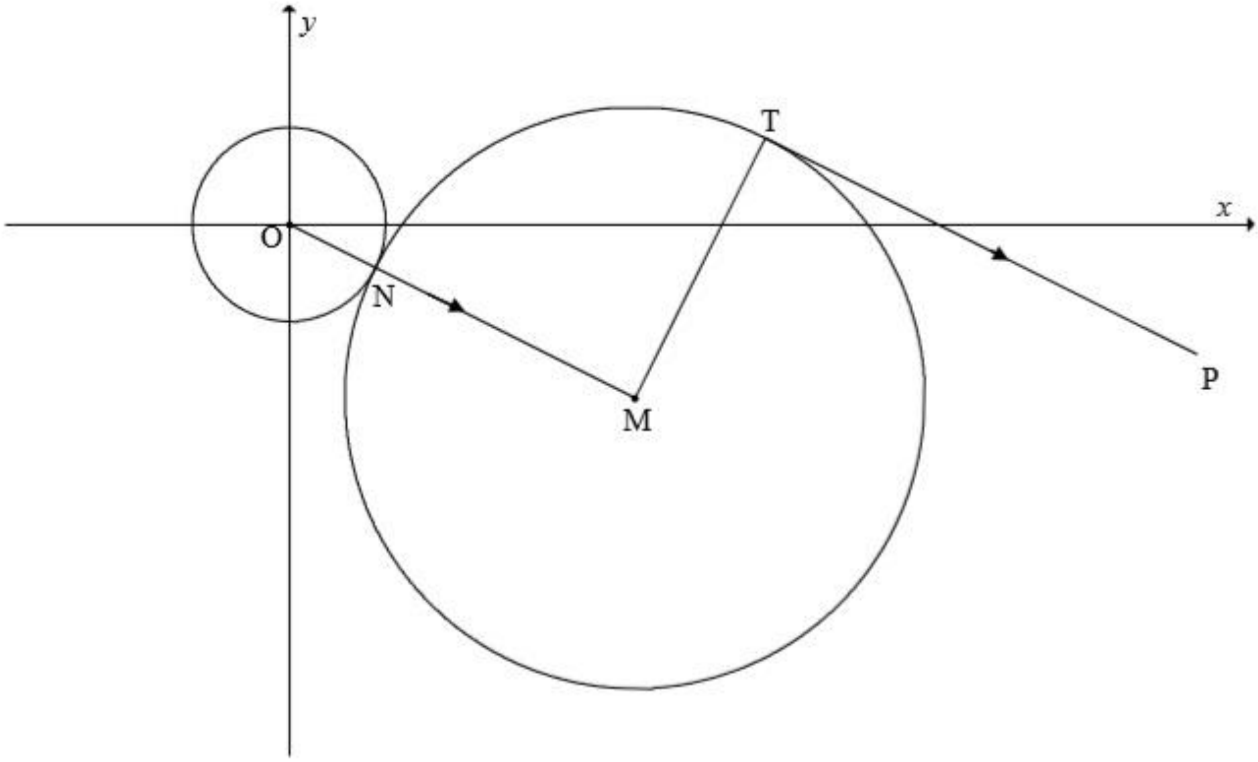


4.1	Determine the value of k.	(2)
4.2	Determine the coordinates of B.	(2)
4.3	Determine the gradient of AB.	(2)
4.4	Calculate the size of θ.	(5)
4.5	Calculate the length of AD. Leave your answer in surd form.	(2)
4.6	If AC = 2AD and $AB = \sqrt{113}$, calculate the length of CB.	(5)

[18]

QUESTION 5

In the diagram below, the equation of the circle with centre M is $(x - 8)^2 + (y + 4)^2 = 45$. PT is a tangent to this circle at T and PT is parallel to OM. Another circle, having centre O, touches the circle having centre M at N.



5.1 Write down the coordinates of M. (1)

5.2 Calculate the length of OM. Leave your answer in simplest surd form. (2)

5.3 Calculate the length of ON. Leave your answer in simplest surd form. (3)

5.4 Calculate the size of $O\hat{M}T$. (2)

5.5 Determine the equation of MT in the form $y = mx + c$. (5)

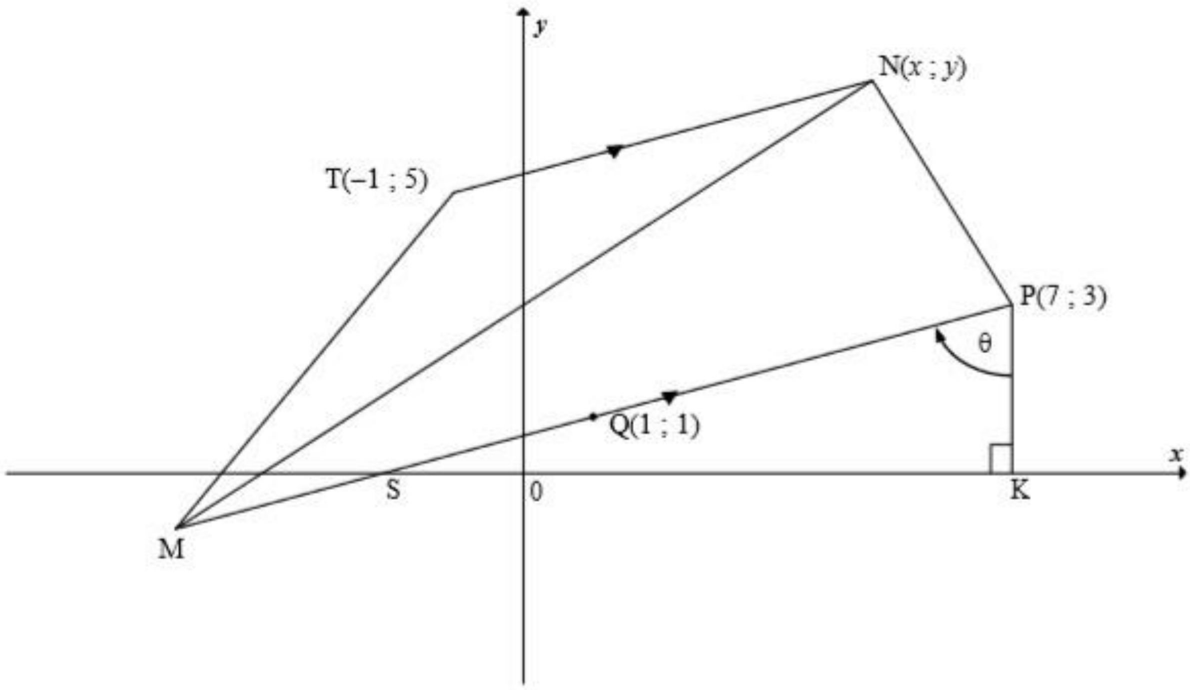
5.6 Calculate the coordinates of T. (6)

[19]

EXEMPL 14

QUESTION 3

In the diagram below, M, T(−1 ; 5), N(x ; y) and P(7 ; 3) are vertices of trapezium MTNP having TN | | MP. Q(1 ; 1) is the midpoint of MP. PK is a vertical line and $S\hat{P}K = \theta$. The equation of NP is $y = -2x + 17$.



3.1 Write down the coordinates of K. (1)

3.2 Determine the coordinates of M. (2)

3.3 Determine the gradient of PM. (2)

3.4 Calculate the size of θ. (3)

3.5 Hence, or otherwise, determine the length of PS. (3)

3.6 Determine the coordinates of N. (5)

3.7 If A(a ; 5) lies in the Cartesian plane:

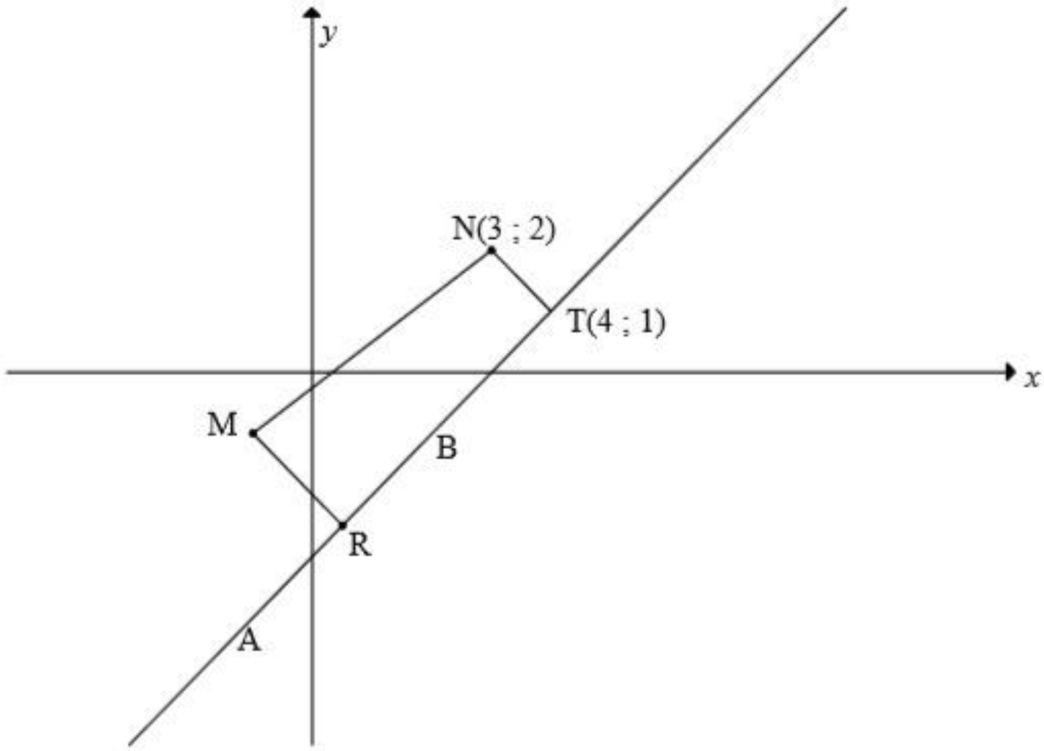
3.7.1 Write down the equation of the straight line representing the possible positions of A. (1)

3.7.2 Hence, or otherwise, calculate the value(s) of a for which $T\hat{A}Q = 45°$. (5)

[22]

QUESTION 4

In the diagram below, the equation of the circle having centre M is $(x + 1)^2 + (y + 1)^2 = 9$. R is a point on chord AB such that MR bisects AB. ABT is a tangent to the circle having centre N(3 ; 2) at point T(4 ; 1).

