EXPERT TUITION

Maths Questions By Topic:

Algebra

Edexcel GCSE (Higher)

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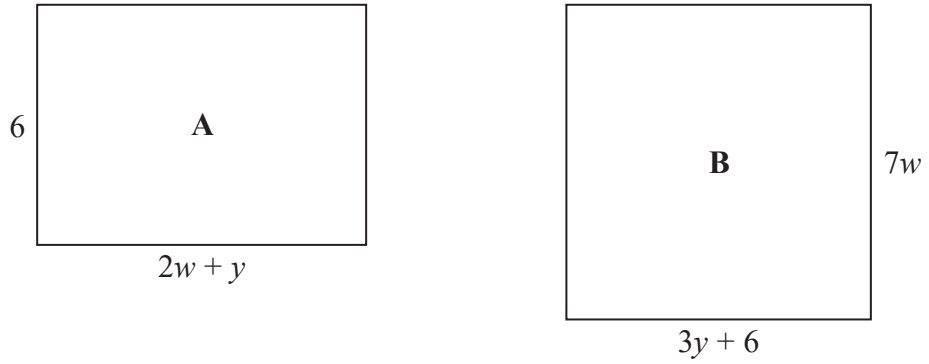
Table Of Contents

1 Solve $x^2 = 5x + 24$

.....

(Total for Question 1 is 3 marks)

2 The diagram shows two rectangles, **A** and **B**.



All measurements are in centimetres.

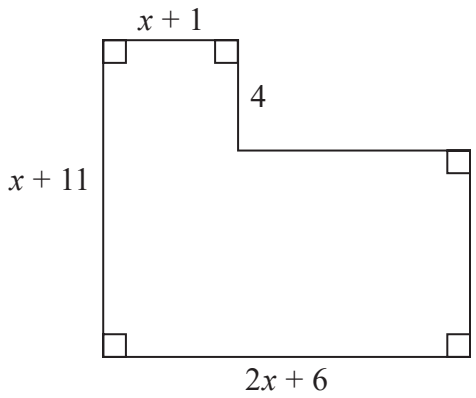
The area of rectangle **A** is equal to the area of rectangle **B**.

Find an expression for y in terms of w.

.....

(Total for Question 2 is 4 marks)

3 Here is a shape with all its measurements in centimetres.



The area of the shape is A cm^2

Show that $A = 2x^2 + 24x + 46$

(Total for Question 3 is 3 marks)

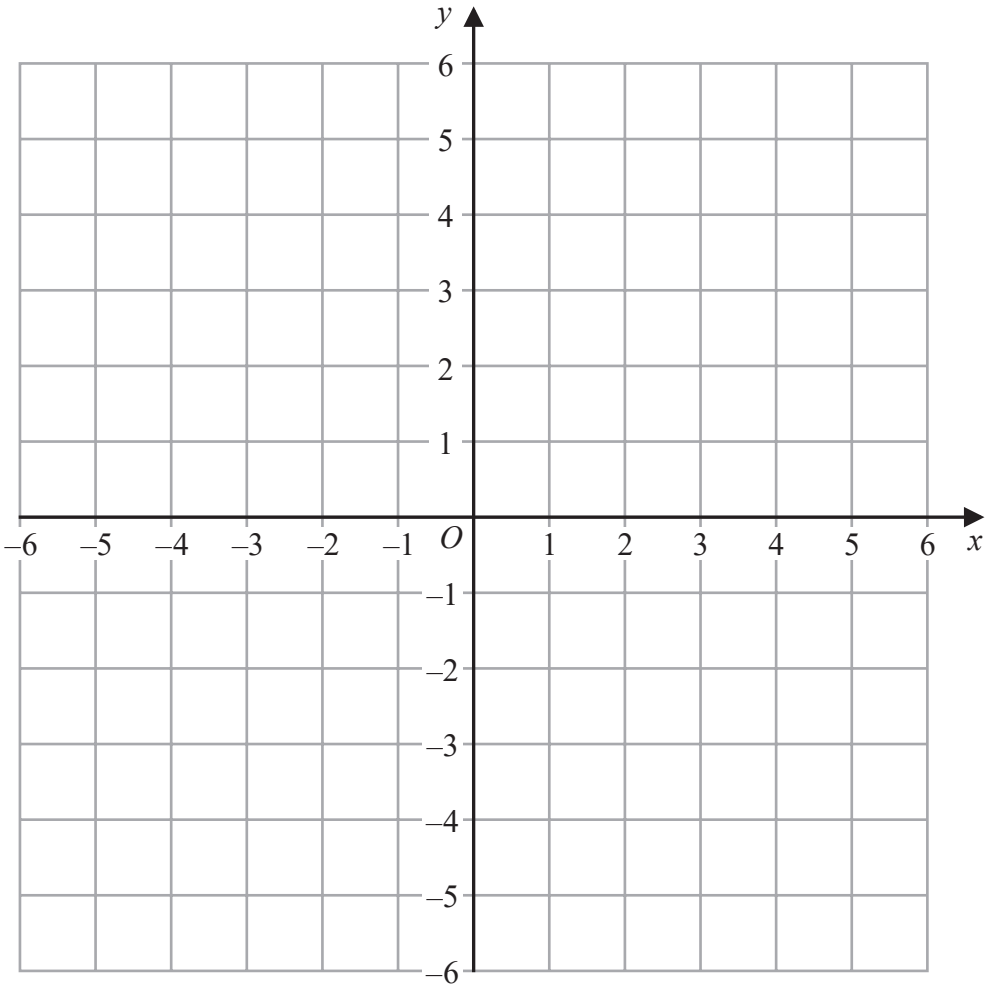
4 Show that $\frac{4x+3}{2x}+\frac{3}{5}$ can be written in the form $\frac{ax+b}{cx}$ where a, b and c are integers.

(Total for Question 4 is 3 marks)

5 On the grid show, by shading, the region that satisfies all of these inequalities.

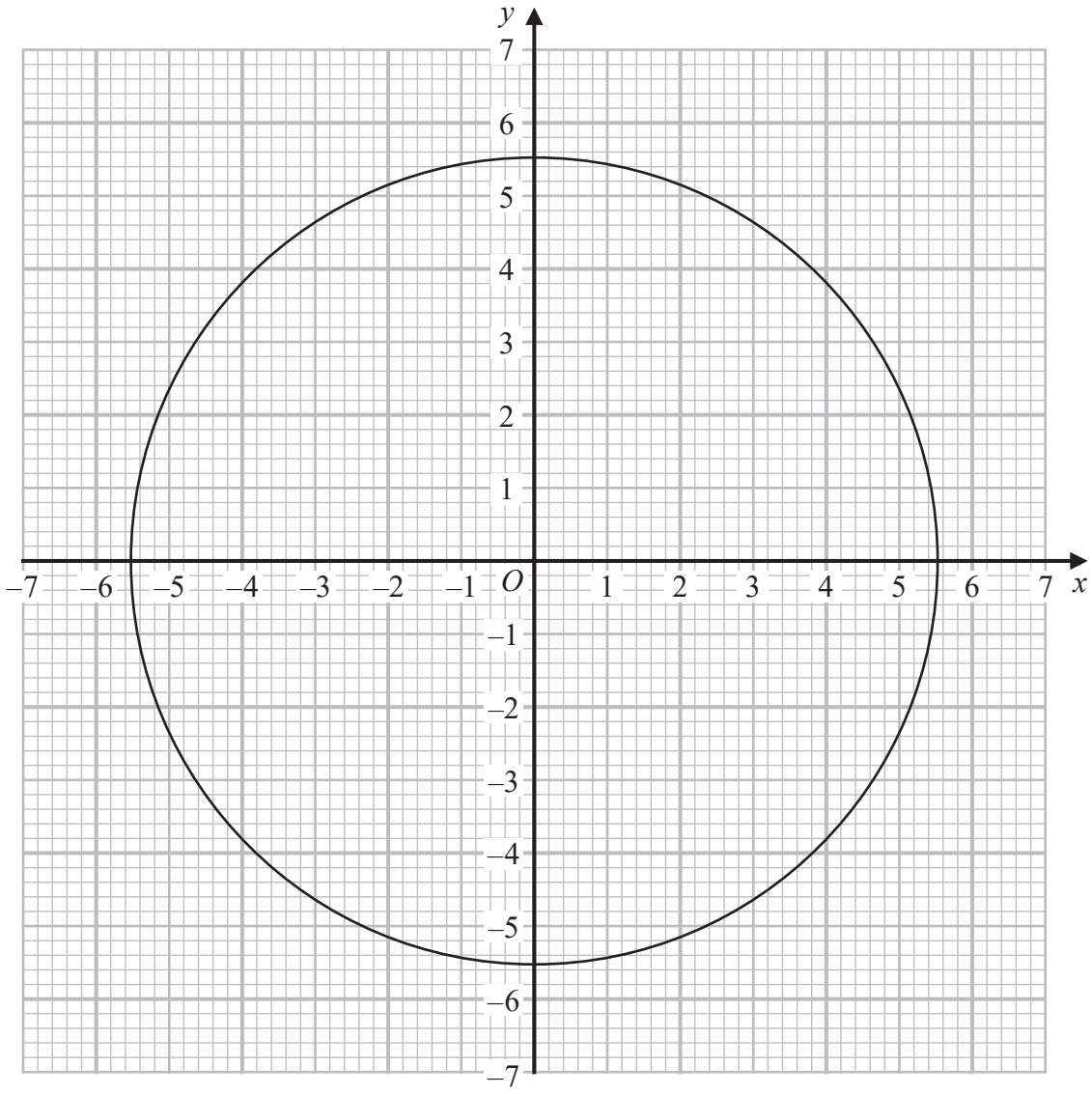
$$2y + 4 < x \qquad x < 3 \qquad y < 6 - 3x$$

Label the region **R**.



(Total for Question 5 is 3 marks)

6 The diagram shows the graph of $x^2 + y^2 = 30.25$



Use the graph to find estimates for the solutions of the simultaneous equations

$$x^2 + y^2 = 30.25$$
$$y - 2x = 1$$

.....

(Total for Question 6 is 3 marks)

7 The functions f and g are such that

$$f(x) = 3x^2 + 1 \quad \text{for } x > 0 \qquad \text{and} \qquad g(x) = \frac{4}{x^2} \quad \text{for } x > 0$$

(a) Work out gf(1)

.....

(2)

The function h is such that $h = (fg)^{-1}$

(b) Find $h(x)$

.....

(4)

(Total for Question 7 is 6 marks)

8 Find the coordinates of the turning point on the curve with equation $y = 9 + 18x - 3x^2$

You must show all your working.

(..... , ...)

(Total for Question 8 is 4 marks)

9 The first five terms of an arithmetic sequence are

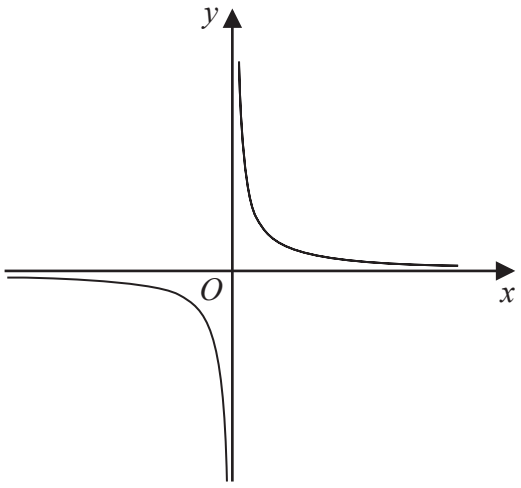
1 4 7 10 13

Write down an expression, in terms of n, for the nth term of this sequence.

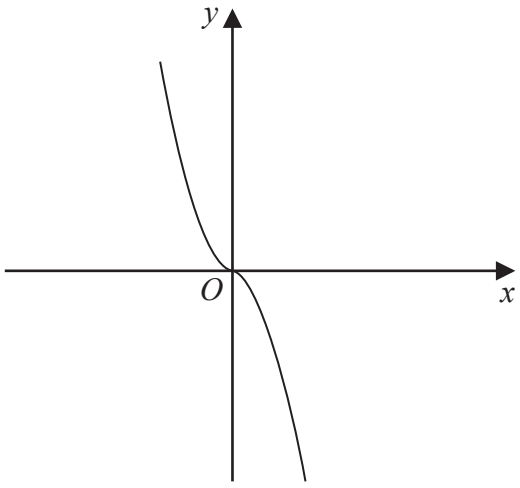
.....

(Total for Question 9 is 2 marks)

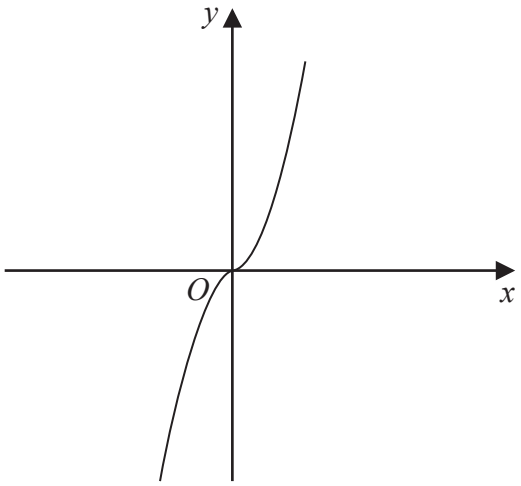
10 The diagram shows four graphs.



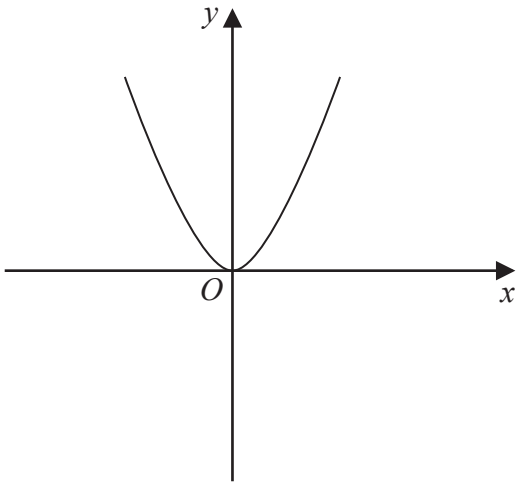
Graph **A**



Graph **B**



Graph **C**



Graph **D**

Each of the equations in the table is the equation of one of the graphs.

Complete the table.

Equation	Letter of graph
$y = -x^3$	
$y = x^3$	
$y = x^2$	
$y = \frac{1}{x}$	

(Total for Question 10 is 2 marks)

11 The straight line L_1 has equation $y = 3x - 4$
The straight line L_2 is perpendicular to L_1 and passes through the point (9, 5)

Find an equation of line L_2

.....

(Total for Question 11 is 3 marks)

12 Make f the subject of the formula $d = \dfrac{3(1 - f)}{f - 4}$

.....

(Total for Question 12 is 4 marks)

13 f and g are functions such that

$$f(x) = \frac{12}{\sqrt{x}} \quad \text{and} \quad g(x) = 3(2x + 1)$$

(a) Find g(5)

.....

(1)

(b) Find gf(9)

.....

(2)

(c) Find $g^{-1}(6)$

.....

(2)

(Total for Question 13 is 5 marks)

14 (a) Simplify $(p^2)^5$

.....

(1)

(b) Simplify $12x^7y^3 \div 6x^3y$

.....

(2)

(Total for Question 14 is 3 marks)

15 $T = \frac{q}{2} + 5$

Here is Spencer's method to make q the subject of the formula.

$2 \times T = q + 5$

$q = 2T - 5$

What mistake did Spencer make in the first line of his method?

.....

.....

.....

(Total for Question 15 is 1 mark)

---

16 (a) Write $\frac{5}{x+1} + \frac{2}{3x}$ as a single fraction in its simplest form.

.....

(2)

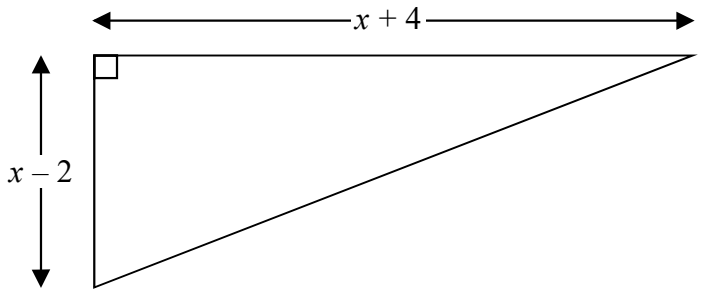
(b) Factorise $(x + y)^2 + 3(x + y)$

.....

(1)

(Total for Question 16 is 3 marks)

17 The diagram shows a right-angled triangle.



All the measurements are in centimetres.

The area of the triangle is 27.5 cm^2

Work out the length of the shortest side of the triangle.
You must show all your working.

..... cm

(Total for Question 17 is 4 marks)

18 The function f is given by

$$f(x) = 2x^3 - 4$$

(a) Show that $f^{-1}(50) = 3$

(2)

The functions g and h are given by

$$g(x) = x + 2 \text{ and } h(x) = x^2$$

(b) Find the values of x for which

$$hg(x) = 3x^2 + x - 1$$

.....

(4)

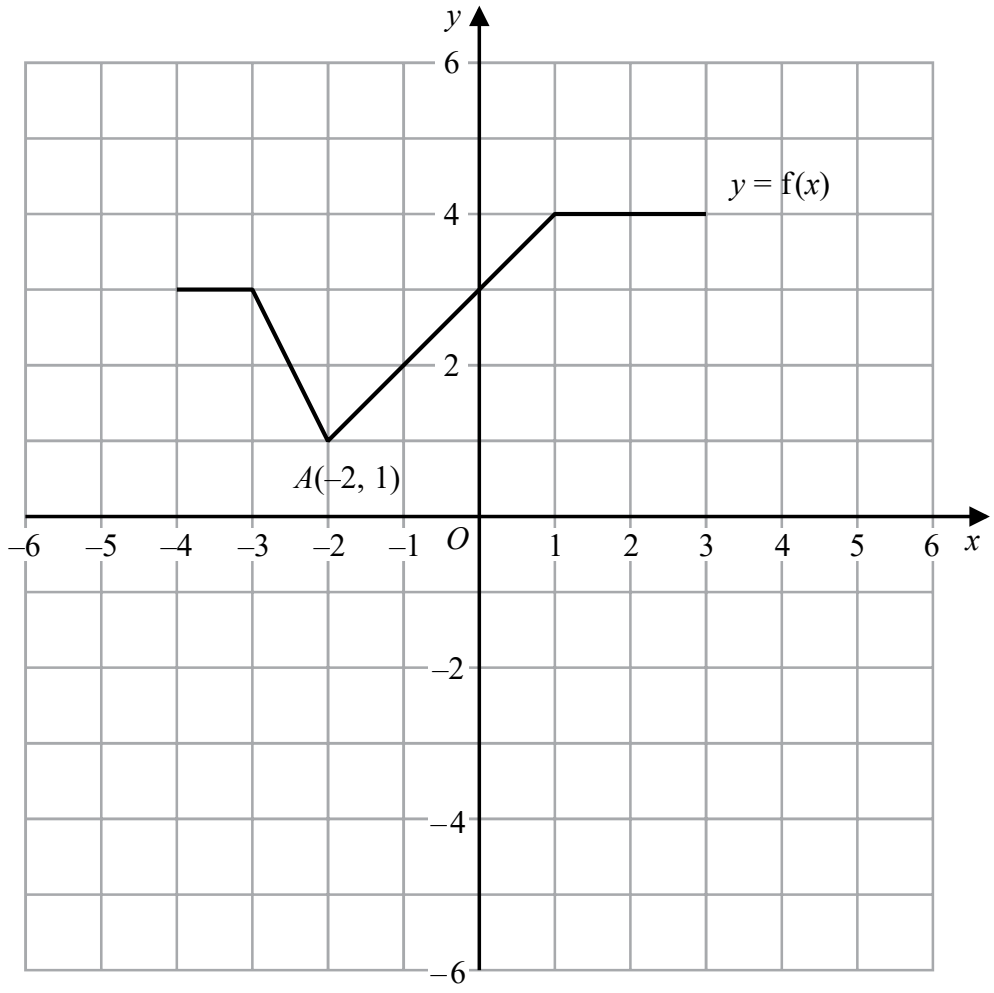
(Total for Question 18 is 6 marks)

19 Given that $9^{-\frac{1}{2}} = 27^{\frac{1}{4}} \div 3^{x+1}$
find the exact value of x.

$x =$ .....

(Total for Question 19 is 3 marks)

20 The graph of $y = f(x)$ is shown on the grid.



(a) On the grid, draw the graph with equation $y = f(x + 1) - 3$

(2)

Point $A(-2, 1)$ lies on the graph of $y = f(x)$.

When the graph of $y = f(x)$ is transformed to the graph with equation $y = f(-x)$, point A is mapped to point B.

(b) Write down the coordinates of point B.

(..... , ...)

(1)

(Total for Question 20 is 3 marks)

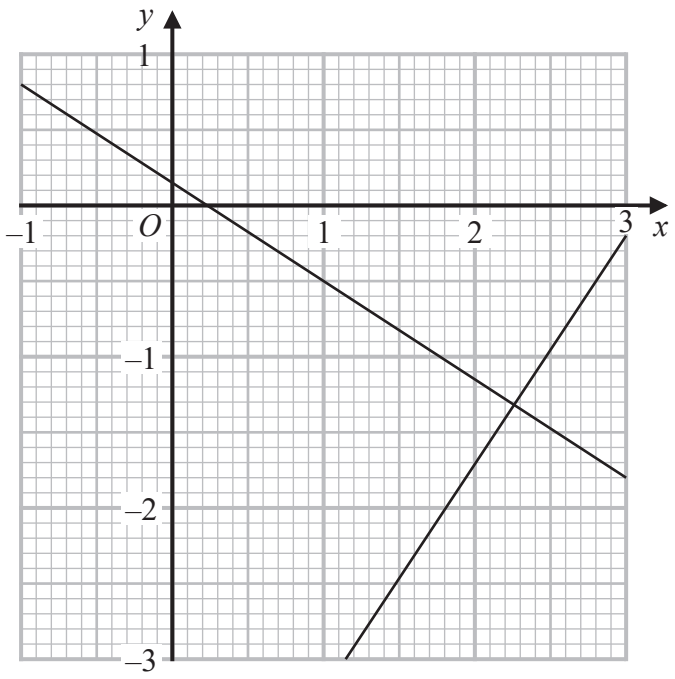
21 Sketch the graph of

$$y = 2x^2 - 8x - 5$$

showing the coordinates of the turning point and the exact coordinates of any intercepts with the coordinate axes.

(Total for Question 21 is 5 marks)

22 The graphs with equations $3y + 2x = \frac{1}{2}$ and $2y - 3x = -\frac{113}{12}$ have been drawn on the grid below.



Using the graphs, find estimates of the solutions of the simultaneous equations

$$3y + 2x = \frac{1}{2}$$

$$2y - 3x = -\frac{113}{12}$$

$x =$ .....

$y =$ .....

(Total for Question 22 is 2 marks)

23 Given that n can be any integer such that $n > 1$, prove that $n^2 - n$ is never an odd number.

(Total for Question 23 is 2 marks)

24 Given that

$$x^2 : (3x + 5) = 1 : 2$$

find the possible values of x.

.....

(Total for Question 24 is 4 marks)

25 Given that $x^2 - 6x + 1 = (x - a)^2 - b$ for all values of x,

(i) find the value of a and the value of b.

$a =$ .....

$b =$ .....

(2)

(ii) Hence write down the coordinates of the turning point on the graph of $y = x^2 - 6x + 1$

(..... , ...)

(1)

(Total for Question 25 is 3 marks)

26 The functions f and g are such that

$$f(x) = 3x - 1 \quad \text{and} \quad g(x) = x^2 + 4$$

(a) Find $f^{-1}(x)$

$f^{-1}(x) =$ .....

(2)

Given that $fg(x) = 2gf(x)$,

(b) show that $15x^2 - 12x - 1 = 0$

(5)

(Total for Question 26 is 7 marks)

27 $v^2 = u^2 + 2as$

$u = 12$ $a = -3$ $s = 18$

(a) Work out a value of v.

.....

(2)

(b) Make s the subject of $v^2 = u^2 + 2as$

.....

(2)

(Total for Question 27 is 4 marks)

28 Solve the simultaneous equations

$$5x + y = 21$$
$$x - 3y = 9$$

$x =$ .....

$y =$ .....

(Total for Question 28 is 3 marks)

29 (a) Simplify $\dfrac{x-1}{5(x-1)^2}$

.....

(1)

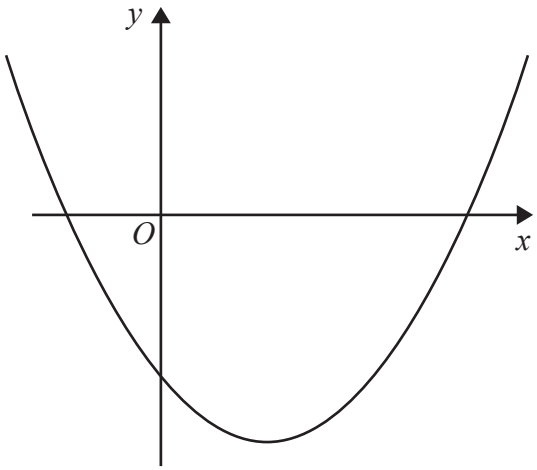
(b) Factorise fully $50 - 2y^2$

.....

(2)

(Total for Question 29 is 3 marks)

30 Here is a sketch of a curve.



The equation of the curve is $y = x^2 + ax + b$ where a and b are integers.

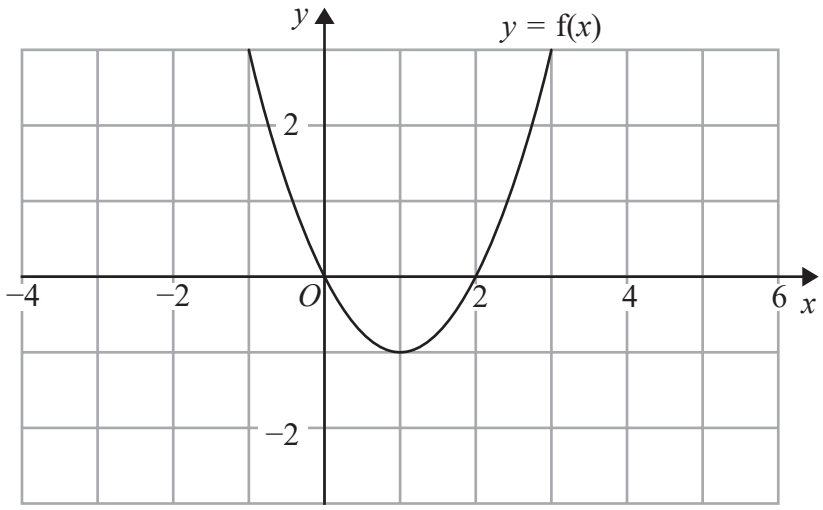
The points $(0, -5)$ and $(5, 0)$ lie on the curve.

Find the coordinates of the turning point of the curve.

(..... , ...)

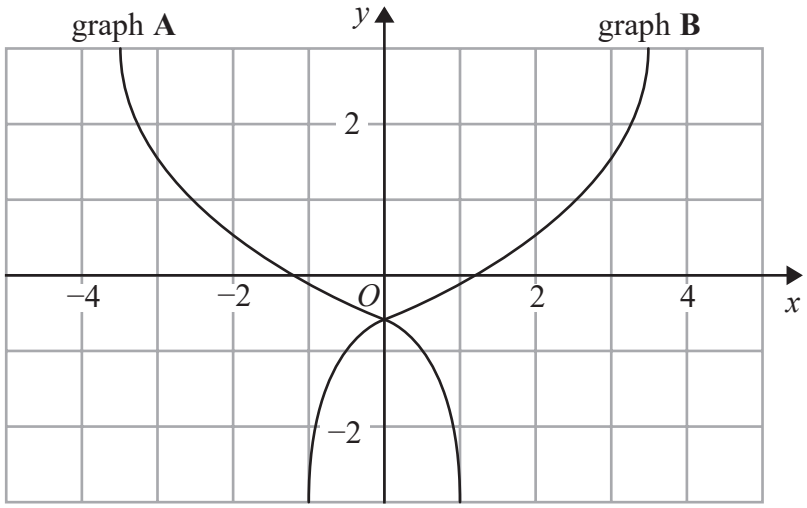
(Total for Question 30 is 4 marks)

31 The graph of $y = f(x)$ is shown on the grid below.



(a) On the grid above, sketch the graph of $y = f(x - 2)$

(1)



On the grid, graph **A** has been reflected to give graph **B**.

The equation of graph **A** is $y = g(x)$

(b) Write down the equation of graph **B**.

.....

(1)

(Total for Question 31 is 2 marks)

32 For all values of x

$$f(x) = (x + 1)^2 \quad \text{and} \quad g(x) = 2(x - 1)$$

(a) Show that $gf(x) = 2x(x + 2)$

(2)

(b) Find $g^{-1}(7)$

.....

(2)

(Total for Question 32 is 4 marks)

33 Prove that the square of an odd number is always 1 more than a multiple of 4

(Total for Question 33 is 4 marks)

34 (a) Factorise $a^2 - b^2$

.....

(1)

(b) Hence, or otherwise, simplify fully $(x^2 + 4)^2 - (x^2 - 2)^2$

.....

(3)

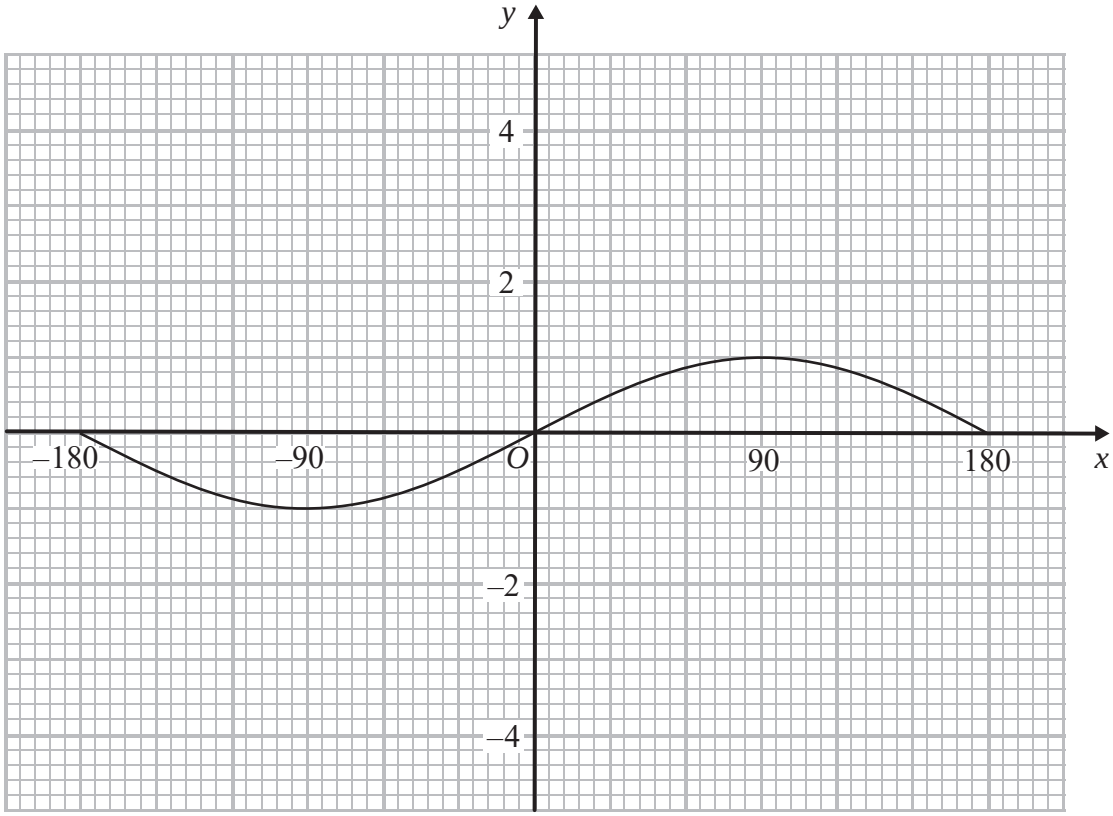
(Total for Question 34 is 4 marks)

35 Simplify fully $\dfrac{3x^2 - 8x - 3}{2x^2 - 6x}$

.....

(Total for Question 35 is 3 marks)

36 Here is the graph of $y = \sin x°$ for $-180 \leqslant x \leqslant 180$



On the grid, sketch the graph of $y = \sin x° - 2$ for $-180 \leqslant x \leqslant 180$

(Total for Question 36 is 2 marks)

37 The point P has coordinates (3, 4)
The point Q has coordinates (a, b)

A line perpendicular to PQ is given by the equation $3x + 2y = 7$

Find an expression for b in terms of a.

.....

(Total for Question 37 is 5 marks)

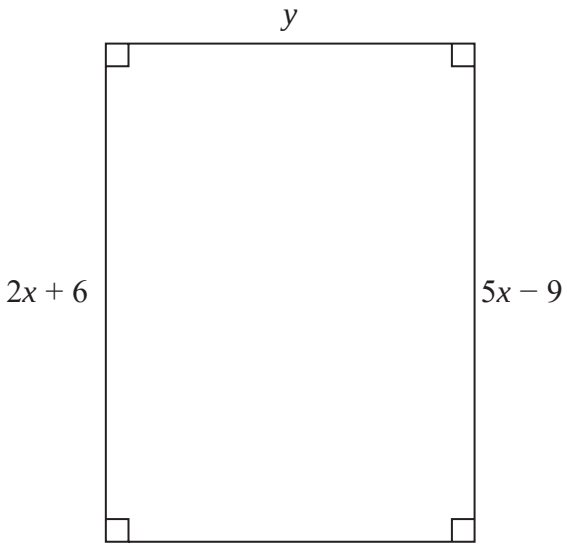
38 n is an integer such that $3n + 2 \leqslant 14$ and $\dfrac{6n}{n^2 + 5} > 1$

Find all the possible values of n.

.....

(Total for Question 38 is 5 marks)

39 Here is a rectangle.



All measurements are in centimetres.

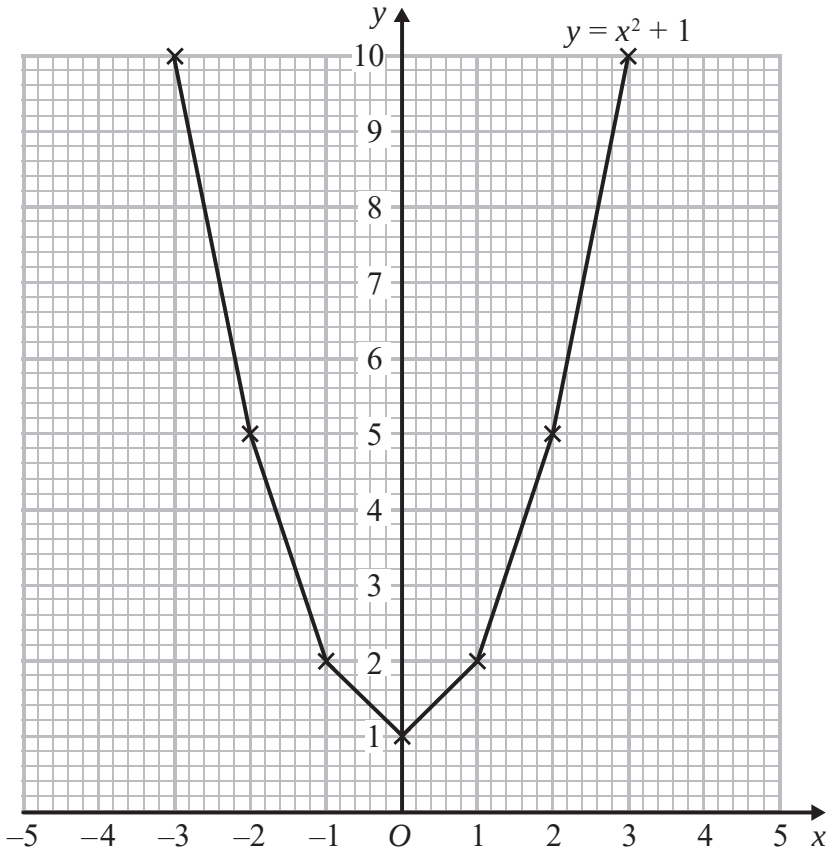
The area of the rectangle is 48 cm^2.

Show that $y = 3$

(Total for Question 39 is 4 marks)

40 Brogan needs to draw the graph of $y = x^2 + 1$

Here is her graph.



Write down one thing that is wrong with Brogan's graph.

.....

.....

(Total for Question 40 is 1 mark)

41 3 teas and 2 coffees have a total cost of £7.80
5 teas and 4 coffees have a total cost of £14.20

Work out the cost of one tea and the cost of one coffee.

tea £.....

coffee £.....

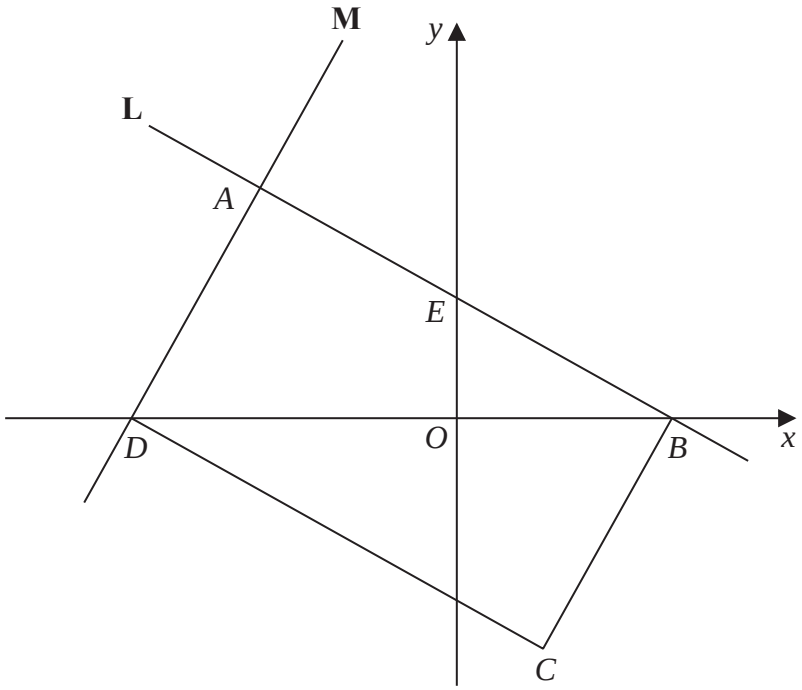
(Total for Question 41 is 4 marks)

42 n is an integer.

Prove algebraically that the sum of $\frac{1}{2}n(n+1)$ and $\frac{1}{2}(n+1)(n+2)$ is always a square number.

(Total for Question 42 is 2 marks)

43



ABCD is a rectangle.

A, *E* and *B* are points on the straight line **L** with equation $x + 2y = 12$
A and *D* are points on the straight line **M**.

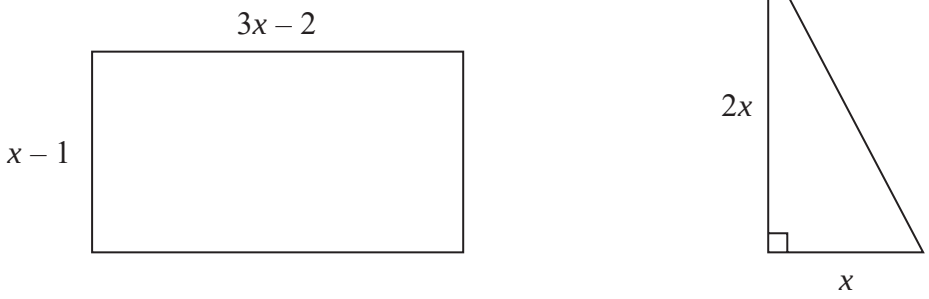
$AE = EB$

Find an equation for **M**.

.....

(Total for Question 43 is 4 marks)

44 Here is a rectangle and a right-angled triangle.



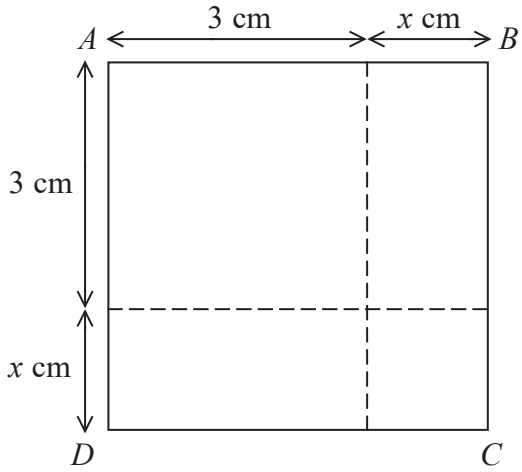
All measurements are in centimetres.
The area of the rectangle is greater than the area of the triangle.

Find the set of possible values of x.

.....

(Total for Question 44 is 5 marks)

45



The area of square $ABCD$ is 10 cm^2.

Show that $x^2 + 6x = 1$

(Total for Question 45 is 3 marks)

46 The equation of the line L_1 is $y = 3x - 2$
The equation of the line L_2 is $3y - 9x + 5 = 0$

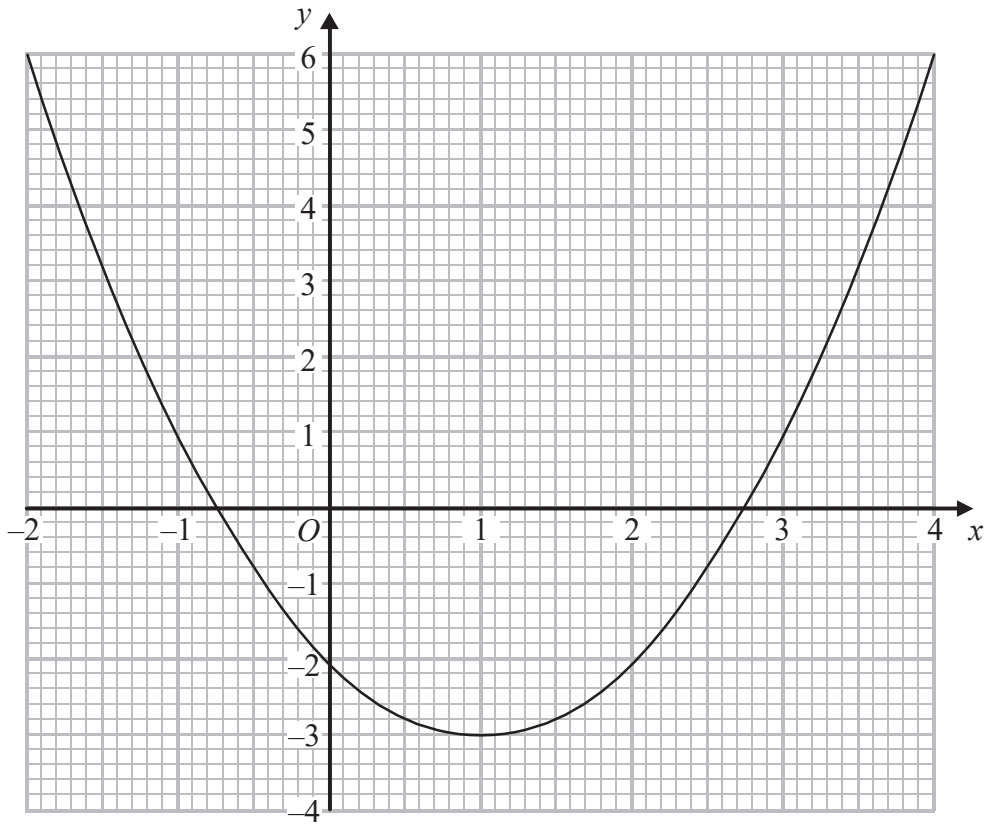
Show that these two lines are parallel.

