31- (4PM0-W 2012-Paper 2-Q7)-*CARTESIAN COORDINATES*

The points A, B and C have coordinates (3,5), (7,8) and (6,1) respectively.

(a) Show, by calculation, that AB is perpendicular to AC.

(4)

(b) Find an equation for AC in the form $ax + by + c = 0$, where a, b and c are integers whose values must be stated.

(3)

The point D is on AC produced and $AC : CD = 1 : 2$

(c) Find the coordinates of D.

(2)

(d) Calculate the area of triangle ABD.

(4)

The equation of line l_1 is $2x + 3y + 6 = 0$

(a) Find the gradient of l_1

(1)

The line l_2 is perpendicular to l_1 and passes through the point P with coordinates (7, 2).

(b) Find an equation for l_2

(3)

The lines l_1 and l_2 intersect at the point Q.

(c) Find the coordinates of Q.

(3)

The line l_3 is parallel to l_1 and passes through the point P.

(d) Find an equation for l_3

(2)

The line l_1 crosses the x-axis at the point R.

(e) Show that $PQ = QR$.

(3)

The point S lies on l_3

The line PR is perpendicular to QS.

(f) Find the exact area of the quadrilateral $PQRS$.

(3)

33- (4PM0-W 2014-Paper 2-Q1)-*CARTESIAN COORDINATES*

The points A and B have coordinates (5, 9) and (9, 3) respectively. The line l is the perpendicular bisector of AB.

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

(5)

The points A and B have coordinates (2, 9) and (10, 3) respectively.

The point M is the midpoint of AB.

(a) Find the coordinates of M.

(2)

(b) Find the length of AB.

(2)

The line l is the perpendicular bisector of AB.

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

(4)

The point D lies on l and has coordinates $(d, 2)$.

(d) Find the value of d.

(2)

The point E lies on l and is such that $DM : ME = 1 : 2$

(e) Find the coordinates of E.

(2)

(f) Find the area of the kite $AEBD$.

(4)

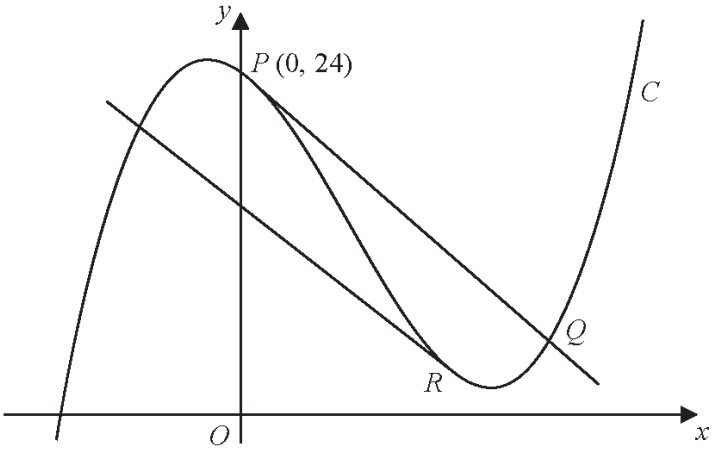

Diagram **NOT** accurately drawn

Figure 3

Figure 3 shows the curve C with equation $y = 9x^3 - 18x^2 - 8x + 24$
The curve cuts the y-axis at the point P with coordinates (0, 24).
The point Q lies on C and the line PQ is the tangent to C at P.

(a) Find an equation of PQ.

(4)

(b) Find the coordinates of Q.

(5)

The point R lies on C and S is the point such that $PQRS$ is a parallelogram.
Given that RS is the tangent to C at R,

(c) find the coordinates of R,

(4)

(d) find the coordinates of S.

(2)

(e) Show that S lies on C.

(2)

The first term of a geometric series S is $\sqrt{2}$

The second term of S is $\sqrt{2} - 2$

(a) (i) Find the exact value of the common ratio of S.

(ii) Find the third term of S, giving your answer in the form $a\sqrt{2} + b$, where a and b are integers.

(5)

(b) (i) Explain why the series is convergent.

(ii) Find the sum to infinity of S.

(3)

The sum of the first and third terms of a geometric series G is 104

The sum of the second and third terms of G is 24

Given that G is convergent and that the sum to infinity is S, find

(a) the common ratio of G

(4)

(b) the value of S

(4)

The sum of the first and third terms of another geometric series H is also 104 and the sum of the second and third terms of H is 24
The sum of the first n terms of H is S_n

(c) Write down the common ratio of H

(1)

(d) Find the least value of n for which $S_n > S$

(6)

38- (4PM0-S 2013-Paper 2-Q4)-*SERIES*

The nth term of a geometric series is t_n and the common ratio is r, where $r > 0$

Given that $t_1 = 1$

(a) write down an expression in terms of r and n for t_n

(1)

Given also that $t_n + t_{n+1} = t_{n+2}$

(b) show that $r = \dfrac{1 + \sqrt{5}}{2}$

(4)

(c) find the exact value of t_4 giving your answer in the form $f + g\sqrt{h}$, where f, g and h are integers.

(3)

The third and fifth terms of a geometric series S are 48 and 768 respectively. Find

(a) the two possible values of the common ratio of S,

(3)

(b) the first term of S.

(1)

Given that the sum of the first 5 terms of S is 615

(c) find the sum of the first 9 terms of S.

(4)

Another geometric series T has the same first term as S. The common ratio of T is $\frac{1}{r}$ where r is one of the values obtained in part (a). The nth term of T is t_n

Given that $t_2 > t_3$

(d) find the common ratio of T.

(1)

The sum of the first n terms of T is T_n

(e) Writing down all the numbers on your calculator display, find T_9

(2)

The sum to infinity of T is T_∞

Given that $T_\infty - T_n > 0.002$

(f) find the greatest value of n.

(5)