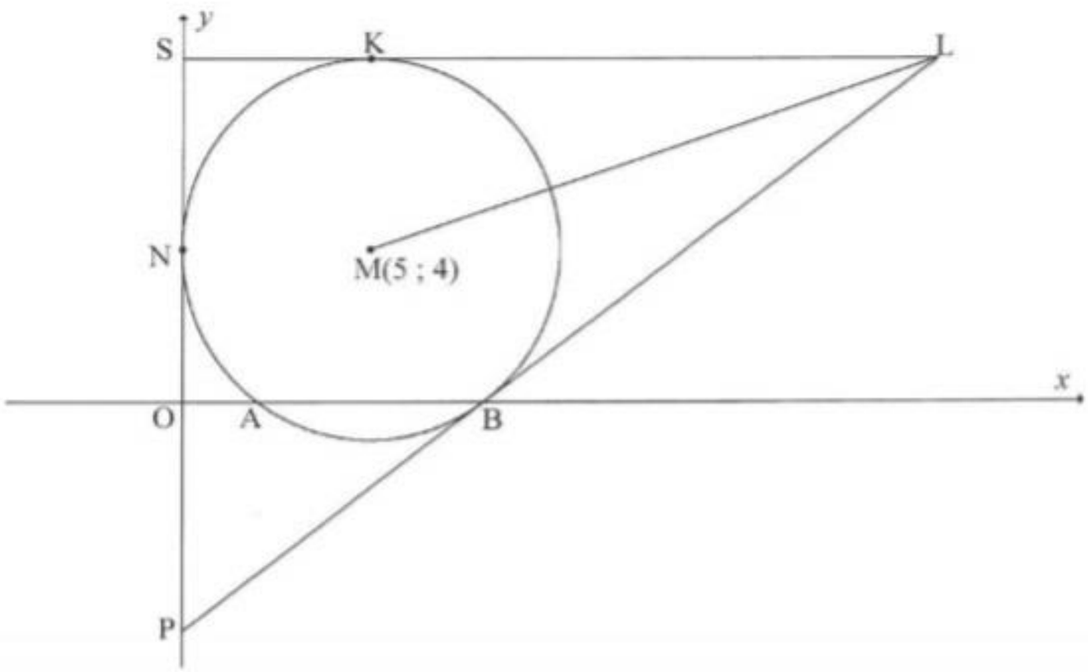


4.1	Write down the coordinates of M.	(1)
4.2	Determine the equation of AT in the form $y = mx + c$.	(5)
4.3	If it is further given that $MR = \frac{\sqrt{10}}{2}$ units, calculate the length of AB. Leave your answer in simplest surd form.	(4)
4.4	Calculate the length of MN.	(2)
4.5	Another circle having centre N touches the circle having centre M at point K. Determine the equation of the new circle. Write your answer in the form $x^2 + y^2 + Cx + Dy + E = 0$.	(3)
		[15]

NOV 14

QUESTION 3

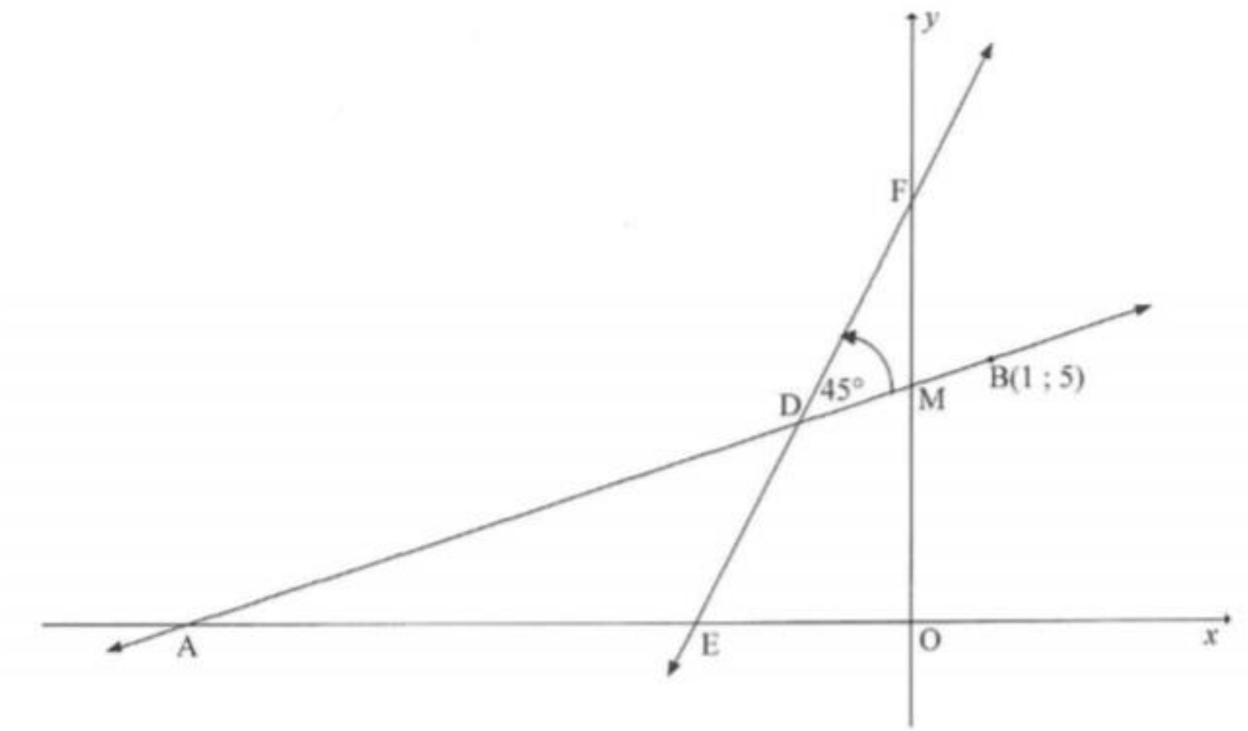
In the diagram below, a circle with centre M(5 ; 4) touches the y-axis at N and intersects the x-axis at A and B. PBL and SKL are tangents to the circle where SKL is parallel to the x-axis and P and S are points on the y-axis. LM is drawn.



3.1	Write down the length of the radius of the circle having centre M.	(1)
3.2	Write down the equation of the circle having centre M, in the form $(x-a)^2+(y-b)^2=r^2$.	(1)
3.3	Calculate the coordinates of A.	(3)
3.4	If the coordinates of B are (8 ; 0), calculate:	
	3.4.1 The gradient of MB	(2)
	3.4.2 The equation of the tangent PB in the form $y = mx + c$	(3)
3.5	Write down the equation of tangent SKL.	(2)
3.6	Show that L is the point (20 ; 9).	(2)
3.7	Calculate the length of ML in surd form.	(2)
3.8	Determine the equation of the circle passing through points K, L and M in the form $(x-p)^2+(y-q)^2=c^2$	(5)
		[21]

QUESTION 4

In the diagram below, E and F respectively are the x- and y-intercepts of the line having equation $y = 3x + 8$. The line through B(1 ; 5) making an angle of 45° with EF, as shown below, has x- and y-intercepts A and M respectively.



4.1 Determine the coordinates of E. (2)

4.2 Calculate the size of $D\hat{A}E$. (3)

4.3 Determine the equation of AB in the form $y = mx + c$. (4)

4.4 If AB has equation $x - 2y + 9 = 0$, determine the coordinates of D. (4)

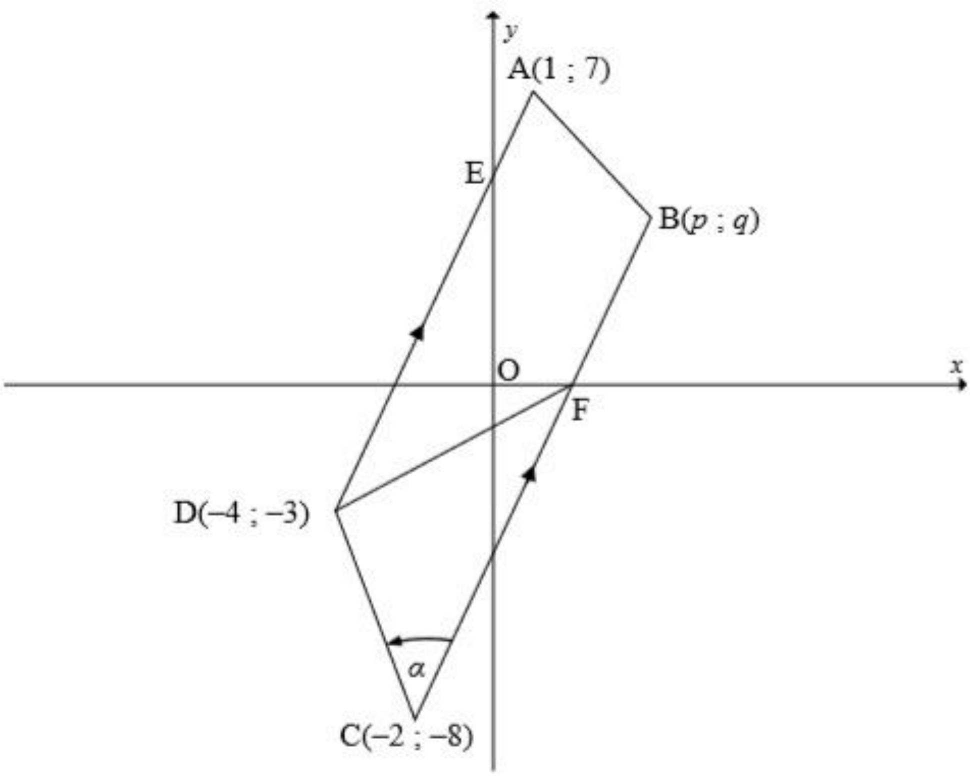
4.5 Calculate the area of quadrilateral DMOE. (6)