(Total for Question 46 is 2 marks)

47 Show that $(x + 1)(x + 2)(x + 3)$ can be written in the form $ax^3 + bx^2 + cx + d$ where a, b, c and d are positive integers.

(Total for Question 47 is 3 marks)

48 The graph of $y = f(x)$ is drawn on the grid.



(a) Write down the coordinates of the turning point of the graph.

(..... , ...)

(1)

(b) Write down estimates for the roots of $f(x) = 0$

.....

(1)

(c) Use the graph to find an estimate for $f(1.5)$

.....

(1)

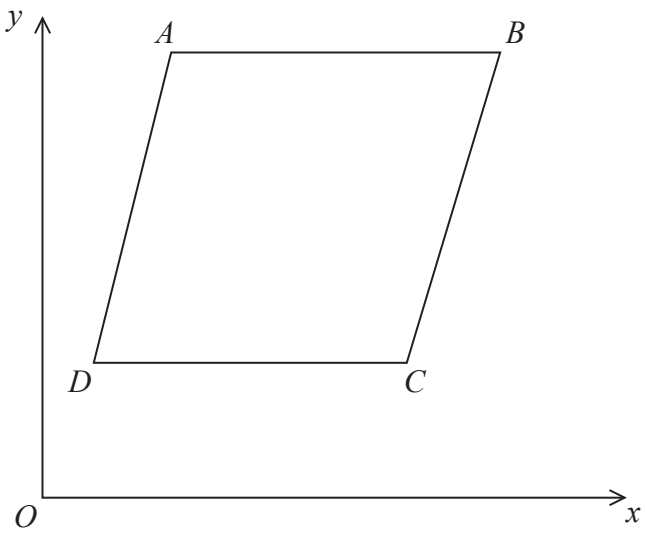
(Total for Question 48 is 3 marks)

49 n is an integer greater than 1

Prove algebraically that $n^2 - 2 - (n - 2)^2$ is always an even number.

(Total for Question 49 is 4 marks)

50



ABCD is a rhombus.
The coordinates of *A* are $(5, 11)$
The equation of the diagonal *DB* is $y = \frac{1}{2}x + 6$

Find an equation of the diagonal *AC*.

.....

(Total for Question 50 is 4 marks)

51 Solve algebraically the simultaneous equations

$$x^2 + y^2 = 25$$
$$y - 3x = 13$$

.....

(Total for Question 51 is 5 marks)

52 Expand and simplify $(m + 7)(m + 3)$

.....

(Total for Question 52 is 2 marks)

53 Factorise fully $20x^2 - 5$

.....

(Total for Question 53 is 2 marks)

54 Make a the subject of $a + 3 = \frac{2a + 7}{r}$

.....

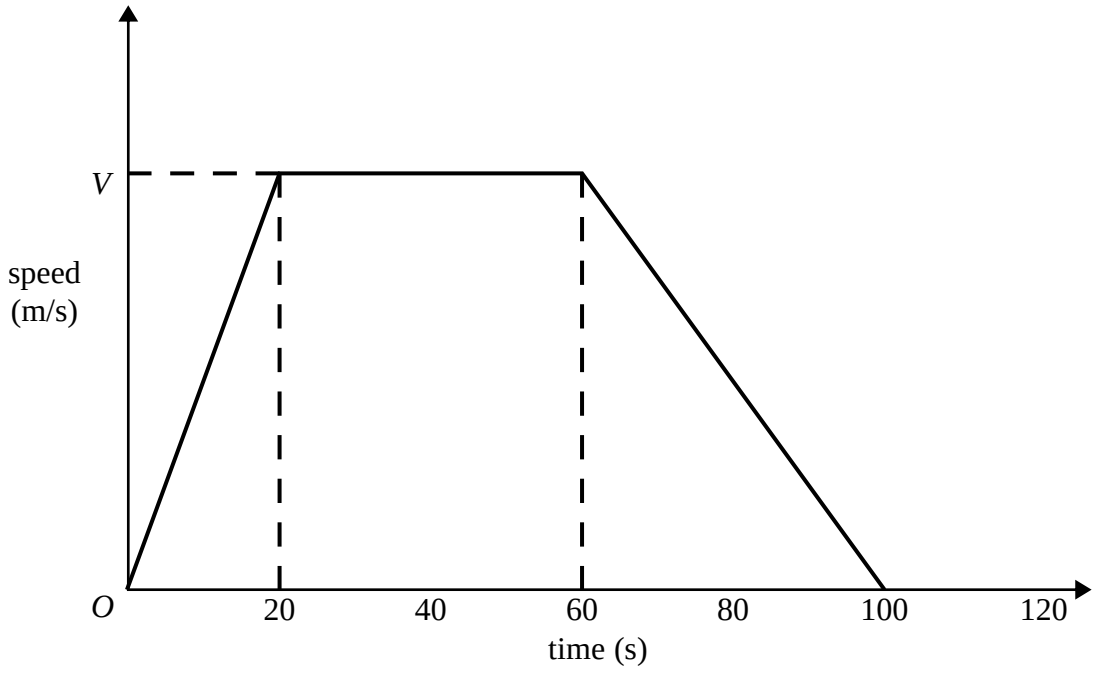
(Total for Question 54 is 3 marks)

55 Solve $x^2 > 3x + 4$

.....

(Total for Question 55 is 3 marks)

56 Here is a speed-time graph for a car journey.
The journey took 100 seconds.



The car travelled 1.75 km in the 100 seconds.

(a) Work out the value of *V*.

.....

(3)

(b) Describe the acceleration of the car for each part of this journey.

.....

.....

.....

.....

(2)

(Total for Question 56 is 5 marks)

57 $A(-2, 1)$, $B(6, 5)$ and $C(4, k)$ are the vertices of a right-angled triangle ABC.
Angle ABC is the right angle.

Find an equation of the line that passes through A and C.
Give your answer in the form $ay + bx = c$ where a, b and c are integers.

.....

(Total for Question 57 is 5 marks)

58 $m = \sqrt{\dfrac{k^3 + 1}{4}}$

Make k the subject of the formula.

.....

(Total for Question 58 is 3 marks)

59 Solve $\frac{x+2}{3x} + \frac{x-2}{2x} = 3$

$x =$ .....

(Total for Question 59 is 3 marks)

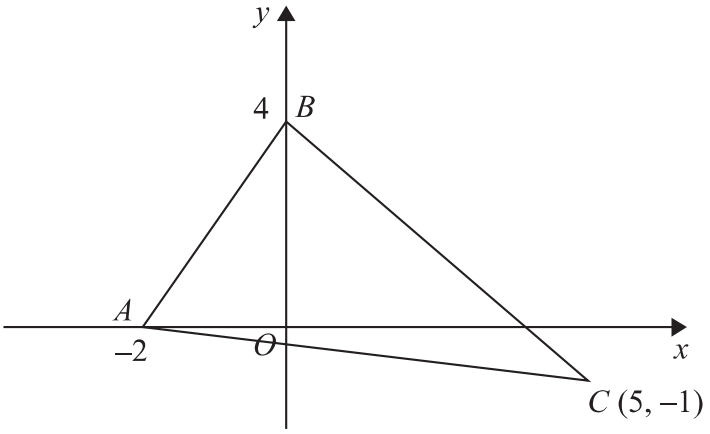
60 Show that $\frac{2x^2 - 3x - 5}{x^2 + 6x + 5}$ can be written in the form $\frac{ax + b}{cx + d}$ where a, b, c and d are integers.

(Total for Question 60 is 3 marks)

61 Prove algebraically that the difference between the squares of any two consecutive integers is equal to the sum of these two integers.

(Total for Question 61 is 4 marks)

62



Find an equation of the line that passes through C and is perpendicular to AB.

.....

(Total for Question 62 is 4 marks)

63 (a) Factorise $y^2 + 27y$

.....

(1)

(b) Simplify $(t^3)^2$

.....

(1)

(c) Simplify $\frac{w^9}{w^4}$

.....

(1)

(Total for Question 63 is 3 marks)

64 Solve $x^2 - 6x - 8 = 0$

Write your answer in the form $a \pm \sqrt{b}$ where a and b are integers.

.....

(Total for Question 64 is 3 marks)

65 Show that $\frac{3x + 6}{x^2 - 3x - 10} \div \frac{x + 5}{x^3 - 25x}$ simplifies to ax where a is an integer.

(Total for Question 65 is 4 marks)

66 Solve the inequality $x^2 > 3(x + 6)$

.....

(Total for Question 66 is 4 marks)

67 The line l is a tangent to the circle $x^2 + y^2 = 40$ at the point A.
A is the point (2, 6).

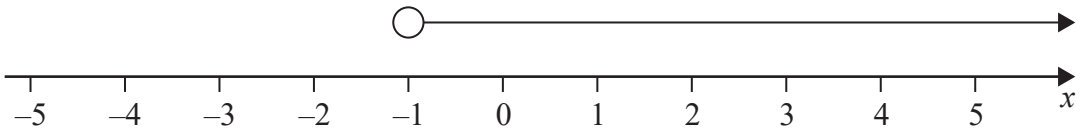
The line l crosses the x-axis at the point P.

Work out the area of triangle OAP.

.....

(Total for Question 67 is 5 marks)

68 (a) Write down the inequality shown on this number line.



.....

(1)

(b) On the number line below, show the inequality $-3 \leqslant y < 4$

(2)

(Total for Question 68 is 3 marks)

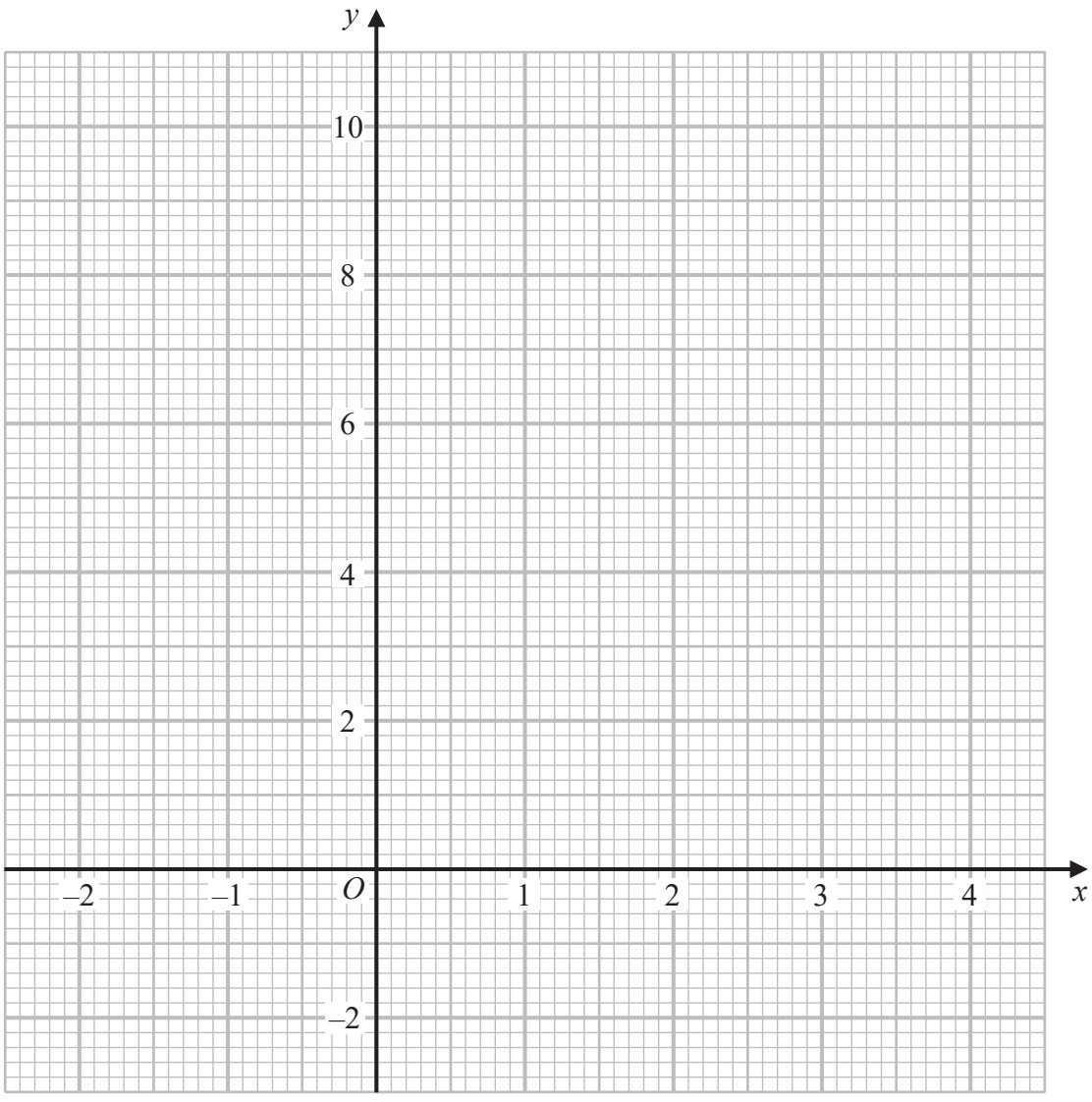
69 (a) Complete the table of values for $y = x^2 - 2x + 2$

x	–2	–1	0	1	2	3	4
y	10		2			5	

(2)

(b) On the grid, draw the graph of $y = x^2 - 2x + 2$ for values of x from –2 to 4

(2)



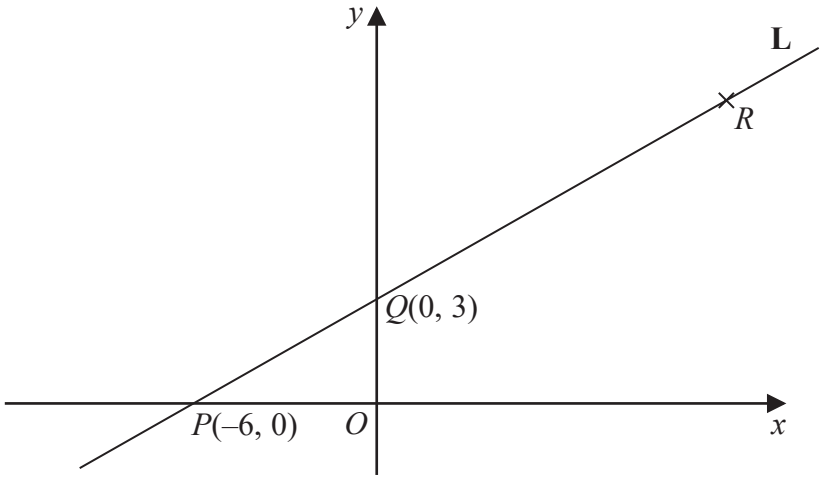
(c) Use your graph to find estimates of the solutions of the equation $x^2 - 2x + 2 = 4$

.....

(2)

(Total for Question 69 is 6 marks)

70 Here is a sketch of the line **L**.



The points $P(-6, 0)$ and $Q(0, 3)$ are points on the line **L**.

The point R is such that PQR is a straight line and $PQ : QR = 2 : 3$

(a) Find the coordinates of R.

(..... , ...)

(2)

(b) Find an equation of the line that is perpendicular to **L** and passes through Q.

.....

(3)

(Total for Question 70 is 5 marks)

71 Expand and simplify $(x - 2)(3x + 2)(2x + 3)$

.....

(Total for Question 71 is 3 marks)

72 (a) Use the iteration formula $x_{n+1} = \sqrt[3]{10 - 2x_n}$ to find the values of x_1, x_2 and x_3
Start with $x_0 = 2$

$x_1 =$ .....

$x_2 =$ .....

$x_3 =$ .....

(3)

The values of x_1, x_2 and x_3 found in part (a) are estimates of the solution of an equation of the form $x^3 + ax + b = 0$ where a and b are integers.

(b) Find the value of a and the value of b.

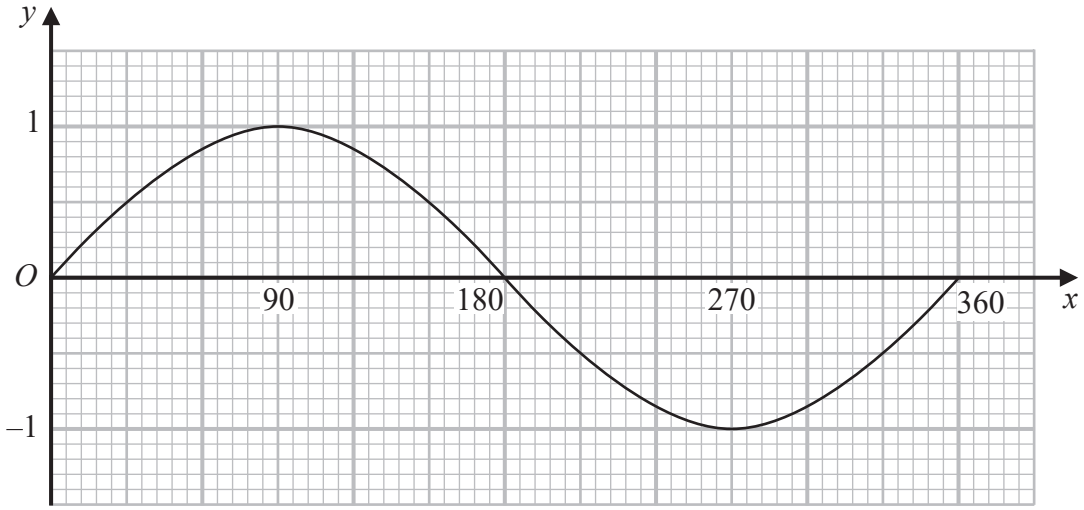
$a =$ .....

$b =$ .....

(1)

(Total for Question 72 is 4 marks)

73 Here is a graph of $y = \sin x°$ for $0 \leqslant x \leqslant 360$



(a) Using this graph, find estimates of all **four** solutions of

$$\sin x° = 0.6 \quad \text{for } 0 \leqslant x \leqslant 720$$

.....

(2)

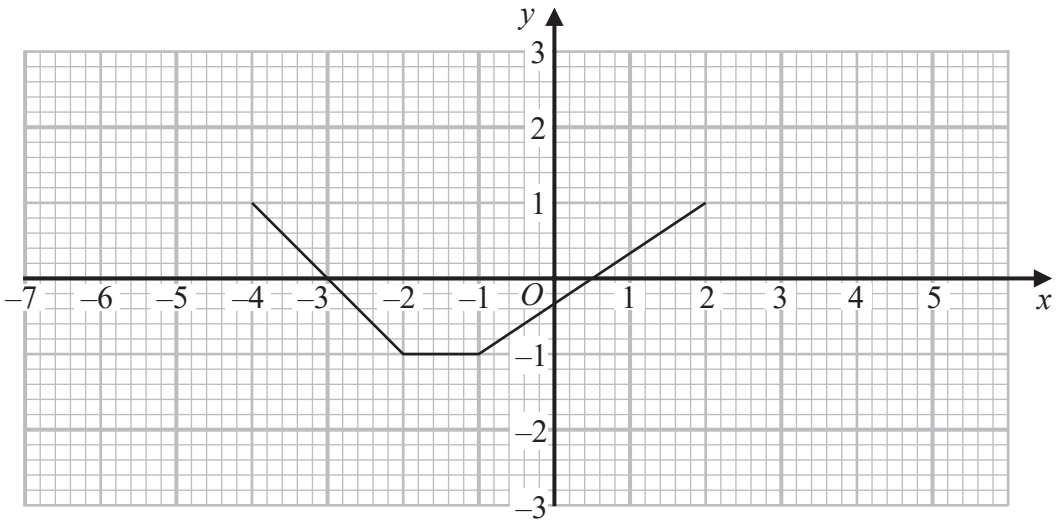
The graph of $y = \sin x°$ is reflected in the x-axis.

(b) Write down an equation of the reflected graph.

.....

(1)

Here is a graph of $y = f(x)$



(c) On the grid, draw the graph of $y = f(x – 2)$

(1)

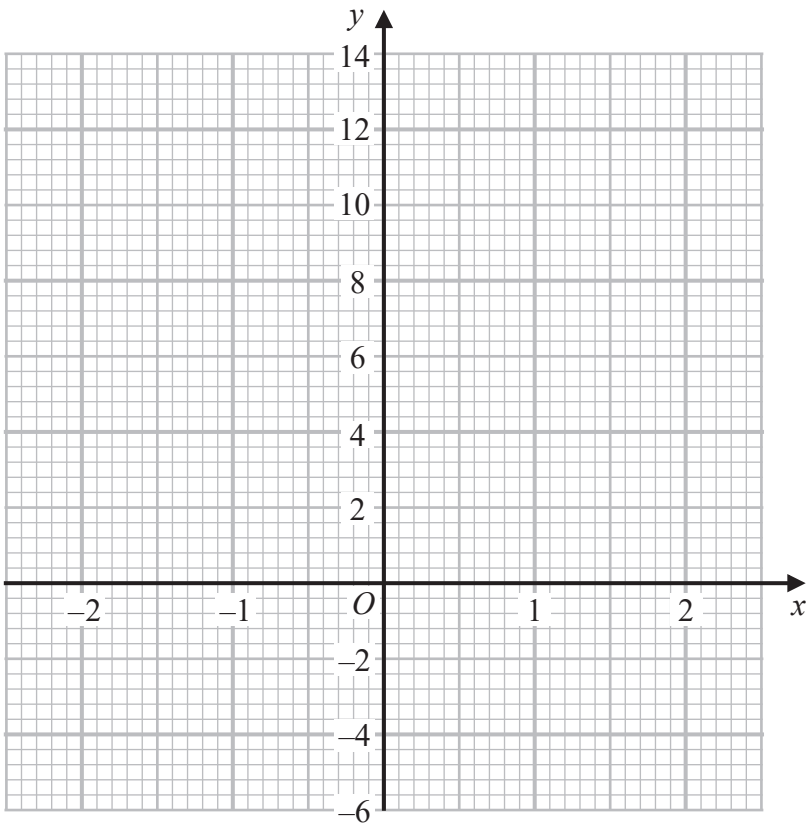
(Total for Question 73 is 4 marks)

74 (a) Complete the table of values for $y = 5 - x^3$

x	–2	–1	0	1	2
y		6			

(2)

(b) On the grid below, draw the graph of $y = 5 - x^3$ for values of x from –2 to 2



(2)

(Total for Question 74 is 4 marks)

75 (a) Simplify $\left(\frac{1}{m^2}\right)^0$

.....

(1)

(b) Simplify $\frac{8(x-4)}{(x-4)^2}$

.....

(1)

(c) Simplify $(3n^4w^2)^3$

.....

(2)

(Total for Question 75 is 4 marks)

76 Here are the first five terms of a quadratic sequence.

10 21 38 61 90

Find an expression, in terms of n, for the nth term of this sequence.

.....

(Total for Question 76 is 3 marks)

77 Write down the coordinates of the turning point on the graph of $y = (x + 12)^2 - 7$

(..... , ...)

(Total for Question 77 is 1 mark)

78 A hot air balloon is descending.
The height of the balloon n minutes after it starts to descend is h_n metres.

The height of the balloon $(n+1)$ minutes after it starts to descend, h_{n+1} metres, is given by

$$h_{n+1} = K \times h_n + 20 \quad \text{where } K \text{ is a constant.}$$

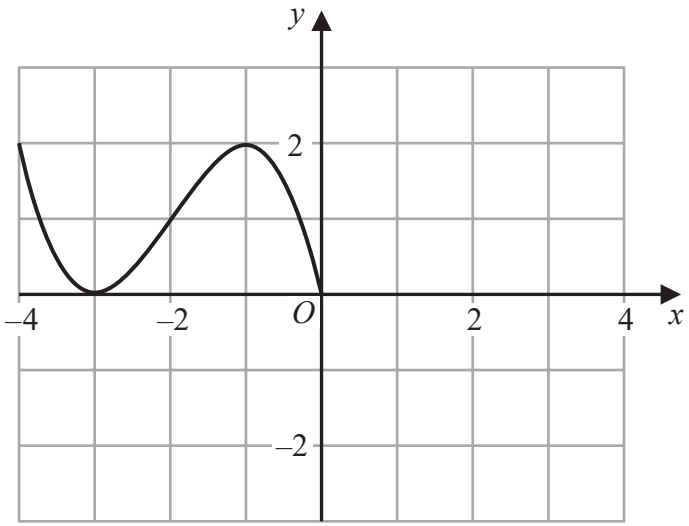
The balloon starts to descend from a height of 1200 metres at 09 15
At 09 16 the height of the balloon is 1040 metres.

Work out the height of the balloon at 09 18

..... m

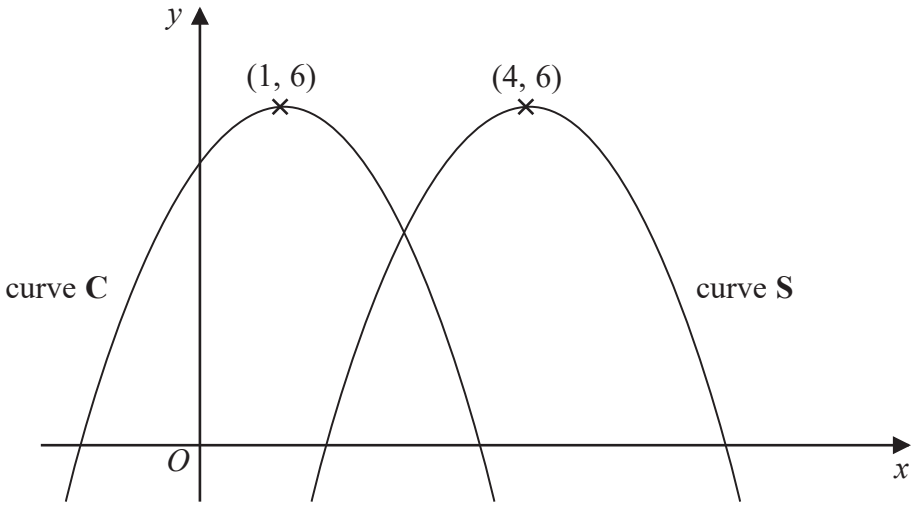
(Total for Question 78 is 4 marks)

79 The graph of the curve with equation $y = f(x)$ is shown on the grid below.



(a) On the grid above, sketch the graph of the curve with equation $y = f(-x)$

(2)



The curve **C** with equation $y = 5 + 2x - x^2$ is transformed by a translation to give the curve **S** such that the point (1, 6) on **C** is mapped to the point (4, 6) on **S**.

(b) Find an equation for **S**.

.....

(2)

(Total for Question 79 is 4 marks)

80 **C** is a circle with centre the origin.

A tangent to **C** passes through the points (–20, 0) and (0, 10)

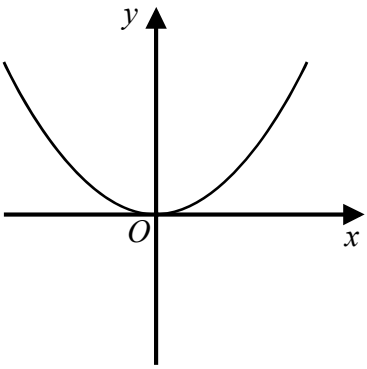
Work out an equation of **C**.
You must show all your working.

.....

(Total for Question 80 is 5 marks)

81 Here are six graphs.

A



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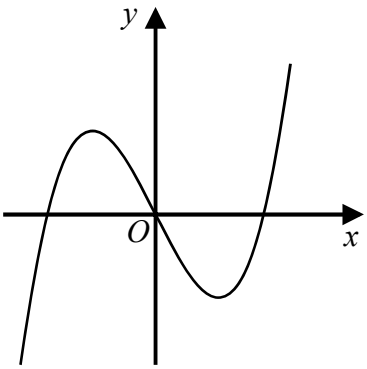
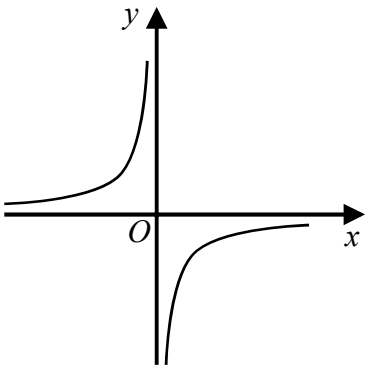


C



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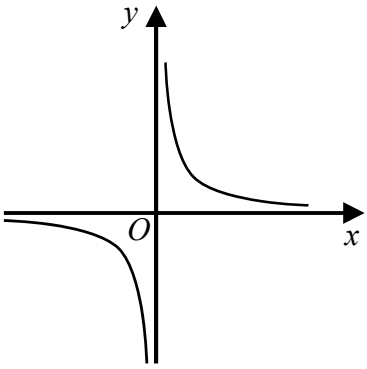

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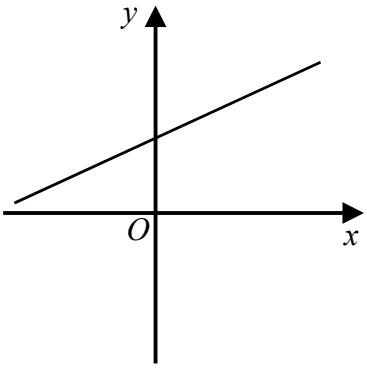

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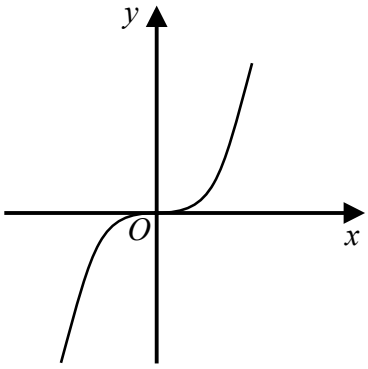


Write down the letter of the graph that could have the equation

(a) $y = x^3$

.....

(1)

(b) $y = \frac{1}{x}$

.....

(1)

(Total for Question 81 is 2 marks)

82 The nth term of a sequence is $2n^2 - 1$

The nth term of a different sequence is $40 - n^2$

Show that there is only one number that is in both of these sequences.

(Total for Question 82 is 3 marks)

83 Make k the subject of the formula $y = \sqrt{2m - k}$

.....

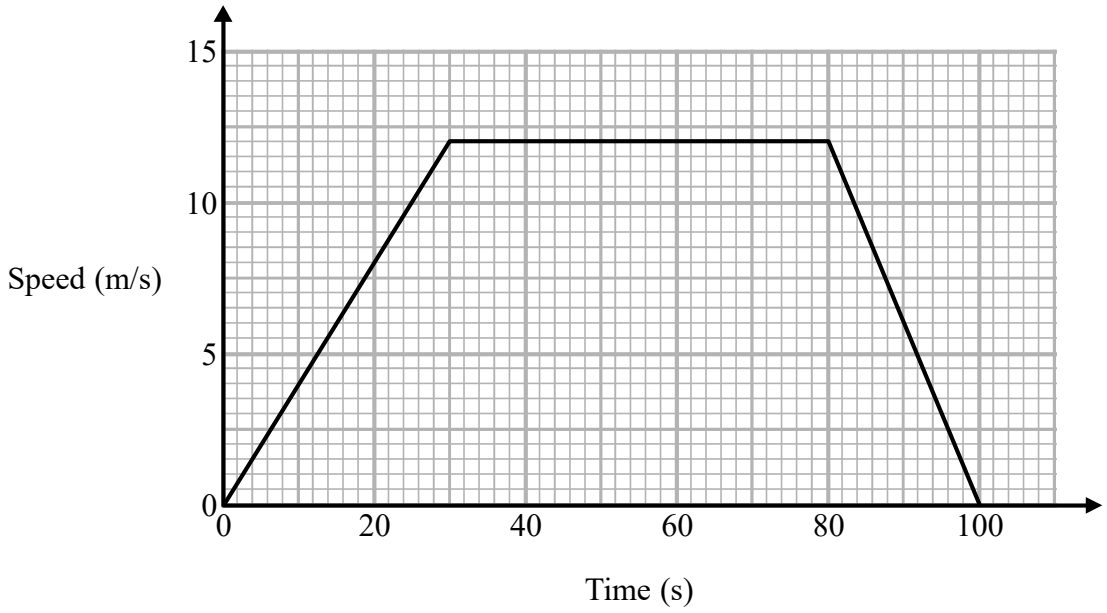
(Total for Question 83 **is 2 marks)**

84 Expand and simplify $(3x + 2)(2x + 1)(x - 5)$

.....

(Total for Question 84 **is 3 marks)**

85 Here is a speed-time graph for a train journey between two stations.
The journey took 100 seconds.



(a) Calculate the time taken by the train to travel half the distance between the two stations.
You must show all your working.

..... seconds
(4)

(b) Compare the acceleration of the train during the first part of its journey with the acceleration of the train during the last part of its journey.

.....

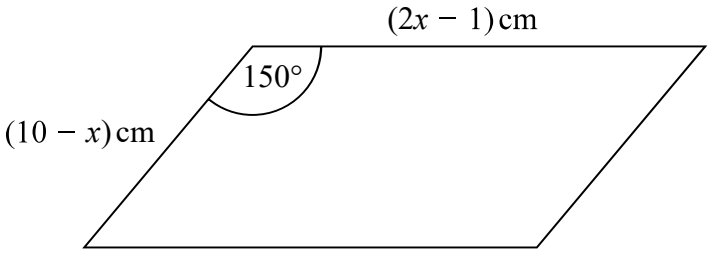
.....

.....

(1)

(Total for Question 85 is 5 marks)

86 The diagram shows a parallelogram.



The area of the parallelogram is greater than 15 cm^2

(a) Show that $2x^2 - 21x + 40 < 0$

(3)

(b) Find the range of possible values of x.

.....

(3)

(Total for Question 86 is 6 marks)

87 The straight line **L** has equation $3x + 2y = 17$

The point A has coordinates (0, 2)
The straight line **M** is perpendicular to **L** and passes through A.

Line **L** crosses the y-axis at the point B.
Lines **L** and **M** intersect at the point C.

Work out the area of triangle ABC.
You must show all your working.

.....

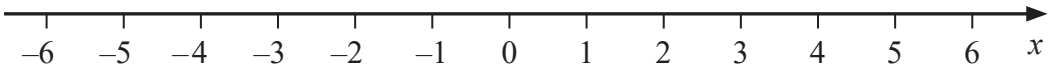
(Total for Question 87 is 5 marks)

88 (a) Solve $14n > 11n + 6$

.....

(2)

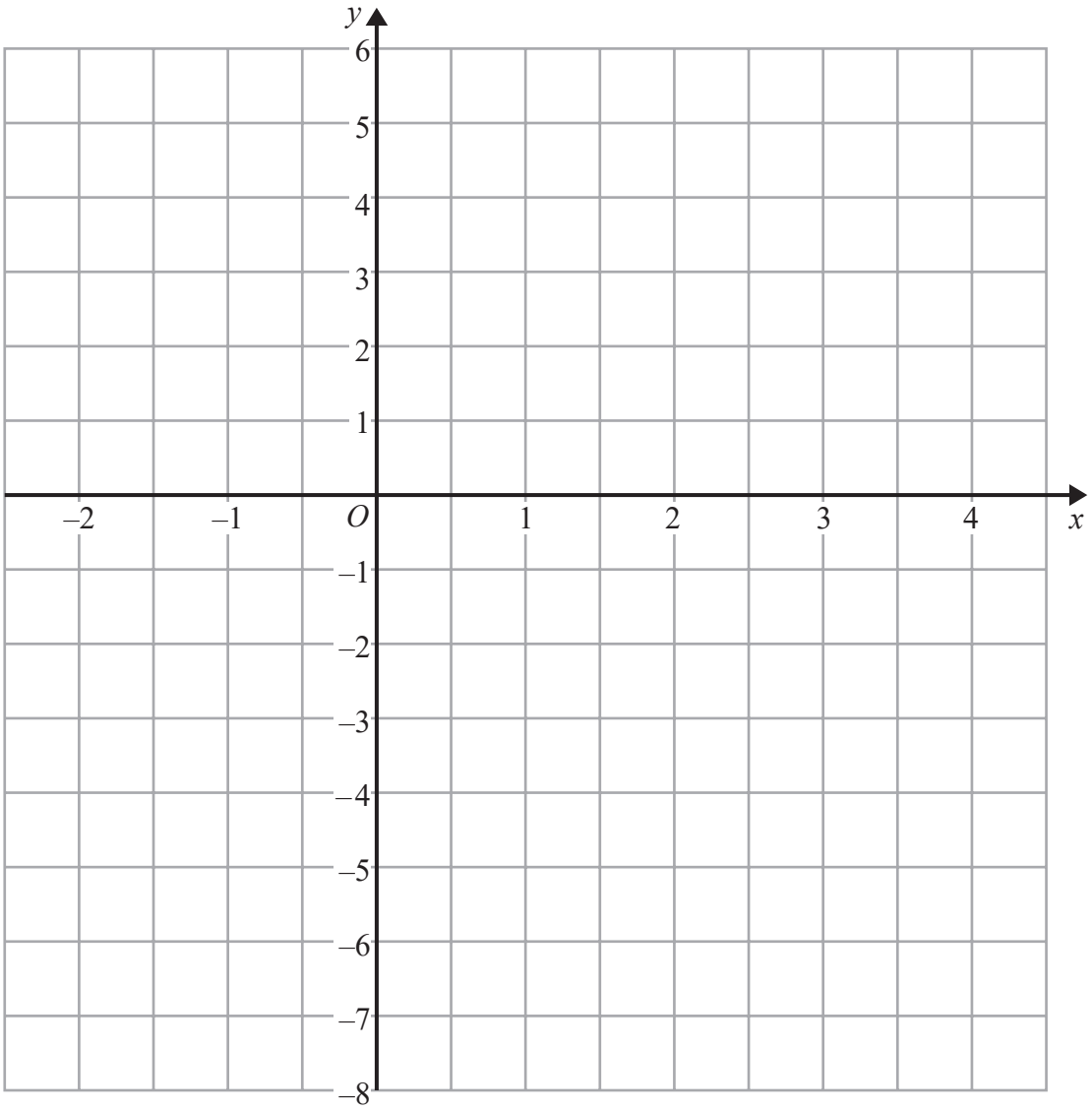
(b) On the number line below, show the set of values of x for which $-2 < x + 3 \leqslant 4$



(3)

(Total for Question 88 is 5 marks)

89 On the grid below, draw the graph of $y = 2x - 3$ for values of x from -2 to 4



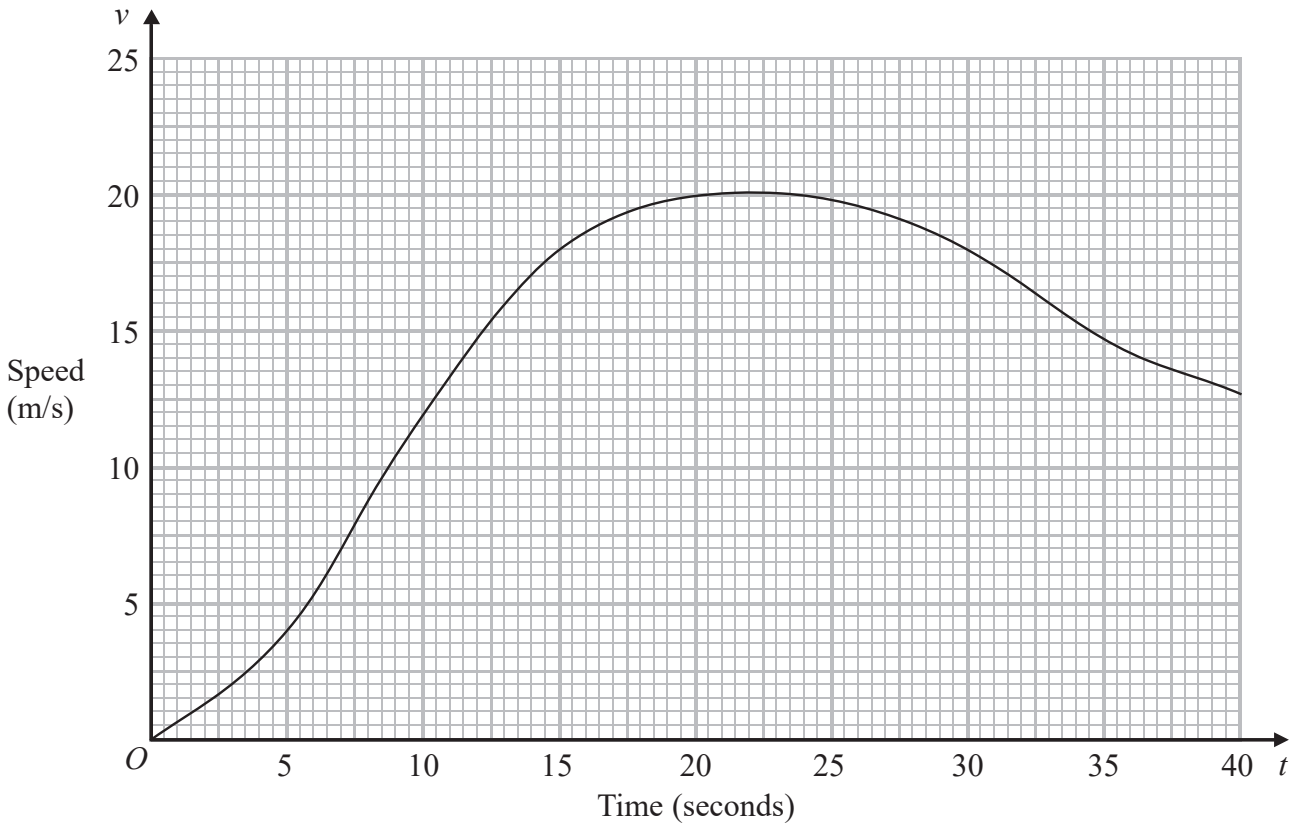
(Total for Question 89 is 3 marks)

90 Show that $6 + \left[(x + 5) \div \frac{x^2 + 3x - 10}{x - 1} \right]$ simplifies to $\frac{ax - b}{cx - d}$ where a, b, c and d are integers.