[19]

FEB 13

QUESTION 4

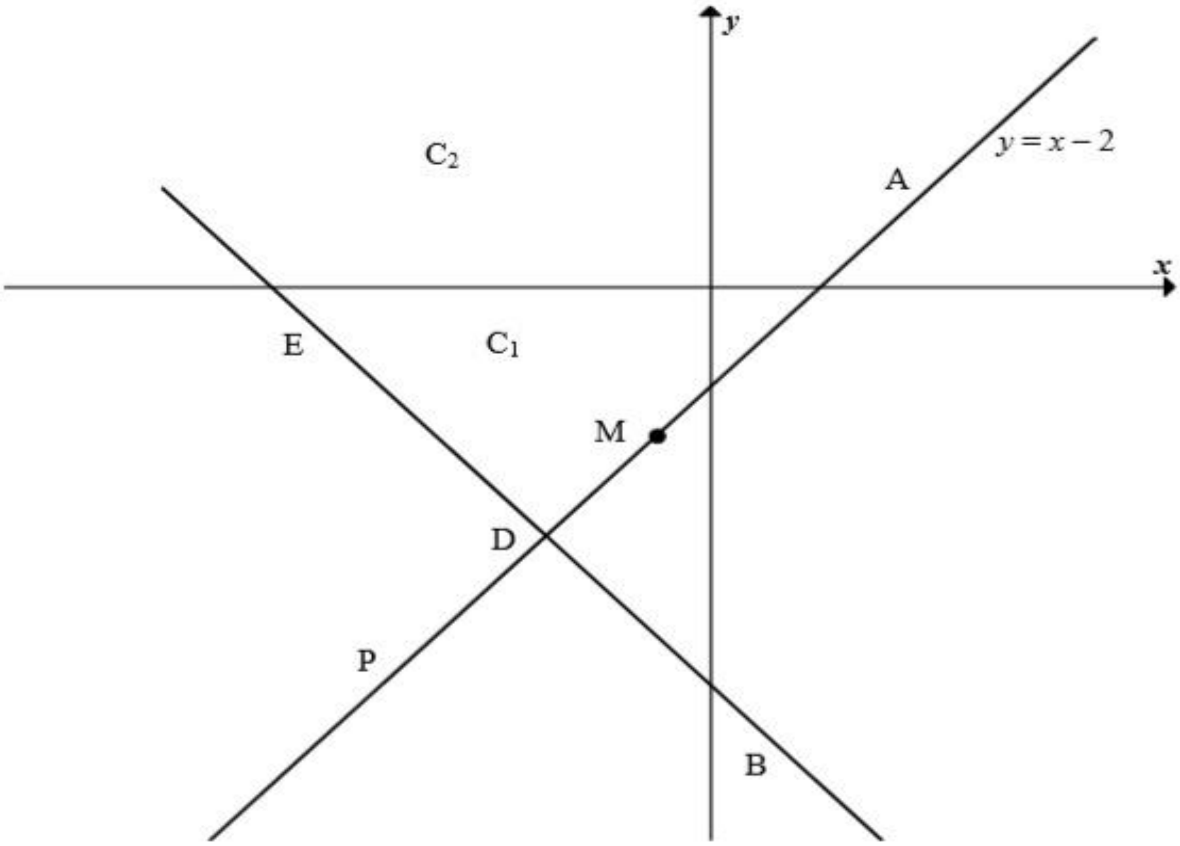
In the diagram below, trapezium ABCD with AD // BC is drawn. The coordinates of the vertices are A(1 ; 7); B(p ; q); C(–2 ; –8) and D(–4 ; –3). BC intersects the x-axis at F. $D\hat{C}B = \alpha$.



4.1	Calculate the gradient of AD.	(2)
4.2	Determine the equation of BC in the form $y = mx + c$.	(3)
4.3	Determine the coordinates of point F.	(2)
4.4	$AB^{/}CD$ is a parallelogram with $B^{/}$ on BC. Determine the coordinates of $B^{/}$, using a transformation $(x\,;\,y) \rightarrow (x+a\,;\,y+b)$ that sends A to $B^{/}$.	(2)
4.5	Show that $\alpha = 48{,}37\,°$.	(4)
4.6	Calculate the area of ΔDCF.	(6)
		[19]

QUESTION 5

Circles C_1 and C_2 in the figure below have the same centre M. P is a point on C_2. PM intersects C_1 at D. The tangent DB to C_1 intersects C_2 at B. The equation of circle C_1 is given by $x^2 + 2x + y^2 + 6y + 2 = 0$ and the equation of line PM is $y = x - 2$.



5.1 Determine the following:

5.1.1 The coordinates of centre M (3)

5.1.2 The radius of circle C_1 (1)

5.2 Determine the coordinates of D, the point where line PM and circle C_1 intersect. (5)

5.3 If it is given that $DB = 4\sqrt{2}$, determine MB, the radius of circle C_2. (3)

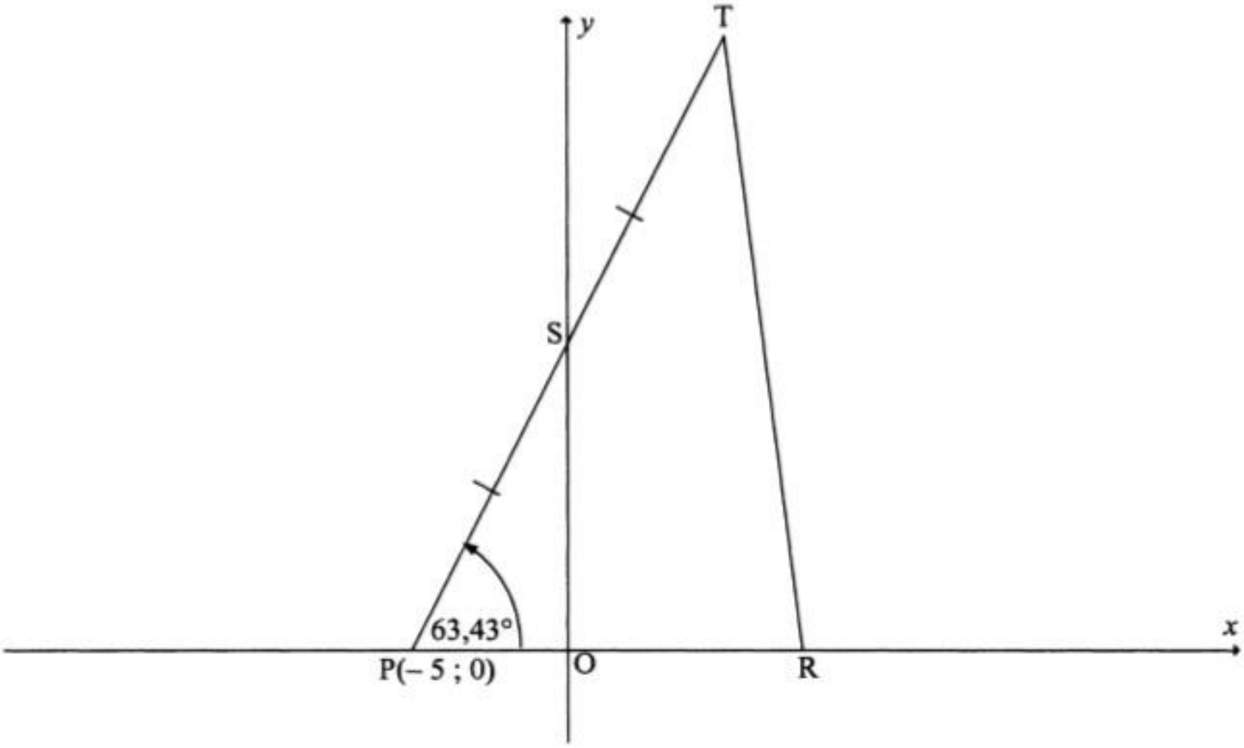
5.4 Write down the equation of C_2 in the form $(x-a)^2 + (y-b)^2 = r^2$. (2)

5.5 Is the point $F(2\sqrt{5}\,;0)$ inside circle C_2? Support your answer with calculations. (4)

[18]

NOV 13

In the diagram below, P is a point (– 5 ; 0). The inclination of line PT is 63,43°. S is the midpoint and the y-intercept of PT. R is a point on the x-axis such that PO : OR = 2 : 3.



5.1 Determine:

5.1.1 The gradient of PT, correct to the nearest integer value (2)

5.1.2 The equation of PT in the form $y = mx + c$ (2)

5.1.3 The distance PS in surd form (3)

5.1.4 The coordinates of T (2)

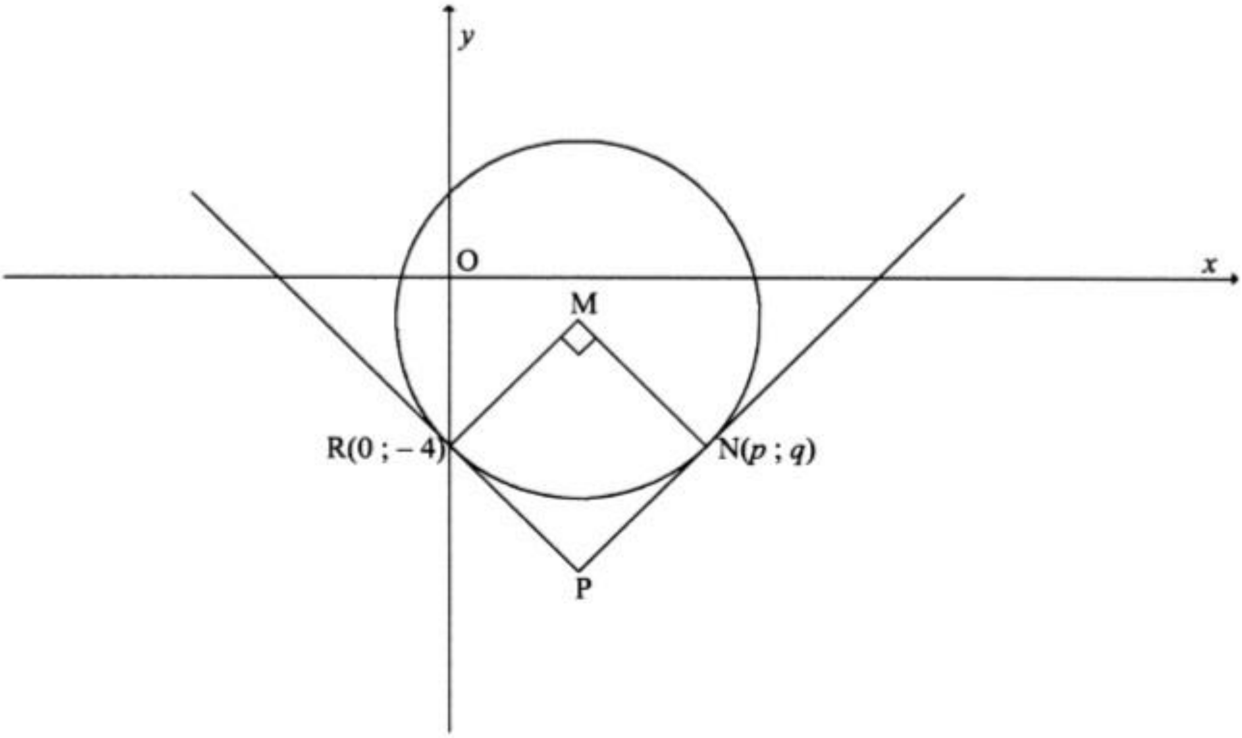
5.2 Determine the coordinates of R. (2)

5.3 Calculate the area of ΔPTR. (4)

[15]

QUESTION 6

In the diagram below, M is the centre of the circle having the equation $x^2+y^2-6x+2y-8=0$. The circle passes through R(0 ; − 4) and N(p ; q).
$R\hat{M}N=90°$. The tangents drawn to the circle at R and N meet at P.



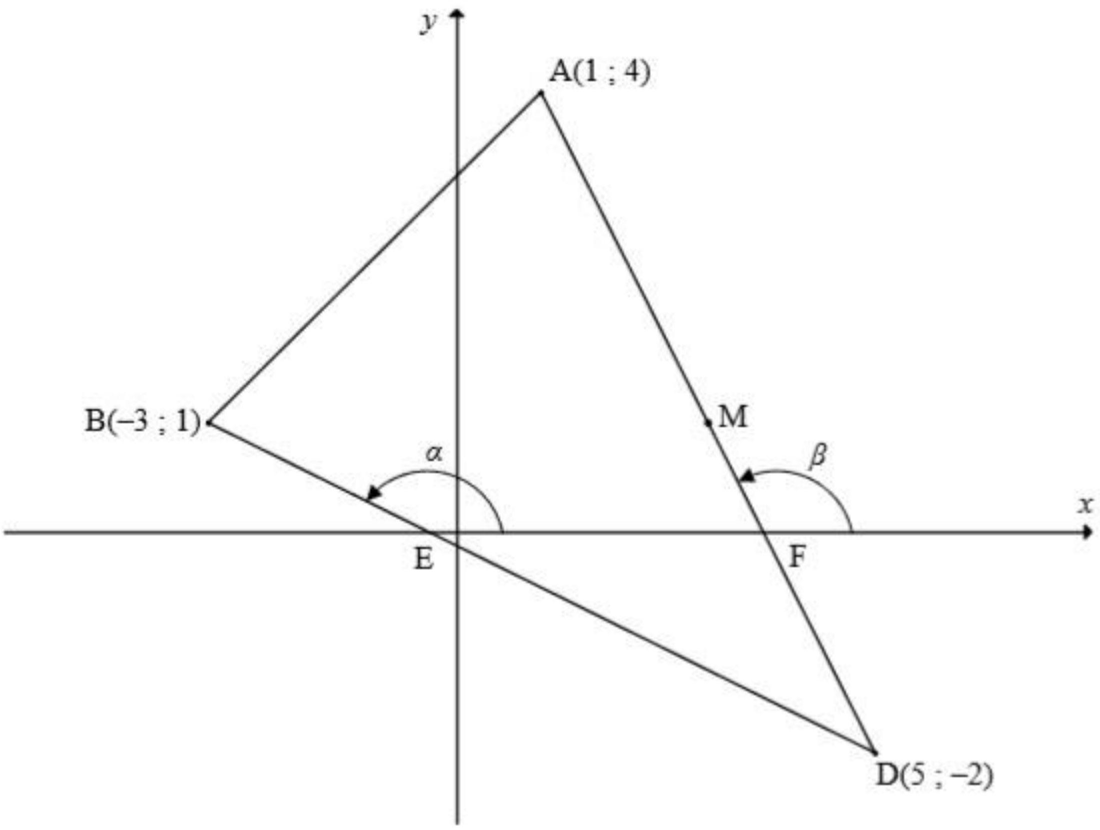
6.1	Show that M is the point (3 ; − 1).	(4)
6.2	Determine the equation of MR in the form $y=mx+c$.	(3)
6.3	Show that $q=2-p$.	(4)
6.4	Determine the values of p and q.	(5)
6.5	Determine the equation of the circle having centre O and passing through N.	(2)
6.6	Calculate the area of the circle centred at M.	(2)
6.7	Calculate the ratio in its simplest form: $\frac{NP}{MP}$	(4)
		[24]

FEB 12

QUESTION 5

In the figure below, A(1 ; 4), B(–3 ; 1) and D(5 ; –2) are the coordinates of the vertices of ΔABD.

- BD and AD intersect the x-axis at E and F respectively.
- The angle of inclination of BD with the x-axis at E is α.
- The angle of inclination of AD with the x-axis at F is β.

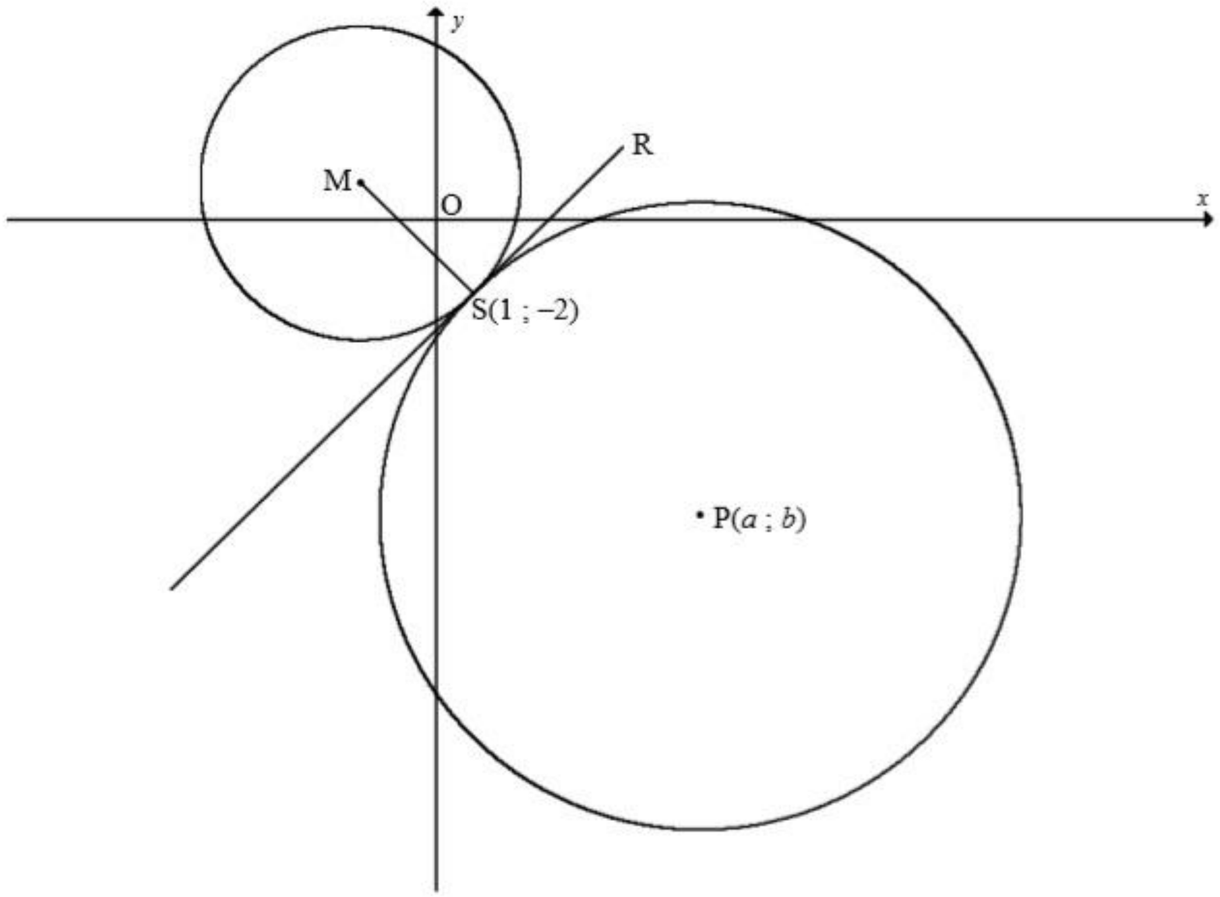


5.1	Calculate the gradient of AD.	(2)
5.2	Determine the length of the line segment AD. (Leave your answer in surd form, if necessary.)	(2)
5.3	Determine the coordinates of M, the midpoint of AD.	(2)
5.4	C is a point such that line BC is parallel to AD. Determine the equation of line BC in the form $ax + by + c = 0$.	(3)
5.5	5.5.1 Calculate the size of β.	(2)
	5.5.2 Calculate ALL the angles of ΔDEF.	(5)
5.6	Determine the equation of a circle, with centre M, which passes through the points A and D. Give your answer in the form: $(x-a)^2 + (y-b)^2 = r^2$.	(2)
5.7	Does the point B lie inside, outside or on the circle in QUESTION 5.6? Show ALL calculations to justify your answer.	(2)

[20]

QUESTION 6

In the figure below, a circle with centre M is drawn. The equation of the circle is $(x+2)^2+(y-1)^2=r^2$.
S(1 ; −2) is a point on the circle.
SR is a tangent to the circle.