(Total for Question 90 is 4 marks)

91 A car moves from rest.

The graph gives information about the speed, v metres per second, of the car t seconds after it starts to move.



(a) (i) Calculate an estimate of the gradient of the graph at $t = 15$

.....

(3)

(ii) Describe what your answer to part (i) represents.

.....

(1)

(b) Work out an estimate for the distance the car travels in the first 20 seconds of its journey.
Use 4 strips of equal width.

.....m

(3)

(Total for Question 91 is 7 marks)

92 Make m the subject of the formula $f = \dfrac{3m + 4}{m - 1}$

.....

(Total for Question 92 is 3 marks)

93 The straight line **L** has the equation $3y = 4x + 7$
The point A has coordinates $(3, -5)$

Find an equation of the straight line that is perpendicular to **L** and passes through A.

.....

(Total for Question 93 is 3 marks)

94 A is the point with coordinates (5, 9)
B is the point with coordinates (d, 15)

The gradient of the line AB is 3

Work out the value of d.

.....

(Total for Question 94 is 3 marks)

95 (a) Write $\frac{4x^2 - 9}{6x + 9} \times \frac{2x}{x^2 - 3x}$ in the form $\frac{ax + b}{cx + d}$ where a, b, c and d are integers.

.....

(3)

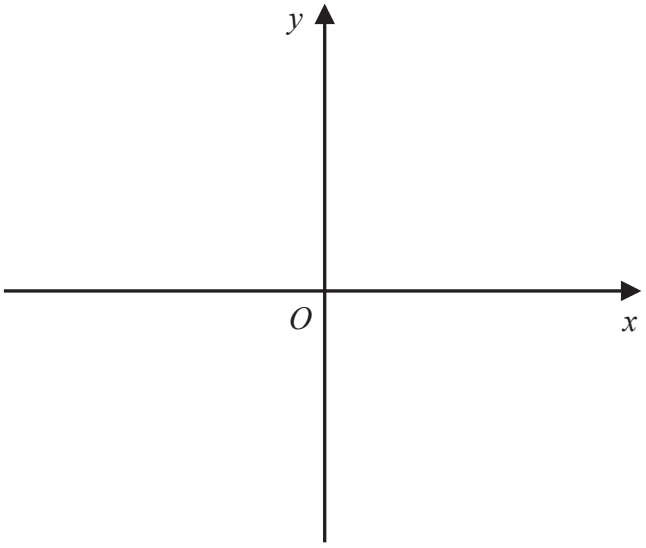
(b) Express $\frac{3}{x+1} + \frac{1}{x-2} - \frac{4}{x}$ as a single fraction in its simplest form.

.....

(3)

(Total for Question 95 is 6 marks)

96 On the grid, sketch the curve with equation $y = 2^x$
Give the coordinates of any points of intersection with the axes.



(Total for Question 96 is 2 marks)

97 The equation of a circle is $x^2 + y^2 = 42.25$

Find the radius of the circle.

.....

(Total for Question 97 is 1 mark)

98 The straight line $\mathbf{L}_1$ passes through the points with coordinates (4, 6) and (12, 2)
The straight line $\mathbf{L}_2$ passes through the origin and has gradient -3

The lines $\mathbf{L}_1$ and $\mathbf{L}_2$ intersect at point P.

Find the coordinates of P.

(..... , ...)

(Total for Question 98 is 4 marks)

99 Solve $22 < \frac{m^2 + 7}{4} < 32$

Show all your working.

.....

(Total for Question 99 is 5 marks)

100 (a) Simplify $m^3 \times m^4$

.....

(1)

(b) Simplify $(5np^3)^3$

.....

(2)

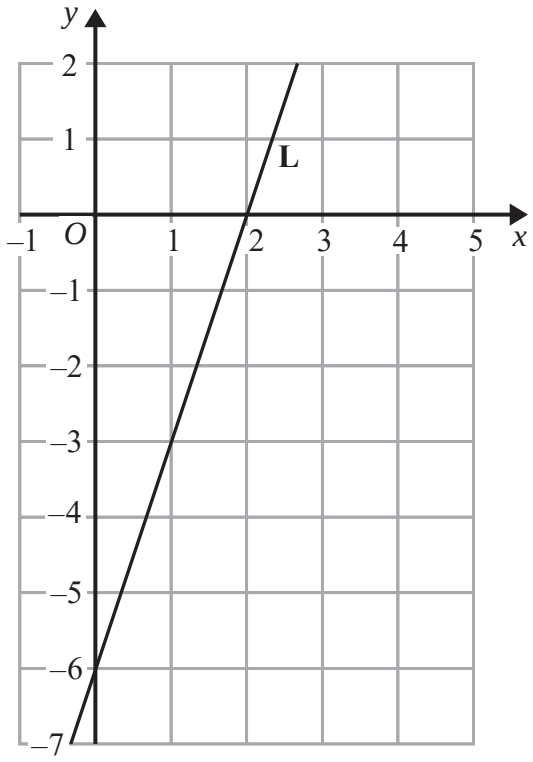
(c) Simplify $\dfrac{32q^9r^4}{4q^3r}$

.....

(2)

(Total for Question 100 is 5 marks)

101 The line **L** is shown on the grid.



Find an equation for **L**.

.....

(Total for Question 101 is 3 marks)

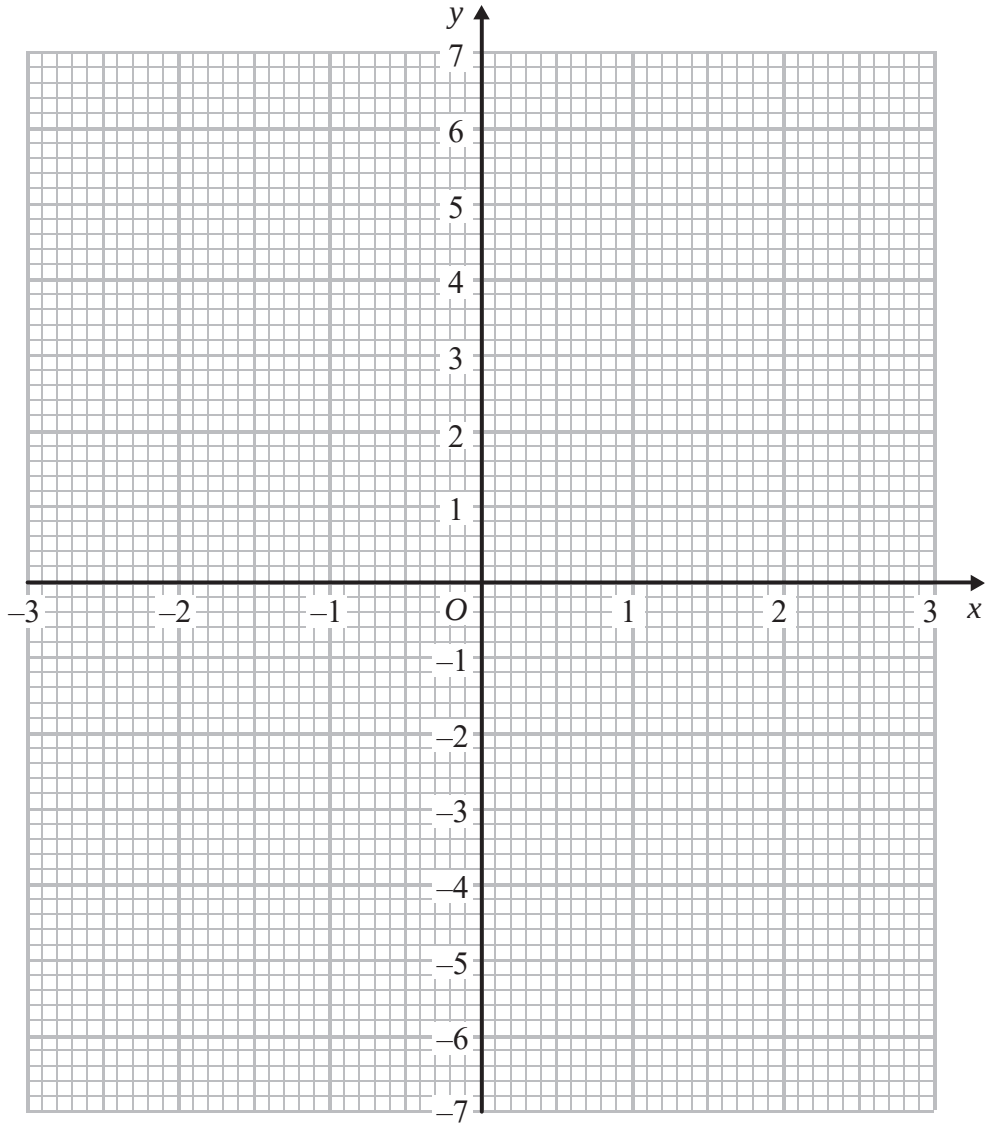
102 (a) Complete the table of values for $y = x^2 - x - 6$

x	–3	–2	–1	0	1	2	3
y	6			– 6			

(2)

(b) On the grid, draw the graph of $y = x^2 - x - 6$ for values of x from –3 to 3

(2)



(c) Use your graph to find estimates of the solutions to the equation $x^2 - x - 6 = -2$

.....

(2)

(Total for Question 102 is 6 marks)

---

103 f and g are functions such that

$$f(x) = \frac{2}{x^2} \quad \text{and} \quad g(x) = 4x^3$$

(a) Find f(–5)

.....

(1)

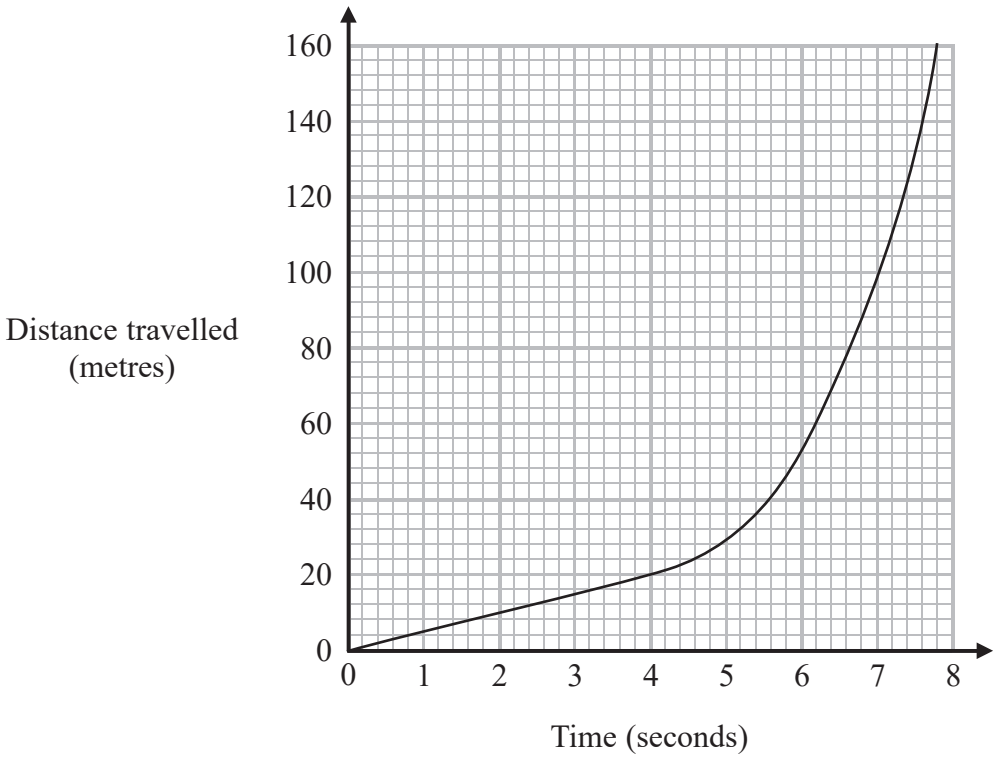
(b) Find fg(1)

.....

(2)

(Total for Question 103 is 3 marks)

104 The distance-time graph shows information about part of a car journey.

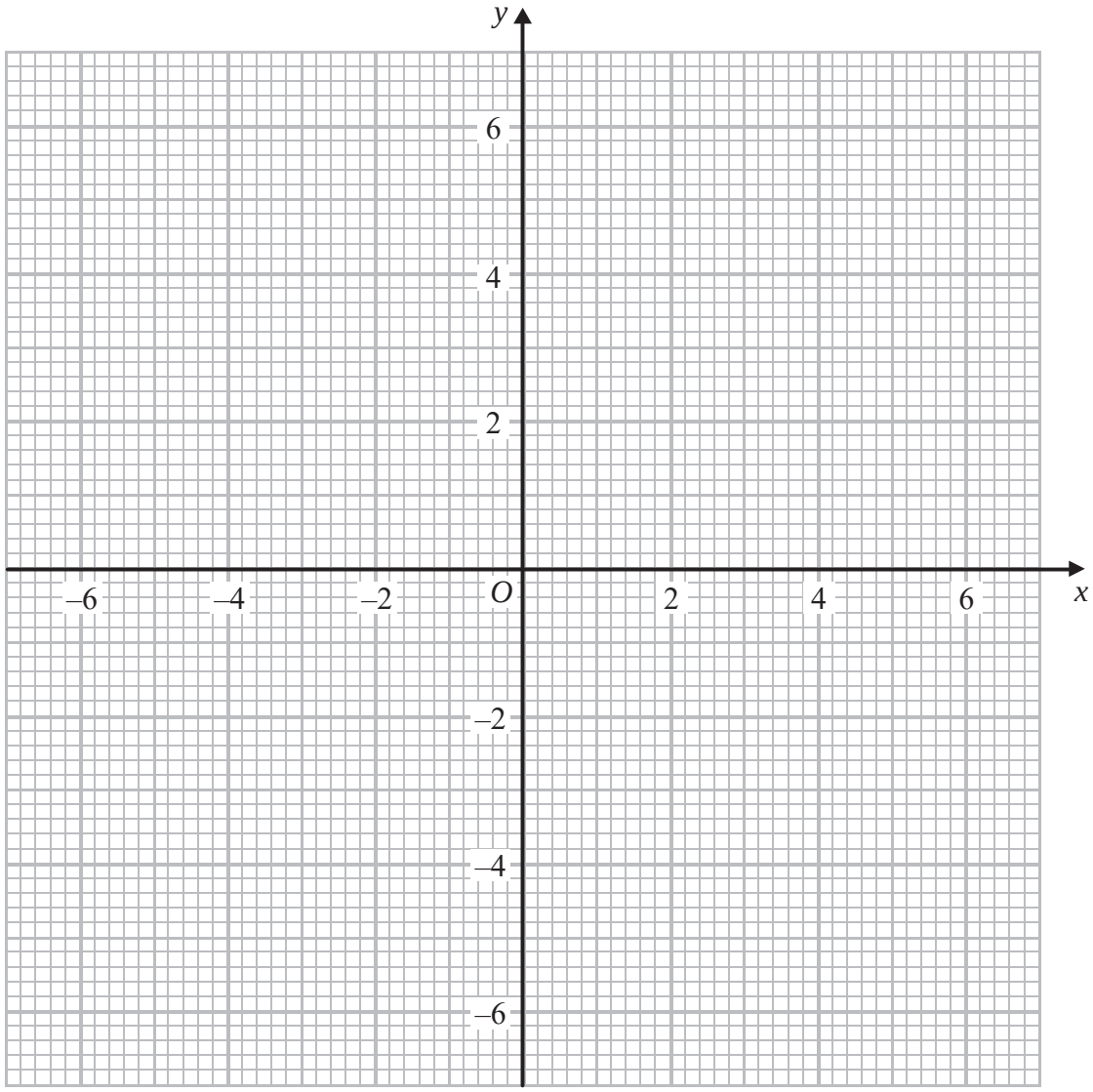


Use the graph to estimate the speed of the car at time 5 seconds.

..... m/s

(Total for Question 104 is 3 marks)

105 (a) On the grid, draw the graph of $x^2 + y^2 = 12.25$



(2)

(b) Hence find estimates for the solutions of the simultaneous equations

$$x^2 + y^2 = 12.25$$
$$2x + y = 1$$

.....

(3)

(Total for Question 105 is 5 marks)

106 Solve $5x - 6 = 3(x - 1)$

$x =$.....

(Total for Question 106 is 3 marks)

107 $p^3 \times p^x = p^9$

(a) Find the value of x.

$x =$ .....

(1)

$(7^2)^y = 7^{10}$

(b) Find the value of y.

$y =$ .....

(1)

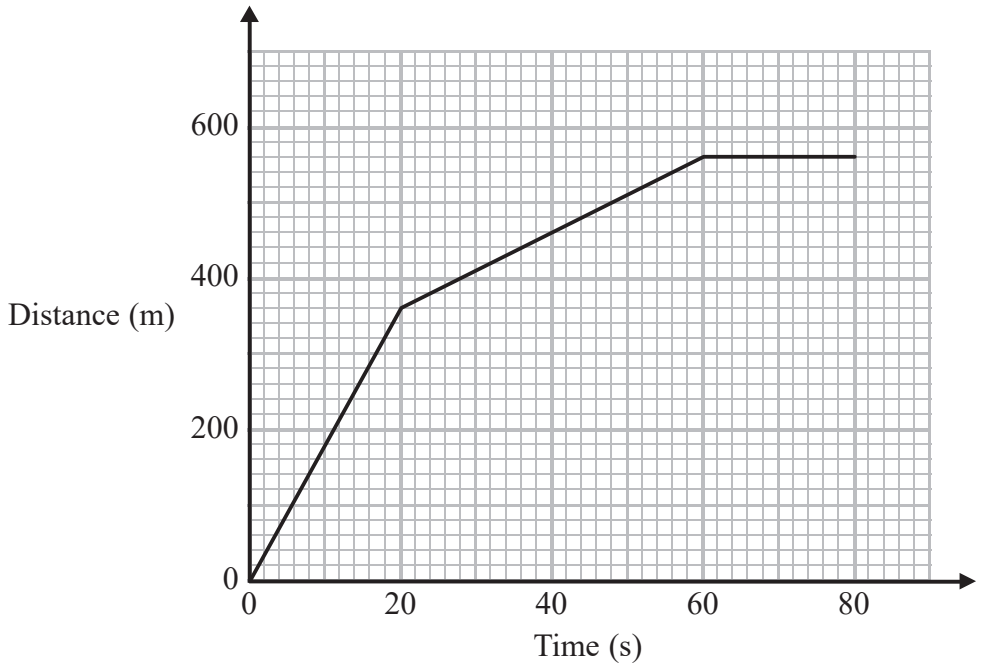
$100^a \times 1000^b$ can be written in the form 10^w

(c) Show that $w = 2a + 3b$

(2)

(Total for Question 107 is 4 marks)

108 Here is part of a distance-time graph for a car's journey.



(a) Between which two times does the car travel at its greatest speed?
Give a reason for your answer.

.....

.....

(2)

(b) Work out this greatest speed.

..... m/s

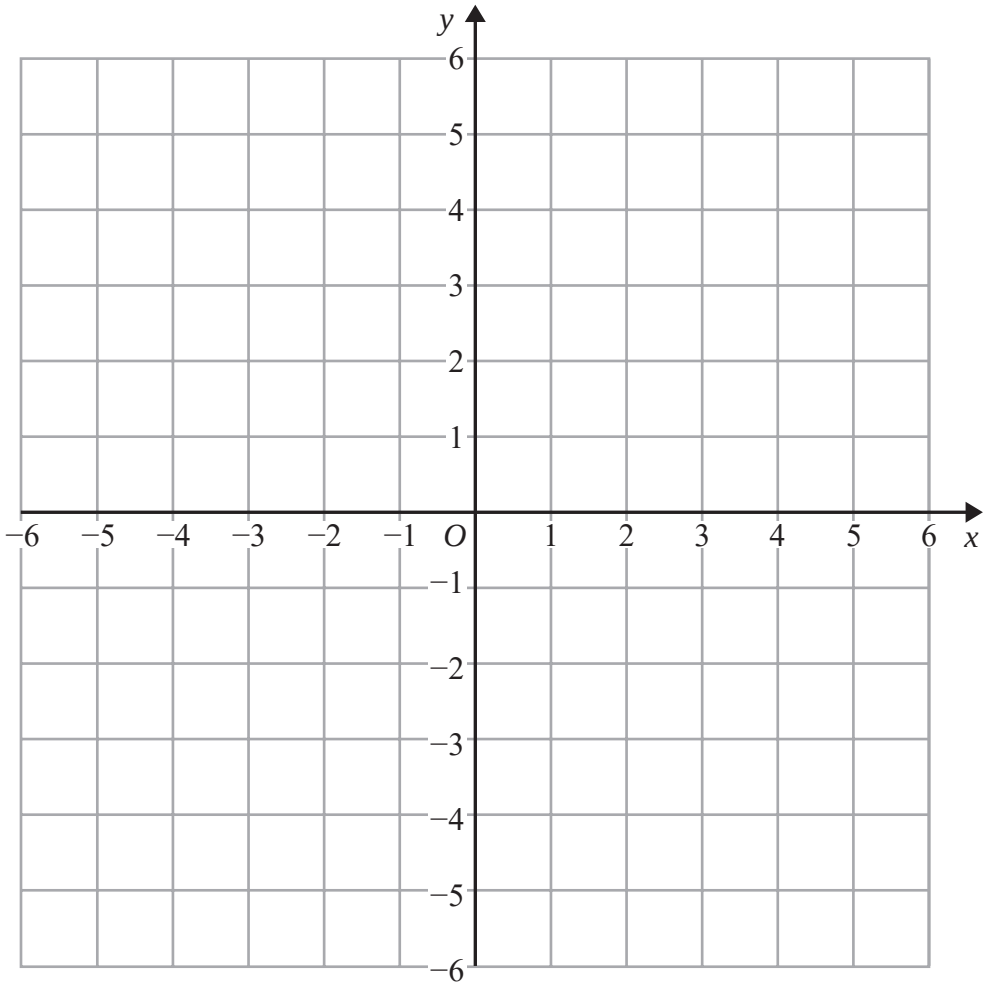
(1)

(Total for Question 108 is 3 marks)

109 On the grid, shade the region that satisfies all these inequalities.

$y > 1$ $x + y < 5$ $y > 2x$

Label the region **R**.



(Total for Question 109 is 3 marks)

110 Solve $(x - 2)^2 = 3$

Give your solutions correct to 3 significant figures.

.....

(Total for Question 110 is 2 marks)

111 The functions f and g are such that

$$f(x) = 5x + 3 \qquad g(x) = ax + b \qquad \text{where } a \text{ and } b \text{ are constants.}$$

$g(3) = 20$ and $f^{-1}(33) = g(1)$

Find the value of a and the value of b.

$a =$ .....

$b =$ .....

(Total for Question 111 is 5 marks)

112 S is a geometric sequence.

(a) Given that $(\sqrt{x} - 1)$, 1 and $(\sqrt{x} + 1)$ are the first three terms of S, find the value of x.
You must show all your working.

.....

(3)

(b) Show that the 5th term of S is $7 + 5\sqrt{2}$

(2)

(Total for Question 112 is 5 marks)

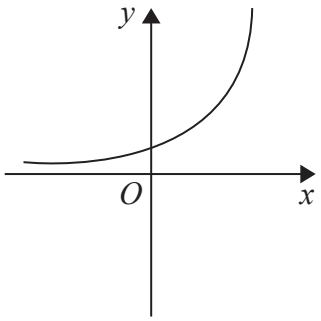
113 Solve $\frac{3x-2}{4} - \frac{2x+5}{3} = \frac{1-x}{6}$

$x =$ .....

(Total for Question 113 is 4 marks)

114 Here are some graphs.

A



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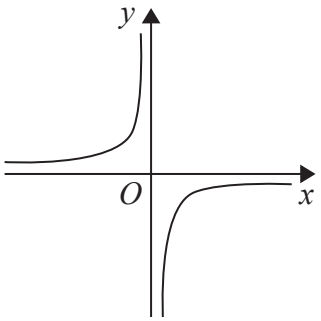

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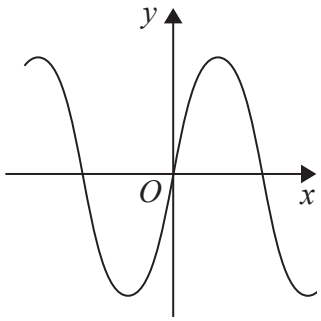

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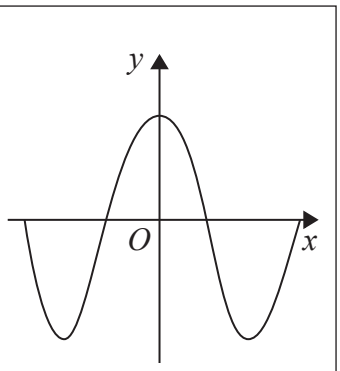

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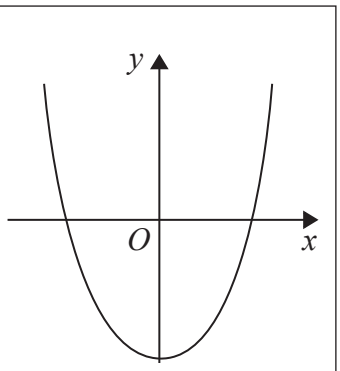

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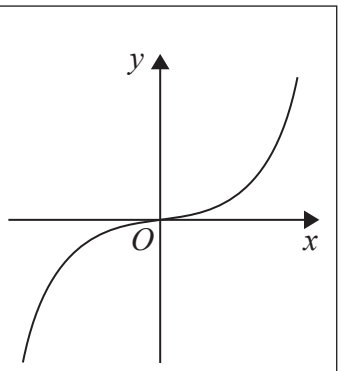
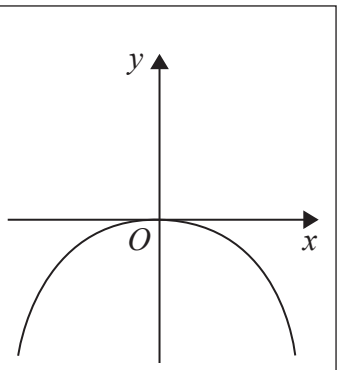


G



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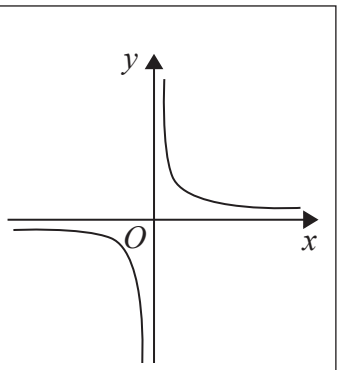

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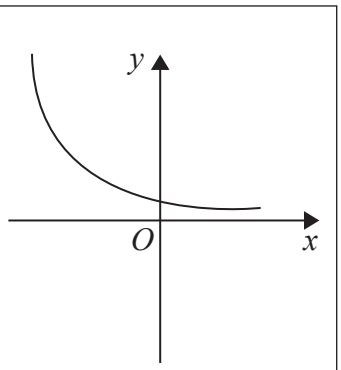


In the table below, match each equation with the letter of its graph.

Equation	Graph
$y = \sin x$	
$y = x^3 + 4x$	
$y = 2^x$	
$y = \frac{4}{x}$	

(Total for Question 114 is 3 marks)

115 $16^{\frac{1}{5}} \times 2^x = 8^{\frac{3}{4}}$

Work out the exact value of x.

.....

(Total for Question 115 is 3 marks)

116 $2 - \dfrac{x+2}{x-3} - \dfrac{x-6}{x+3}$ can be written as a single fraction in the form $\dfrac{ax+b}{x^2-9}$ where a and b are integers.

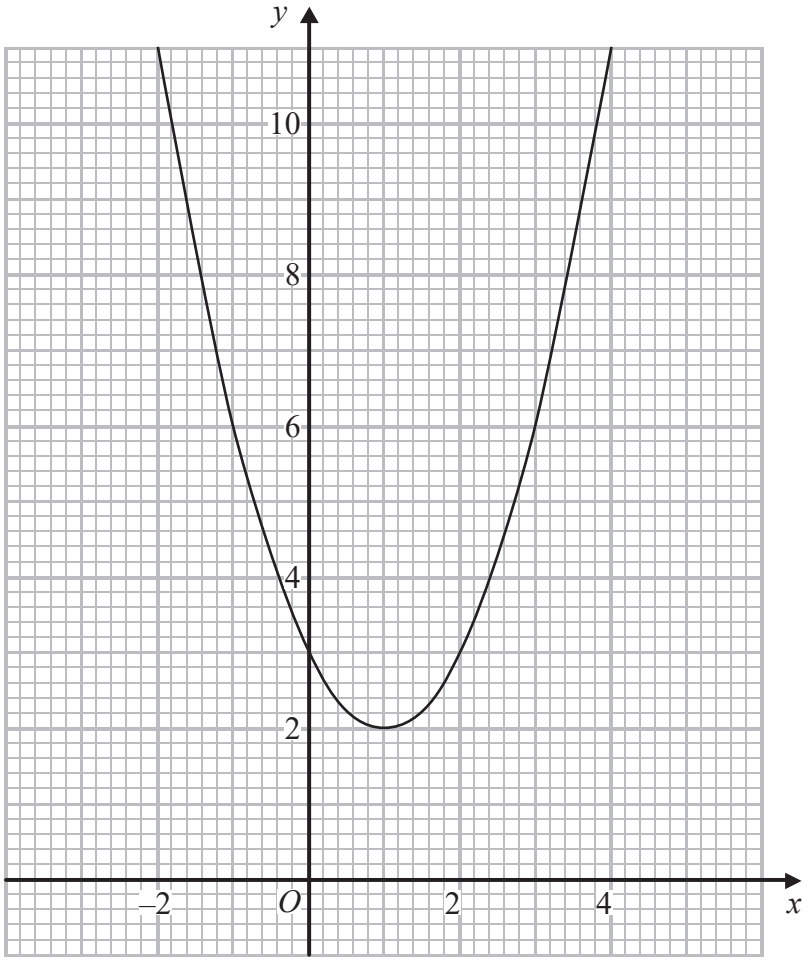
Work out the value of a and the value of b.

$a =$ .....

$b =$ .....

(Total for Question 116 is 4 marks)

117 The diagram shows part of the graph of $y = x^2 - 2x + 3$



(a) By drawing a suitable straight line, use your graph to find estimates for the solutions of $x^2 - 3x - 1 = 0$

.....

(2)

P is the point on the graph of $y = x^2 - 2x + 3$ where $x = 2$

(b) Calculate an estimate for the gradient of the graph at the point P.

.....

(3)

(Total for Question 117 is 5 marks)

118 Here are the first five terms of a sequence.

4 11 22 37 56

Find an expression, in terms of n, for the nth term of this sequence.

.....

(Total for Question 118 is 3 marks)

119 **L** is the circle with equation $x^2 + y^2 = 4$

$P\left(\frac{3}{2}, \frac{\sqrt{7}}{2}\right)$ is a point on **L**.

Find an equation of the tangent to **L** at the point P.

.....

(Total for Question 119 is 3 marks)

120 Here are the first four terms of an arithmetic sequence.

6 10 14 18

(a) Write an expression, in terms of n, for the nth term of this sequence.

.....

(2)

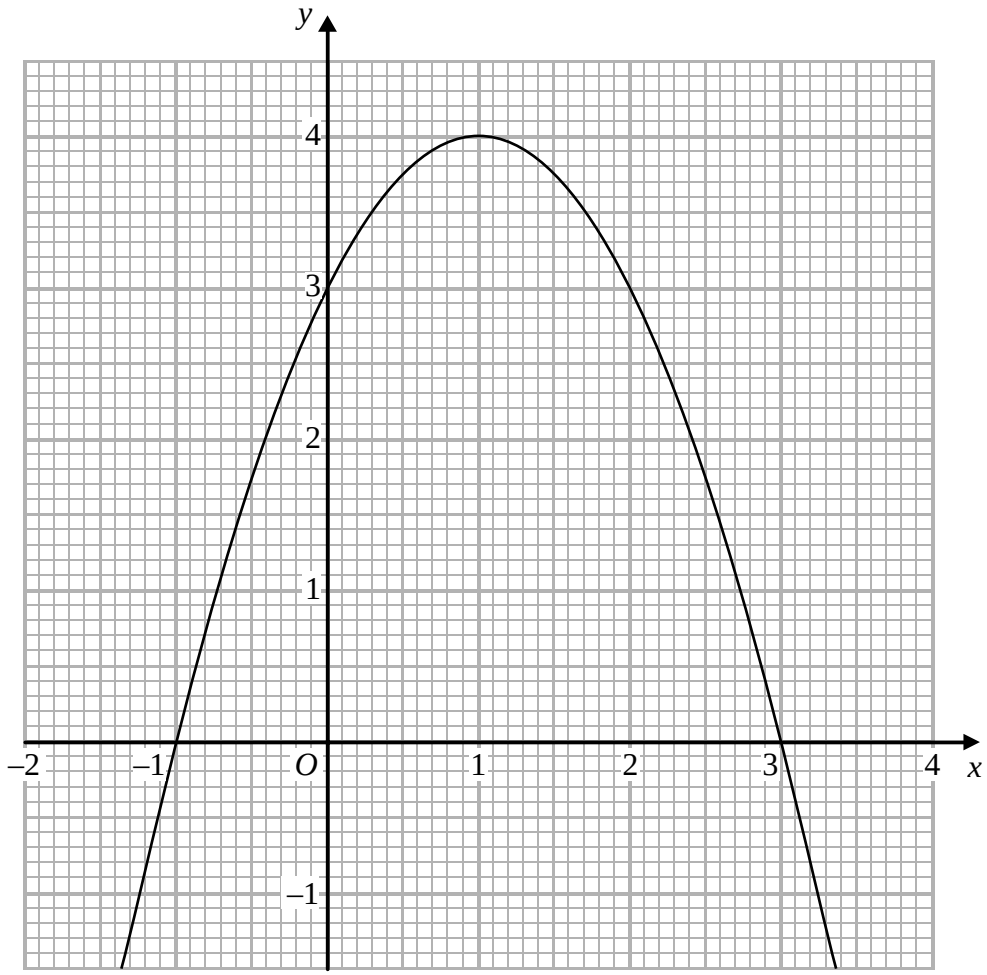
The nth term of a different arithmetic sequence is $3n + 5$

(b) Is 108 a term of this sequence?
Show how you get your answer.

(2)

(Total for Question 120 is 4 marks)

121 The graph of $y = f(x)$ is drawn on the grid.



(a) Write down the coordinates of the turning point of the graph.

(.....,.....)

(1)

(b) Write down the roots of $f(x) = 2$

.....

(1)

(c) Write down the value of f(0.5)

.....

(1)

(Total for Question 121 is 3 marks)

122 Prove algebraically that

$$(2n + 1)^2 - (2n + 1) \text{ is an even number}$$

for all positive integer values of n.

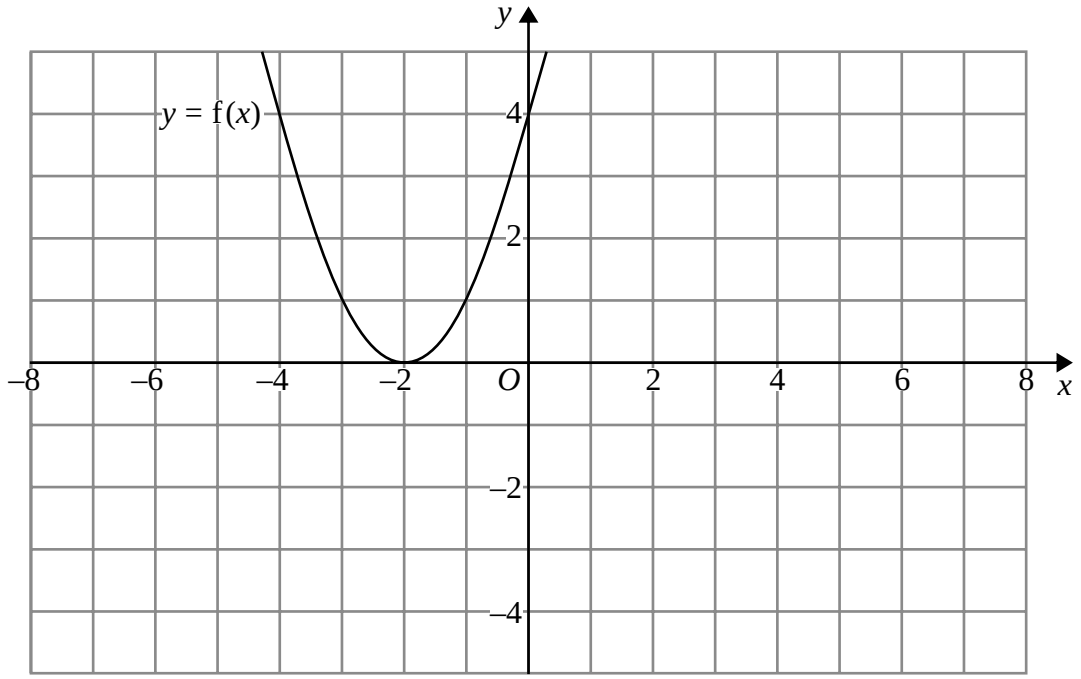
(Total for Question 122 is 3 marks)

123 Show that $\dfrac{1}{6x^2 + 7x - 5} \div \dfrac{1}{4x^2 - 1}$ simplifies to $\dfrac{ax + b}{cx + d}$ where a, b, c and d are integers.

.....

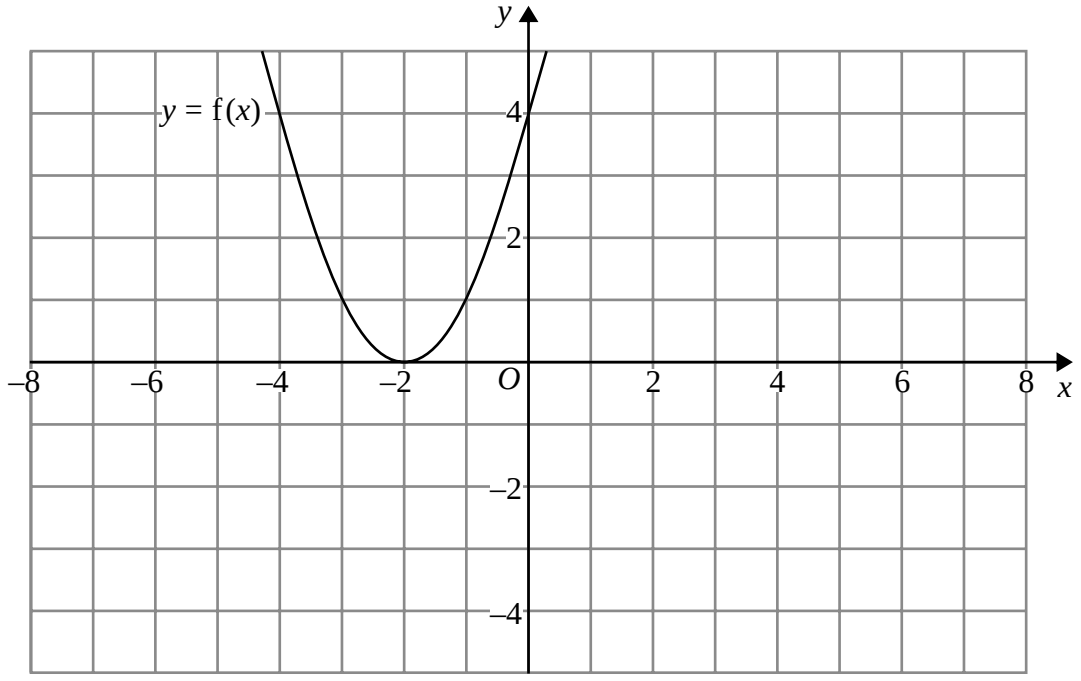
(Total for Question 123 is 3 marks)

124 The graph of $y = f(x)$ is shown on both grids below.



(a) On the grid above, sketch the graph of $y = f(-x)$

(1)



(b) On this grid, sketch the graph of $y = -f(x) + 3$

(1)

(Total for Question 124 is 2 marks)

125 Solve algebraically the simultaneous equations

$$x^2 + y^2 = 25$$
$$y - 2x = 5$$

.....

(Total for Question 125 is 5 marks)

126 Make t the subject of the formula $w = 3t + 11$

.....

(Total for Question 126 is 2 marks)

127 Show that

$$(3x - 1)(x + 5)(4x - 3) = 12x^3 + 47x^2 - 62x + 15$$

for all values of x.

(Total of Question 127 is 3 marks)

128 Here are the first 5 terms of a quadratic sequence.

1 3 7 13 21

Find an expression, in terms of n, for the nth term of this quadratic sequence.

.....

(Total for Question 128 is 3 marks)

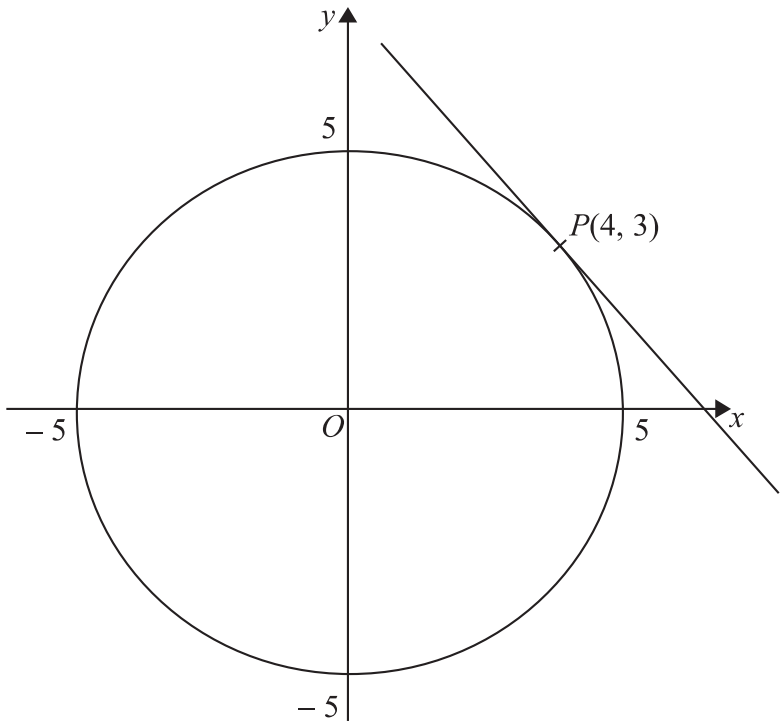
129 $f(x) = 3x^2 - 2x - 8$

Express $f(x + 2)$ in the form $ax^2 + bx$

.....

(Total for Question 129 is 3 marks)

130 Here is a circle, centre O, and the tangent to the circle at the point $P(4, 3)$ on the circle.



Find an equation of the tangent at the point P.

.....

(Total for Question 130 is 3 marks)

131 (a) Expand and simplify $3(y - 2) + 5(2y + 1)$

.....

(2)

(b) Simplify $5u^2w^4 \times 7uw^3$

.....

(2)

(Total for Question 131 is 4 marks)

132 Steve is asked to solve the equation $5(x + 2) = 47$

Here is his working.

$$5(x + 2) = 47$$
$$5x + 2 = 47$$
$$5x = 45$$
$$x = 9$$

Steve's answer is wrong.

(a) What mistake did he make?

.....

.....

(1)

Liz is asked to solve the equation $3x^2 + 8 = 83$

Here is her working.

$$3x^2 + 8 = 83$$
$$3x^2 = 75$$
$$x^2 = 25$$
$$x = 5$$

(b) Explain what is wrong with Liz's answer.

.....

.....

(1)

(Total for Question 132 is 2 marks)

133 The number of slugs in a garden t days from now is p_t where

$p_0 = 100$

$p_{t+1} = 1.06p_t$

Work out the number of slugs in the garden 3 days from now.

.....

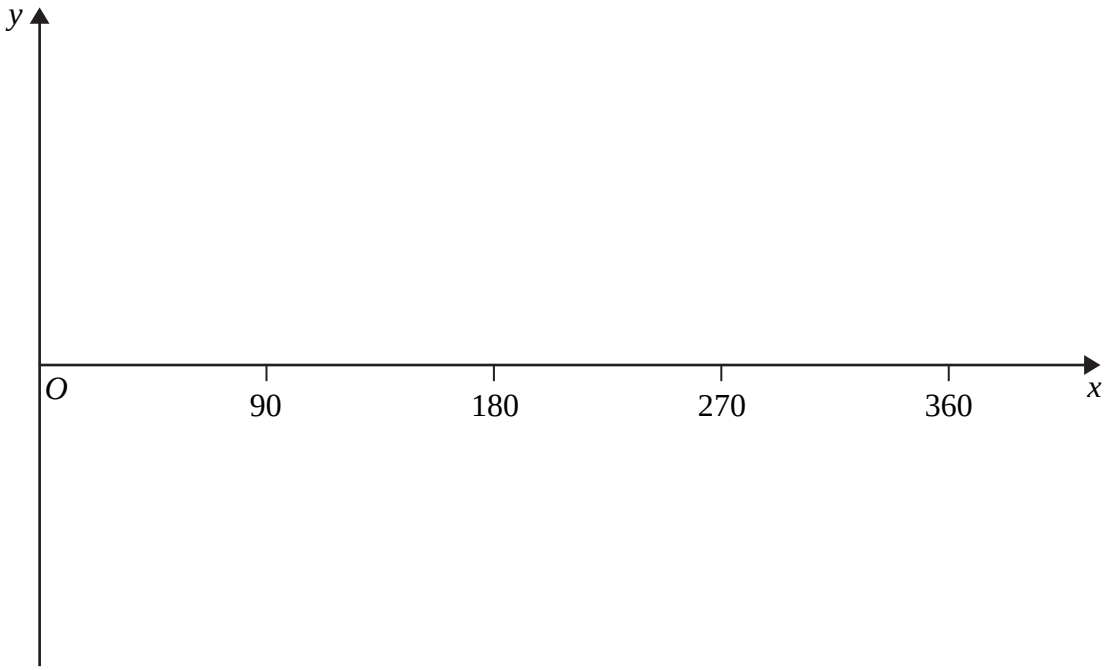
(Total for Question 133 is 3 marks)

134 Simplify fully $(\sqrt{a} + \sqrt{4b})(\sqrt{a} - 2\sqrt{b})$

.....

(Total for Question 134 is 3 marks)

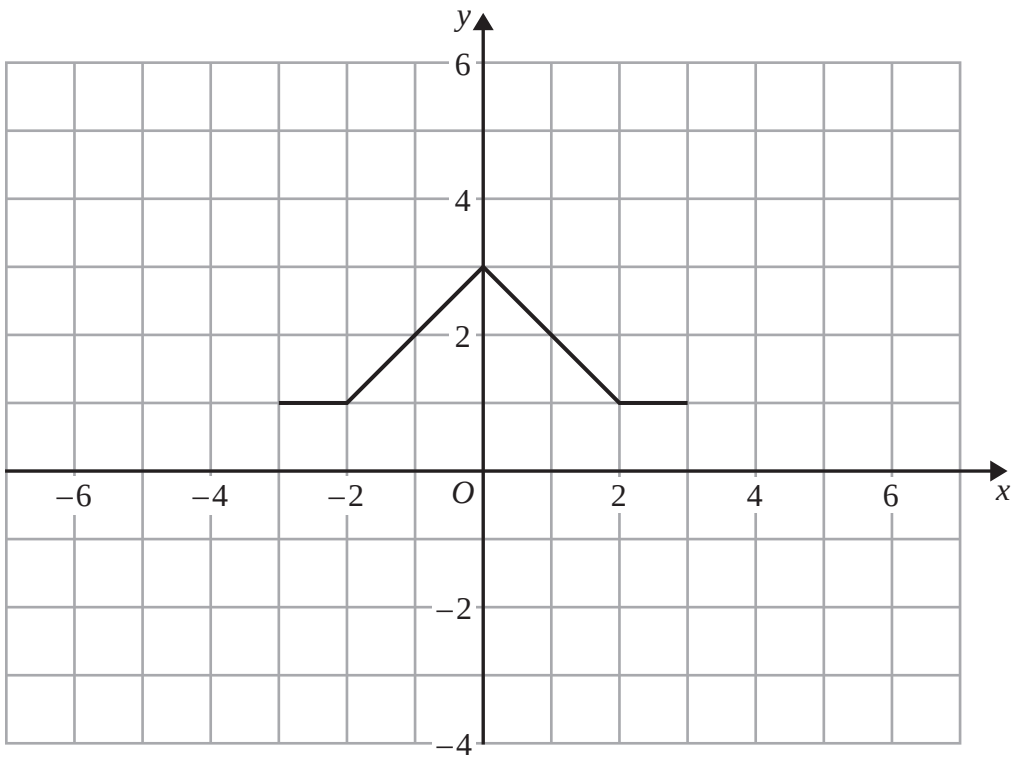
135 (a) Sketch the graph of $y = \cos x°$ for $0 \leqslant x \leqslant 360$



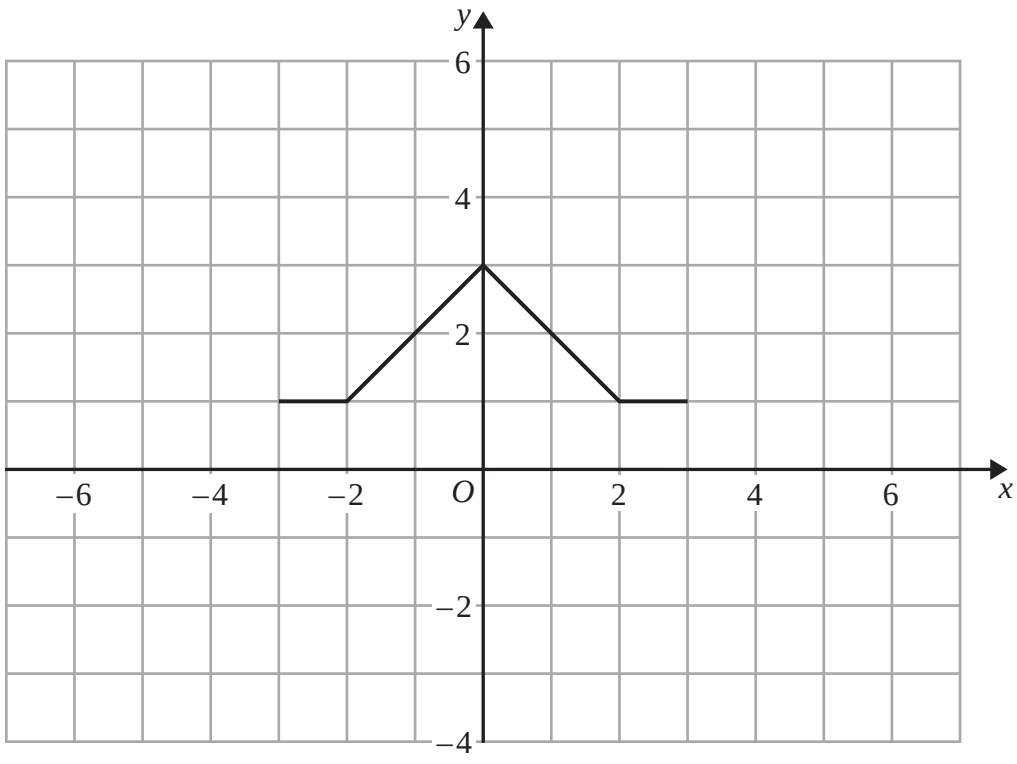
(2)

(b) The graph of $y = f(x)$ is shown on both grids below.

(i) On this grid, draw the graph of $y = 2f(x)$



(ii) On the grid below, draw the graph of $y = f(x - 3)$



(2)

(Total for Question 135 is 4 marks)

136 The first four terms of a Fibonacci sequence are

$a \qquad 2a \qquad 3a \qquad 5a$

The sum of the first five terms of this sequence is 228

Work out the value of a.

.....

(Total for Question 136 is 3 marks)

137 $(ax^6)^{\frac{1}{n}} = 7x^3$

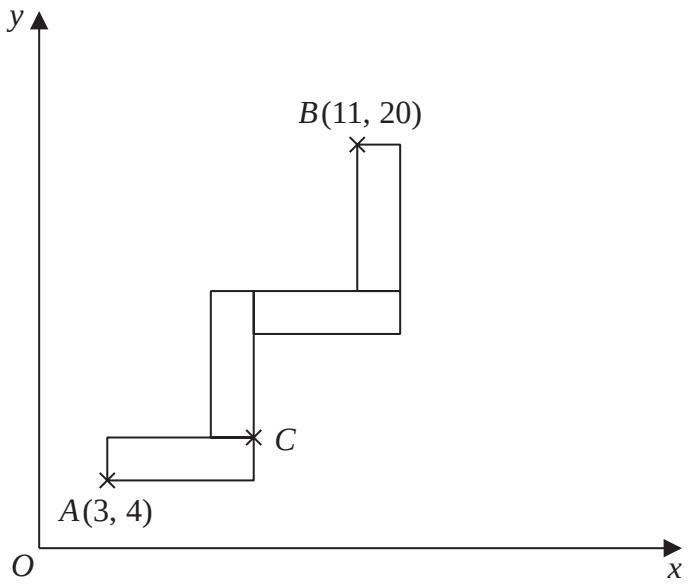
Work out the value of a and the value of n.

$a =$ .....

$n =$ .....

(Total for Question 137 is 2 marks)

138 A pattern is made from four identical rectangles.
The sides of the rectangles are parallel to the axes.



Point A has coordinates (3, 4)
Point B has coordinates (11, 20)
Point C is marked on the diagram.

Work out the coordinates of C.
You must show all your working.

(..... , ...)

(Total for Question 138 is 5 marks)

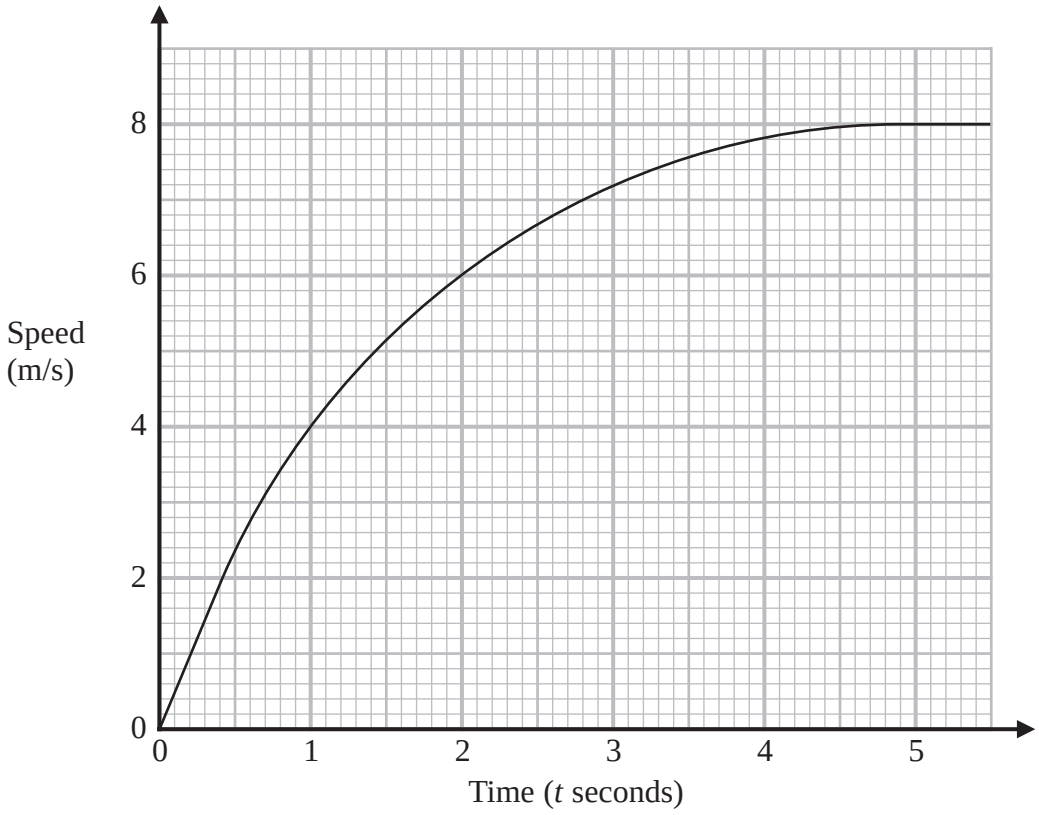
139 The curve **C** has equation $y = x^2 + 3x - 3$

The line **L** has equation $y - 5x + 4 = 0$

Show, algebraically, that **C** and **L** have exactly one point in common.

(Total for Question 139 is 4 marks)

140 Here is a speed-time graph showing the speed, in metres per second, of an object t seconds after it started to move from rest.



(a) Using 3 trapeziums of equal width, work out an estimate for the area under the graph between $t = 1$ and $t = 4$

.....

(3)

(b) What does this area represent?

.....

(1)

(Total for Question 140 is 4 marks)

141 Show that $\frac{6x^3}{(9x^2 - 144)} \div \frac{2x^4}{3(x - 4)}$ can be written in the form $\frac{1}{x(x + r)}$ where r is an integer.

(Total for Question 141 is 3 marks)

142 (a) Simplify $n^3 \times n^5$

.....

(1)

(b) Simplify $\dfrac{c^3d^4}{c^2d}$

.....

(2)

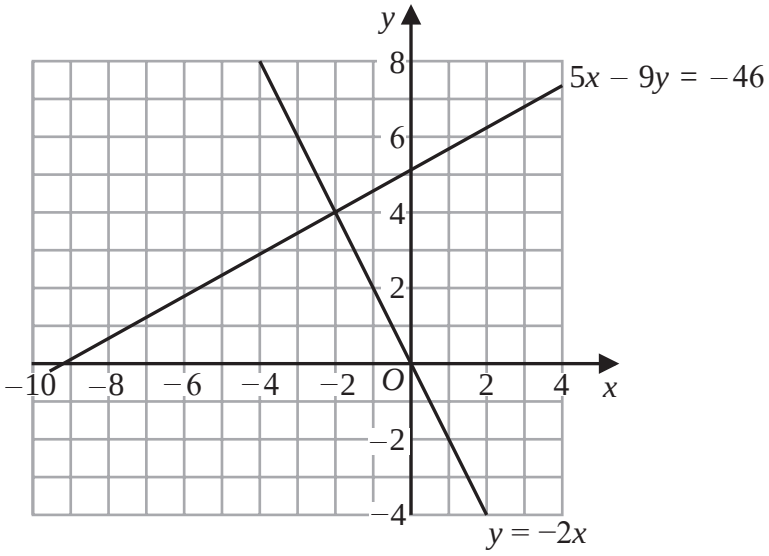
(c) Solve $\dfrac{5x}{2} > 7$

.....

(2)

(Total for Question 142 is 5 marks)

143



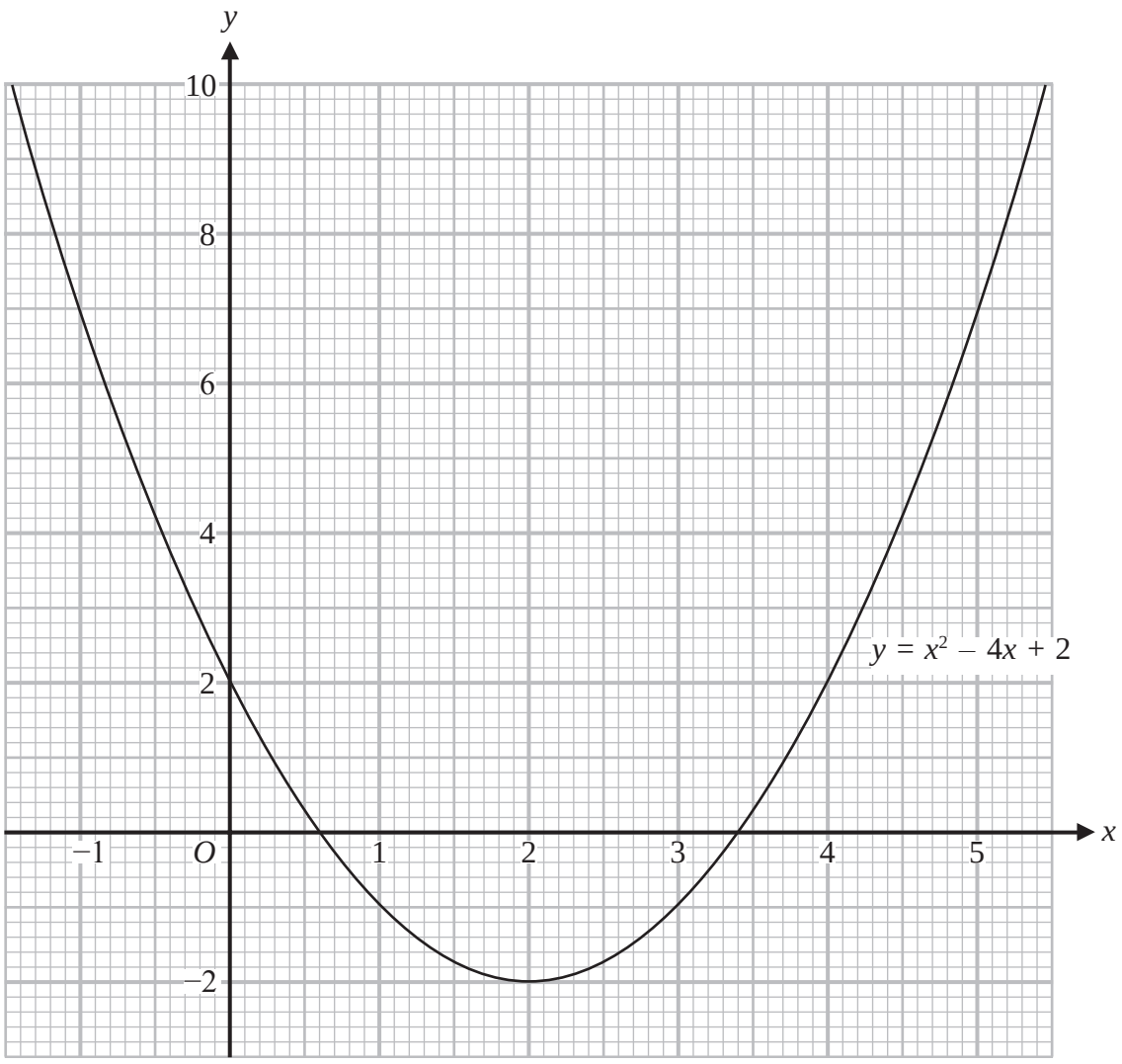
(a) Use these graphs to solve the simultaneous equations

$$5x - 9y = -46$$
$$y = -2x$$

$x =$ .....

$y =$ .....

(1)



(b) Use this graph to find estimates for the solutions of the quadratic equation $x^2 - 4x + 2 = 0$

.....

(2)

(Total for Question 143 is 3 marks)

144 (a) Express $\frac{x}{x+2} + \frac{2x}{x-4}$ as a single fraction in its simplest form.

.....

(3)

(b) Expand and simplify $(x - 3)(2x + 3)(4x + 5)$

.....

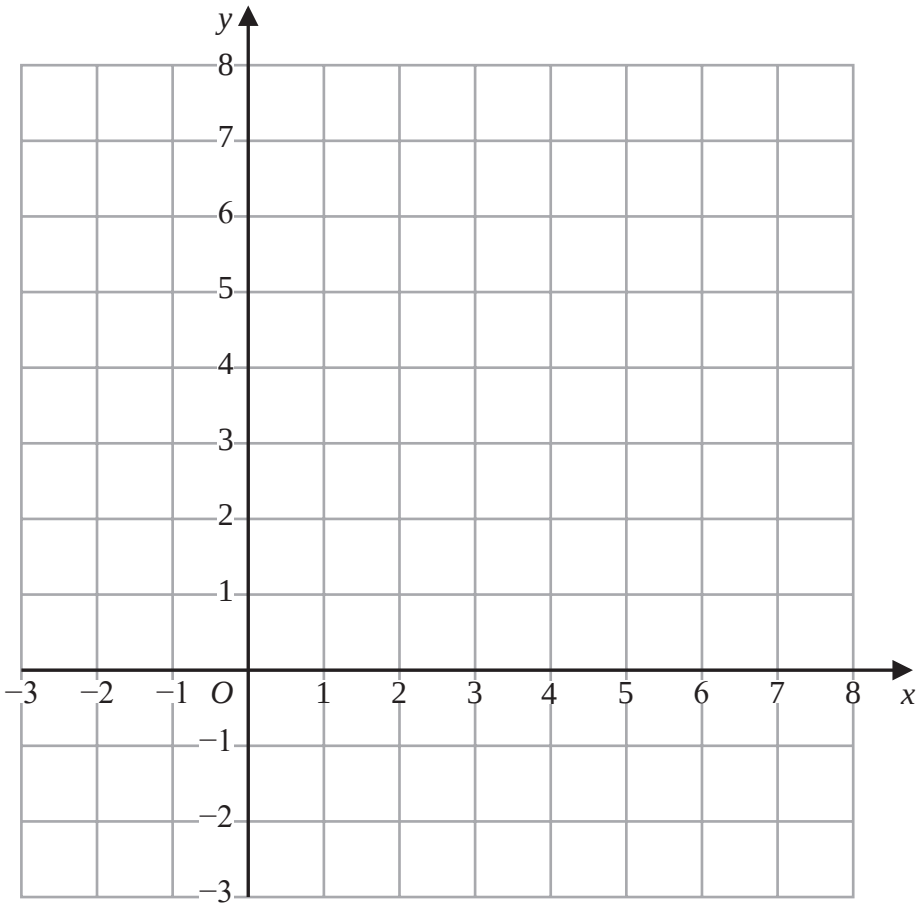
(3)

(Total for Question 144 is 6 marks)

145 (a) On the grid show, by shading, the region that satisfies all these inequalities.

$x \geqslant 0$ $x \leqslant 2$ $y \leqslant x + 3$ $2x + 3y \geqslant 6$

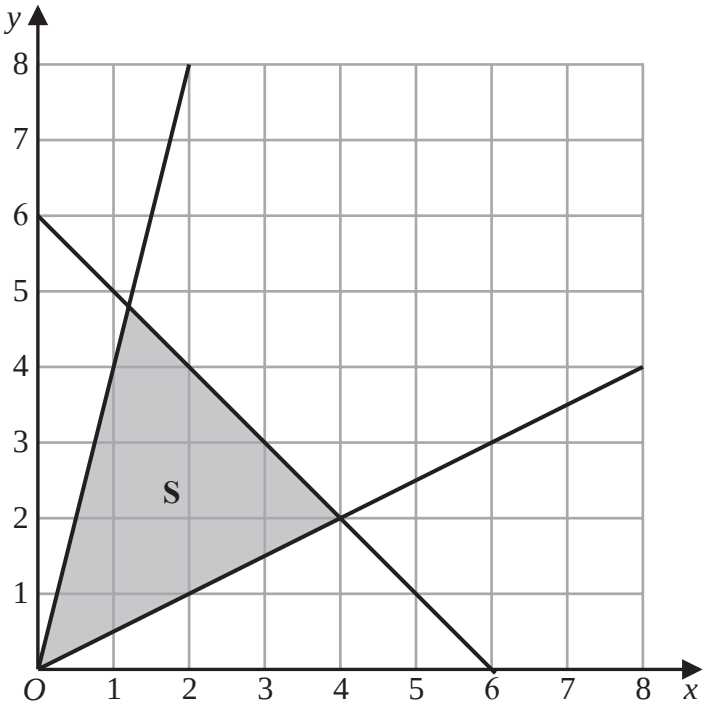
Label the region **R**.



(4)

(b) The diagram below shows the region **S** that satisfies the inequalities

$$y \leqslant 4x \qquad y \geqslant \frac{1}{2}x \qquad x + y \leqslant 6$$



Geoffrey says that the point with coordinates (2, 4) does not satisfy all the inequalities because it does not lie in the shaded region.

Is Geoffrey correct?
You must give a reason for your answer.

.....

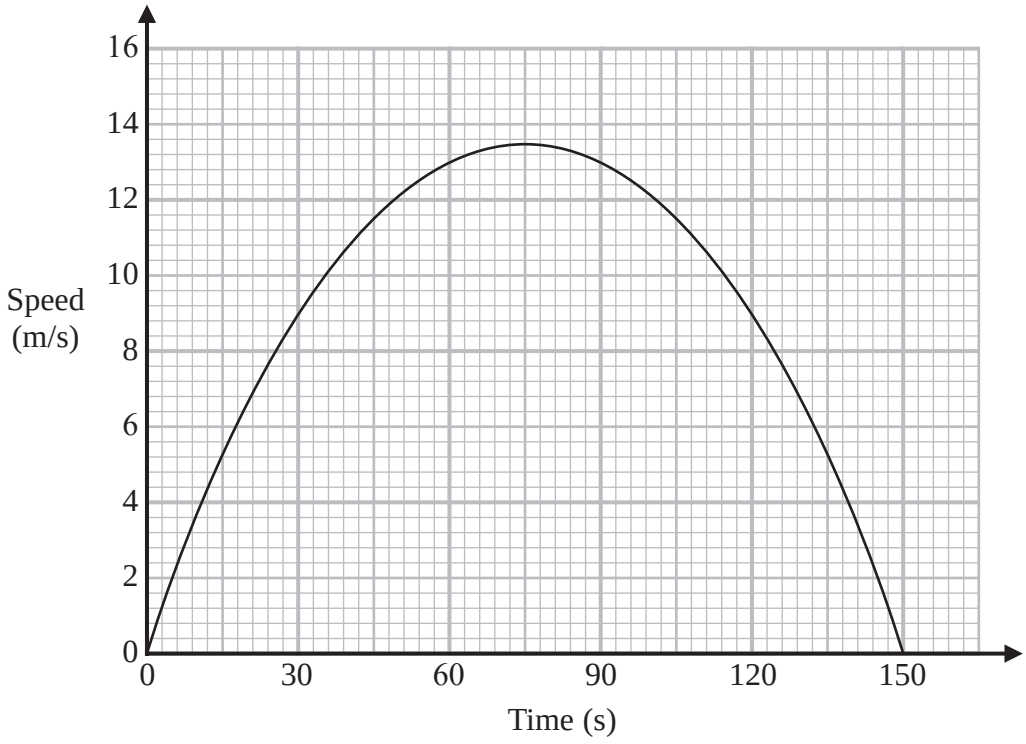
.....

.....

(1)

(Total for Question 145 is 5 marks)

146 Here is a speed-time graph for a car.



(a) Work out an estimate for the distance the car travelled in the first 30 seconds.

..... m

(2)

(b) Is your answer to part (a) an underestimate or an overestimate of the actual distance the car travelled in the first 30 seconds?
Give a reason for your answer.

.....

.....

.....

(1)

Julian used the graph to answer this question.

Work out an estimate for the acceleration of the car at time 60 seconds.

Here is Julian's working.

$$\text{acceleration} = \text{speed} \div \text{time}$$

$$= 13 \div 60$$

$$= 0.21\dot{6} \text{ m/s}^2$$

Julian's method does not give a good estimate of the acceleration at time 60 seconds.

(c) Explain why.

.....

.....

.....

(1)

(Total for Question 146 is 4 marks)

147 (a) Expand and simplify $(x + 5)(x - 9)$

.....

(2)

(b) Factorise fully $9x^2 + 6x$

.....

(2)

(Total for Question 147 is 4 marks)

148 (a) Solve $\frac{9+x}{7} = 11 - x$

$x =$ .....

(3)

(b) Simplify $\frac{4(y+3)^3}{(y+3)^2}$

.....

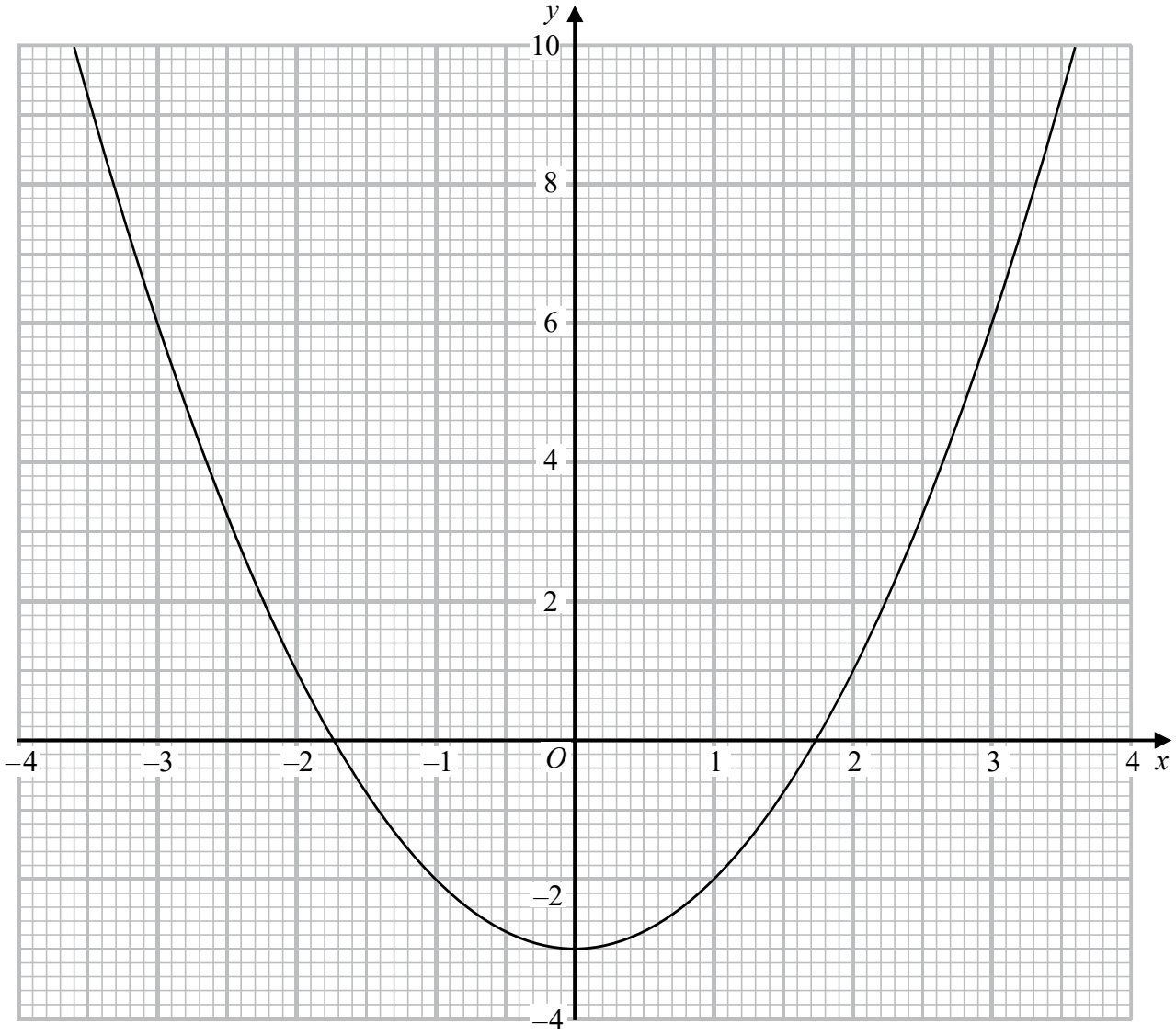
(1)

(Total for Question 148 **is 4 marks)**

149 Prove algebraically that the sum of the squares of any two consecutive even numbers is always a multiple of 4

(Total for Question 149 **is 3 marks)**

150 Here is the graph of $y = x^2 - 3$



Use the graph to find estimates for the solutions to the equation $x^2 - 2x - 2 = 0$
You must show how you get your solutions.

.....

(Total for Question 150 is 4 marks)

151 Here are the first five terms of a sequence.

$$-1 \qquad 0 \qquad 3 \qquad 8 \qquad 15$$

Find an expression, in terms of n, for the nth term of this sequence.

.....

(Total for Question 151 is 4 marks)

152 Show that $\dfrac{7x-14}{x^2+4x-12} \div \dfrac{x-6}{x^3-36x}$ simplifies to ax where a is an integer.

(Total for Question 152 is 4 marks)

153 The graph of the curve C with equation $y = f(x)$ is transformed to give the graph of the curve S with equation $y = f(-x) - 3$

The point on C with coordinates (7, 2) is mapped to the point Q on S.

Find the coordinates of Q.

(..... , ...)

(Total for Question 153 is 2 marks)

154 Here are the first six terms of a quadratic sequence.

−1 5 15 29 47 69

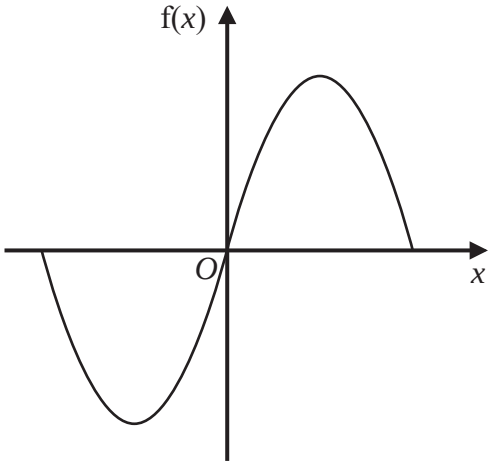
Find an expression, in terms of n, for the nth term of this sequence.

.....

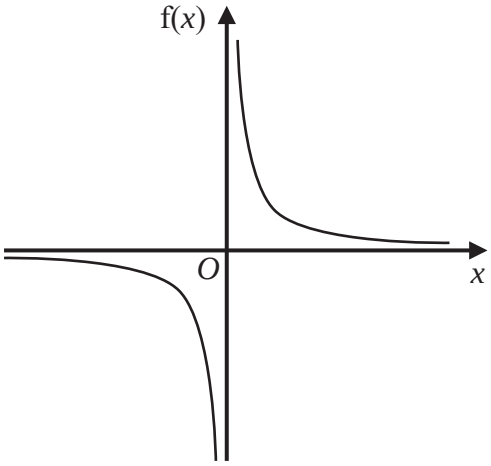
(Total for Question 154 is 3 marks)

155 Here are four graphs.

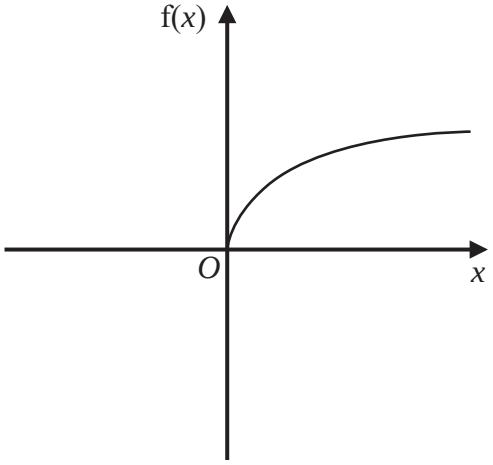
Graph A



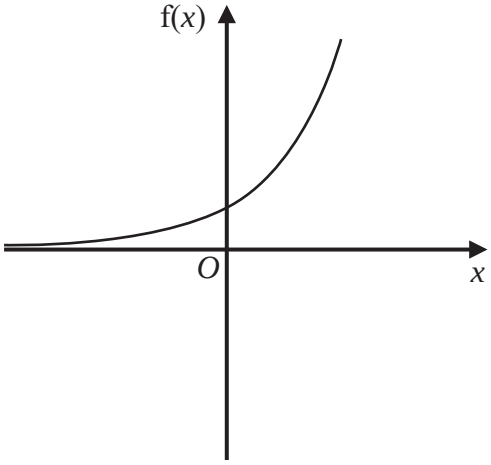
Graph B



Graph C



Graph D



The graphs represent four different types of function f.

Match each description of the function in the table to the letter of its graph.

Description of function	**Graph**
f(x) is inversely proportional to x	
f(x) is a trigonometrical function	
f(x) is an exponential function	
f(x) is directly proportional to $\sqrt{x}$	

(Total for Question 155 is 2 marks)

156 (a) Show that $(2x + 1)(x + 3)(3x + 7)$ can be written in the form $ax^3 + bx^2 + cx + d$ where a, b, c and d are integers.

(3)

(b) Solve $(1 - x)^2 < \frac{9}{25}$

.....

(3)

(Total for Question 156 is 6 marks)

157 Solve algebraically the simultaneous equations

$$x^2 - 4y^2 = 9$$
$$3x + 4y = 7$$

.....

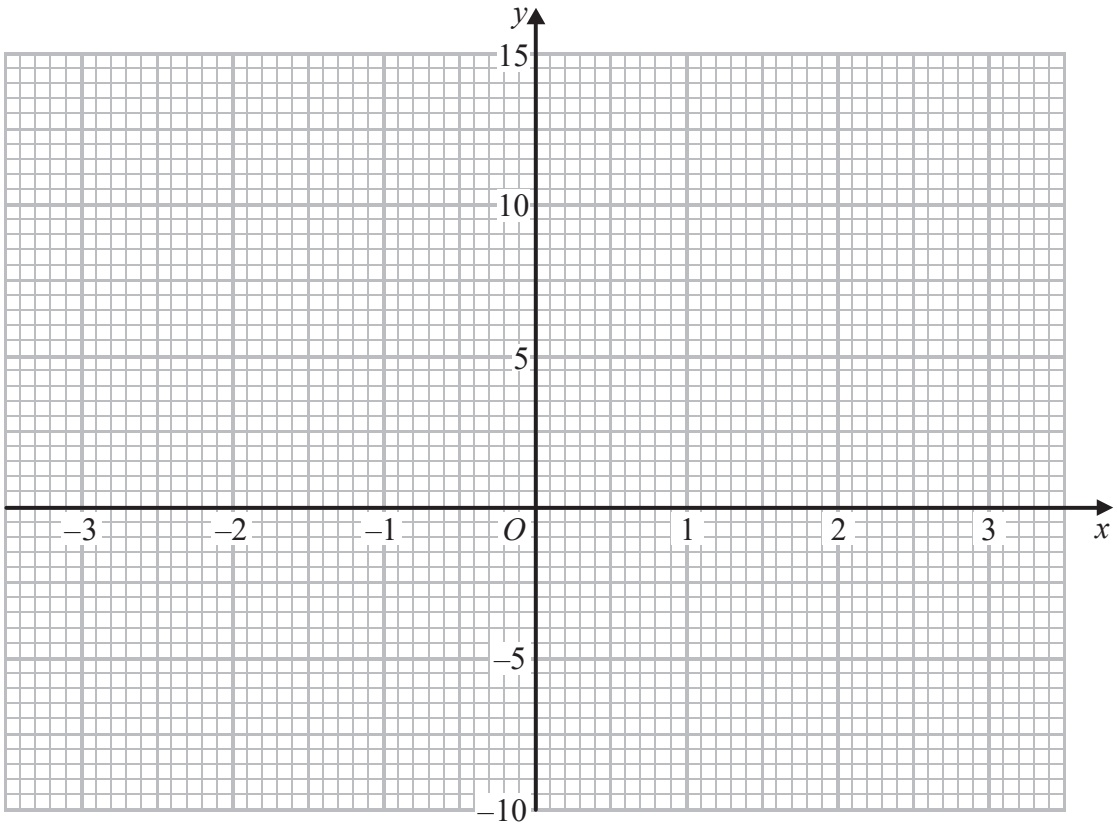
(Total for Question 157 is 5 marks)

158 (a) Complete this table of values for $y = x^2 + x - 4$

x	–3	–2	–1	0	1	2	3
y		–2	–4		–2		

(2)

(b) On the grid, draw the graph of $y = x^2 + x - 4$ for values of x from –3 to 3



(2)

(c) Use the graph to estimate a solution to $x^2 + x - 4 = 0$

.....

(1)

(Total for Question 158 is 5 marks)

159 (a) Expand and simplify $(x - 2)(2x + 3)(x + 1)$

.....

(3)

$$\frac{y^4 \times y^n}{y^2} = y^{-3}$$

(b) Find the value of n.

.....

(2)

(c) Solve $5x^2 - 4x - 3 = 0$
Give your solutions correct to 3 significant figures.

.....

(3)

(Total for Question 159 is 8 marks)

160 $f(x) = 4\sin x°$

(a) Find f(23)
Give your answer correct to 3 significant figures.

.....

(1)

$g(x) = 2x - 3$

(b) Find fg(34)
Give your answer correct to 3 significant figures.

.....

(2)

$h(x) = (x + 4)^2$

Ivan needs to solve the following equation $h(x) = 25$

He writes

$(x + 4)^2 = 25$
$x + 4 = 5$
$x = 1$

This is not fully correct.