6.1 Write down the coordinates of M and the radius of the circle centre M. (4)

6.2 Determine the equation of the tangent RS in the form $y = mx + c$. (4)

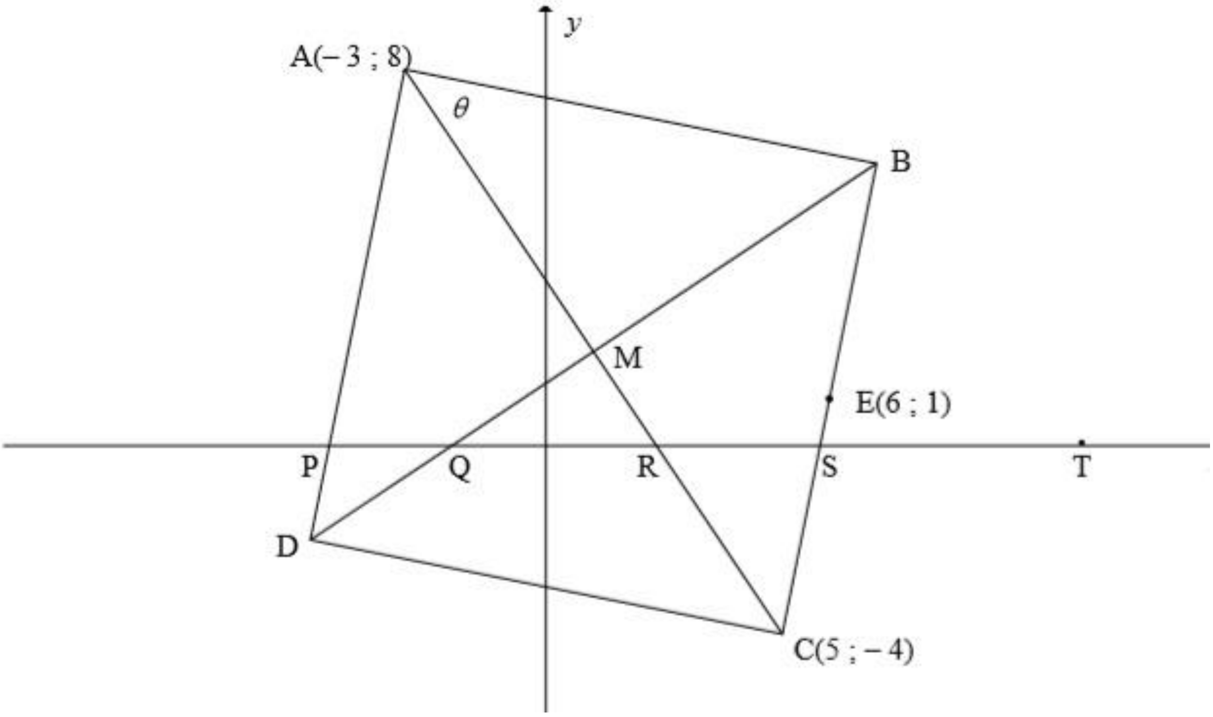
6.3 The circles having centres P and M touch externally at point S. SR is a tangent to both these circles. If MS : MP = 1 : 3, determine the coordinates $(a ; b)$ of point P. (8)

[16]

NOV 12

QUESTION 5

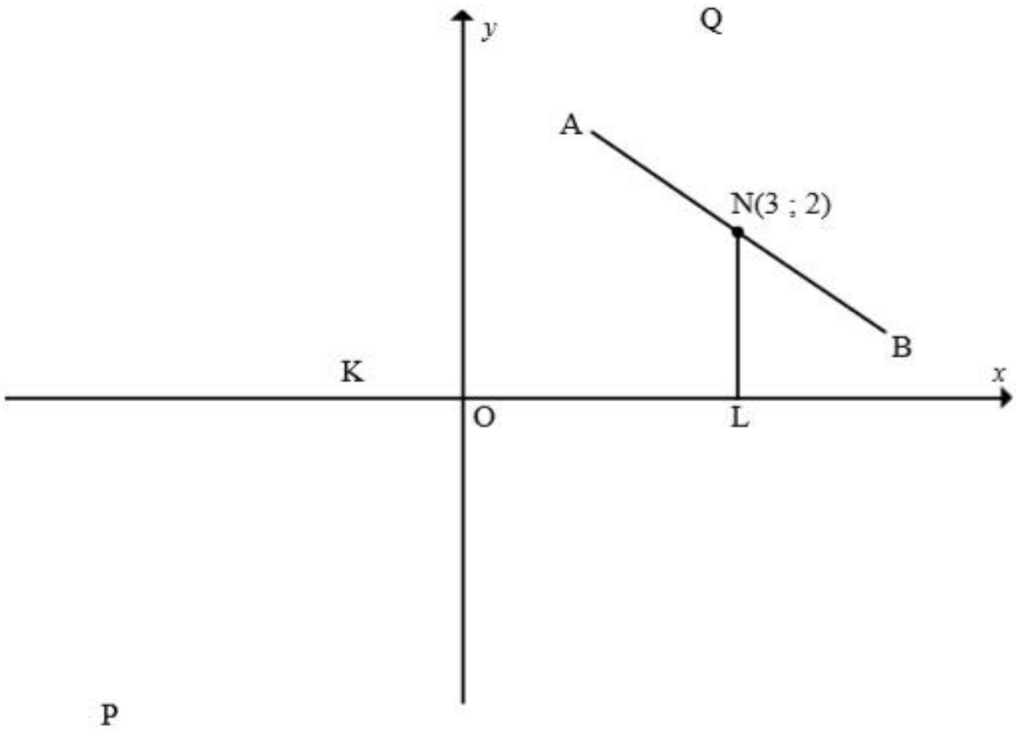
ABCD is a rhombus with A(− 3 ; 8) and C(5 ; − 4). The diagonals of ABCD bisect each other at M. The point E(6 ; 1) lies on BC.



5.1	Calculate the coordinates of M.	(2)
5.2	Calculate the gradient of BC.	(2)
5.3	Determine the equation of the line AD in the form $y = mx + c$.	(3)
5.4	Determine the size of θ, that is $B\hat{A}C$. Show ALL calculations.	(6)
		[13]

QUESTION 6

A circle centred at N(3 ; 2) touches the x-axis at point L. The line PQ, defined by the equation $y = \frac{4}{3}x + \frac{4}{3}$, is a tangent to the same circle at point A.



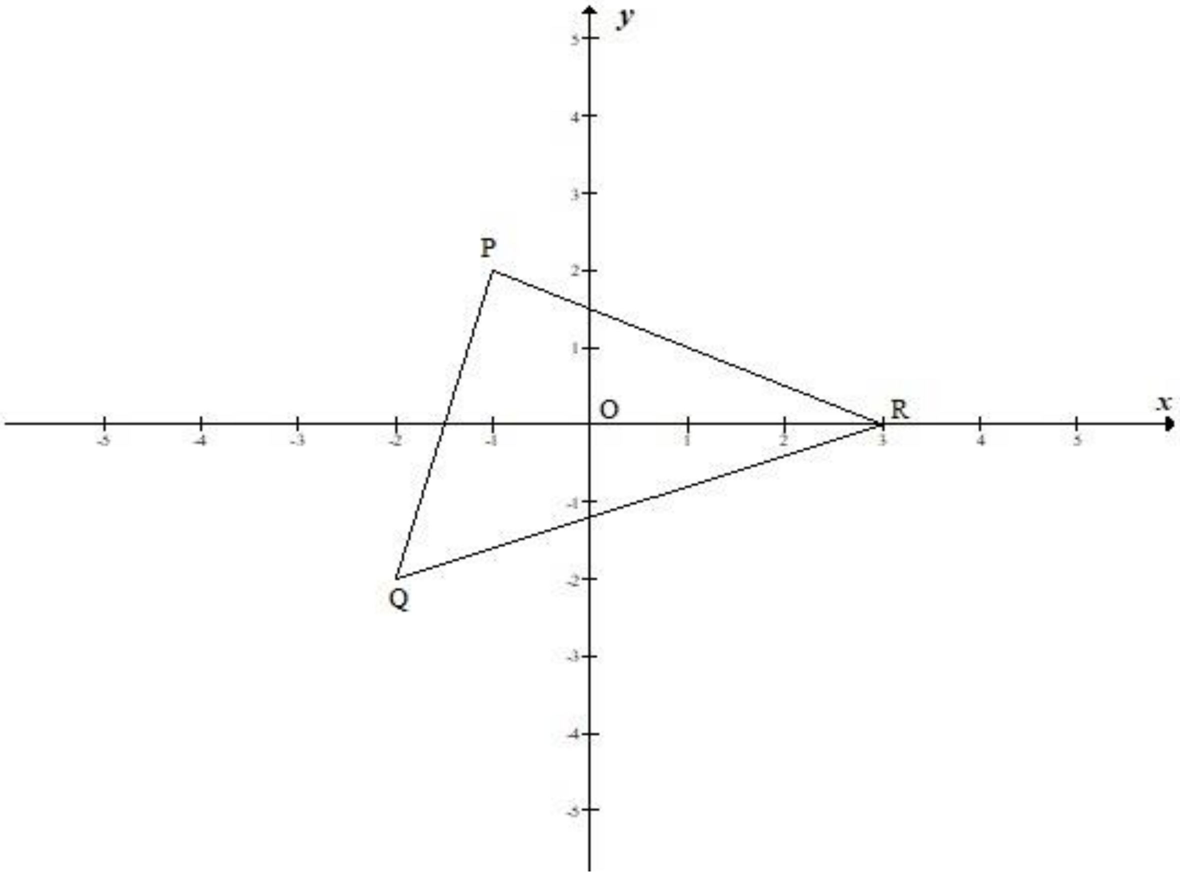
6.1	Why is NL perpendicular to OL?	(1)
6.2	Determine the coordinates of L.	(1)
6.3	Determine the equation of the circle with centre N in the form $(x-a)^2 + (y-b)^2 = r^2$	(3)
6.4	Calculate the length of KL.	(3)
6.5	Determine the equation of the diameter AB in the form $y = mx + c$.	(4)
6.6	Show that the coordinates of A are $\left(\frac{7}{5} ; \frac{16}{5}\right)$.	(3)
6.7	Calculate the length of KA.	(3)
6.8	Why is KLNA a kite?	(2)
6.9	Show that $A\hat{B}K = 45°$.	(3)
6.10	If the given circle is reflected about the x-axis, give the coordinates of the centre of the new circle.	(1)

[24]

FEB 11

QUESTION 4

In the diagram below ΔPQR with vertices P(– 1 ; 2), Q(– 2 ; – 2) and R(3 ; 0) is given.