(c) Explain why.

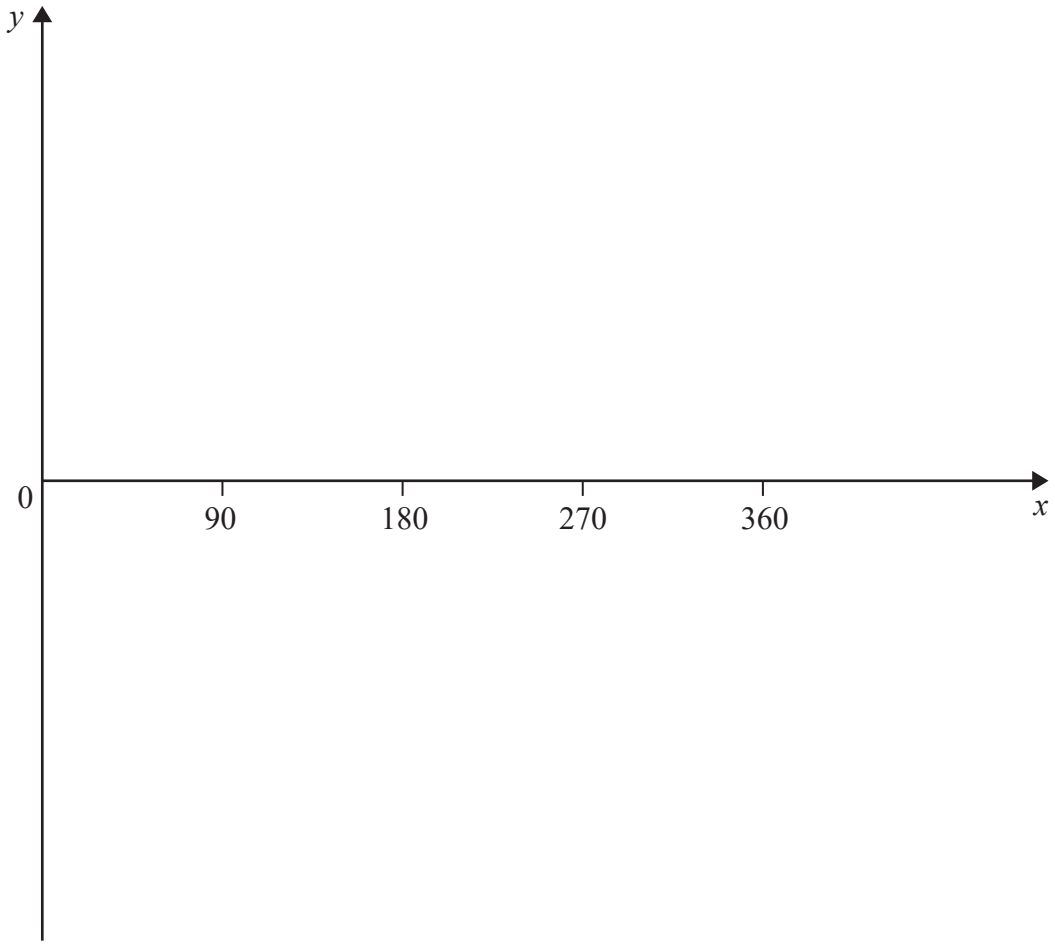
.....

.....

(1)

(Total for Question 160 is 4 marks)

161 Sketch the graph of $y = \tan x°$ for $0 \leqslant x \leqslant 360$



(Total for Question 161 is 2 marks)

162 Prove algebraically that the difference between the squares of any two consecutive odd numbers is always a multiple of 8

(Total for Question 162 is 3 marks)

163 Solve algebraically the simultaneous equations

$$2x^2 - y^2 = 17$$
$$x + 2y = 1$$

(Total for Question 163 is 5 marks)

164 Expand and simplify $5(p + 3) - 2(1 - 2p)$

.....

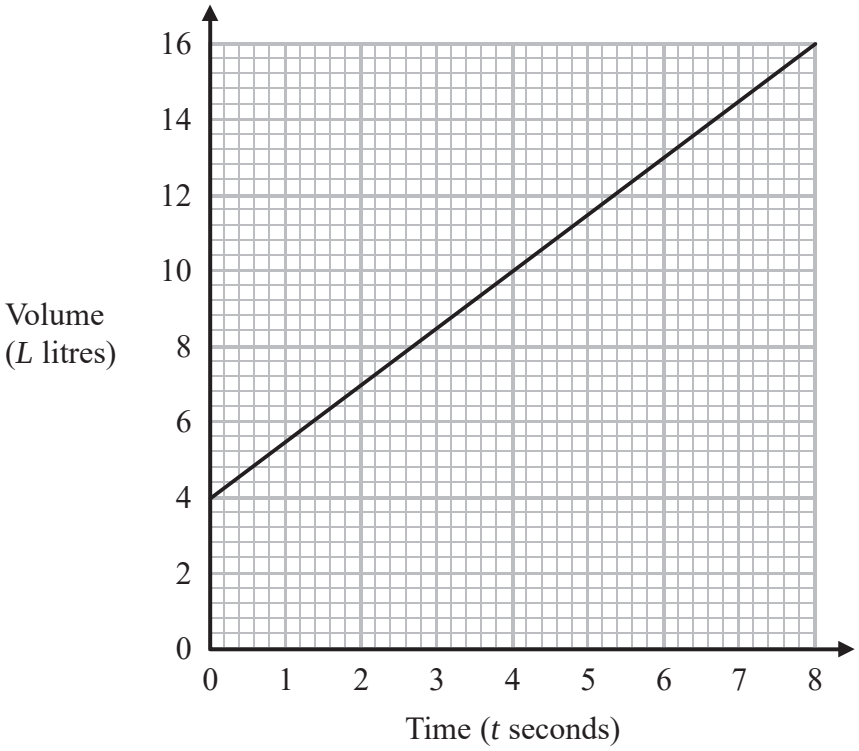
(Total for Question 164 is 2 marks)

165 Solve $\frac{5 - x}{2} = 2x - 7$

$x =$ .....

(Total for Question 165 is 3 marks)

166 The graph shows the volume of liquid (L litres) in a container at time t seconds.



(a) Find the gradient of the graph.

.....

(2)

(b) Explain what this gradient represents.

.....

.....

(1)

The graph intersects the volume axis at $L = 4$

(c) Explain what this intercept represents.

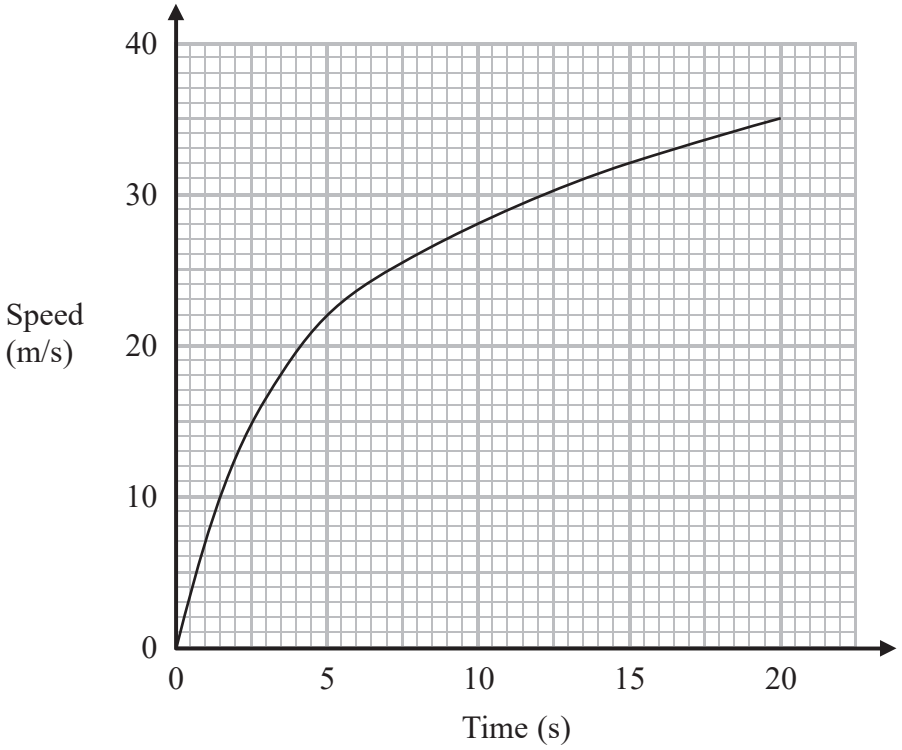
.....

.....

(1)

(Total for Question 166 is 4 marks)

167 The graph shows the speed of a car, in metres per second, during the first 20 seconds of a journey.



(a) Work out an estimate for the distance the car travelled in the first 20 seconds.
Use 4 strips of equal width.

..... metres

(3)

(b) Is your answer to part (a) an underestimate or an overestimate of the actual distance the car travelled in the first 20 seconds?
Give a reason for your answer.

.....

.....

(1)

(Total for Question 167 is 4 marks)

168 The nth term of a sequence is given by $an^2 + bn$ where a and b are integers.

The 2nd term of the sequence is –2
The 4th term of the sequence is 12

(a) Find the 6th term of the sequence.

.....

(4)

Here are the first five terms of a different quadratic sequence.

0 2 6 12 20

(b) Find an expression, in terms of n, for the nth term of this sequence.

.....

(2)

(Total for Question 168 is 6 marks)

169 (a) Show that the equation $x^3 + x = 7$ has a solution between 1 and 2

(2)

(b) Show that the equation $x^3 + x = 7$ can be rearranged to give $x = \sqrt[3]{7 - x}$

(1)

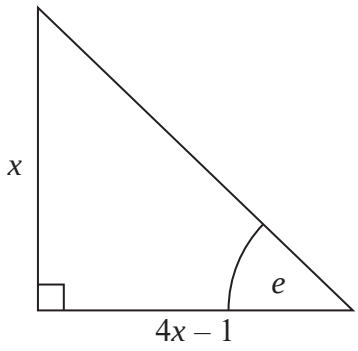
(c) Starting with $x_0 = 2$,
use the iteration formula $x_{n+1} = \sqrt[3]{7 - x_n}$ three times to find an estimate for a solution of $x^3 + x = 7$

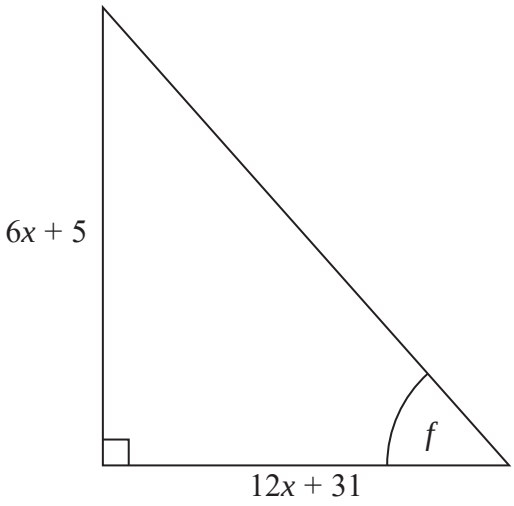
.....

(3)

(Total for Question 169 is 6 marks)

170 Here are two right-angled triangles.





Given that

$$\tan e = \tan f$$

find the value of x.

You must show all your working.

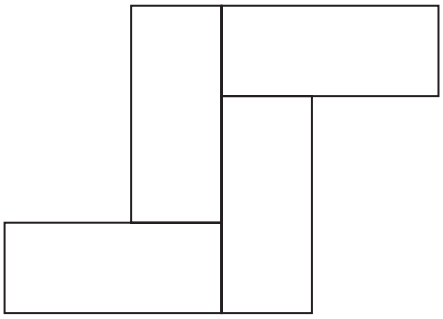
.....

(Total for Question 170 is 5 marks)

171 Here is a rectangle.

The length of the rectangle is 7 cm longer than the width of the rectangle.

4 of these rectangles are used to make this 8-sided shape.



The perimeter of the 8-sided shape is 70 cm.

Work out the area of the 8-sided shape.

..... cm^2

(Total for Question 171 is 5 marks)

172 Write $x^2 + 6x - 7$ in the form $(x + a)^2 + b$ where a and b are integers.

.....

(Total for Question 172 is 2 marks)

173 (a) Show that the equation $x^3 + 7x - 5 = 0$ has a solution between $x = 0$ and $x = 1$

(2)

(b) Show that the equation $x^3 + 7x - 5 = 0$ can be arranged to give $x = \dfrac{5}{x^2 + 7}$

(2)

(c) Starting with $x_0 = 1$, use the iteration formula $x_{n+1} = \dfrac{5}{x_n^{\,2} + 7}$ three times to find an estimate for the solution of $x^3 + 7x - 5 = 0$

.....

(3)

(d) By substituting your answer to part (c) into $x^3 + 7x - 5$,
comment on the accuracy of your estimate for the solution to $x^3 + 7x - 5 = 0$

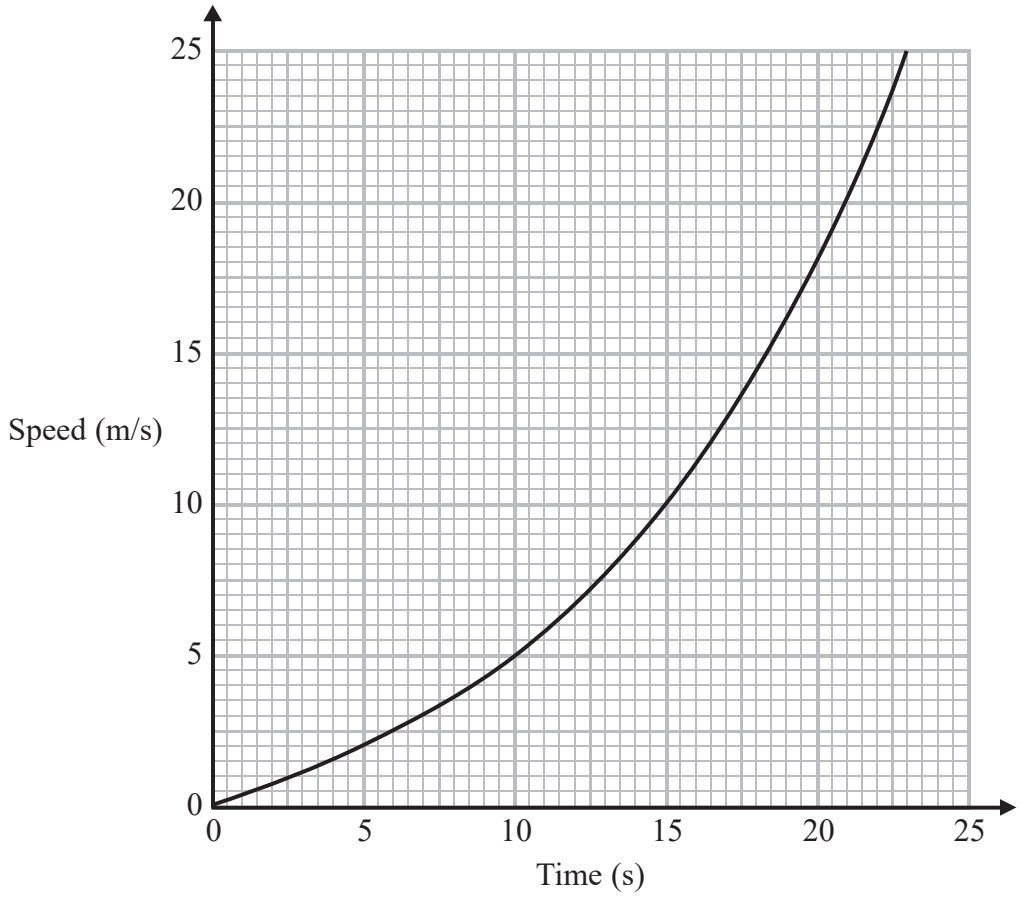
.....

.....

(2)

(Total for Question 173 is 9 marks)

174 Here is a speed-time graph for a train.



(a) Work out an estimate for the distance the train travelled in the first 20 seconds.
Use 4 strips of equal width.

..... m

(3)

(b) Is your answer to (a) an underestimate or an overestimate of the actual distance the train travelled?
Give a reason for your answer.

.....

.....

(1)

(Total for Question 174 is 4 marks)

175 Prove algebraically that the straight line with equation $x - 2y = 10$ is a tangent to the circle with equation $x^2 + y^2 = 20$

(Total for Question 175 is 5 marks)

176 Solve the simultaneous equations

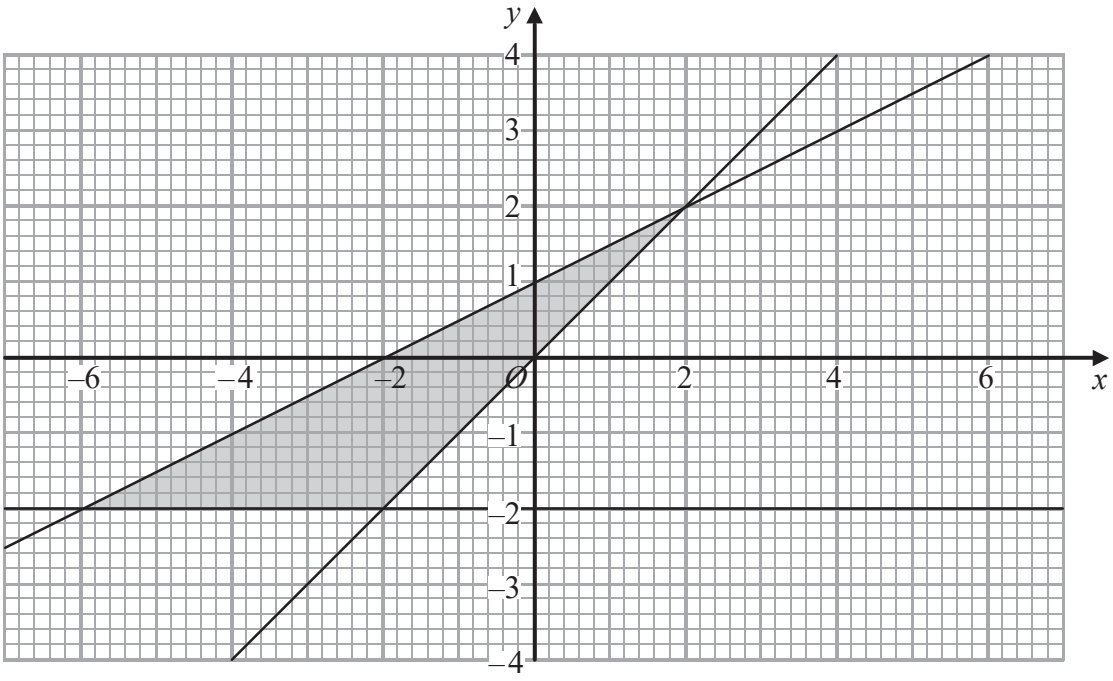
$$3x + y = -4$$
$$3x - 4y = 6$$

$x =$ .....

$y =$ .....

(Total for Question 176 is 3 marks)

177



Write down the three inequalities that define the shaded region.

.....

.....

.....

(Total for Question 177 is 4 marks)

178 (a) Simplify $\dfrac{x^2 - 16}{2x^2 - 5x - 12}$

.....

(3)

(b) Make v the subject of the formula $w = \dfrac{15(t - 2v)}{v}$

.....

(3)

(Total for Question 178 is 6 marks)

179 Solve $2x^2 + 3x - 2 > 0$

.....

(Total for Question 179 is 3 marks)

180 The equation of a curve is $y = a^x$

A is the point where the curve intersects the y-axis.

(a) State the coordinates of A.

(..... , ...)

(1)

The equation of circle **C** is $x^2 + y^2 = 16$

The circle **C** is translated by the vector $\begin{pmatrix} 3 \\ 0 \end{pmatrix}$ to give circle **B**.

(b) Draw a sketch of circle **B**.

Label with coordinates
the centre of circle **B**
and any points of intersection with the x-axis.

(3)

(Total for Question 180 is 4 marks)

181 Here are the first six terms of a Fibonacci sequence.

1 1 2 3 5 8

The rule to continue a Fibonacci sequence is,

the next term in the sequence is the sum of the two previous terms.

(a) Find the 9th term of this sequence.

.....

(1)

The first three terms of a different Fibonacci sequence are

a b $a + b$

(b) Show that the 6th term of this sequence is $3a + 5b$

(2)

Given that the 3rd term is 7 and the 6th term is 29,

(c) find the value of a and the value of b.

.....

(3)

(Total for Question 181 is 6 marks)

182 (a) Factorise $y^2 + 7y + 6$

.....

(2)

(b) Solve $6x + 4 > x + 17$

.....

(2)

(c) n is an integer with $-5 < 2n \leqslant 6$

Write down all the values of n

.....

(2)

(Total for Question 182 is 6 marks)

---

183 The function f is such that

$$f(x) = 4x - 1$$

(a) Find $f^{-1}(x)$

$f^{-1}(x) =$ .....

(2)

The function g is such that

$$g(x) = kx^2 \text{ where } k \text{ is a constant.}$$

Given that $fg(2) = 12$

(b) work out the value of k

$k =$ .....

(2)

(Total for Question 183 is 4 marks)

184 Solve $x^2 - 5x + 3 = 0$

Give your solutions correct to 3 significant figures.

.....

(Total for Question 184 is 3 marks)

185 (a) Show that the equation $x^3 + 4x = 1$ has a solution between $x = 0$ and $x = 1$

(2)

(b) Show that the equation $x^3 + 4x = 1$ can be arranged to give $x = \frac{1}{4} - \frac{x^3}{4}$

(1)

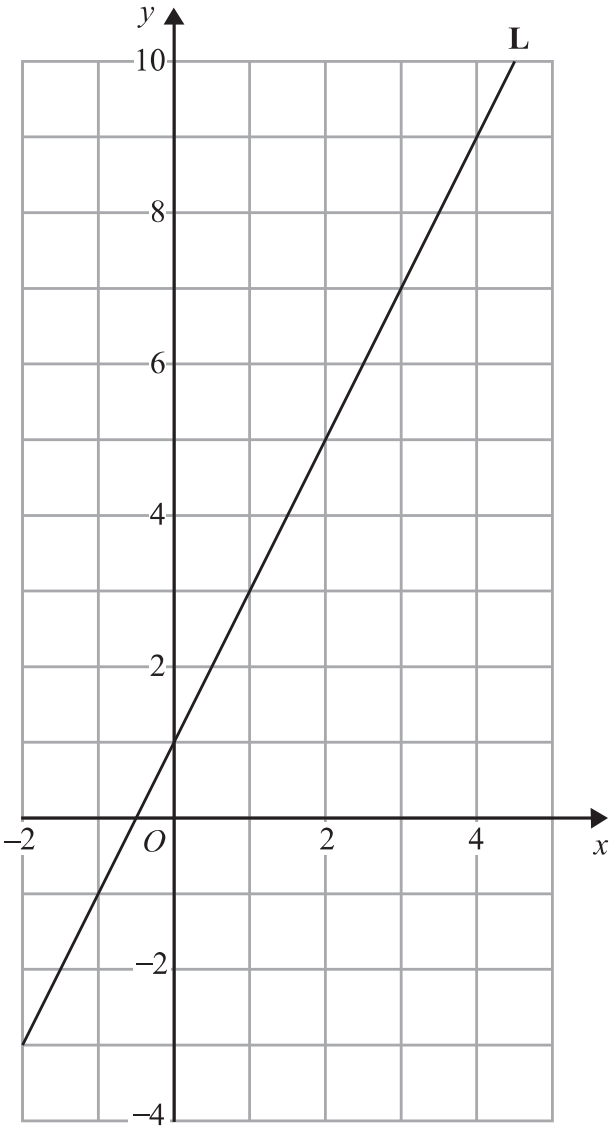
(c) Starting with $x_0 = 0$, use the iteration formula $x_{n+1} = \frac{1}{4} - \frac{x_n^3}{4}$ twice, to find an estimate for the solution of $x^3 + 4x = 1$

.....

(3)

(Total for Question 185 is 6 marks)

186 Line **L** is drawn on the grid below.



Find the equation for the straight line **L**.
Give your answer in the form $y = mx + c$

.....

(Total for Question 186 is 3 marks)

187 Factorise $x^2 + 3x - 4$

.....

(Total for Question 187 is 2 marks)

188 Here are the equations of four straight lines.

Line A $y = 2x + 4$
Line B $2y = x + 4$
Line C $2x + 2y = 4$
Line D $2x - y = 4$

Two of these lines are parallel.

Write down the two parallel lines?

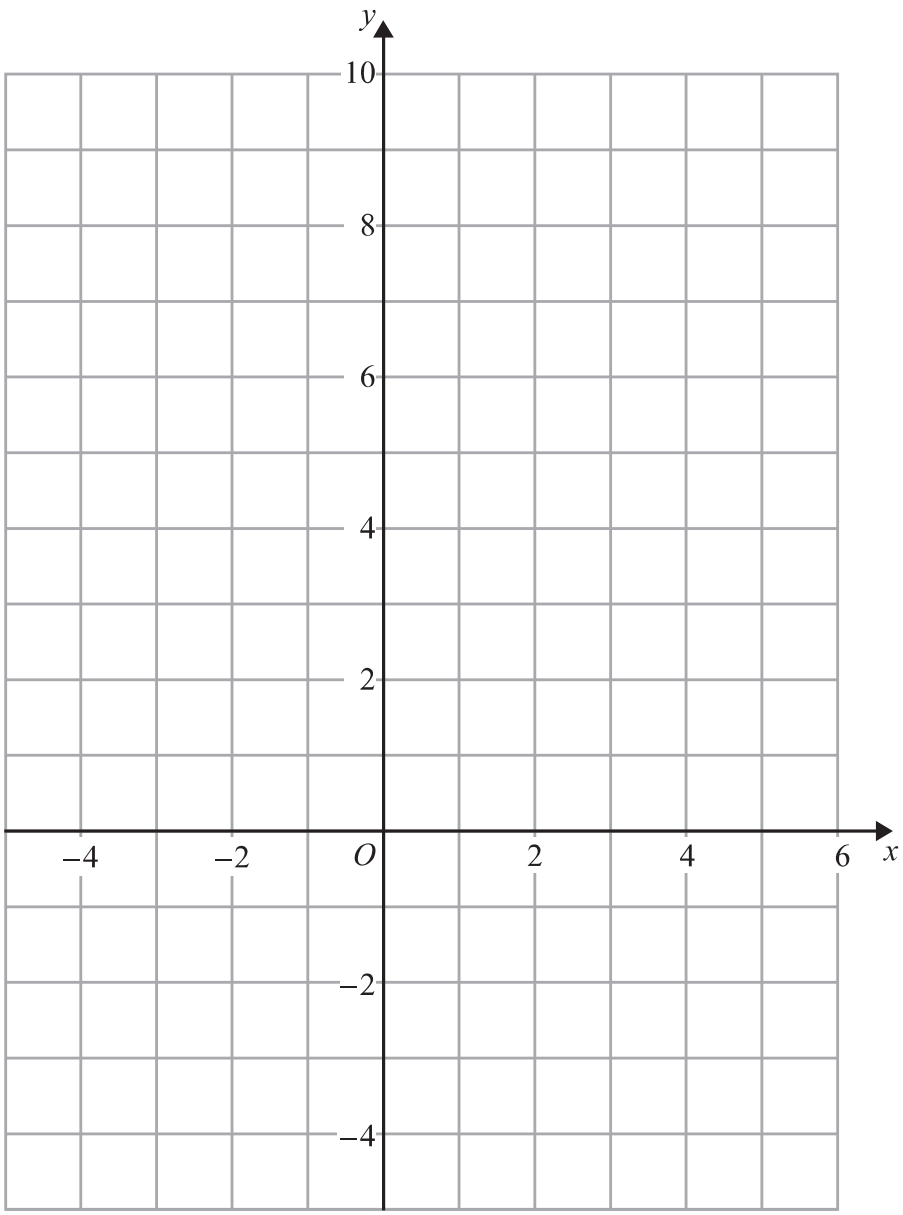
Line ..... and line.....

(Total for Question 188 is 1 mark)

189 On the grid, shade the region that satisfies all these inequalities.

$$x + y < 4 \qquad y > x - 1 \qquad y < 3x$$

Label the region **R**.



(Total for Question 189 is 4 marks)

190 Write $x^2 + 2x - 8$ in the form $(x + m)^2 + n$ where m and n are integers.

.....

(Total for Question 190 is 2 marks)

191 Write

$$4 - \left[(x + 3) \div \frac{x^2 + 5x + 6}{x - 2} \right]$$

as a single fraction in its simplest form.
You must show your working.

.....

(Total for Question 191 is 4 marks)

192 The graph of $y = f(x)$ is transformed to give the graph of $y = -f(x + 3)$
The point A on the graph of $y = f(x)$ is mapped to the point P on the graph of $y = -f(x + 3)$

The coordinates of point A are (9, 1)
Find the coordinates of point P.

(..... , ...)

(Total for Question 192 is 2 marks)

193 (a) Show that the equation $3x^2 - x^3 + 3 = 0$ can be rearranged to give

$$x = 3 + \frac{3}{x^2}$$

(2)

(b) Using

$$x_{n+1} = 3 + \frac{3}{x_n^2} \quad \text{with } x_0 = 3.2,$$

find the values of x_1, x_2 and x_3

.....

(3)

(c) Explain what the values of x_1, x_2 and x_3 represent.

.....

.....

(1)

(Total for Question 193 is 6 marks)

194 Here are the first five terms of an arithmetic sequence.

7 13 19 25 31

Prove that the difference between the squares of any two terms of the sequence is always a multiple of 24

(Total for Question 194 is 6 marks)

195 Make t the subject of the formula $y = \frac{t}{3} - 2a$

.....

(Total for Question 195 is 2 marks)

196 Solve the simultaneous equations

$$2x - 4y = 19$$
$$3x + 5y = 1$$

$x =$ .....

$y =$ .....

(Total for Question 196 is 4 marks)

197 Show that $\frac{a}{b+1} - \frac{a}{(b+1)^2}$ can be written as $\frac{ab}{(b+1)^2}$

(Total for Question 197 is 2 marks)

198 The product of two consecutive positive integers is added to the larger of the two integers.

Prove that the result is always a square number.

(Total for Question 198 is 3 marks)

199 (a) Write $2x^2 + 16x + 35$ in the form $a(x + b)^2 + c$ where a, b, and c are integers.

.....

(3)

(b) Hence, or otherwise, write down the coordinates of the turning point of the graph of $y = 2x^2 + 16x + 35$

.....

(1)

(Total for Question 199 is 4 marks)

200 (a) Simplify $x^7 \times x^5$

.....

(1)

(b) Simplify $2y \div y$

.....

(1)

$v = 2t^2$

$t = 3$

(c) Work out the value of v.

.....

(1)

(d) Give an example to show that, when n is a whole number, $6n + 1$ is **not** always a prime number.
You must give your value of n.

$n =$ .....

(1)

(Total for Question 200 is 4 marks)

201 Solve $4(x + 3) = 2x + 8$

$x =$ .....

(Total for Question 201 is 3 marks)

202 Here are the first five terms of an arithmetic sequence.

2 5 8 11 14

(a) Write down an expression, in terms of n, for the nth term of this sequence.

.....

(2)

(b) Is 299 a term of this sequence?
You must give a reason for your answer.

.....

.....

(2)

(c) Write down an expression, in terms of n, for the $(n + 1)$th term of this sequence.

.....

(1)

(Total for Question 202 is 5 marks)

203 Q, R and S are points on a grid.

Q is the point with coordinates (106, 103)
R is the point with coordinates (106, 105)
S is the point with coordinates (104, 105.5)

P and A are two other points on the grid such that

R is the midpoint of PQ
S is the midpoint of PA

Work out the coordinates of the point A.

(..... , ...)

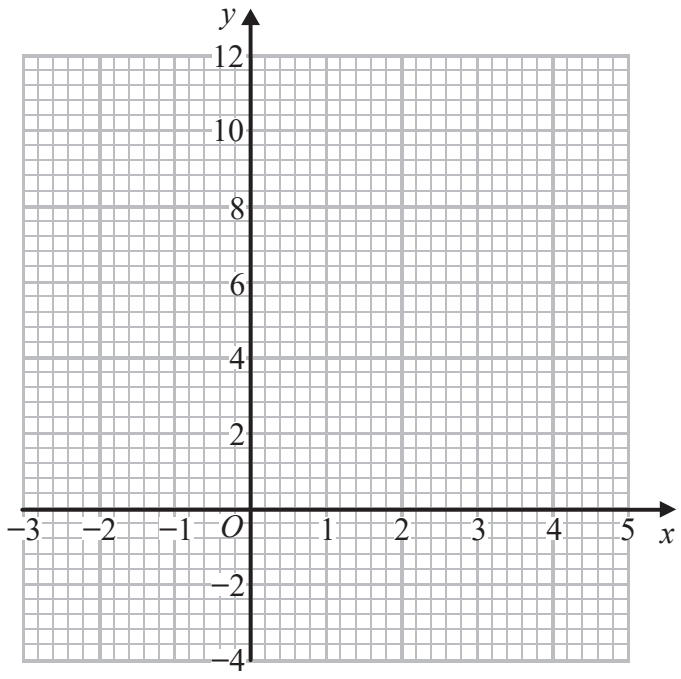
(Total for Question 203 is 3 marks)

204 (a) Complete the table of values for $y = x^2 - 3x + 1$

x	−2	−1	0	1	2	3	4
y	11		1	−1		1	

(2)

(b) On the grid, draw the graph of $y = x^2 - 3x + 1$ for values of x from −2 to 4



(2)

(c) By drawing a suitable straight line on the grid, find estimates for the solutions of

$$x^2 - 3x + 1 = 3$$

.....

(2)

(Total for Question 204 is 6 marks)

205 3 kg of potatoes and 4 kg of carrots have a total cost of 440p.
4 kg of potatoes and 3 kg of carrots have a total cost of 470p.

Work out the total cost of 1 kg of potatoes and 1 kg of carrots.

.....p

(Total for Question 205 is 4 marks)

206 Solve $\frac{x+1}{3} + \frac{2x+5}{4} = 2$

x = ...

(Total for Question 206 is 4 marks)

207 (a) Simplify $(x^{-2})^{-3}$

.....

(1)

(b) Factorise $2y^2 - 5y - 3$

.....

(2)

(Total for Question 207 is 3 marks)

208 $a = \sqrt{8} + 2$

$b = \sqrt{8} - 2$

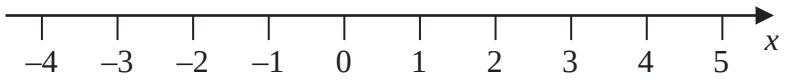
$T = a^2 - b^2$

Work out the value of T.
Give your answer in the form $c\sqrt{2}$ where c is an integer.

.....

(Total for Question 208 is 4 marks)

209 (a) Show the inequality $x < 3$ on the number line below.



(2)

(b) Solve the inequality $4x - 7 \geqslant 13$

.....

(2)

(Total for Question 209 is 4 marks)

210 $h = 3t^2$

(a) Work out the value of h when $t = 5$

.....

(2)

$h = 3t^2$

(b) Work out the value of t when $h = 108$

.....

(2)

(c) Make a the subject of the formula

$$v = u + at$$

.....

(2)

(Total for Question 210 is 6 marks)

211 *AB* is a line segment.

The midpoint of the line segment *AB* has coordinates (3, 5)
Point *A* has coordinates (9, 2)

(a) Work out the coordinates of point *B*.

(..... , ...)

(2)

(b) Work out an equation of the straight line that passes through (9, 2) and (3, 5)

.....

(3)

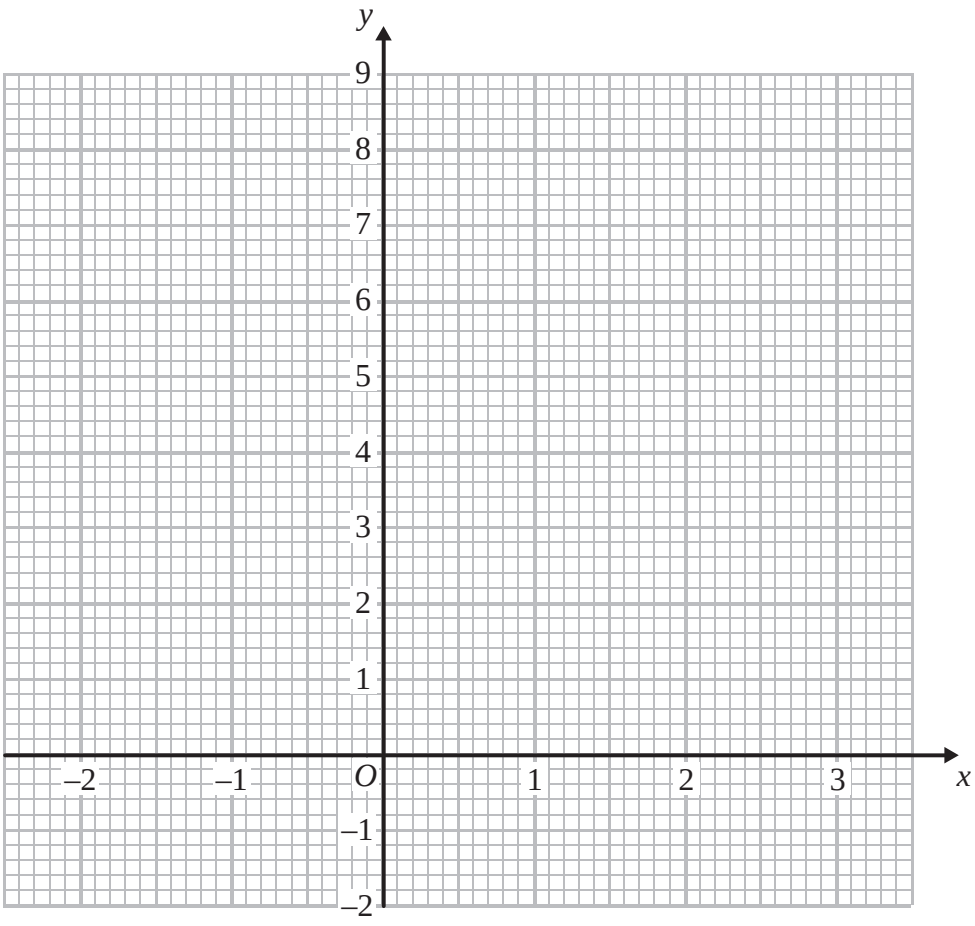
(Total for Question 211 is 5 marks)

212 (a) Complete the table of values for $y = 2^x$

x	–2	–1	0	1	2	3
y	0.25			2		

(2)

(b) On the grid, draw the graph of $y = 2^x$ for values of x from –2 to 3



(2)

(Total for Question 212 is 4 marks)

213 Solve the simultaneous equations

$2x - y = 13$

$x - 2y = 11$

$x =$ .....

$y =$ .....

(Total for Question 213 is 3 marks)

214 (a) Simplify $p^2 \times p^5$

.....

(1)

(b) Simplify $g^6 \div g^4$

.....

(1)

(c) Simplify $(k^3)^2$

.....

(1)

(d) Expand and simplify $3(m + 4) – 2(4m + 1)$

.....

(2)

(e) Factorise $n^2 – 7n$

.....

(1)

(Total for Question 214 is 6 marks)

215 A shop sells packets of envelopes.

There are 5 envelopes in a small packet.
There are 20 envelopes in a large packet.

There is a total of T envelopes in x small packets and y large packets.

Write down a formula for T in terms of x and y.

.....

(Total for Question 215 is 3 marks)

216

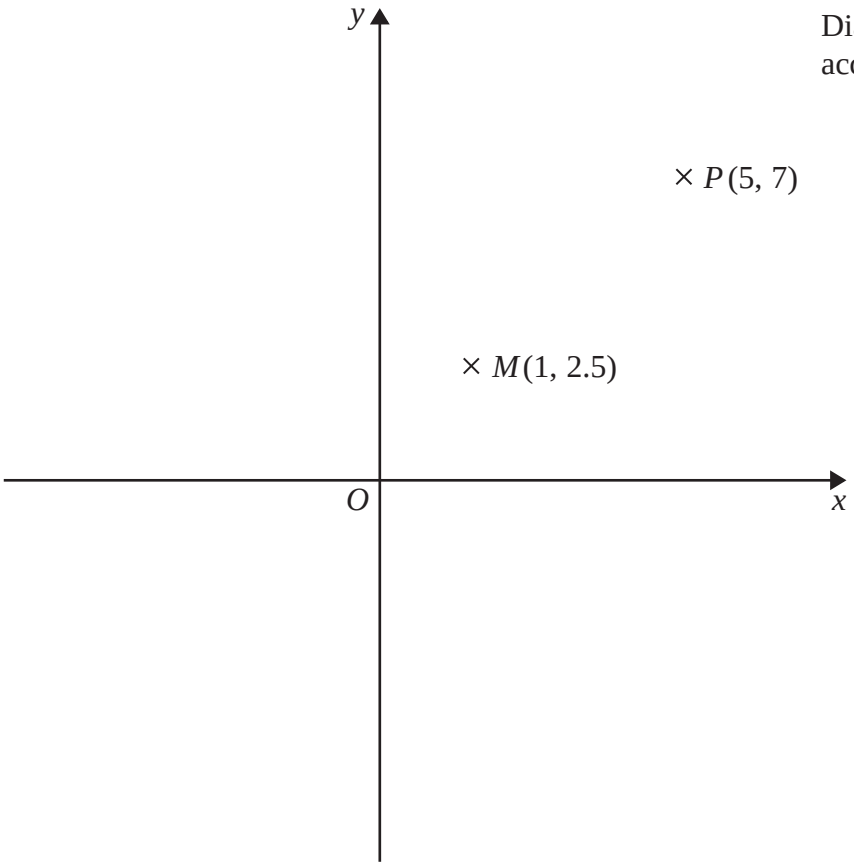


Diagram **NOT** accurately drawn

Point P has coordinates (5, 7).
Point M has coordinates (1, 2.5).

Point M is the midpoint of the line PQ.

Find the coordinates of point Q.

(..... , ...)

(Total for Question 216 is 2 marks)

217 (a) Solve $3x - 5 < 16$

.....

(2)

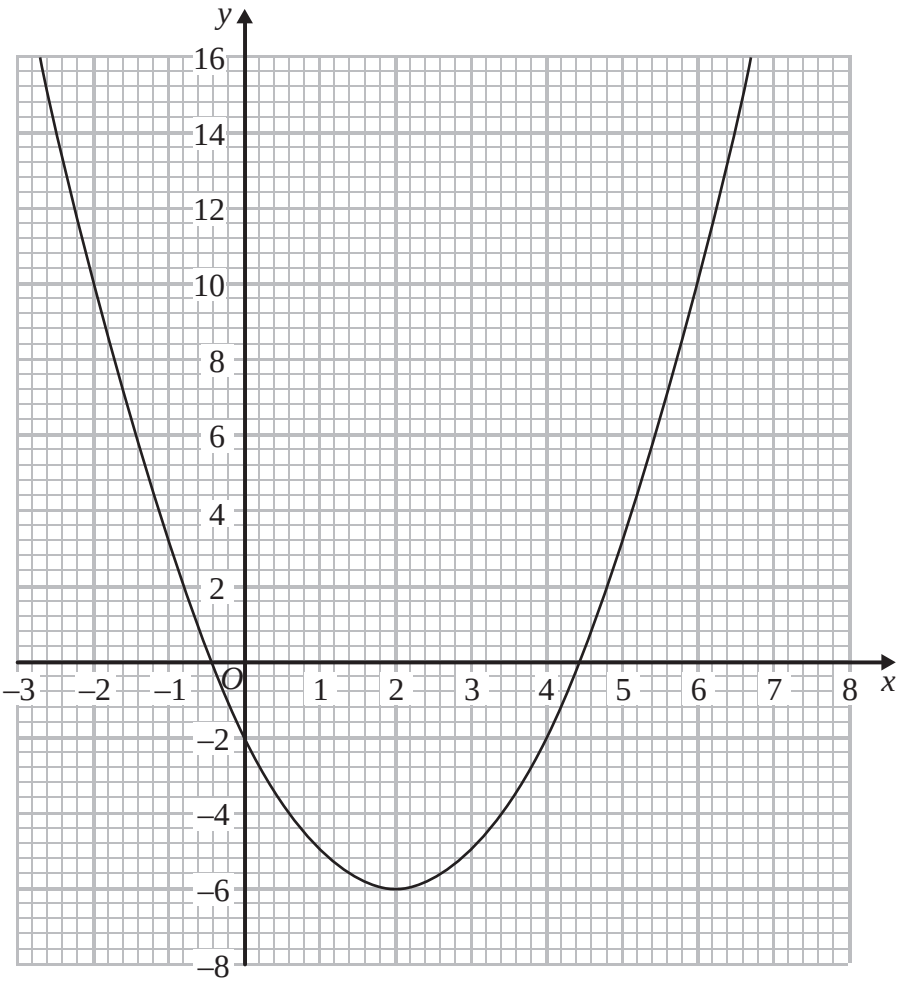
(b) Solve $\frac{11 - w}{4} = 1 + w$

$w =$ .....

(3)

(Total for Question 217 is 5 marks)

218 The diagram shows the graph of $y = x^2 - 4x - 2$



(a) Use the graph to find estimates for the solutions of

(i) $x^2 - 4x - 2 = 0$

.....

(ii) $x^2 - 4x - 6 = 0$

.....

(3)

(b) Use the graph to find estimates for the values of x that satisfy the simultaneous equations

$$y = x^2 - 4x - 2$$

$$x + y = 6$$

.....

(3)

(Total for Question 218 is 6 marks)

219 Solve $x^2 = 4(x - 3)^2$

.....

(Total for Question 219 is 3 marks)

220 Here are the first four terms of an arithmetic sequence.

11 17 23 29

(a) Find, in terms of n, an expression for the nth term of this arithmetic sequence.

.....

(2)

(b) Is 121 a term of this arithmetic sequence?
You must explain your answer.

.....

.....

.....

(2)

(Total for Question 220 is 4 marks)

221 (a) Expand $x(x + 2)$

.....

(1)

(b) Expand and simplify $3(y + 2) + 4(x - 1)$

.....

(2)

(c) Expand and simplify $(2t - 3)(t + 5)$

.....

(2)

(d) Factorise fully $8a^2 + 12a$

.....

(2)

(e) Factorise $y^2 - y - 2$

.....

(2)

(Total for Question 221 is 9 marks)

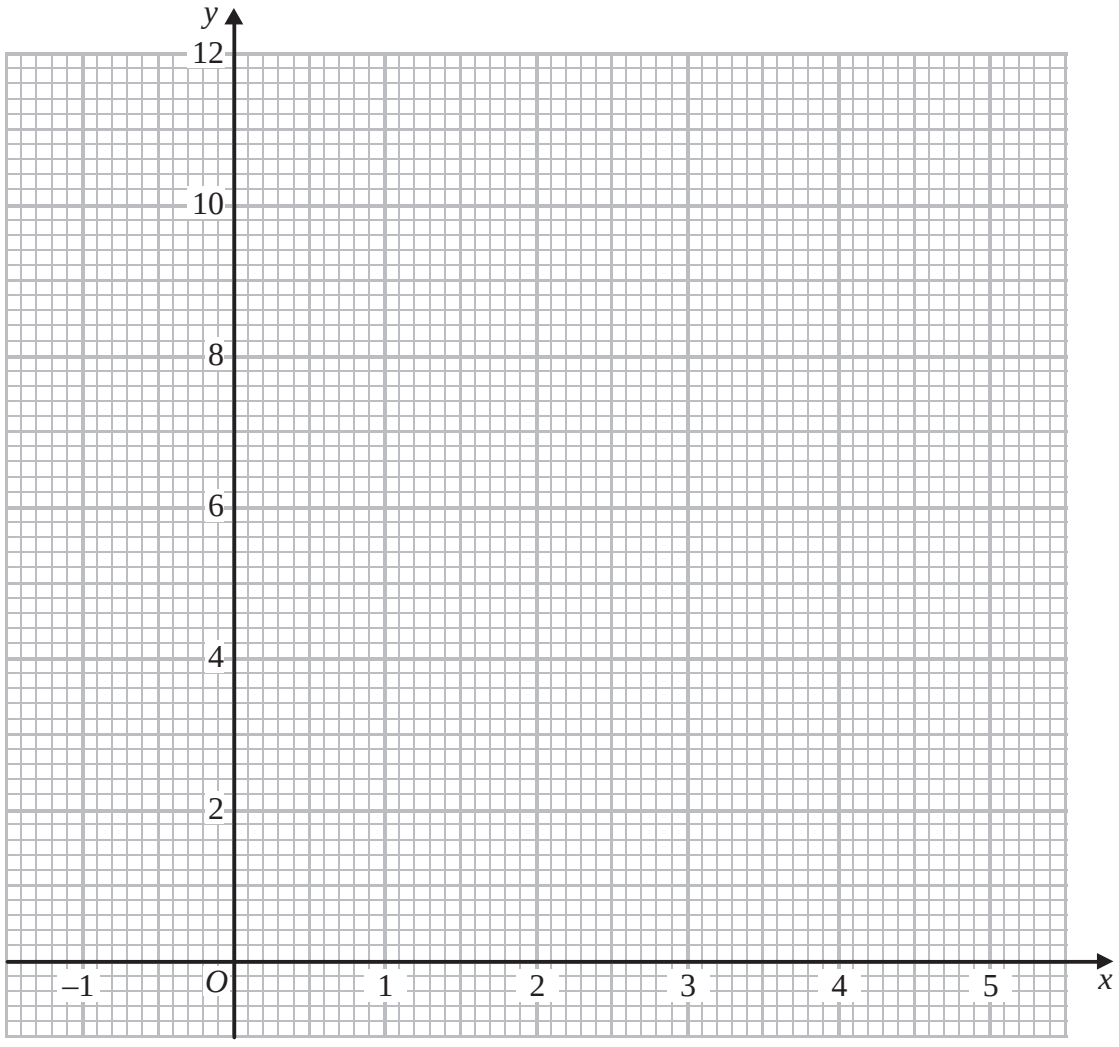
222 (a) Complete the table of values for $y = x^2 - 3x + 2$

x	−1	0	1	2	3	4	5
y	6				2		12

(2)

(b) On the grid, draw the graph of $y = x^2 - 3x + 2$ for values of x from –1 to 5

(2)



(c) Find estimates for the solutions of the equation $x^2 - 3x + 2 = 4$

.....

(2)

(Total for Question 222 is 6 marks)

223 Solve

$$2x + 3y = \frac{2}{3}$$

$$3x - 4y = 18$$

$x =$ .....

$y =$ .....

(Total for Question 223 is 4 marks)

224 (a) Write as a single fraction in its simplest form $\frac{5}{2-x} - \frac{4}{x}$

.....

(3)

(b) Make y the subject of the formula

$$t = \frac{2-3y}{y+2}$$

.....

(4)

(Total for Question 224 is 7 marks)

225 $x = 3$

(a) Work out the value of $4x^2$

.....

(1)

(b) Solve $5x + 4 = 14 + x$

$x =$ .....

(2)

(Total for Question 225 is 3 marks)

226 (a) Simplify $6g - 5h - 4g + 2h$

.....

(2)

(b) Factorise $y^2 - 2y$

.....

(1)

(c) Simplify fully $\dfrac{p^3 \times p^4}{p^2}$

.....

(2)

(Total for Question 226 is 5 marks)

227 *A* and *B* are two points.

Point *A* has coordinates (–2, 4).
Point *B* has coordinates (8, 9).

C is the midpoint of the line segment *AB*.

(a) Find the coordinates of *C*.

(..... , ...)

(2)

D is the point with coordinates (100, 56).

*(b) Does point *D* lie on the straight line that passes through *A* and *B*?
You must show how you work out your answer.

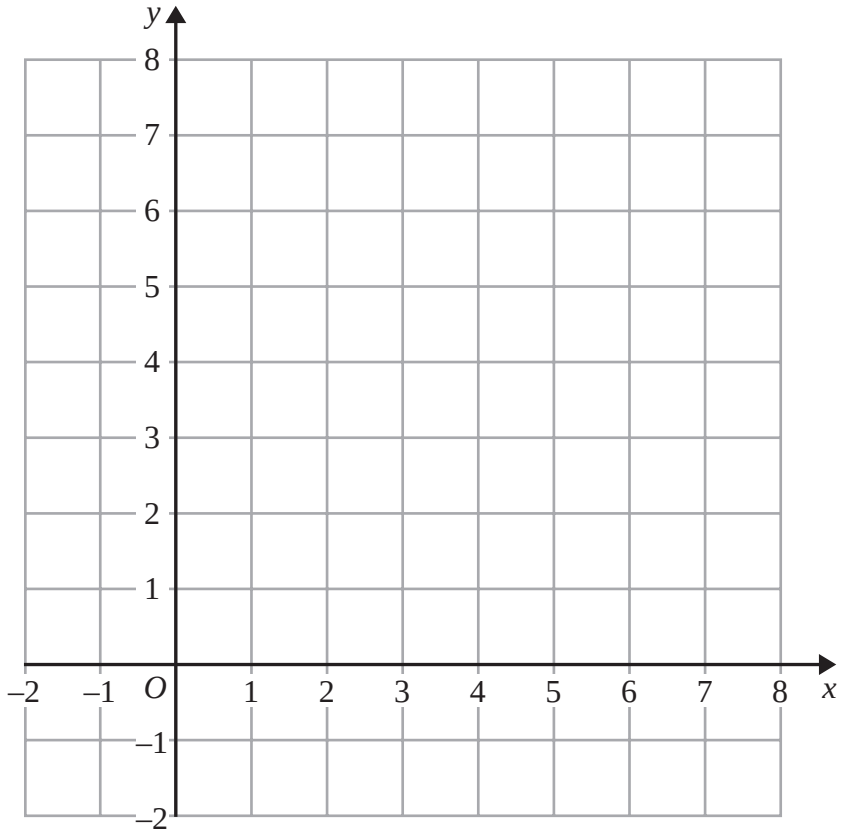
(3)

(Total for Question 227 is 5 marks)

228 On the grid show, by shading, the region that satisfies all three of the inequalities

$x + y < 7$ $y < 2x$ $y > 3$

Label the region **R**.



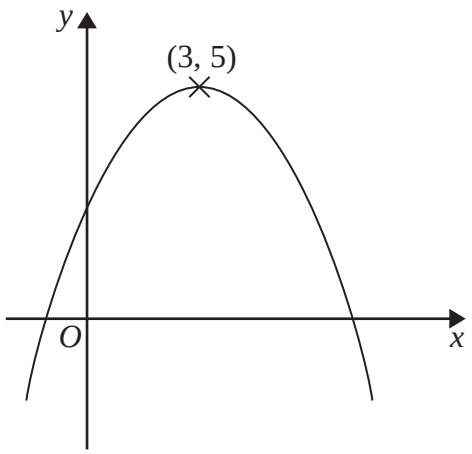
(Total for Question 228 is 4 marks)

229 Make a the subject of the formula $p = \dfrac{3a + 5}{4 - a}$

.....

(Total for Question 229 is 4 marks)

230



The diagram shows part of the curve with equation $y = f(x)$.
The coordinates of the maximum point of the curve are (3, 5).

(a) Write down the coordinates of the maximum point of the curve with equation

(i) $y = f(x + 3)$

(..... , ...)

(ii) $y = 2f(x)$

(..... , ...)

(iii) $y = f(3x)$

(..... , ...)

(3)

The curve with equation $y = f(x)$ is transformed to give the curve with equation $y = f(x) - 4$

(b) Describe the transformation.

.....

(1)

(Total for Question 230 is 4 marks)

231 Kalinda buys x packs of currant buns and y boxes of iced buns.

There are 6 currant buns in a pack of currant buns.
There are 8 iced buns in a box of iced buns.

Kalinda buys a total of T buns.
Write down a formula for T in terms of x and y.

.....

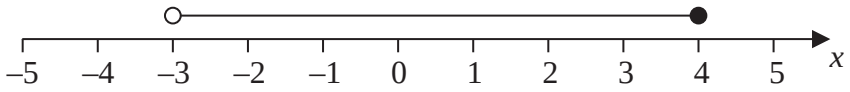
(Total for Question 231 is 3 marks)

232 (a) Solve the inequality $6y + 5 > 8$

.....

(2)

(b) Here is an inequality, in x, shown on a number line.



Write down the inequality.

.....

(2)

(Total for Question 232 is 4 marks)

233 (a) Factorise $3e^2 + 5e$

.....

(1)

(b) Solve $7(k - 3) = 3k - 5$

$k =$ .....

(3)

(c) Expand and simplify $(2x + 3)(x - 8)$

.....

(2)

(d) Solve $\dfrac{7 - 3f}{4} = 2$

$f =$ .....

(3)

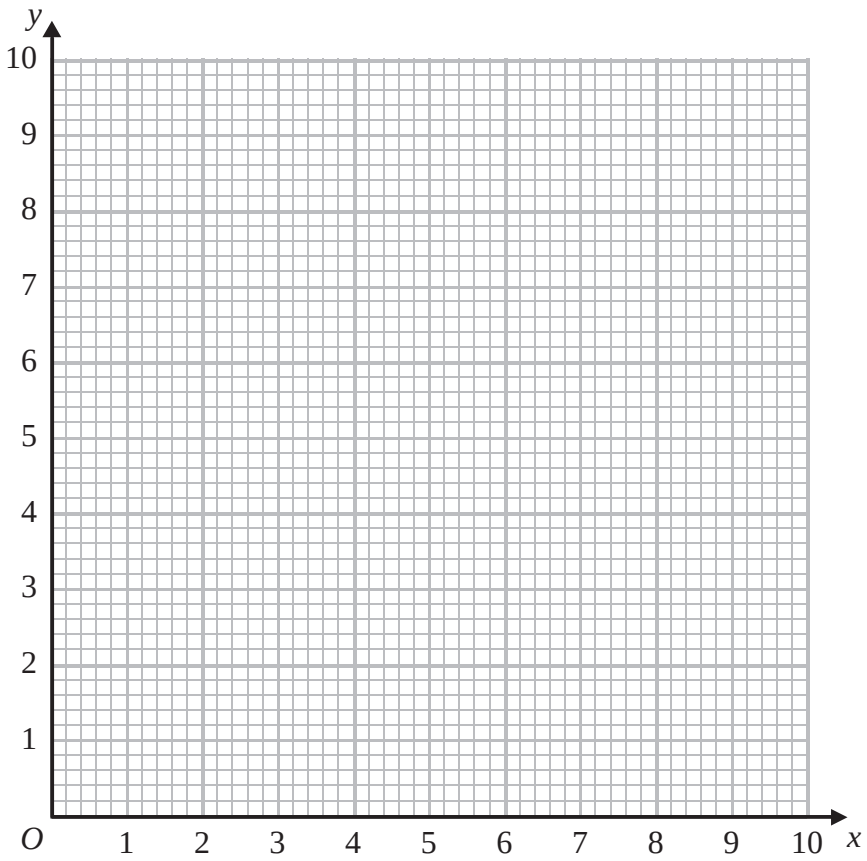
(Total for Question 233 is 9 marks)

234 (a) Complete the table of values for $y = \frac{4}{x}$

x	0.5	1	2	4	5	8
y		4	2			

(2)

(b) On the grid, draw the graph of $y = \frac{4}{x}$ for $0.5 \leqslant x \leqslant 8$



(2)

(Total for Question 234 is 4 marks)

235 (a) Simplify fully $(3e)^0$

.....

(1)

(b) Simplify fully $\left(\frac{64x^6}{25y^2}\right)^{-\frac{1}{2}}$

.....

(2)

(c) Write $\frac{5}{x-3} - \frac{4}{x+3}$ as a single fraction in its simplest form.

.....

(3)

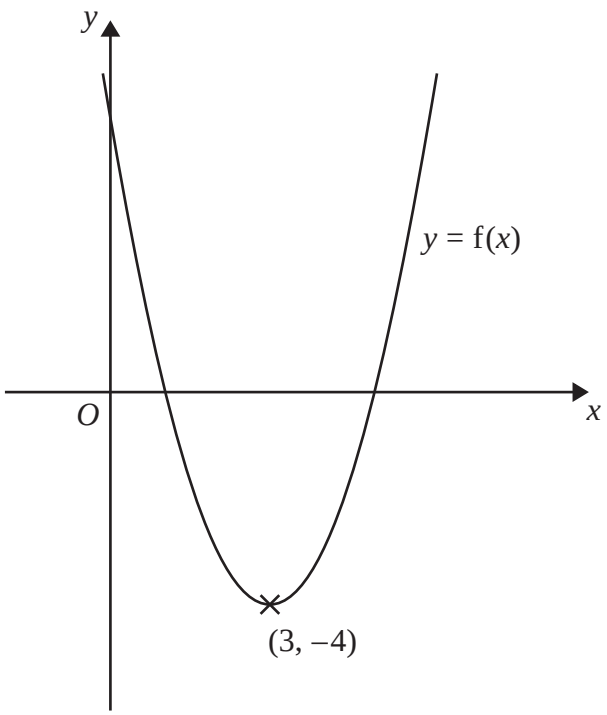
(Total for Question 235 is 6 marks)

***236** A is the point with coordinates (1, 3)
B is the point with coordinates (4, –1)
The straight line L goes through both A and B.

Is the line with equation $2y = 3x - 4$ perpendicular to line L?
You must show how you got your answer.

(Total for Question 236 is 4 marks)

237



The diagram shows part of the curve with equation $y = f(x)$.
The coordinates of the minimum point of this curve are $(3, -4)$

Write down the coordinates of the minimum point of the curve with equation

(i) $y = f(x) + 3$

(..... , ...)

(ii) $y = f(2x)$

(..... , ...)

(iii) $y = f(-x)$

(..... , ...)

(Total for Question 237 is 3 marks)

238 (a) Expand $2m(m + 3)$

.....

(1)

(b) Factorise fully $3xy^2 - 6xy$

.....

(2)

(Total for Question 238 is 3 marks)

239 You can change temperatures from °F to °C by using the formula

$$C = \frac{5(F - 32)}{9}$$

F is the temperature in °F.
C is the temperature in °C.

The minimum temperature in an elderly person's home should be 20 °C.

Mrs Smith is an elderly person.
The temperature in Mrs Smith's home is 77 °F.

*(a) Decide whether or not the temperature in Mrs Smith's home is lower than the minimum temperature should be.

(3)

(b) Make F the subject of the formula $C = \frac{5(F - 32)}{9}$

.....

(3)

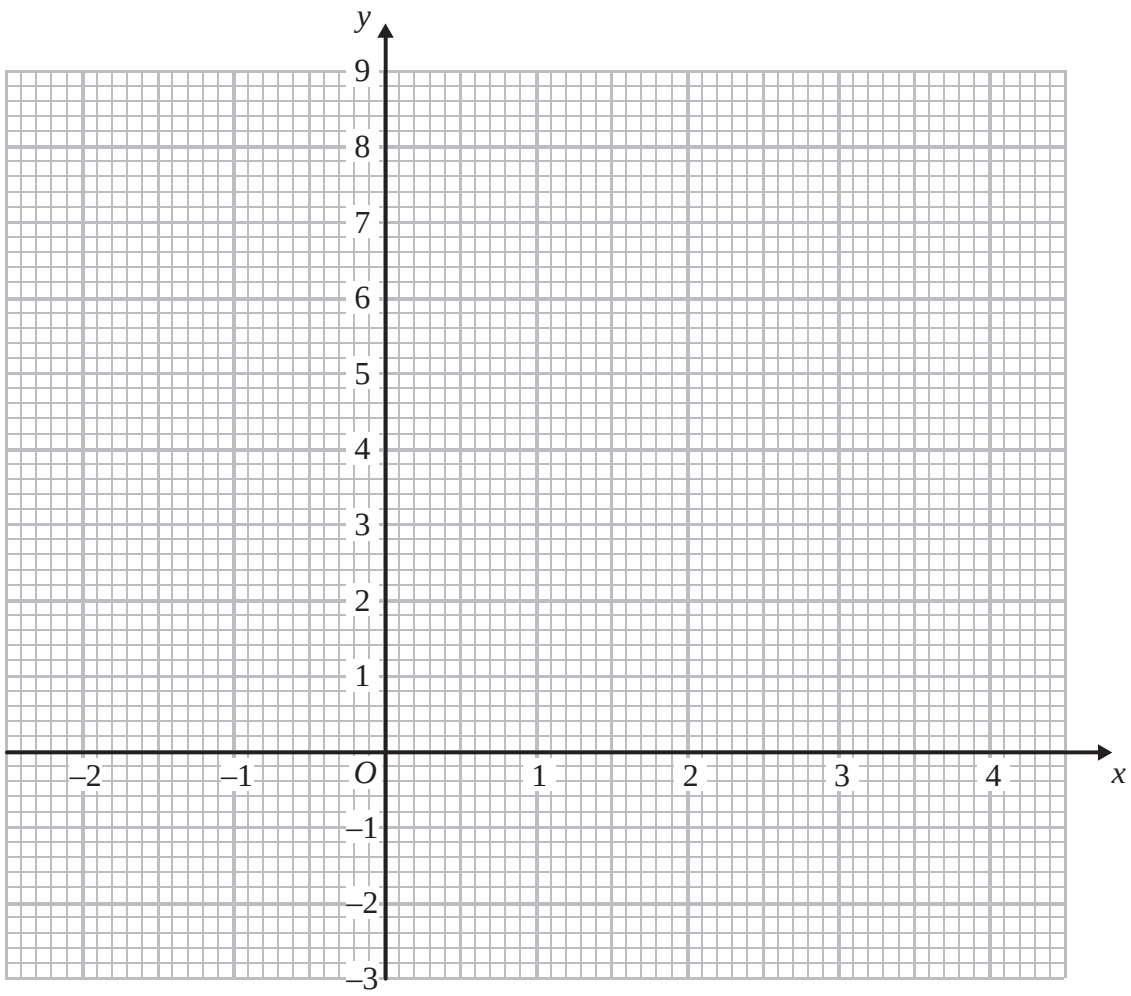
(Total for Question 239 is 6 marks)

240 (a) Complete the table of values for $y = x^2 - 2x - 1$

x	–2	–1	0	1	2	3	4
y	7			–2	–1		

(2)

(b) On the grid, draw the graph of $y = x^2 - 2x - 1$ for values of x from –2 to 4



(2)

(c) Solve $x^2 - 2x - 1 = x + 3$

.....

(2)

(Total for Question 240 is 6 marks)

241 Solve the simultaneous equations

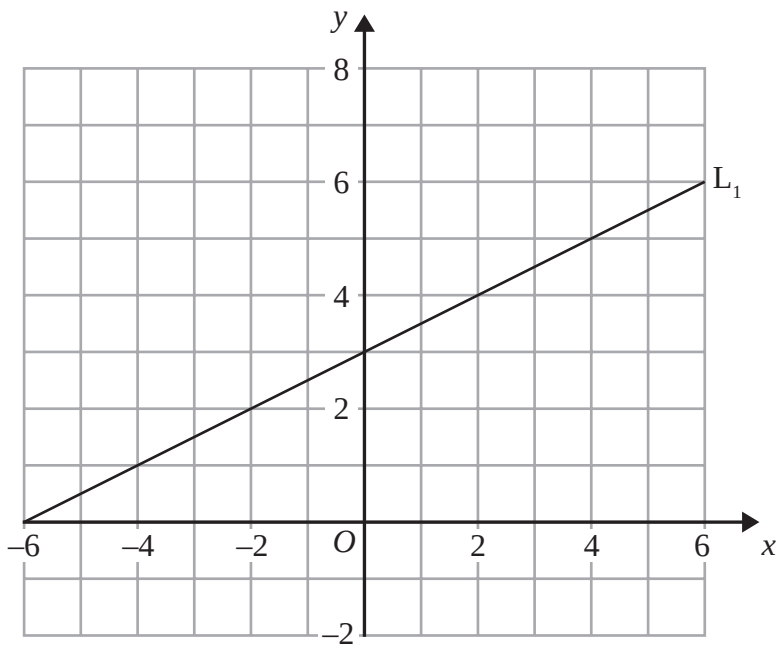
$$4x + y = 25$$
$$x - 3y = 16$$

$x =$ .....

$y =$ .....

(Total for Question 241 is 3 marks)

242 The diagram shows a straight line, L_1, drawn on a grid.



A straight line, L_2, is parallel to the straight line L_1 and passes through the point (0, –5).

Find an equation of the straight line L_2.

.....

(Total for Question 242 is 3 marks)

243 (a) Simplify $(3x^2y^4)^3$

.....

(2)

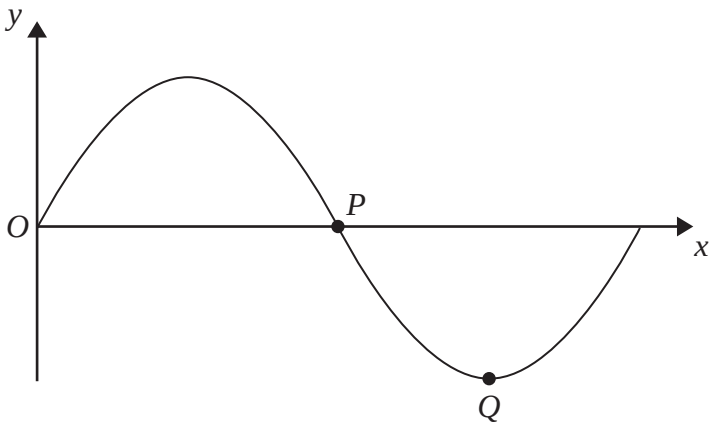
(b) Simplify $\dfrac{x^2 - 9}{2x^2 + 5x - 3}$

.....

(3)

(Total for Question 243 is 5 marks)

244 The diagram shows part of a sketch of the curve $y = \sin x°$.



(a) Write down the coordinates of the point P.

(..... , ...)

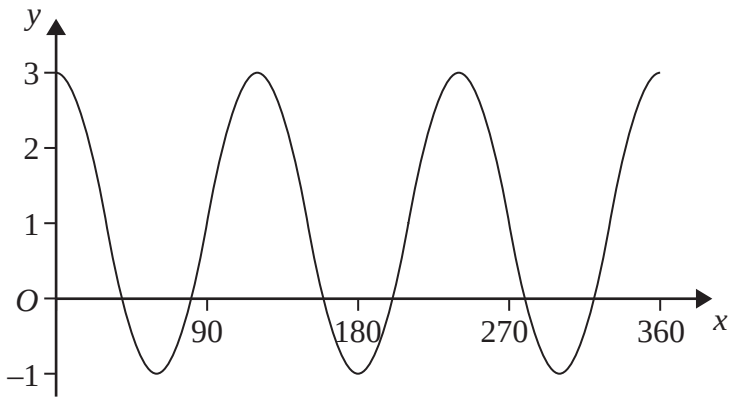
(1)

(b) Write down the coordinates of the point Q.

(..... , ...)

(1)

Here is a sketch of the curve $y = a\cos bx° + c, \quad 0 \leqslant x \leqslant 360$



(c) Find the values of a, b and c.

a = ...

b = ...

c = ...

(3)

(Total for Question 244 is 5 marks)

245 (a) Simplify $4y + 2x - 3 + 3x + 8$

.....

(2)

(b) Factorise fully $9x^2 - 6xy$

.....

(2)

(c) Expand $4(x + 2)$

.....

(1)

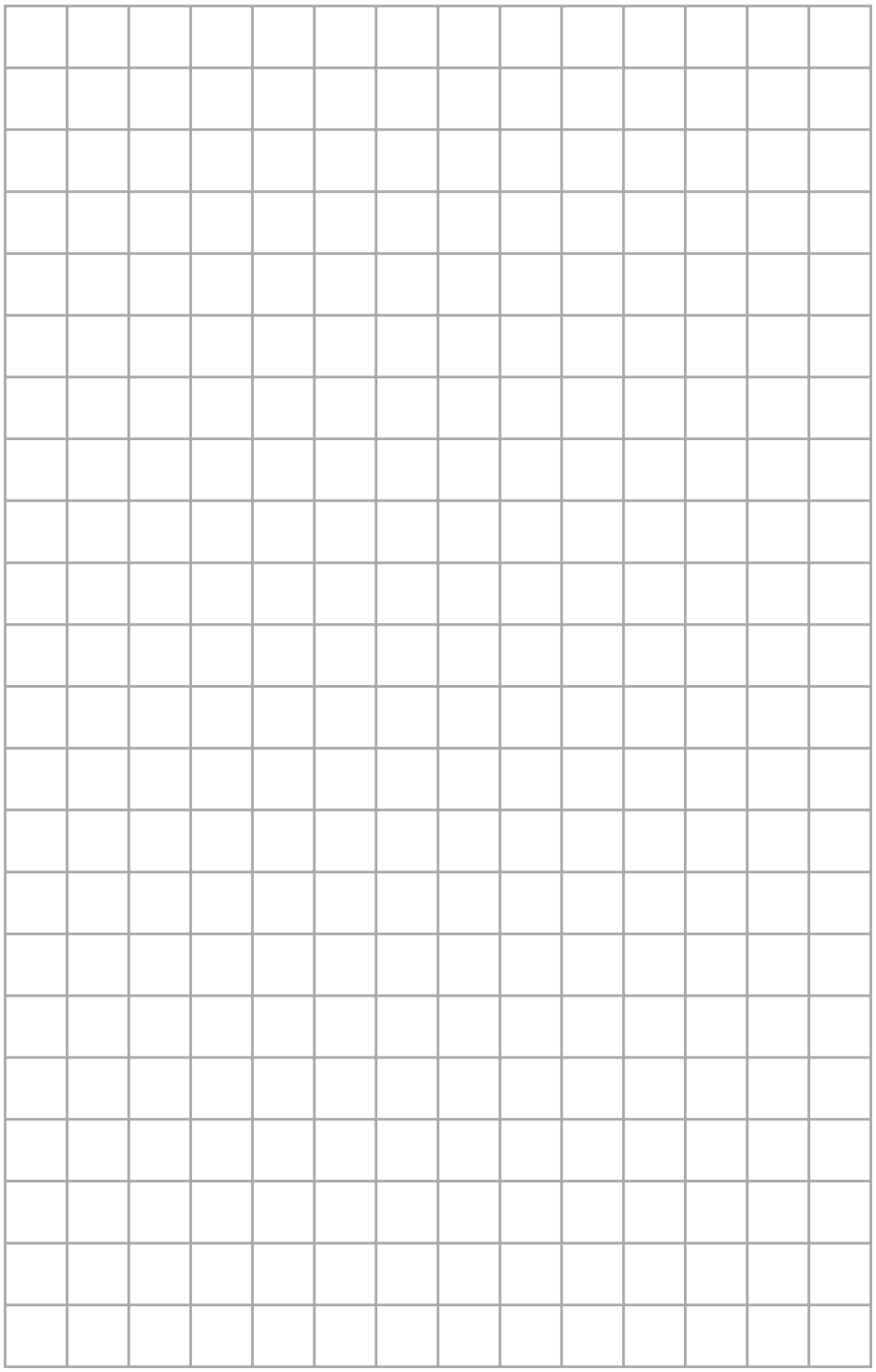
(d) Expand and simplify $(x - 5)(x + 3)$

.....

(2)

(Total for Question 245 is 7 marks)

246 On the grid, draw the graph of $y = 3x + 2$ for values of x from -2 to 2



(Total for Question 246 is 4 marks)

247 Solve the simultaneous equations

$3x + 4y = 5$
$2x - 3y = 9$

$x =$ .....

$y =$ .....

(Total for Question 247 is 4 marks)

248 AB is a line segment.

A is the point with coordinates (3, 6, 7).
The midpoint of AB has coordinates (–2, 2, 5).

Find the coordinates of B.

.....

(Total for Question 248 is 2 marks)

249 (a) Solve $\frac{4(8x - 2)}{3x} = 10$

.....

(3)

(b) Write as a single fraction in its simplest form

$$\frac{2}{y + 3} - \frac{1}{y - 6}$$

.....

(3)

(Total for Question 249 is 6 marks)

250 (a) Expand $3(2 + t)$

.....

(1)

(b) Expand $3x(2x + 5)$

.....

(2)

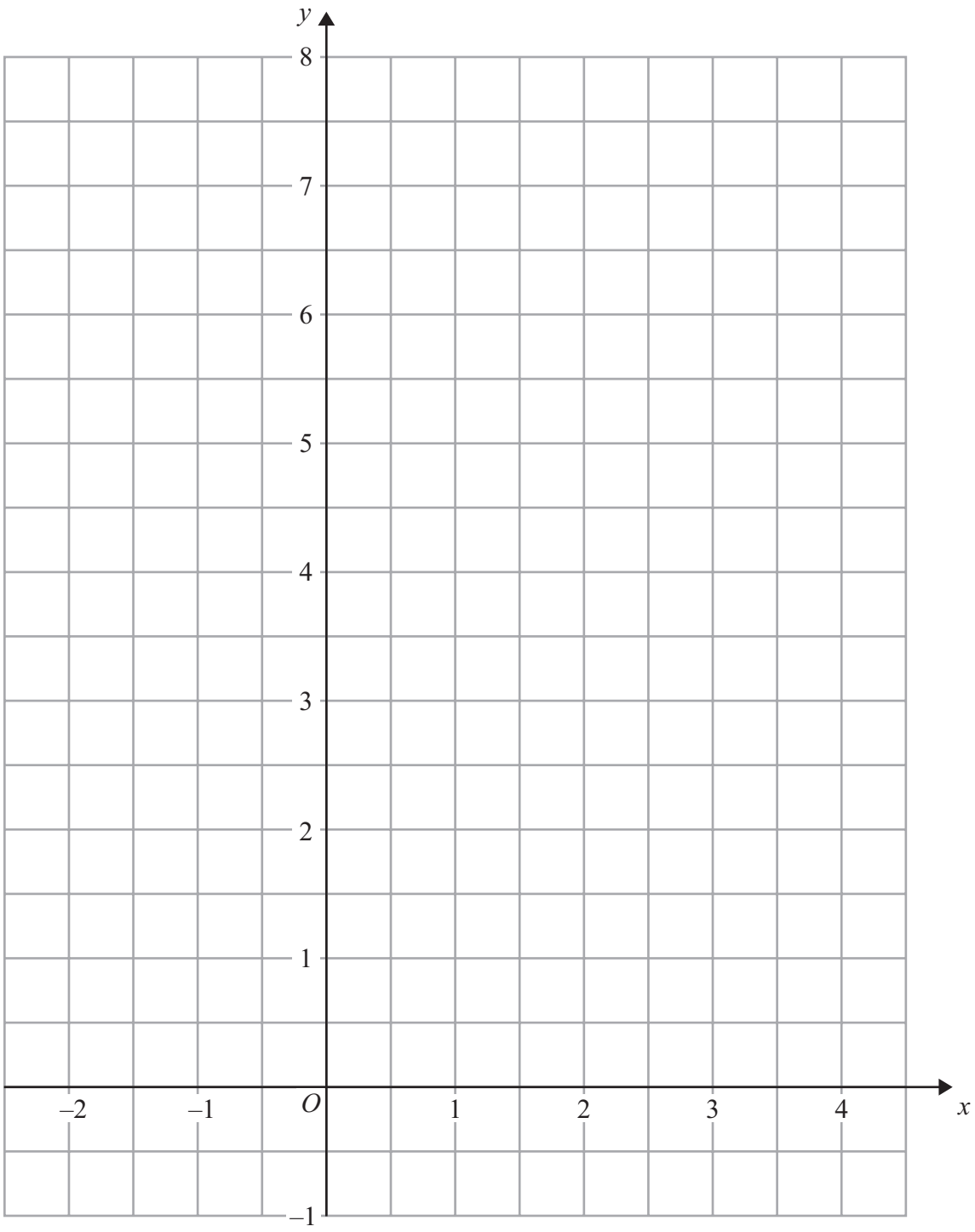
(c) Expand and simplify $(m + 3)(m + 10)$

.....

(2)

(Total for Question 250 is 5 marks)

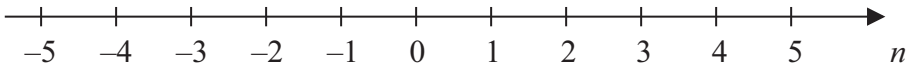
251 On the grid, draw the graph of $y = \frac{1}{2}x + 5$ for values of x from –2 to 4



(Total for Question 251 is 3 marks)

252 $-2 < n \leqslant 3$

(a) Represent this inequality on the number line.



(2)

(b) Solve the inequality $8x - 3 \geqslant 6x + 4$

.....

(2)

(Total for Question 252 is 4 marks)

253 Solve the simultaneous equations

$$4x + 7y = 1$$
$$3x + 10y = 15$$

$x =$ .....

$y =$ .....

(Total for Question 253 is 4 marks)

254 Simplify $\dfrac{4(x+5)}{x^2+2x-15}$

.....

(Total for Question 254 is 2 marks)

255 The expression $x^2 - 8x + 21$ can be written in the form $(x - a)^2 + b$ for all values of x.

(a) Find the value of a and the value of b.

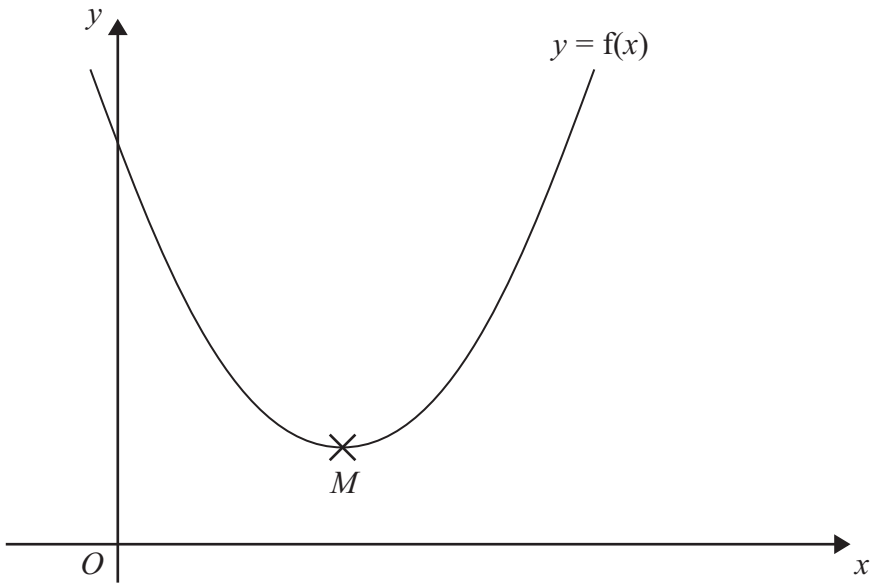
$a =$ .....

$b =$ .....

(3)

The equation of a curve is $y = f(x)$ where $f(x) = x^2 - 8x + 21$

The diagram shows part of a sketch of the graph of $y = f(x)$.



The minimum point of the curve is M.

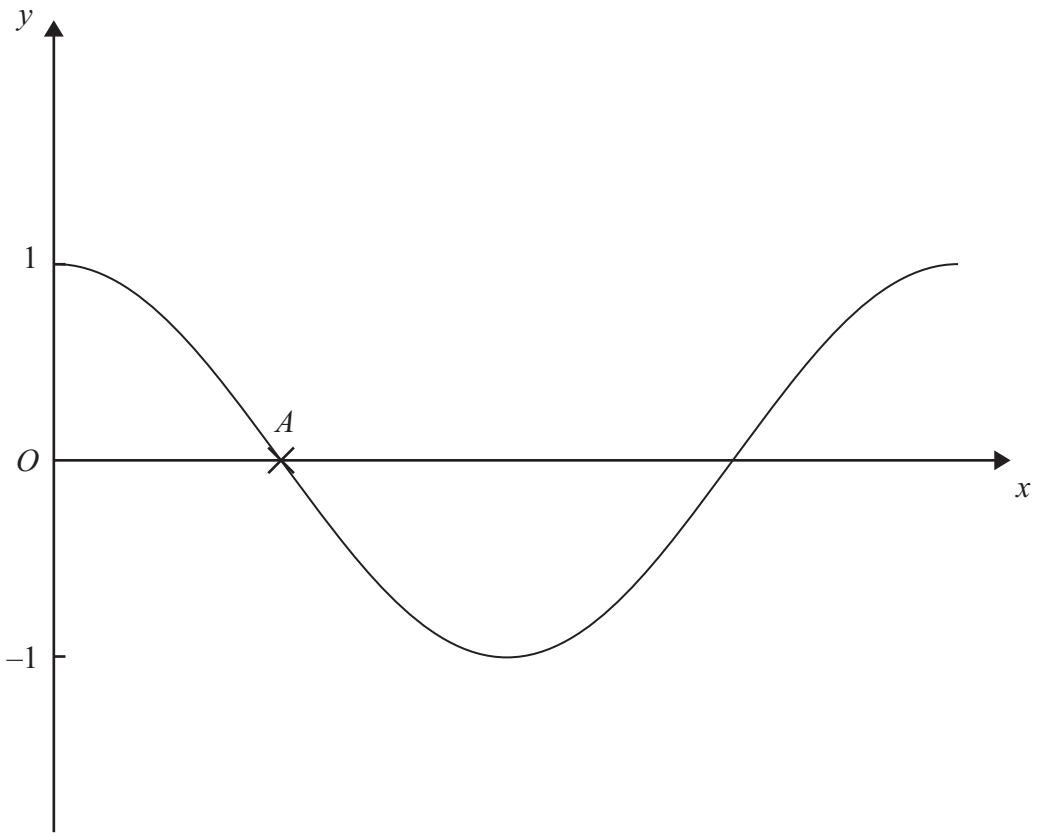
(b) Write down the coordinates of M.