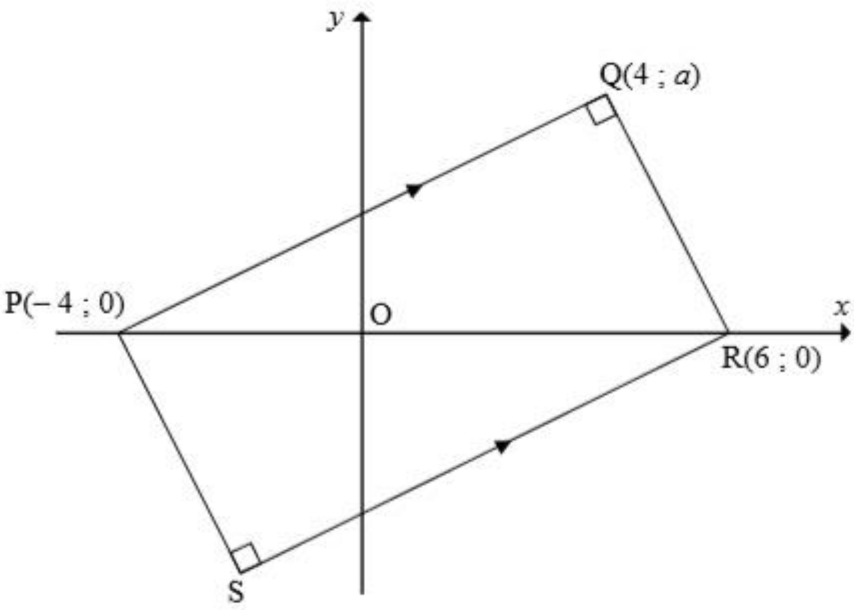


4.1	Calculate the angle that PQ makes with the positive x-axis.	(3)
4.2	Determine the coordinates of M, the midpoint of PR.	(2)
4.3	Determine the perimeter of ΔPQR to the nearest whole number.	(5)
4.4	Determine an equation of the line parallel to PQ that passes through M.	(3) **[13]**

NOV 11

QUESTION 5

In the diagram below, PQRS is a rectangle with vertices P(– 4 ; 0), Q(4 ; a), R(6 ; 0) and S. Q lies in the first quadrant.



5.1 Show that $a = 4$. (4)

5.2 Determine the equation of the straight line passing through the points S and R in the form $y = mx + c$. (4)

5.3 Calculate the coordinates of S. (4)

5.4 Calculate the length of PR. (2)

5.5 Determine the equation of the circle that has diameter PR. Give the equation of the circle in the form $(x-a)^2 + (y-b)^2 = r^2$. (3)

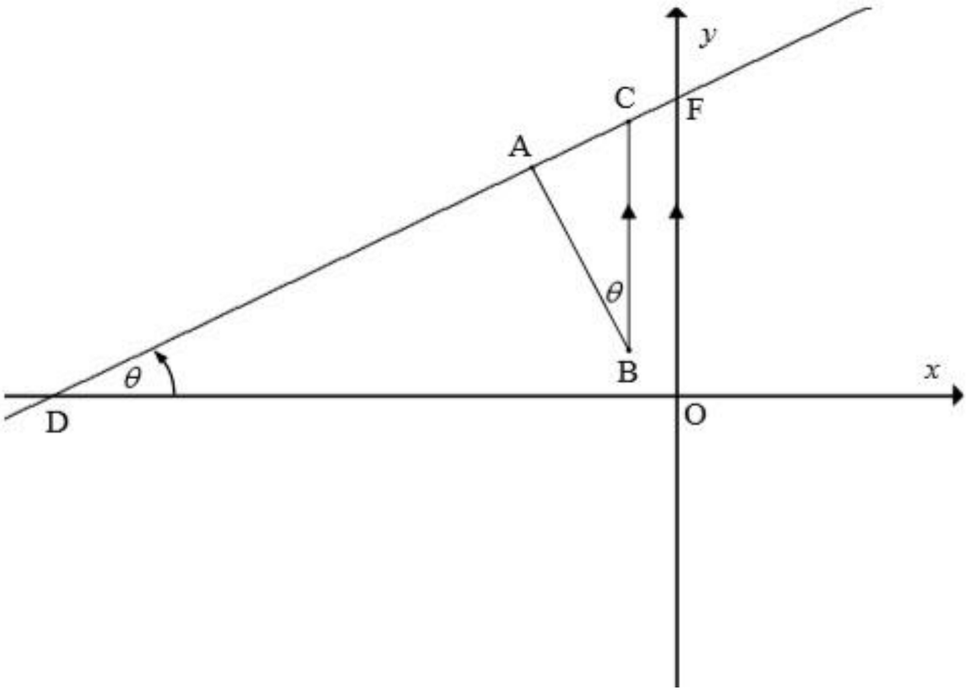
5.6 Show that Q is a point on the circle in QUESTION 5.5. (2)

5.7 Rectangle PQRS undergoes the transformation $(x ; y) \rightarrow (x+k ; y+l)$ where k and l are numbers. What is the minimum value of $k + l$ so that the image of PQRS lies in the first quadrant (that is, $x \geq 0$ and $y \geq 0$)? (3)

[22]

QUESTION 6

The circle with centre B(–1 ; 1) and radius $\sqrt{20}$ is shown. BC is parallel to the y-axis and CB = 5. The tangent to the circle at A passes through C.
$A\hat{B}C = A\hat{D}O = \theta$



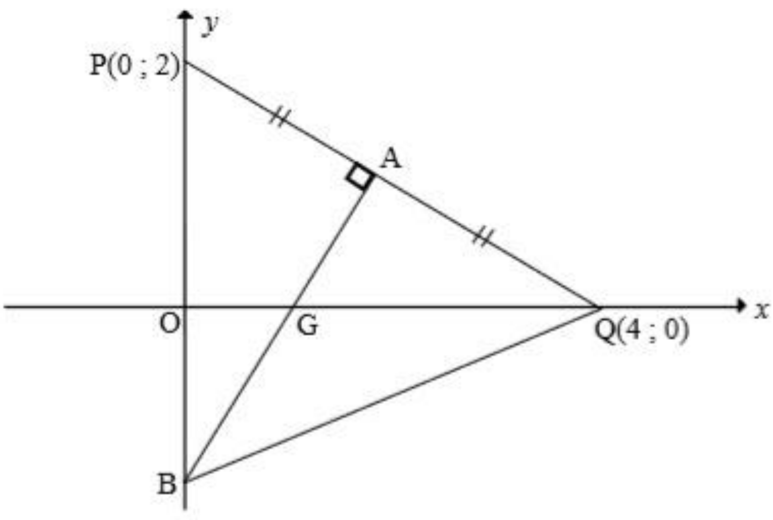
6.1	Determine the coordinates of C.	(2)
6.2	Calculate the length of CA.	(3)
6.3	Write down the value of tan θ.	(1)
6.4	Show that the gradient of AB is – 2.	(2)
6.5	Determine the coordinates of A.	(6)
6.6	Calculate the ratio of the area of ΔABC to the area of ΔODF. Simplify your answer.	(5)

[19]

FEB 10

QUESTION 4

The diagram below shows the points P(0 ; 2) and Q(4 ; 0). Point A is the midpoint of PQ. The line AB is perpendicular to PQ and intersects the x-axis at G and the y-axis at B.



4.1 Show that the gradient of PQ is $-\frac{1}{2}$. (1)

4.2 Determine the coordinates of A. (2)

4.3 Determine the equation of the line AB. (5)

4.4 Calculate the length of BQ. (3)

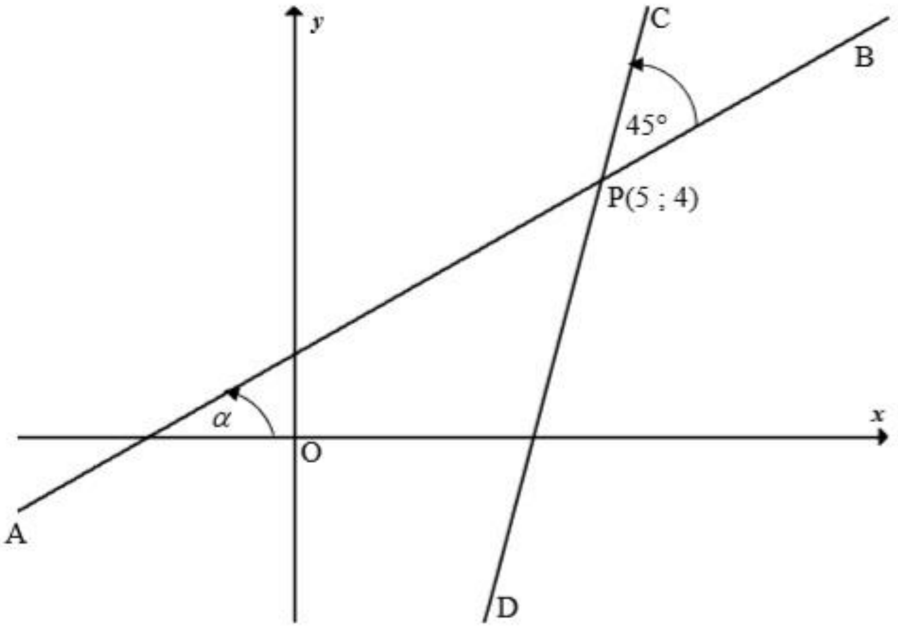
4.5 Show that ΔBPQ is isosceles. (2)

4.6 If PBQR is a rhombus, determine the coordinates of R. (3)

[16]

QUESTION 5

The straight line AB has the equation $5y-3x-5=0$. Another straight line CD is drawn to intersect AB at P(5 ; 4) such that the acute angle between AB and CD is 45°.