(..... , ...)

(1)

(Total for Question 255 is 4 marks)

256 The diagram shows a sketch of the graph of $y = \cos x°$



(a) Write down the coordinates of the point A.

(..... , ...)

(1)

(b) On the same diagram, draw a sketch of the graph of $y = 2 \cos x°$

(1)

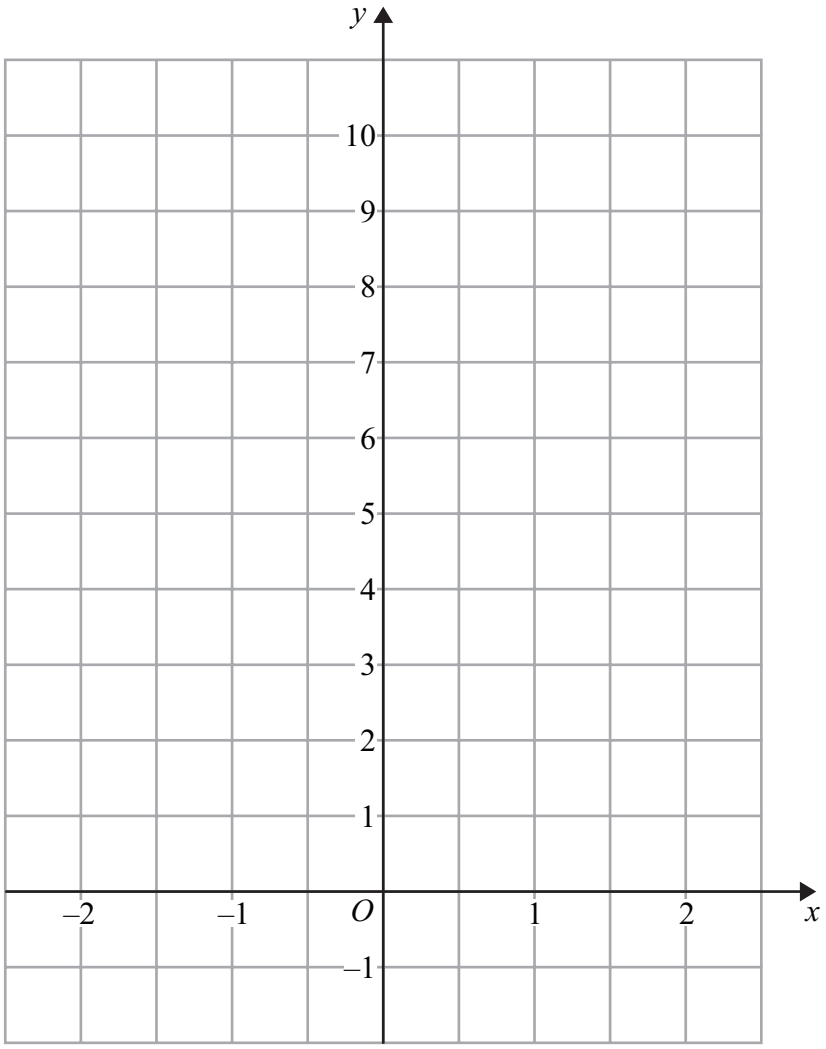
(Total for Question 256 is 2 marks)

257 (a) Complete the table of values for $y = 2x + 5$

x	–2	–1	0	1	2
y	1		5		

(2)

(b) On the grid, draw the graph of $y = 2x + 5$ for values of x from $x = –2$ to $x = 2$



(2)

(Total for Question 257 is 4 marks)

258 Here are the first 5 terms of an arithmetic sequence.

3 9 15 21 27

(a) Find an expression, in terms of n, for the nth term of this sequence.

.....

(2)

Ben says that 150 is in the sequence.

(b) Is Ben right?
You must explain your answer.

.....

.....

.....

(1)

(Total for Question 258 is 3 marks)

259 (a) Simplify $5x + 4y + x - 7y$

.....

(2)

(b) Solve $7(x + 2) = 7$

.....

(2)

(Total for Question 259 is 4 marks)

260 (a) Simplify $a^4 \times a^5$

.....

(1)

(b) Simplify $\dfrac{45e^6 f^8}{5ef^2}$

.....

(2)

(c) Write down the value of $9^{\frac{1}{2}}$

.....

(1)

(Total for Question 260 is 4 marks)

---

261 Solve $\dfrac{4x-1}{5} + \dfrac{x+4}{2} = 3$

$x =$ .....

(Total for Question 261 is 3 marks)

262 (a) (i) Factorise $x^2 - 12x + 27$

.....

(ii) Solve the equation $x^2 - 12x + 27 = 0$

.....

(3)

(b) Factorise $y^2 - 100$

.....

(1)

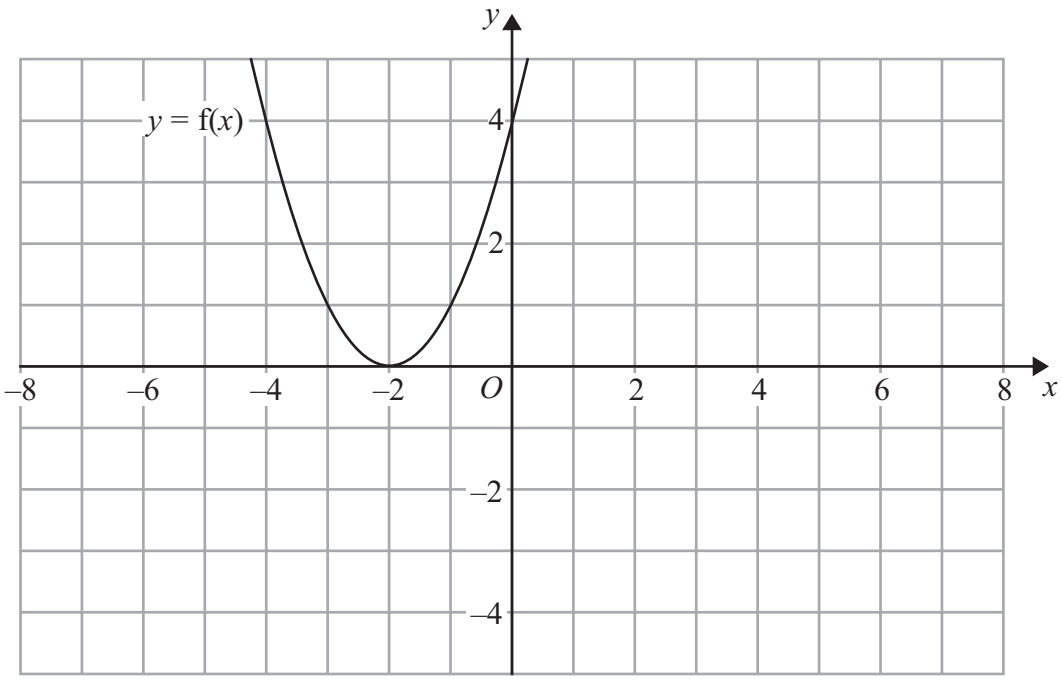
(Total for Question 262 is 4 marks)

***263** Prove algebraically that the difference between the squares of any two consecutive integers is equal to the sum of these two integers.

(Total for Question 263 is 4 marks)

264 $y = f(x)$

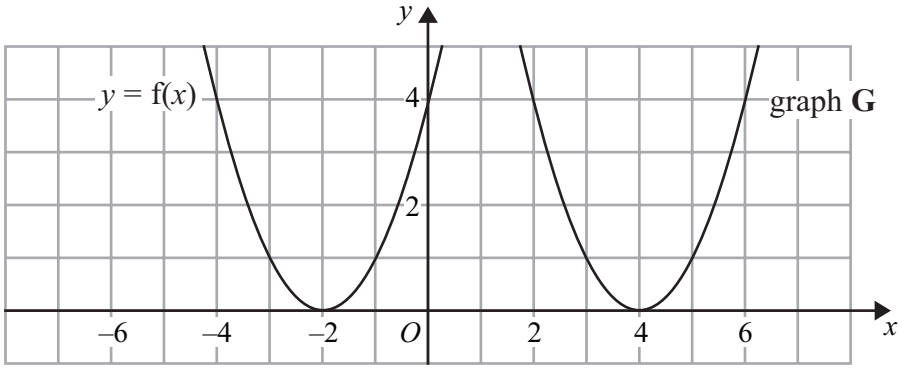
The graph of $y = f(x)$ is shown on the grid.



(a) On the grid above, sketch the graph of $y = -f(x)$.

(2)

The graph of $y = f(x)$ is shown on the grid.



The graph **G** is a translation of the graph of $y = f(x)$.

(b) Write down the equation of graph **G**.

.....

(1)

(Total for Question 264 is 3 marks)

265 (a) Expand $4(3x + 5)$

.....

(1)

(b) Expand and simplify $2(x - 4) + 3(x + 5)$

.....

(2)

(c) Expand and simplify $(x + 4)(x + 6)$

.....

(2)

(Total for Question 265 is 5 marks)

266 (a) Simplify $m^5 \div m^3$

.....

(1)

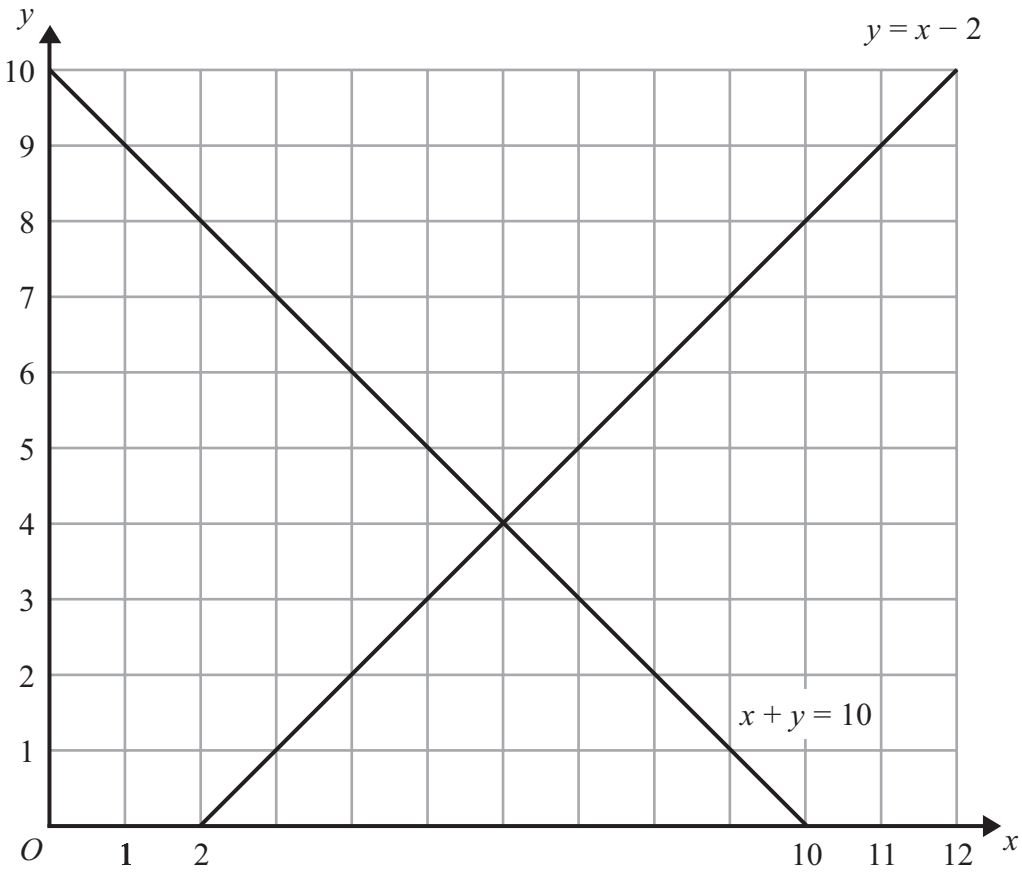
(b) Simplify $5x^4y^3 \times x^2y$

.....

(2)

(Total for Question 266 is 3 marks)

267 The lines $y = x - 2$ and $x + y = 10$ are drawn on the grid.



On the grid, mark with a cross (×) each of the points with integer coordinates that are in the region defined by

$y > x - 2$
$x + y < 10$
$x > 3$

(Total for Question 267 is 3 marks)

268 Solve the simultaneous equations

$$3x + 2y = 4$$
$$4x + 5y = 17$$

$x =$ .....

$y =$ .....

(Total for Question 268 is 4 marks)

269

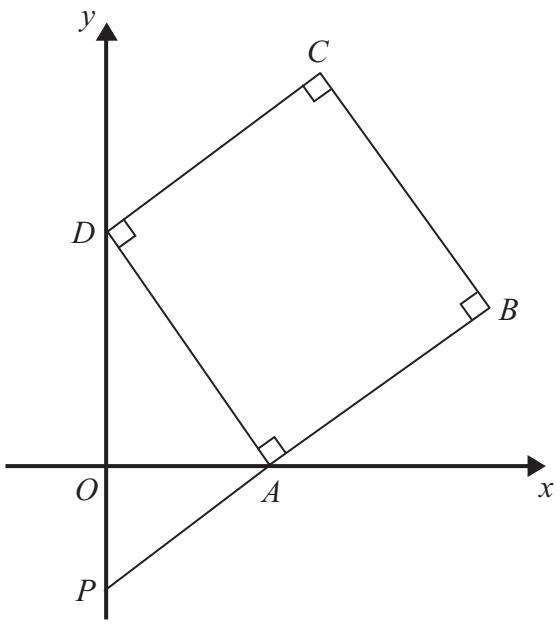


Diagram **NOT** accurately drawn

ABCD is a square.
P and *D* are points on the *y*-axis.
A is a point on the *x*-axis.
PAB is a straight line.

The equation of the line that passes through the points *A* and *D* is $y = -2x + 6$

Find the length of *PD*.

.....

(Total for Question 269 is 4 marks)

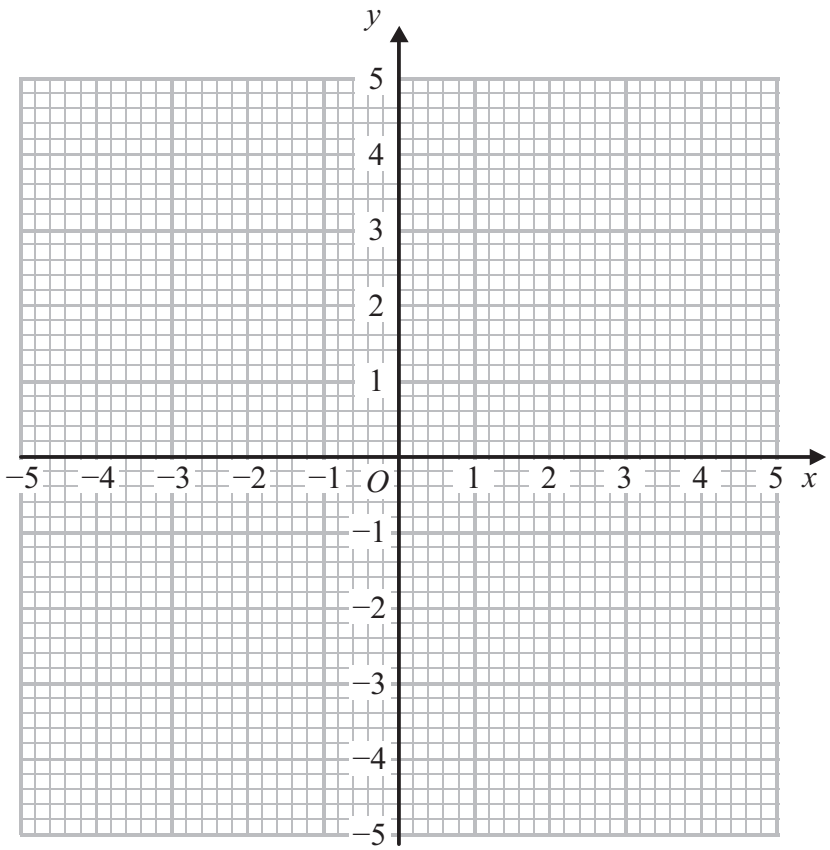
270 Make t the subject of the formula

$$p = \frac{3 - 2t}{4 + t}$$

.....

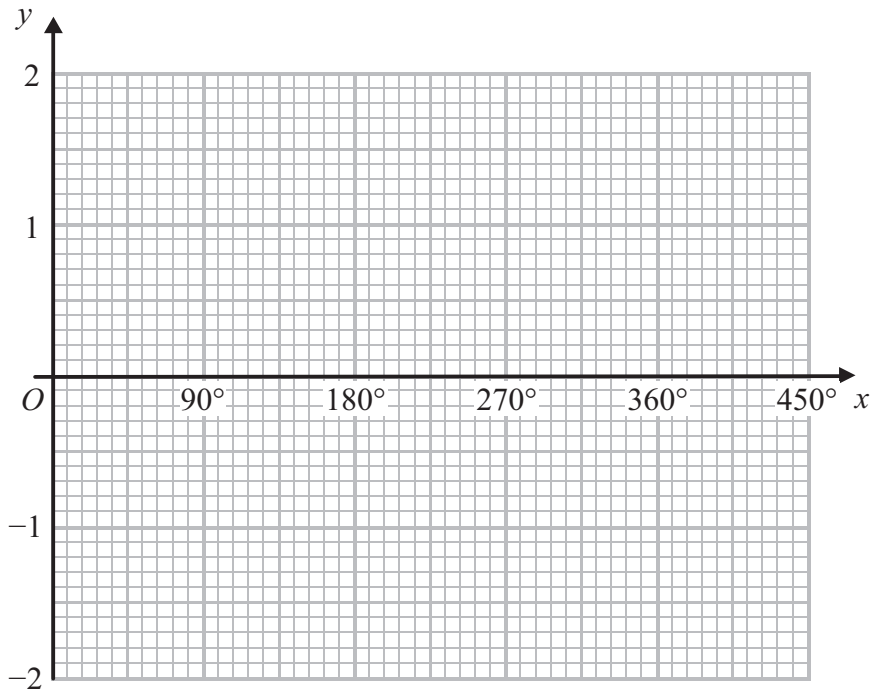
(Total for Question 270 is 4 marks)

271.



(a) On the grid, draw the graph of $x^2 + y^2 = 4$

(2)



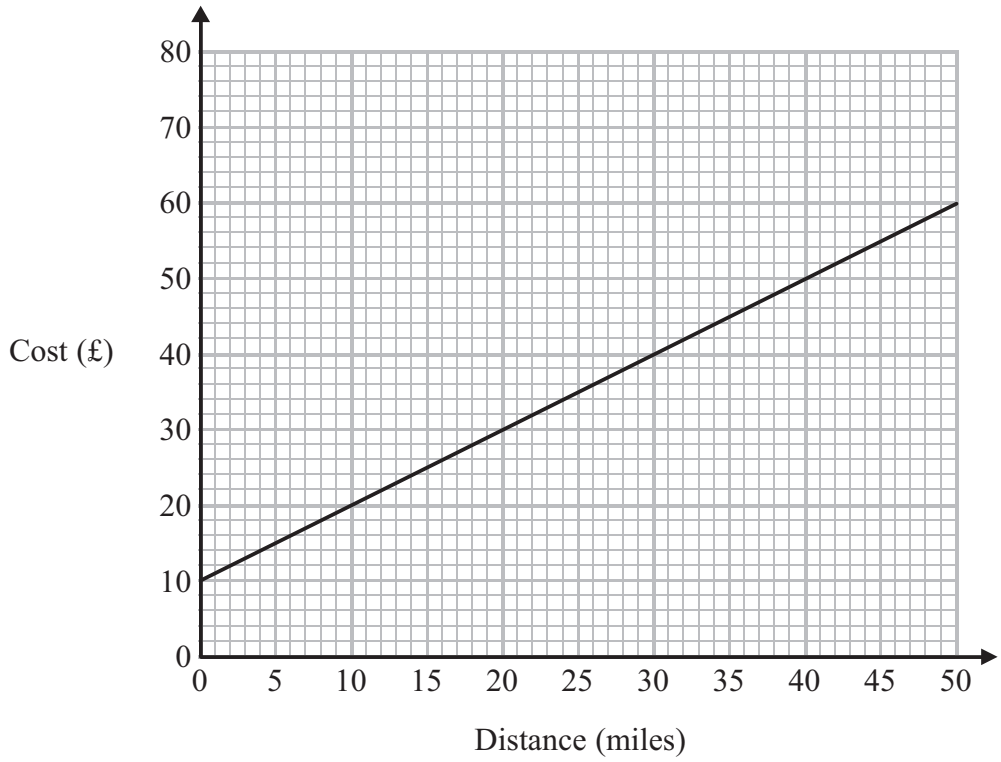
(b) On the grid, sketch the graph of $y = \cos x$ for $0° \leqslant x \leqslant 360°$

(2)

(Total for Question 271 is 4 marks)

***272** Bill uses his van to deliver parcels.
For each parcel Bill delivers there is a fixed charge plus £1.00 for each mile.

You can use the graph to find the total cost of having a parcel delivered by Bill.



(a) How much is the fixed charge?

£ .....

(1)

Ed uses a van to deliver parcels.
For each parcel Ed delivers it costs £1.50 for each mile.
There is **no** fixed charge.

(b) Compare the cost of having a parcel delivered by Bill with the cost of having a parcel delivered by Ed.

(3)

(Total for Question 272 is 4 marks)

273

You can work out the amount of medicine, c m*l*, to give to a child by using the formula

$$c = \frac{ma}{150}$$

m is the age of the child, in months.
a is an adult dose, in m*l*.

A child is 30 months old.
An adult's dose is 40 m*l*.

Work out the amount of medicine you can give to the child.

..... m*l*

(Total for Question 273 is 2 marks)

274 (a) Expand $3(2y - 5)$

.....

(1)

(b) Factorise completely $8x^2 + 4xy$

.....

(2)

(c) Make h the subject of the formula

$$t = \frac{gh}{10}$$

$h =$ .....

(2)

(Total for Question 274 is 5 marks)

---

275 (a) Simplify $(m^{-2})^5$

.....

(1)

(b) Factorise $x^2 + 3x - 10$

.....

(2)

(Total for Question 275 is 3 marks)

276 Solve the simultaneous equations

$$5x + 2y = 11$$
$$4x - 3y = 18$$

$x =$ .....

$y =$ .....

(Total for Question 276 is 4 marks)

277 (a) Simplify fully $\dfrac{x^2 + 3x - 4}{2x^2 - 5x + 3}$

.....

(3)

(b) Write $\dfrac{4}{x+2} + \dfrac{3}{x-2}$ as a single fraction in its simplest form.

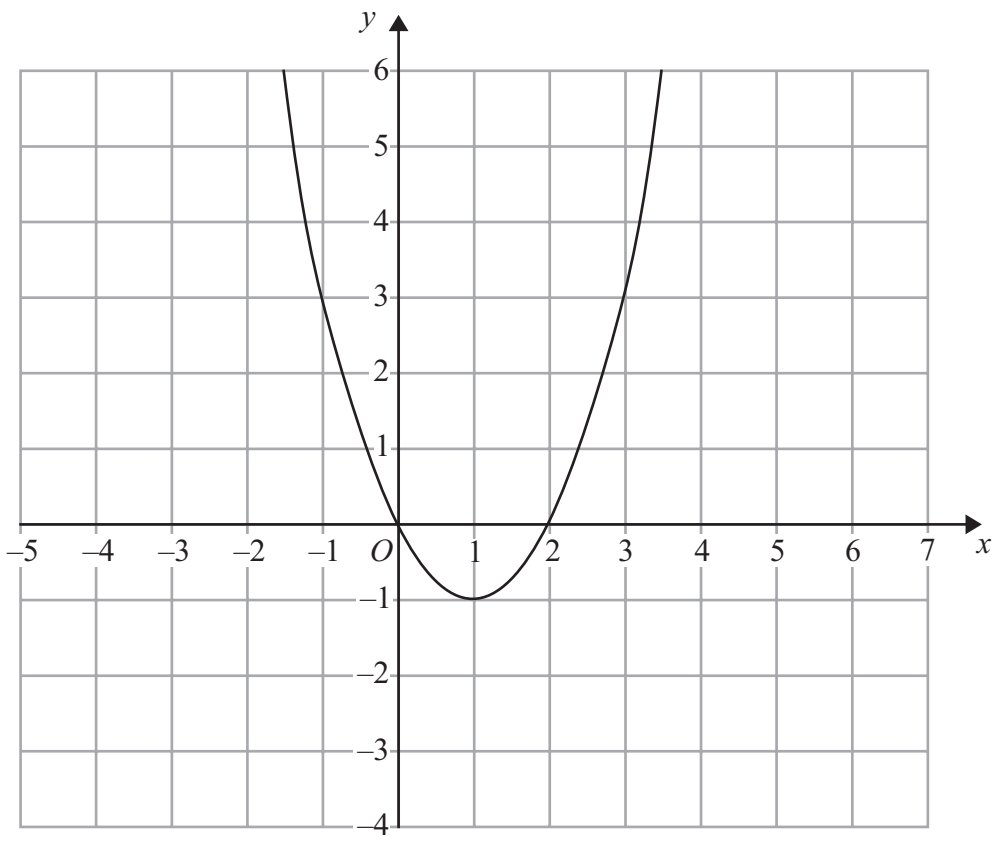
.....

(3)

(Total for Question 277 is 6 marks)

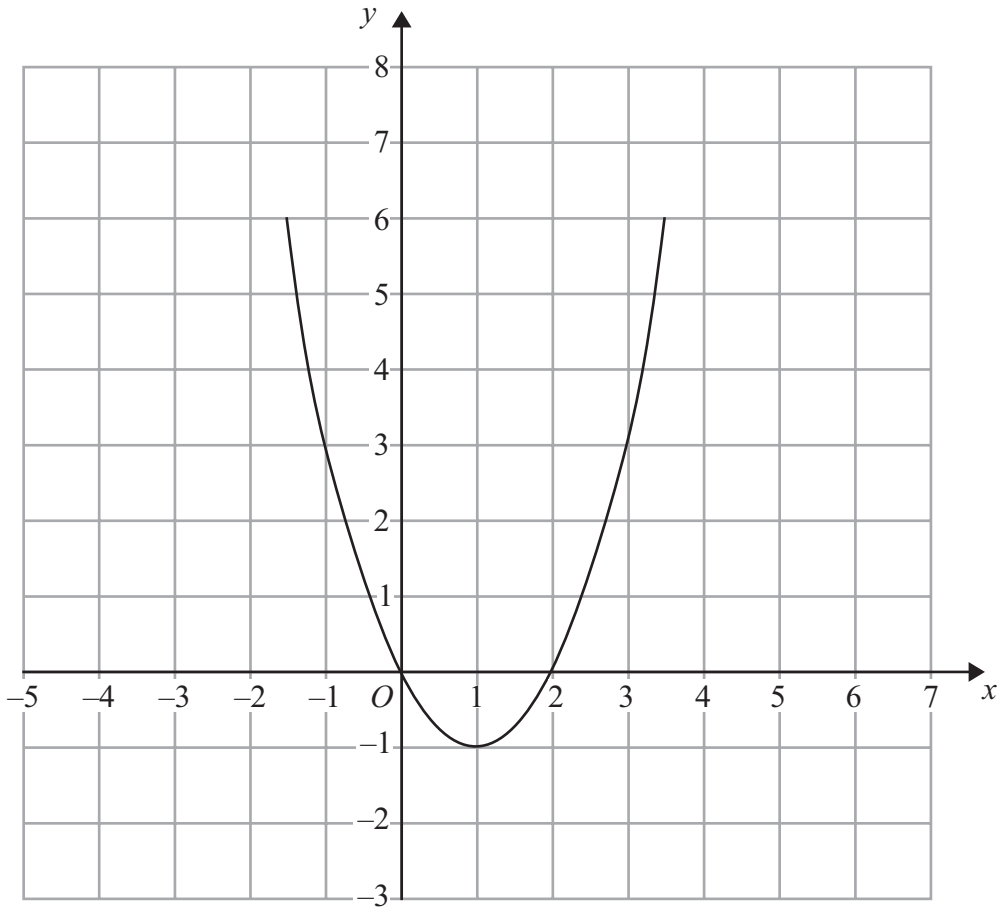
278 The graph of $y = f(x)$ is shown on each of the grids.

(a) On this grid, sketch the graph of $y = f(x - 3)$



(2)

(b) On this grid, sketch the graph of $y = 2f(x)$



(2)

(Total for Question 278 is 4 marks)

279 (i) Simplify $13x - 24y + 17x + 14y$

.....

(ii) Solve $6(1 - 2x) - 3(x + 1) = 0$

.....

(Total for Question 279 is 5 marks)

280 (a) Solve $5p - 16 = 4$

(2)

$p =$ .....

(b) Solve $2q - 4 = 5q + 5$

(2)

$q =$ .....

$y = 3(2x - 1) - 2(5 + 3x)$

(c) Show that y will always be the same value.

(2)

(Total for Question 280 is 6 marks)

281 The nth term of a sequence is $2n^2$

(i) Find the 4th term of the sequence.

.....

(ii) Is the number 400 a term of the sequence?

.....

Give reasons for your answer.

(Total for Question 281 is 3 marks)

282 (a) Simplify

(i) $a^5 \div a^3$

(3)

.....

(ii) $2x^2 \times 3x^2y^2$

.....

(b) Expand and simplify $(x + 3)(x + 7)$

(2)

.....

(c) Factorise fully $3pq - 12p^2$

(2)

.....

(d) (i) Factorise $3y^2 - 10y + 3$

(4)

.....

Hence, or otherwise

(ii) Factorise $3(x+2)^2 - 10(x+2) + 3$

.....

(Total for Question 282 is 11 marks)

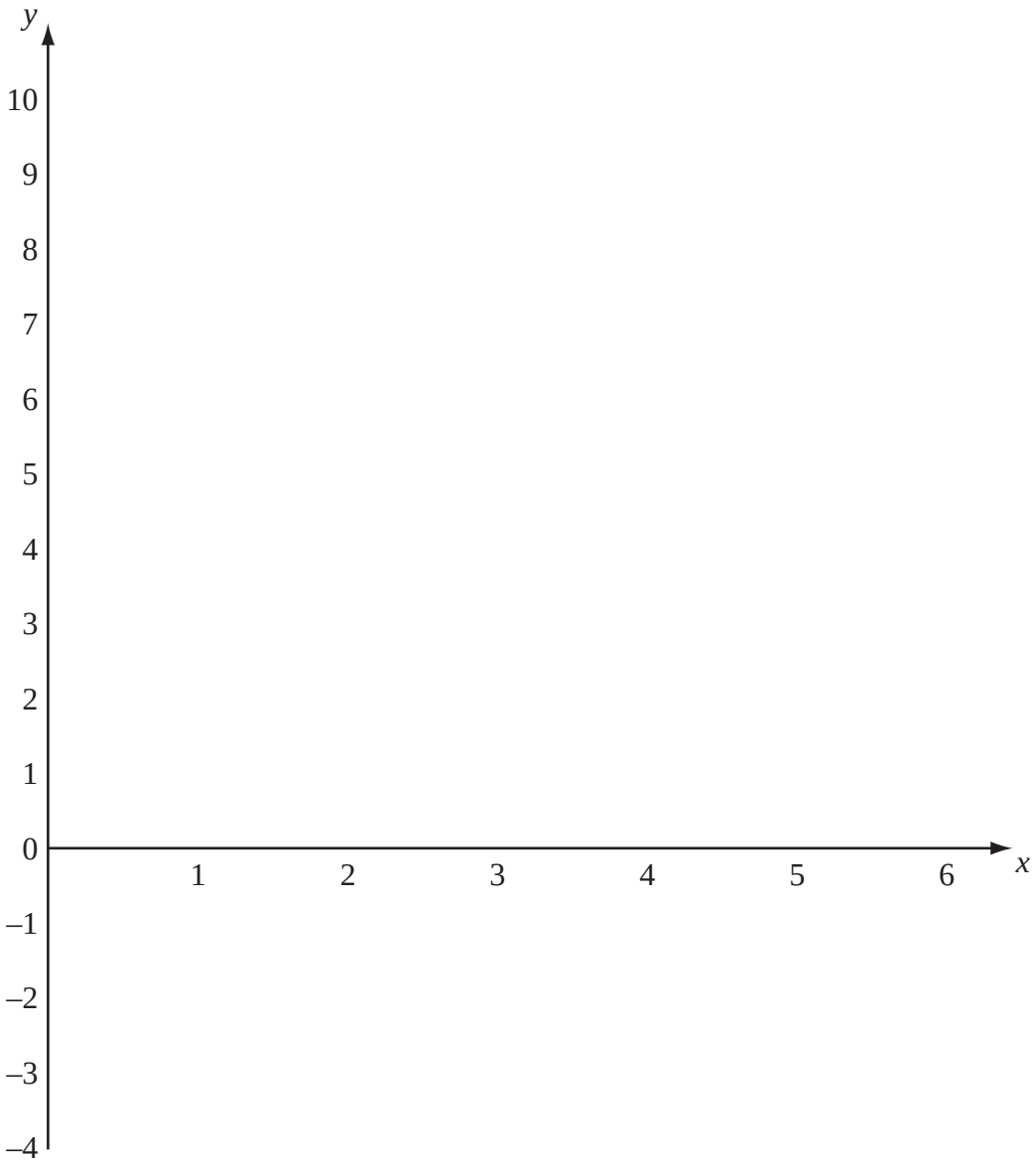
283 Simplify $\dfrac{3x^2 - 16x - 35}{9x^2 - 25}$

.....

(Total for Question 283 is 3 marks)

284 (a) On the grid draw the graph of $y = x(x-3)$

(2)



(b) Using your result for (a), or otherwise, solve the simultaneous equations

$y = x(x - 3)$

$x^2 + y^2 = 9$

(3)

(Total for Question 284 is 5 marks)

285 Prove that the difference between the squares of consecutive odd numbers is a multiple of 8

(Total for Question 285 is 6 marks)

286 (a) Simplify $ab - 5g + 5ab - 2g$

.....

(2)

(b) Factorise $6m - 9$

.....

(1)

(c) Simplify $t^8 \div t^3$

.....

(1)

(d) Factorise fully $2x^2y + 4xy^2$

.....

(2)

(e) Expand and simplify $(w - 5)^2$

.....

(2)

(Total for Question 286 is 8 marks)

287 Gemma has the same number of sweets as Betty.

Gemma gives 24 of her sweets to Betty.
Betty now has 5 times as many sweets as Gemma.

Work out the total number of sweets that Gemma and Betty have.

.....

(Total for Question 287 is 4 marks)

288 (a) Simplify $\dfrac{3(x+1)}{(x+1)^2}$

.....

(1)

(b) Solve $\dfrac{15-x}{5} = 3x + 11$

$x =$ .....

(3)

(c) Make m the subject of the formula $v = \sqrt{\dfrac{2E}{m}}$

.....

(3)

(Total for Question 288 is 7 marks)

289 Solve $2x^2 + 3x - 7 = 0$

Give your solutions correct to 2 decimal places.

.....

(Total for Question 289 is 3 marks)

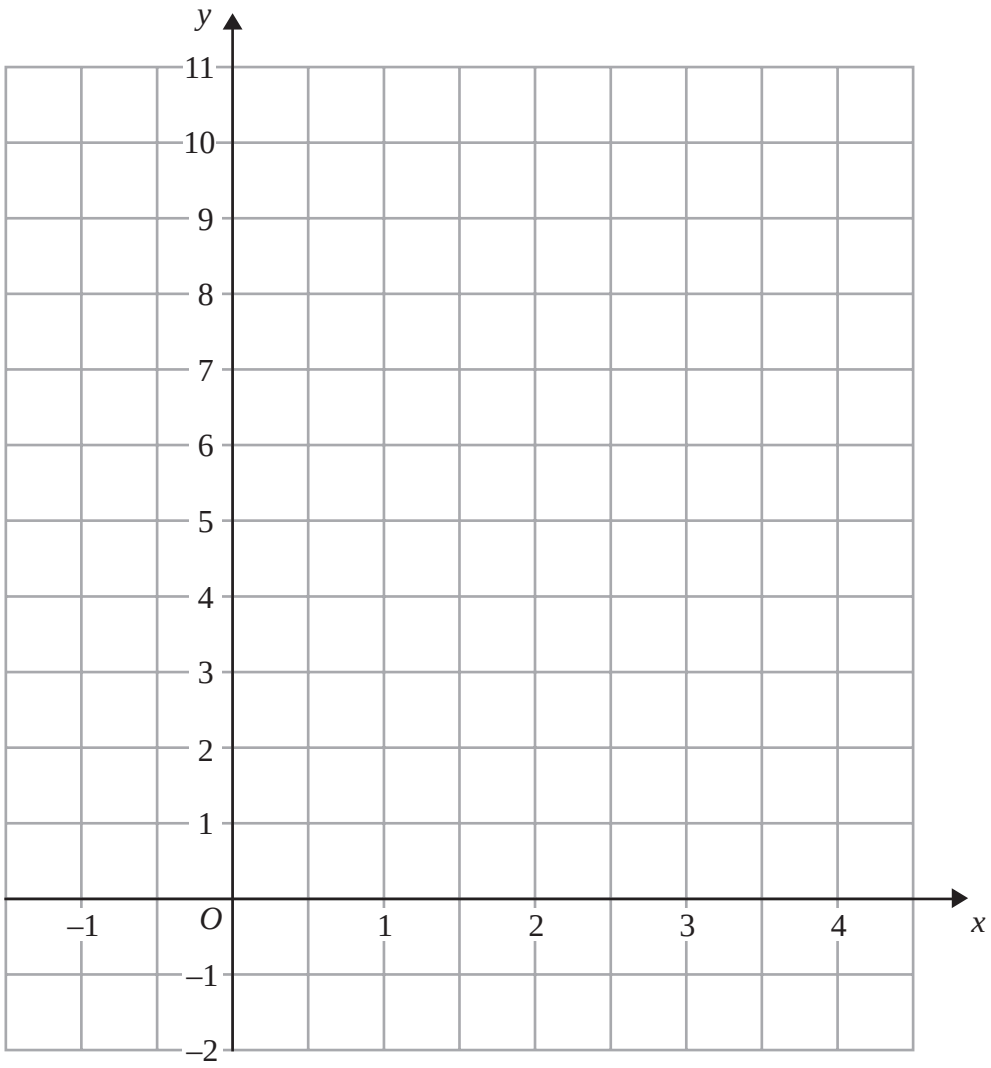
290 The straight line **L** has equation $4x + y = 7$

Find an equation of the straight line perpendicular to **L** that passes through (–8, 3).

.....

(Total for Question 290 is 4 marks)

291 On the grid, draw the graph of $y = 8 - 2x$ for values of x from –1 to 4



(Total for Question 291 is 3 marks)

292 (a) Simplify fully $\dfrac{n^7 \times n^3}{n^6}$

.....

(2)

(b) Expand and simplify $x(x - 2) + 2x(x + 3)$

.....

(2)

(c) Factorise $5y - 15$

.....

(1)

(d) Factorise fully $18ab + 27ab^2$

.....

(2)

(Total for Question 292 is 7 marks)

293 Julie and Liam write down the same number.

Julie multiplies the number by 5 and then adds 4 to the result.
She writes down her answer.

Liam subtracts the number from 10
He writes down his answer.

Julie's answer is two thirds of Liam's answer.

Work out the number that Julie and Liam started with.
You must show your working.

.....

(Total for Question 293 is 5 marks)

294 (a) Expand and simplify $(y + 2)(y + 5)$

.....

(2)

(b) Factorise $e^2 + e - 12$

.....

(2)

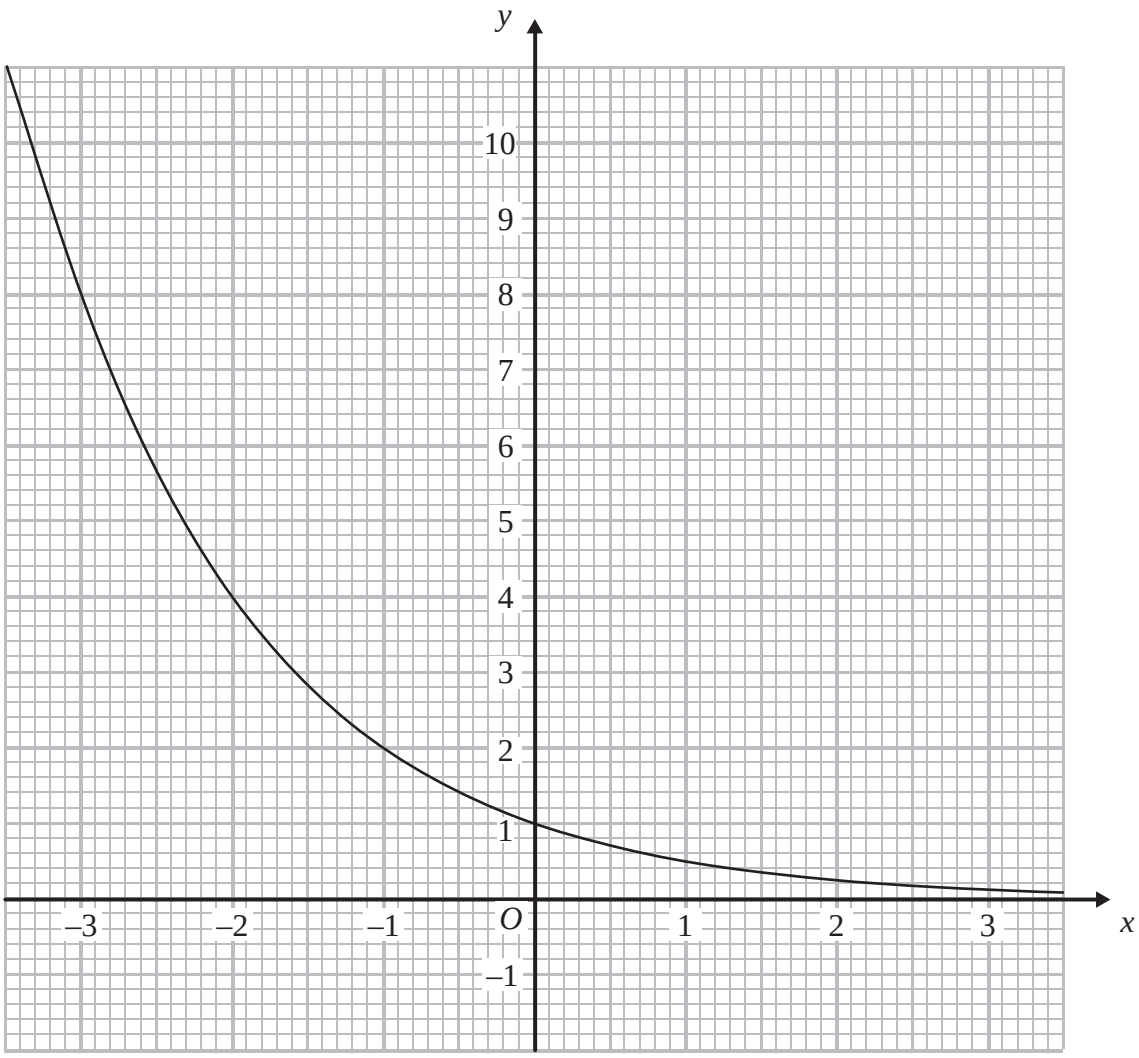
(c) Solve $3x^2 - x - 1 = 0$
Give your solutions correct to 2 decimal places.