5.1 Determine the gradient of the line CD. (5)

5.2 Hence, or otherwise, determine the equation of the line CD. (2)
[7]

QUESTION 6

6.1 Determine the centre and radius of the circle with the equation $x^2+y^2+8x+4y-38=0$. (4)

6.2 A second circle has the equation $(x-4)^2+(y-6)^2=26$. Calculate the distance between the centres of the two circles. (2)

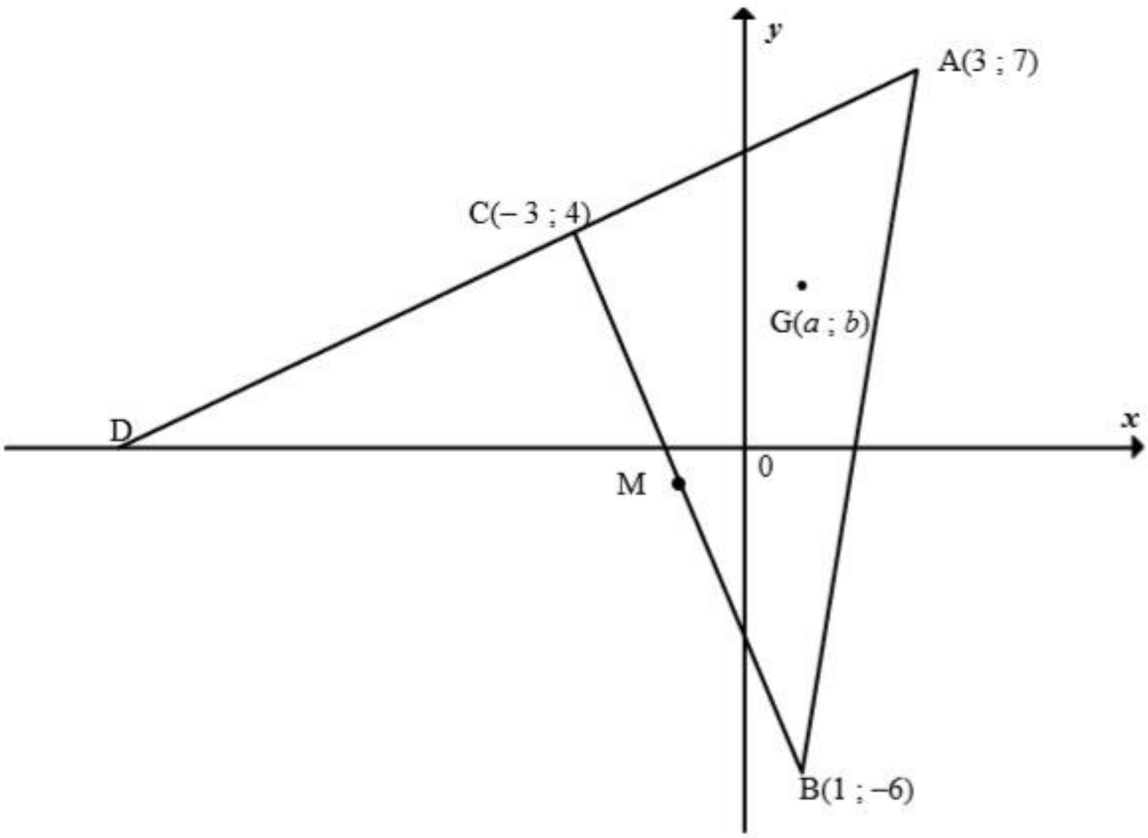
6.3 Hence, show that the circles described in QUESTION 6.1 and QUESTION 6.2 intersect each other. (3)

6.4 Show that the two circles intersect along the line $y=-x+4$. (4)
[13]

NOV 10

QUESTION 5

In the diagram below, A, B and C are the vertices of a triangle. AC is extended to cut the x-axis at D.



5.1 Calculate the gradient of:

5.1.1 AD (2)

5.1.2 BC (1)

5.2 Calculate the size of $D\hat{C}B$. (3)

5.3 Write down an equation of the straight line AD. (2)

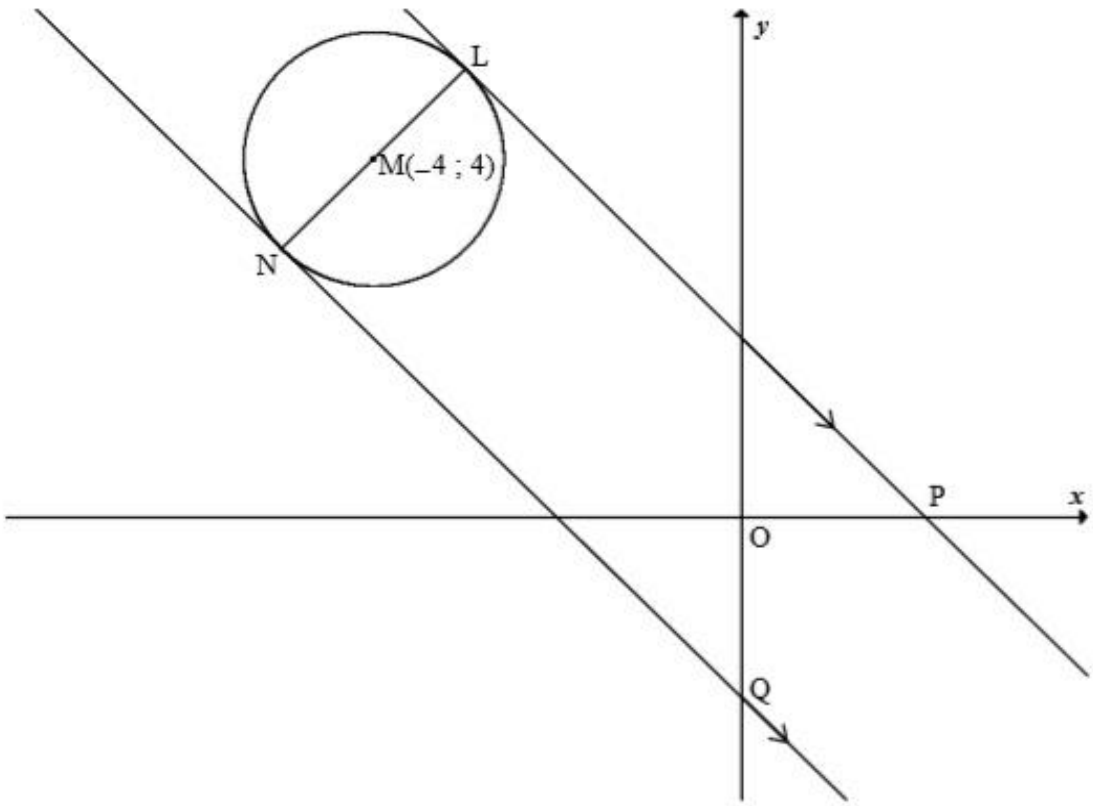
5.4 Determine the coordinates of M, the midpoint of BC. (2)

5.5 If G(a ; b) is a point such that A, G and M lie on the same straight line, show that $b = 2a + 1$. (4)

5.6 Hence calculate TWO possible values of b if $GC = \sqrt{17}$. (6)

[20]

QUESTION 6



The line LP, with equation $y + x - 2 = 0$, is a tangent at L to the circle with centre M(− 4 ;4). LN is a diameter of the circle. Also LP || NQ, where P lies on the x-axis, and Q lies on the y-axis.

6.1 Determine the equation of the diameter LN. (3)

6.2 Calculate the coordinates of L. (2)

6.3 Determine the equation of the circle. (3)

6.4 Write down the coordinates of N. (3)

6.5 Write down the equation of NQ. (3)

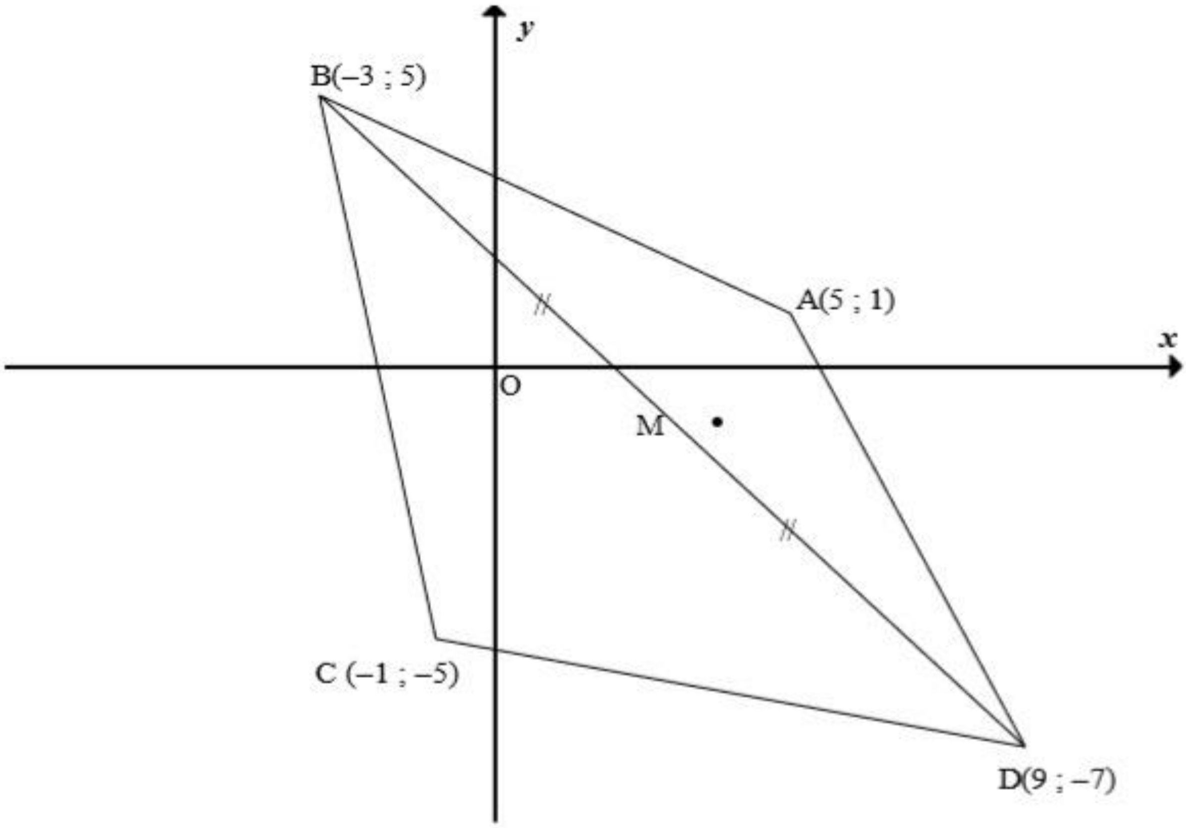
6.6 If the length of the diameter is doubled and the circle is translated horizontally 6 units to the right, write down the equation of the new circle. (3)

[17]

NOV 09

QUESTION 1

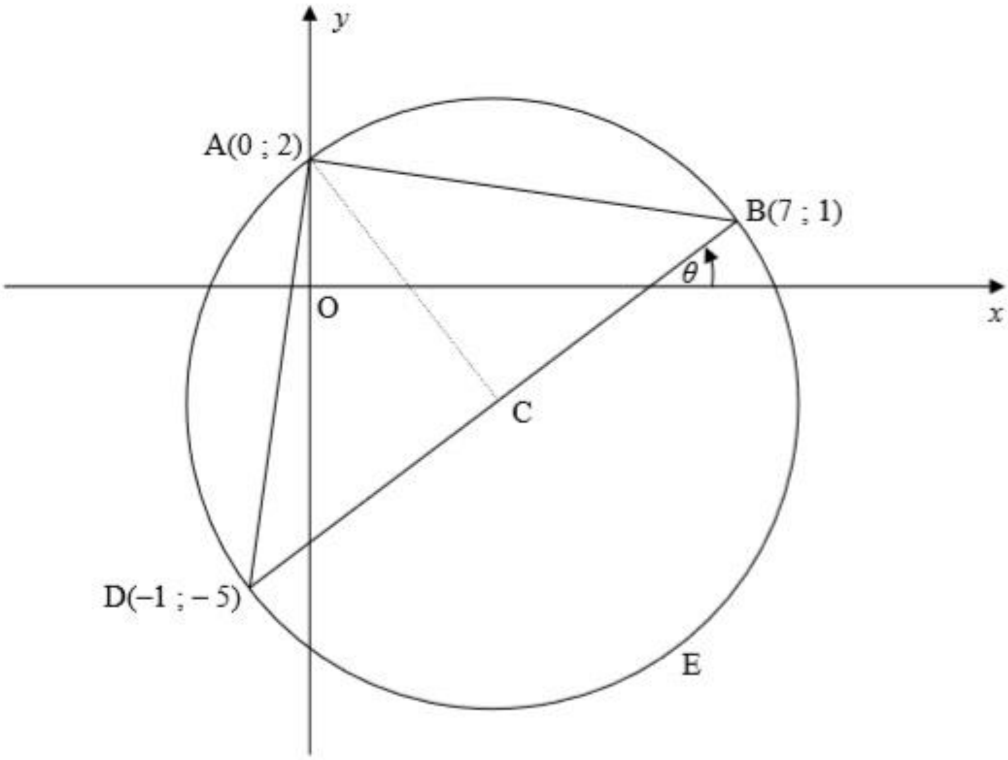
ABCD is a quadrilateral with vertices A(5 ; 1), B(−3 ; 5), C(−1 ; −5) and D(9 ; −7).



1.1	Calculate the gradient of AC.	(2)
1.2	Determine the equation of AC in the form $y = \ldots$	(3)
1.3	Hence, or otherwise, show that the midpoint M of BD lies on AC.	(3)
1.4	Show that $A\hat{M}B = 90°$.	(3)
1.5	Calculate the area of Δ ABC.	(5)
		[16]

QUESTION 2

2.1 The circle that passes through the points A(0 ; 2), B(7 ; 1) and D(−1 ; −5) is given below.



2.1.1	Calculate C, the coordinates of the midpoint of BD.	(2)
2.1.2	Show that CA = CB.	(3)
2.1.3	Hence, give the equation of the circle.	(2)
2.1.4	Calculate the angle θ that BD makes with the positive x-axis.	(3)
2.1.5	If AC is extended to meet the circle at E, calculate the coordinates of E.	(2)
2.1.6	Explain why ABED is a rectangle.	(3)
2.1.7	Determine the equation of the tangent to the circle at B in the form of $y = \ldots$	(3)

2.2 A circle is represented by the equation $x^2 + 2x + y^2 - 4y - 5 = 0$.

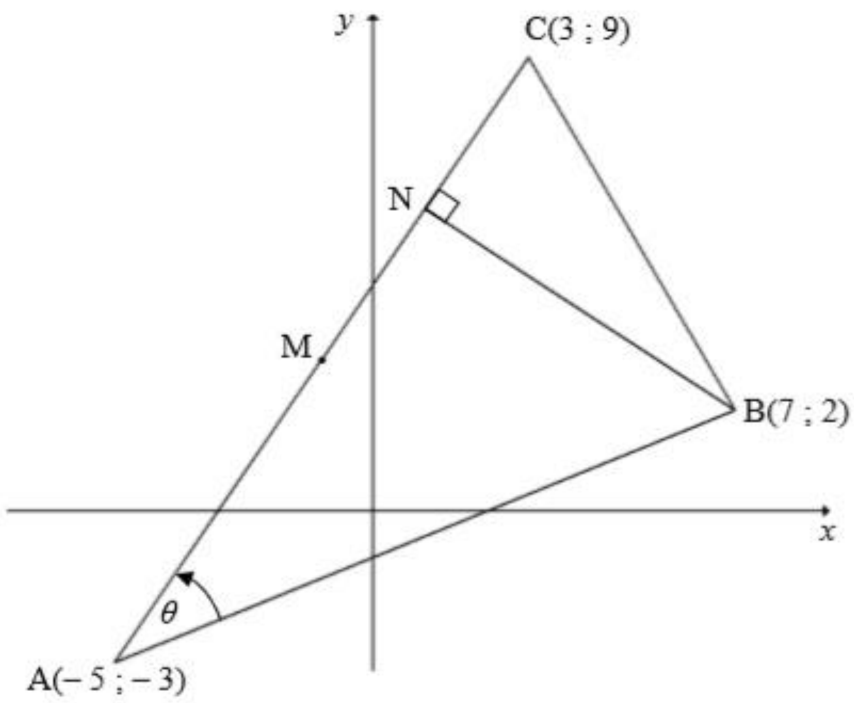
2.2.1	A transformation moves every point 2 units to the left and 4 units up. Determine the equation of the new circle after the transformation.	(3)
2.2.2	Does the origin lie within the new circle? Give a reason for your answer.	(2)

[23]

ADD EXEMPL 08

QUESTION 1

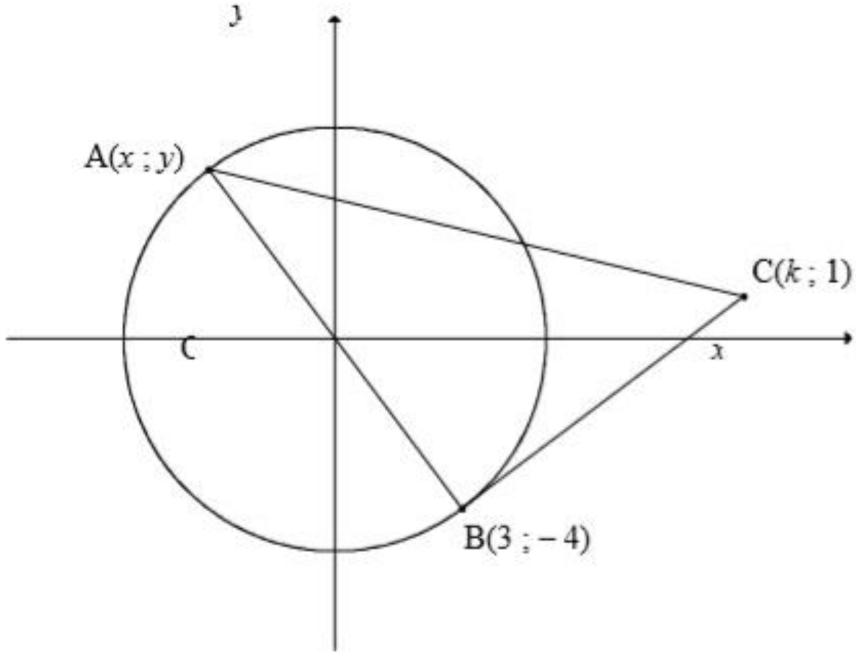
A(– 5 ; – 3), B(7 ; 2) and C(3 ; 9) are the vertices of ΔABC in the Cartesian plane.
BN ⊥ CA and M is the midpoint of AC.



1.1	Calculate the length of AC. (Leave your answer in surd form.)	(3)
1.2	Determine the coordinates of M, the midpoint of AC.	(2)
1.3	Calculate the gradient of AC.	(2)
1.4	Hence, determine the equation of BN.	(3)
1.5	Calculate the area of ΔABC if N is the point (1 ; 6).	(4)
1.6	Calculate the measure of θ correct to 1 decimal place.	(4)
		[18]

QUESTION 2

In the figure below, the origin is the centre of the circle. $A(x\,;y)$ and $B(3\,;-4)$ are two points on the circle. AB is a diameter of the circle and BC is a tangent to the circle at B.
C is the point $(k\,;1)$.



2.1 Determine the equation of the circle with centre O. (3)

2.2 Show that the length of AB is 10. (2)

2.3 Write down the equation of the circle with centre B and radius AB in the form $Ax^2 + Bx + Cy^2 + Dy + E = 0$. (3)

2.4 Explain why the coordinates of the point A are $(-3\,;\ 4)$. (2)

2.5 Calculate the gradient of line AB. (2)

2.6 Determine the equation of the tangent BC. (5)

2.7 Determine the value of k. (3)

[20]