.....

(3)

(Total for Question 294 is 7 marks)

295

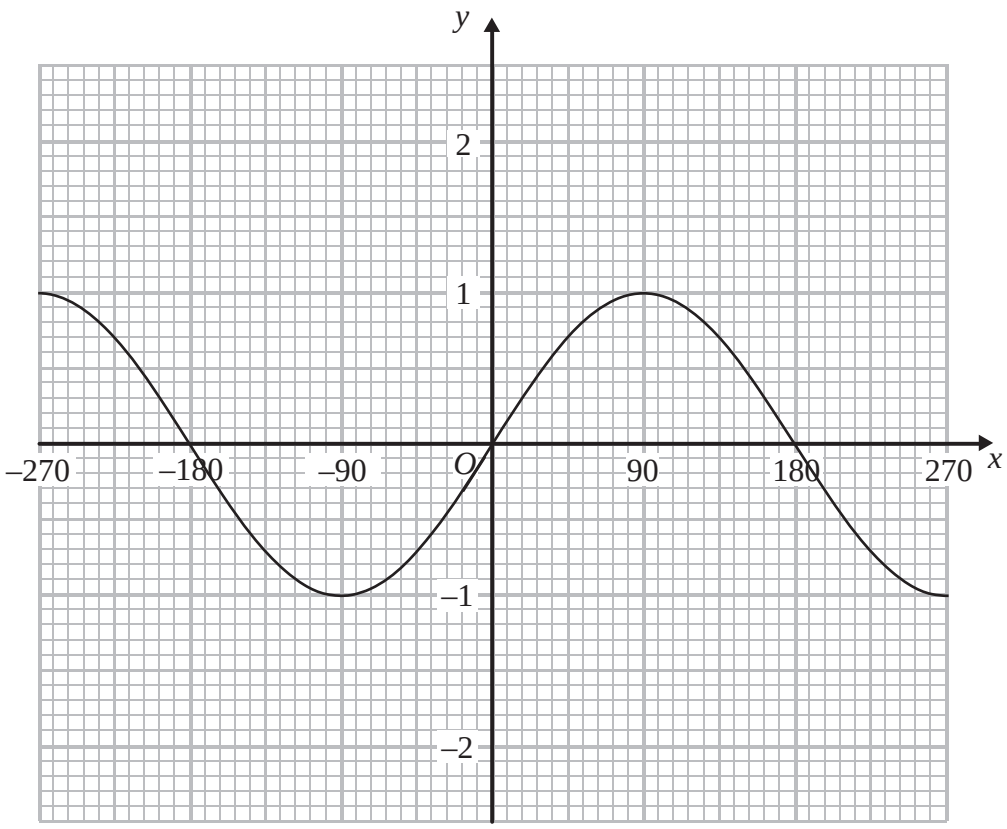


The graph of $y = k^x$, where k is a positive constant, is shown above.

(a) Find the value of k.

k = ...

(2)



The graph of $y = \sin x°$ for values of x from –270 to +270 is shown above.

(b) On the same axes, draw the graph of $y = 1 – \sin x°$ for values of x from –270 to +270

(2)

(Total for Question 295 is 4 marks)

***296** Prove that, for all positive values of n,

$$\frac{(n+2)^2-(n+1)^2}{2n^2+3n}=\frac{1}{n}$$

(Total for Question 296 is 4 marks)

297 (a) Simplify $3a \times 5b \times 2c$

.....

(1)

(b) Factorise $3y + 6$

.....

(1)

(c) Expand $x(x - 3)$

.....

(1)

(Total for Question 297 is 3 marks)

298 The body mass index, B, for a person of mass m kg and height h metres is given by the formula

$$B = \frac{m}{h^2}$$

Usman has a mass of 50 kg.
He has a height of 1.57 m.

(a) Work out Usman's body mass index.
Give your answer correct to one decimal place.

.....

(2)

Tom's height is 1.80 m.
He wants his body mass index to be 21

(b) Work out the mass that will give Tom a body mass index of 21

..... kg

(2)

Tom is a ski jumper.

The maximum length of skis he can use is 145% of his height.
Tom's height is 1.80 m.

(c) Work out the maximum length of skis Tom can use.

..... m

(3)

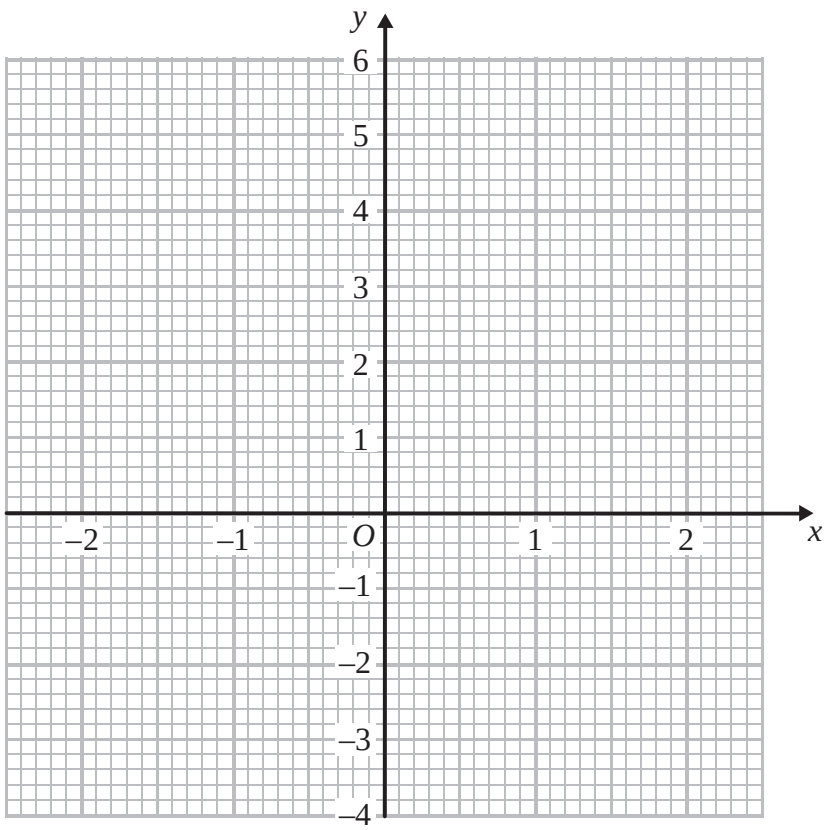
(Total for Question 298 is 7 marks)

299 (a) Complete the table of values for $y = x^3 - 3x + 1$

x	–2	–1	0	1	2
y		3			3

(2)

(b) On the grid, draw the graph of $y = x^3 - 3x + 1$ for values of x from –2 to 2



(2)

(Total for Question 299 is 4 marks)

300 (a) Simplify $2a^3b \times 5a^2b^3$

.....

(2)

(b) Make y the subject of the formula $p = \sqrt{\frac{x + y}{5}}$

.....

(3)

(Total for Question 300 is 5 marks)

301 Solve $3x^2 + 6x - 2 = 0$

Give your solutions correct to 2 decimal places.

.....

(Total for Question 301 is 3 marks)

302 (a) Simplify fully $\dfrac{3-x}{3x^2-5x-12}$

.....

(2)

(b) Write $\dfrac{x}{x-1}-\dfrac{x}{x+1}$ as a single fraction in its simplest form.

.....

(3)

(Total for Question 302 is 5 marks)

303 Ali is y years old.
Bhavara is twice as old as Ali.
Ceris is 3 years younger than Ali.

The total of their ages is 125 years.

Work out the age of each person.

Ali.....years

Bhavara.....years

Ceris.....years

(Total for Question 303 is 4 marks)

304 (a) Solve $3x^2 = 147$

.....

(2)

(b) Work out the value of 2^{-3}

.....

(1)

(c) Simplify $(3x^2)^3$

.....

(2)

$w = 4p - 16$

(d) Make p the subject of this formula.

.....

(2)

(Total for Question 304 is 7 marks)

305 (a) Given that x and y are integers such that

$$3 < x < 7$$
$$4 < y < 9$$
$$\text{and } x + y = 13$$

find all the possible values of x.

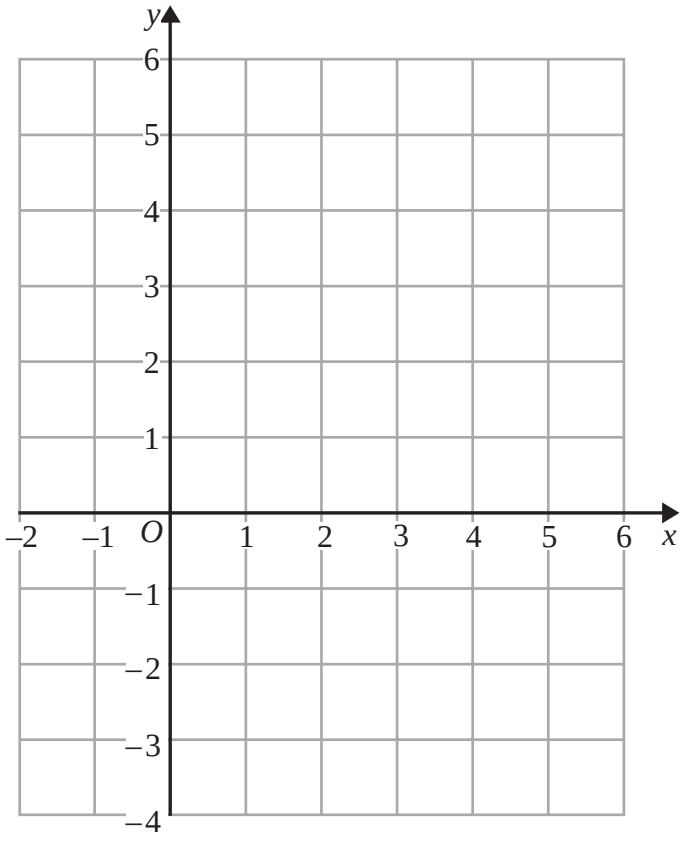
.....

(2)

(b) On the grid below show, by shading, the region defined by the inequalities

$y \geqslant -1$ $\quad y \leqslant 4 - x$ $\quad y \leqslant 3x - 1$

Mark this region with the letter R.



(4)

(Total for Question 305 is 6 marks)

306 $\mathbf{L}_1$ and $\mathbf{L}_2$ are parallel lines.

The equation of $\mathbf{L}_1$ is $y = 3x + 2$
$\mathbf{L}_2$ passes through the point (3, 4).

Find an equation for $\mathbf{L}_2$.

.....

(Total for Question 306 is 3 marks)

307 Alison is using the quadratic formula to solve a quadratic equation.
She substitutes values into the formula and correctly gets

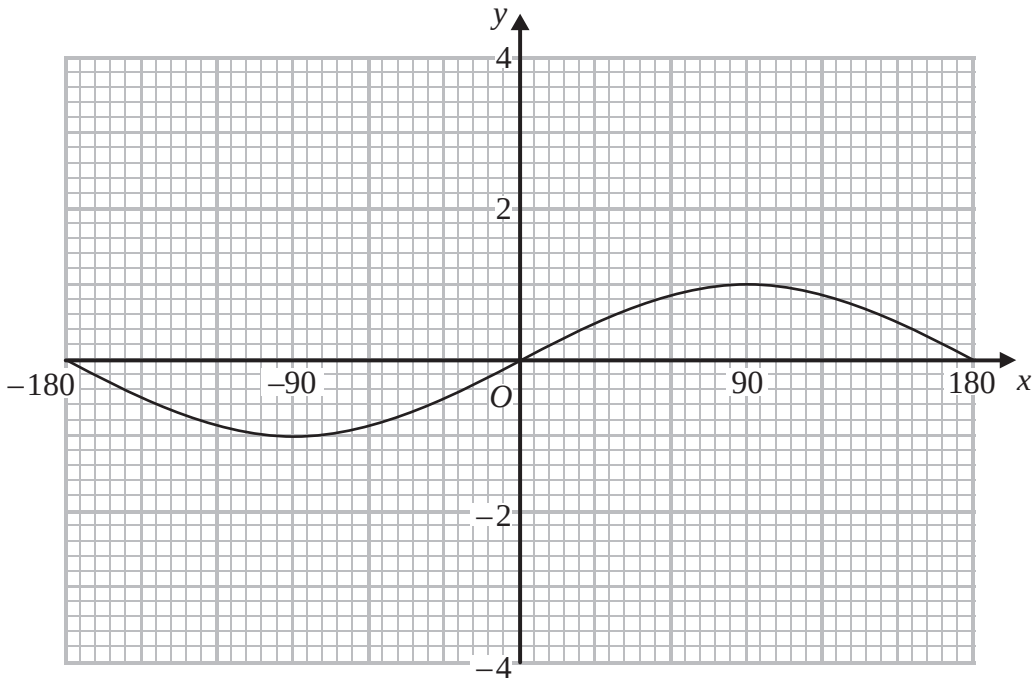
$$x = \frac{-7 \pm \sqrt{49 - 32}}{4}$$

Work out the quadratic equation that Alison is solving.
Give your answer in the form $ax^2 + bx + c = 0$, where a, b and c are integers.

.....

(Total for Question 307 is 3 marks)

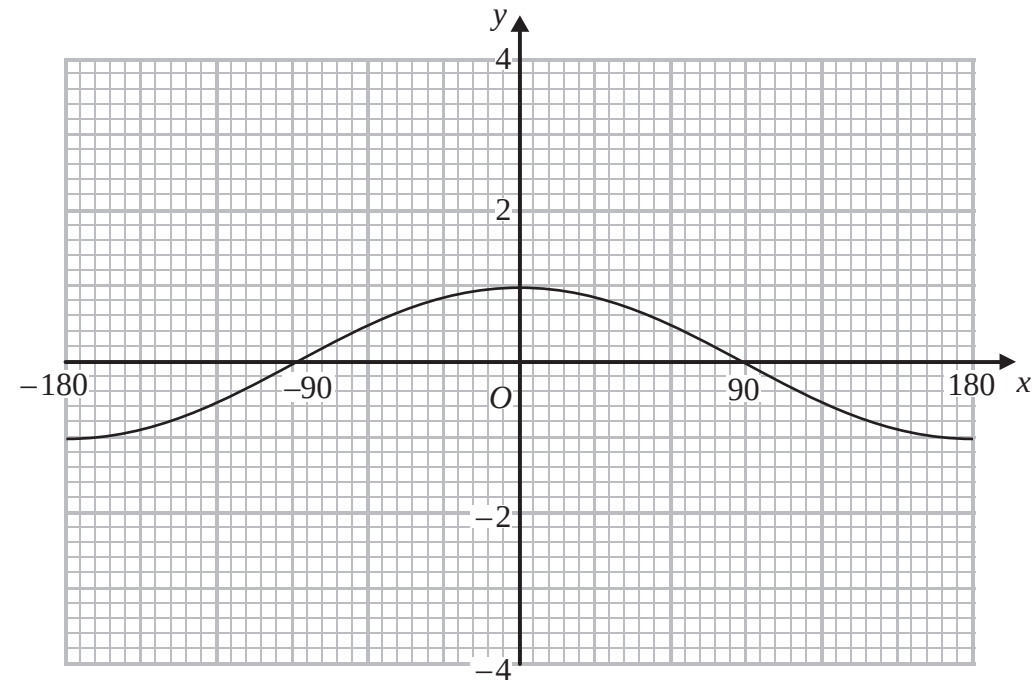
308 Here is the graph of $y = \sin x°$ for $-180 \leqslant x \leqslant 180$



(a) On the grid above, sketch the graph of $y = \sin x° + 2$ for $-180 \leqslant x \leqslant 180$

(2)

Here is the graph of $y = \cos x°$ for $-180 \leqslant x \leqslant 180$



(b) On the grid above, sketch the graph of $y = -2 \cos x°$ for $-180 \leqslant x \leqslant 180$

(2)

(Total for Question 308 is 4 marks)

***309** Redlands School sent x students to a revision day.
St Samuel's School sent twice as many students as Redlands School.
Francis Long School sent 7 fewer students than Redlands School.

Each student paid £15 for the revision day.
The students paid a total of £1155

Work out how many students were sent by each school to the revision day.
You must show all your working.

(Total for Question 309 is 5 marks)

310 (a) Expand $7(x + 5)$

.....

(1)

(b) Expand $3y(4y - 3)$

.....

(1)

(c) Expand and simplify $(t + 2)(t + 4)$

.....

(2)

(Total for Question 310 is 4 marks)

311 The points A, B and C lie in order on a straight line.

The coordinates of A are $(2, 5)$
The coordinates of B are $(4, p)$
The coordinates of C are $(q, 17)$

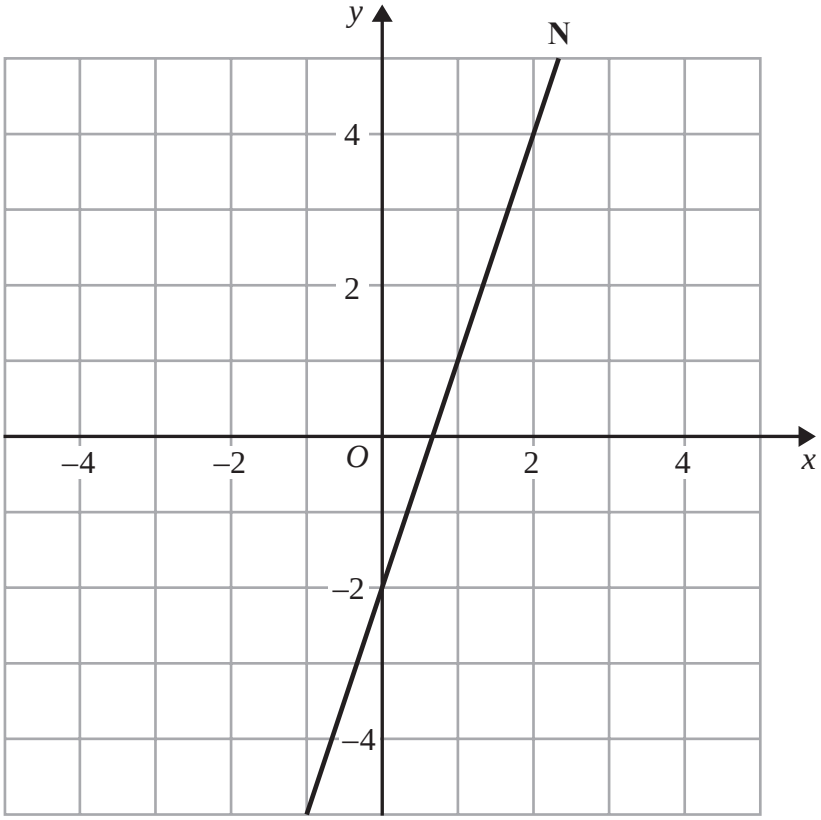
Given that $AC = 4AB$, find the values of p and q.

$p =$ .....

$q =$ .....

(Total for Question 311 is 3 marks)

312 The line **N** is drawn below.



Find an equation of the line perpendicular to line **N** that passes through the point (0, 1).

.....

(Total for Question 312 is 3 marks)

313 Show that $(n + 3)^2 - (n - 3)^2$ is an even number for all positive integer values of n.

(Total for Question 313 is 3 marks)

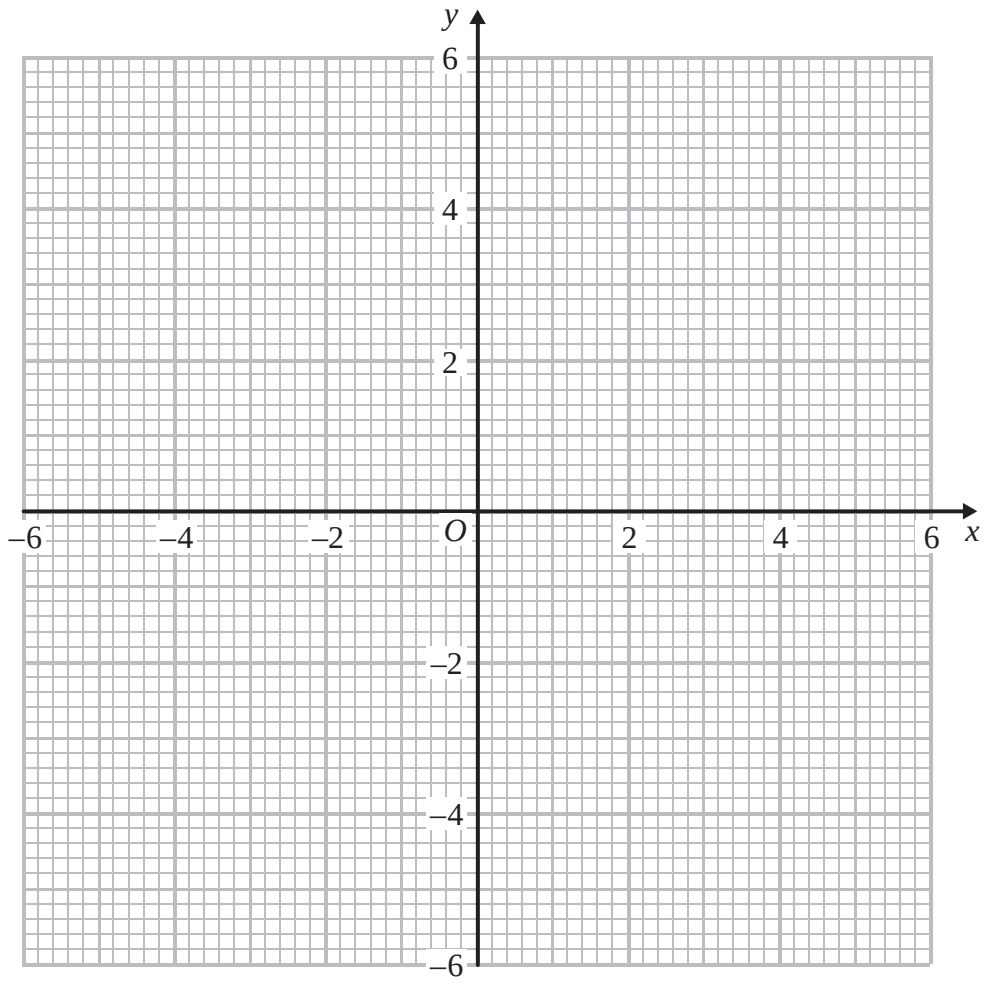
314 Solve the equation $3x^2 + 4x - 12 = 0$

Give your solutions correct to 2 decimal places.

.....

(Total for Question 314 is 3 marks)

315 (a) On the grid, construct the graph of $x^2 + y^2 = 16$



(2)

(b) Find estimates for the solutions of the simultaneous equations

$$x^2 + y^2 = 16$$
$$y = 2x + 1$$

.....

(3)

(Total for Question 315 is 5 marks)

316 $f = 3g + 7h$

(a) Work out the value of f when $g = -5$ and $h = 2$

$f =$ .....

(2)

(b) Factorise $3x + 6$

.....

(1)

(c) Expand and simplify $5(y - 2) + 2(y - 3)$

.....

(2)

(d) Simplify $m^5 \times m^3$

.....

(1)

(e) Simplify $\dfrac{p^6}{p^2}$

.....

(1)

(Total for Question 316 is 7 marks)

317 Here are the first five terms of an arithmetic sequence.

2 6 10 14 18

(a) Write down an expression, in terms of n, for the nth term of this sequence.

.....

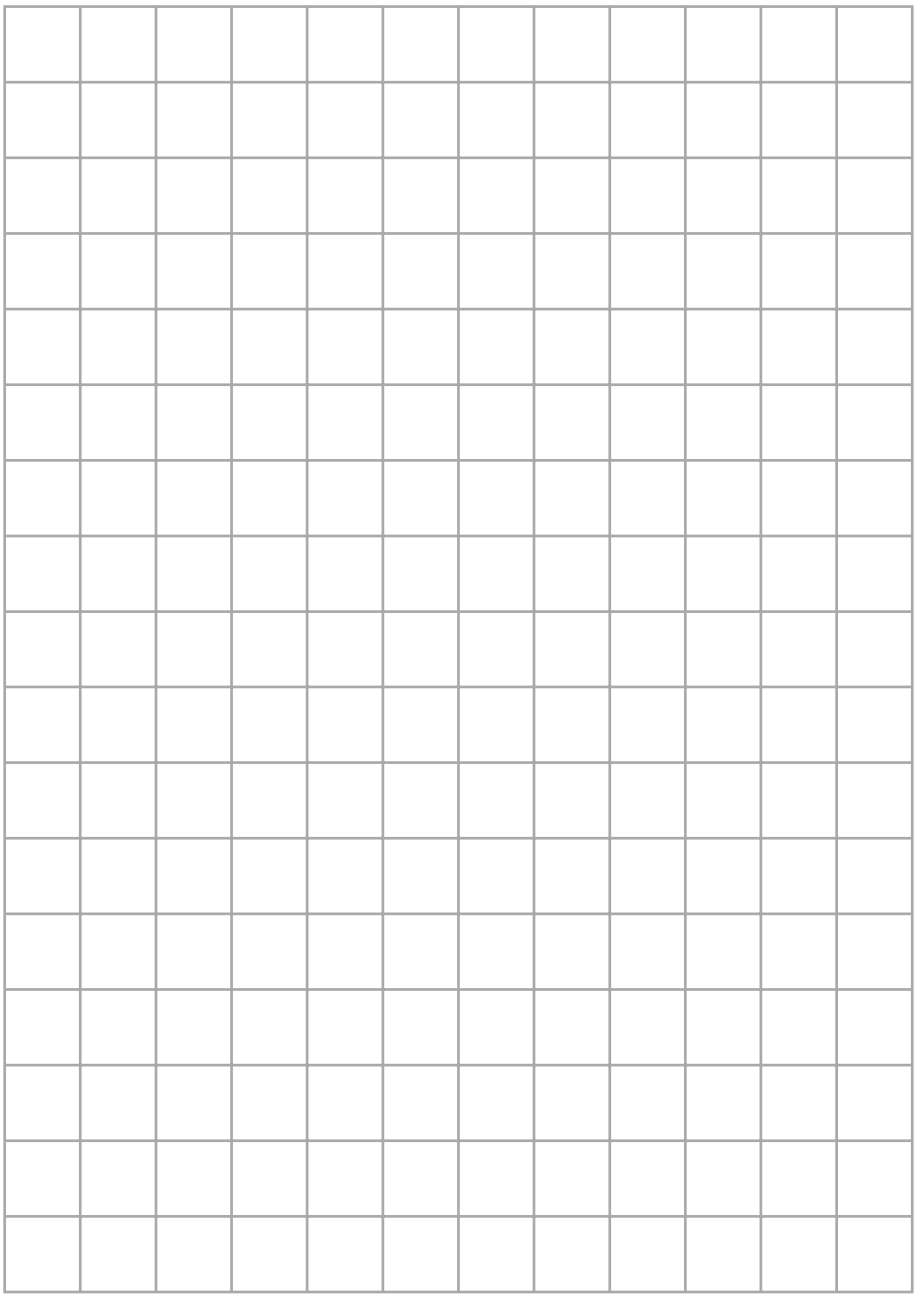
(2)

*(b) Is 86 a term in the sequence?
You must give a reason for your answer.

(1)

(Total for Question 317 is 3 marks)

318 On the grid, draw the graph of $y = 2x - 3$ for values of x from -2 to 3



(Total for Question 318 is 4 marks)

319 A cinema sells adult tickets and child tickets.

The total cost of 3 adult tickets and 1 child ticket is £30
The total cost of 1 adult ticket and 3 child tickets is £22

Work out the cost of an adult ticket and the cost of a child ticket.

adult ticket £.....

child ticket £.....

(Total for Question 319 is 4 marks)

320 Solve $3x^2 - 5x - 1 = 0$

Give your solutions correct to 3 significant figures.

.....

(Total for Question 320 is 3 marks)

321 (a) Simplify fully $\dfrac{2x^2 - 5x + 3}{x^2 + 5x - 6}$

.....

(3)

(b) Make m the subject of

$$\frac{m}{v} - \frac{t}{b} = \frac{m - t}{R}$$

.....

(4)

(Total for Question 321 is 7 marks)

322 The point A has coordinates (2, 3).
The point B has coordinates (6, 8).

M is the midpoint of the line AB.

Find the coordinates of M.

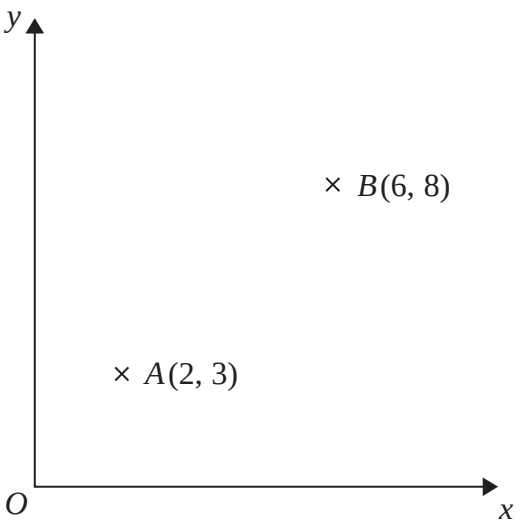


Diagram **NOT** accurately drawn

.....

(Total for Question 322 is 2 marks)

323 $x = 0.7$

Work out the value of $\dfrac{(x+1)^2}{2x}$

Write down all the figures on your calculator display.

.....

(Total for Question 323 is 2 marks)

324 (a) Simplify $(p^3)^2$

.....

(1)

(b) Simplify $\frac{t^8}{t^3}$

.....

(1)

$2^3 \times 2^n = 2^9$

(c) Work out the value of n.

.....

(1)

$2x^3 = 128$

(d) Work out the value of x.

.....

(1)

(Total for Question 324 is 4 marks)

325 Here are the first five terms of an arithmetic sequence.

4 9 14 19 24

(a) Find, in terms of n, an expression for the nth term of this sequence.

.....

(2)

Here are the first five terms of a different sequence.

2 2 0 –4 –10

An expression for the nth term of this sequence is $3n - n^2$

(b) Write down, in terms of n, an expression for the nth term of a sequence whose first five terms are

4 4 0 –8 –20

.....

(1)

(Total for Question 325 is 3 marks)

326 $-5 < y \leqslant 0$

y is an integer.

(a) Write down all the possible values of y.

.....

(2)

(b) Solve $6(x - 2) > 15$

.....

(2)

(Total for Question 326 is 4 marks)

327 (a) Expand and simplify $(y - 2)(y - 5)$

.....

(2)

*(b) Prove algebraically that

$$(2n + 1)^2 - (2n + 1) \quad \text{is an even number}$$

for all positive integer values of n.

(3)

(Total for Question 327 is 5 marks)

328 Solve the equations

$$x^2 + y^2 = 36$$
$$x = 2y + 6$$

.....

(Total for Question 328 is 5 marks)

329 Here are the first four terms of an arithmetic sequence.

3 10 17 24

(a) Find, in terms of n, an expression for the nth term of this arithmetic sequence.

.....

(2)

(b) Is 150 a term of this sequence?

You must explain how you get your answer.

.....

.....

.....

.....

.....

(2)

(Total for Question 329 is 4 marks)

330 (a) Simplify $x^7 \times x^3$

.....

(1)

(b) Simplify $(m^4)^3$

.....

(1)

(c) Simplify $\dfrac{36af^8}{12a^5f^2}$

.....

(2)

(Total for Question 330 is 4 marks)

331 (a) Solve $5(f-3)=f+10$

.....

(3)

(b) Solve $\frac{h+7}{3}+\frac{2h-1}{2}=\frac{5}{6}$

.....

(4)

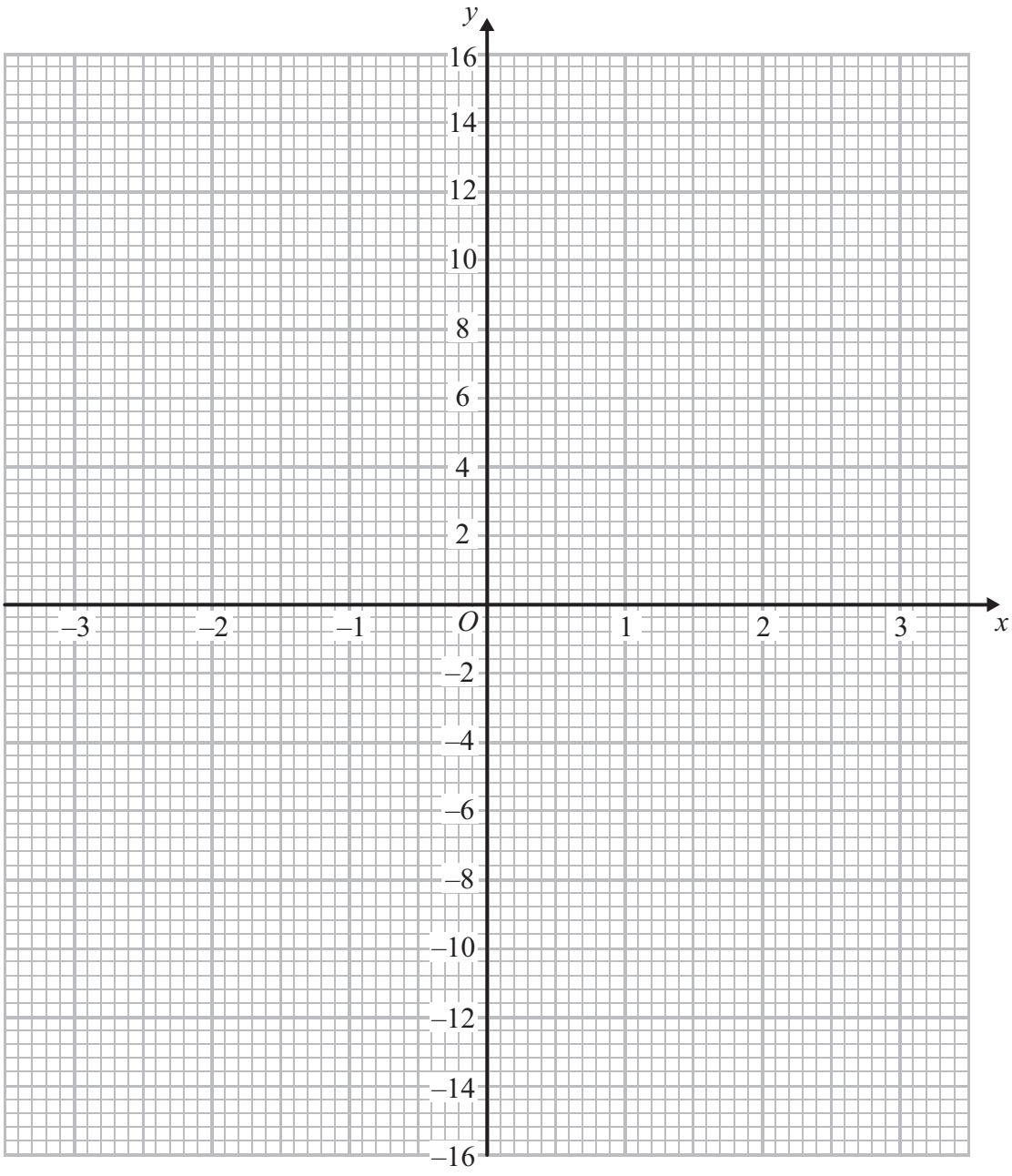
(Total for Question 331 is 7 marks)

332 (a) Complete the table of values for $y = x^3 - 4x$

x	−3	−2	−1	0	1	2	3
y			3	0			15

(2)

(b) On the grid, draw the graph of $y = x^3 - 4x$ from $x = -3$ to $x = 3$



(2)

(Total for Question 332 is 4 marks)

333 (a) Factorise $4x^2 - 9$

.....

(1)

(b) Make m the subject of

$$g - 3m = am + 5$$

.....

(3)

(Total for Question 333 is 4 marks)

***334** **A** and **B** are straight lines.

Line **A** has equation $2y = 3x + 8$

Line **B** goes through the points $(-1, 2)$ and $(2, 8)$

Do lines **A** and **B** intersect?

You must show all your working.

(Total for Question 334 is 3 marks)

335 (a) Solve $3(x - 2) = x + 7$

$x =$ .....

(3)

(b) Solve $\frac{2 - y}{5} = 1$

$y =$ .....

(2)

(Total for Question 335 is 5 marks)

336

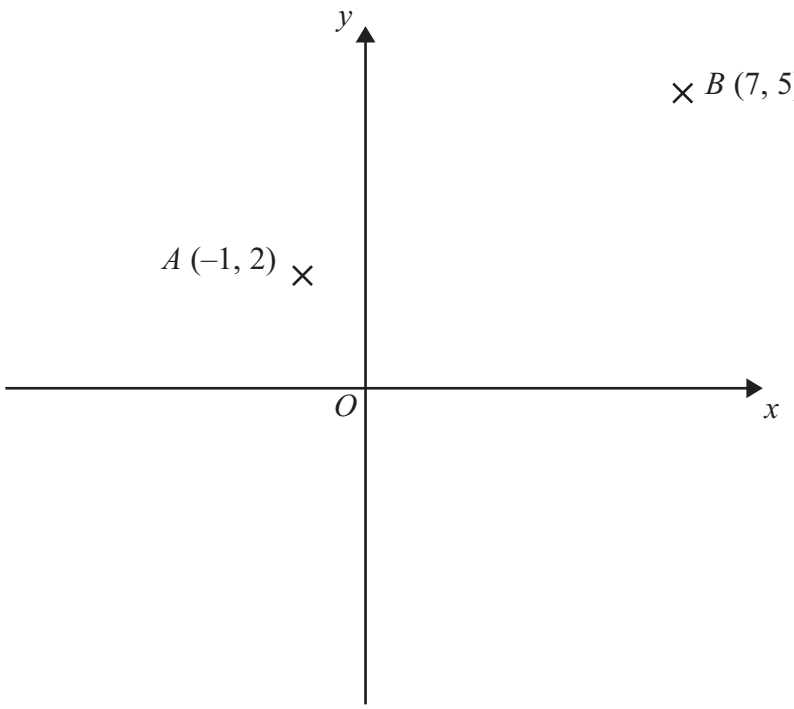


Diagram **NOT** accurately drawn

A is the point (–1, 2)
B is the point (7, 5)

(a) Find the coordinates of the midpoint of *AB*.

(..... , ...)

(2)

P is the point (–4, 4)
Q is the point (1, –5)

(b) Find the gradient of *PQ*.

.....

(2)

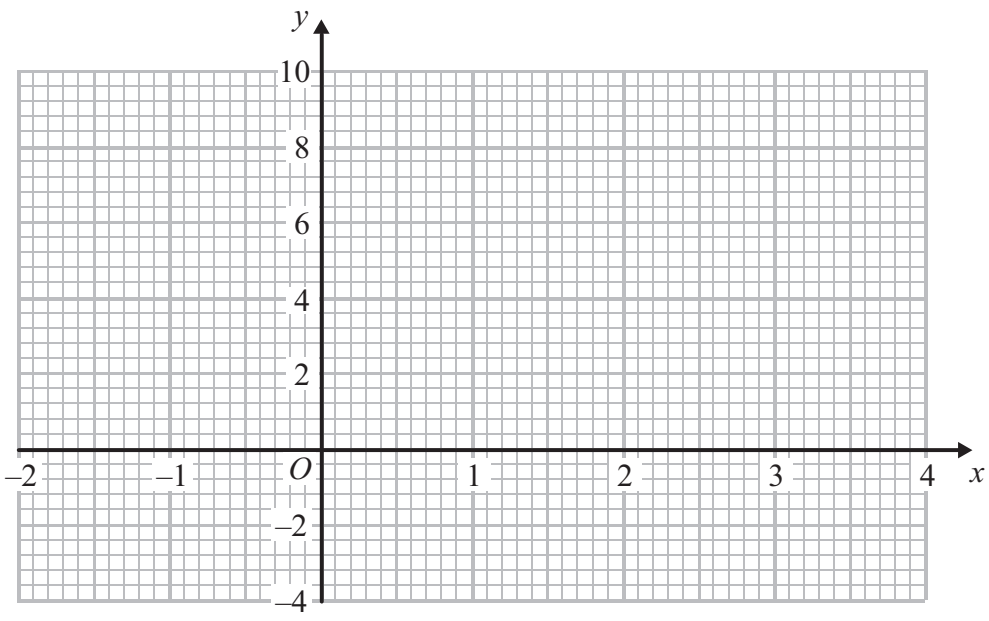
(Total for Question 336 is 4 marks)

337 (a) Complete the table of values for $y = x^2 - 2x$

x	–2	–1	0	1	2	3	4
y		3	0			3	

(2)

(b) On the grid, draw the graph of $y = x^2 - 2x$ for values of x from –2 to 4



(2)

(c) Solve $x^2 - 2x - 2 = 1$

.....

(2)

(Total for Question 337 is 6 marks)

338 Make p the subject of the formula $y = 3p^2 - 4$

.....

(Total for Question 338 is 3 marks)

339 (a) Factorise $6 + 9x$

.....

(1)

(b) Factorise $y^2 - 16$

.....

(1)

(c) Factorise $2p^2 - p - 10$

.....

(2)

(Total for Question 339 is 4 marks)

340 Solve the simultaneous equations $x^2 + y^2 = 9$
$x + y = 2$

Give your answers correct to 2 decimal places.

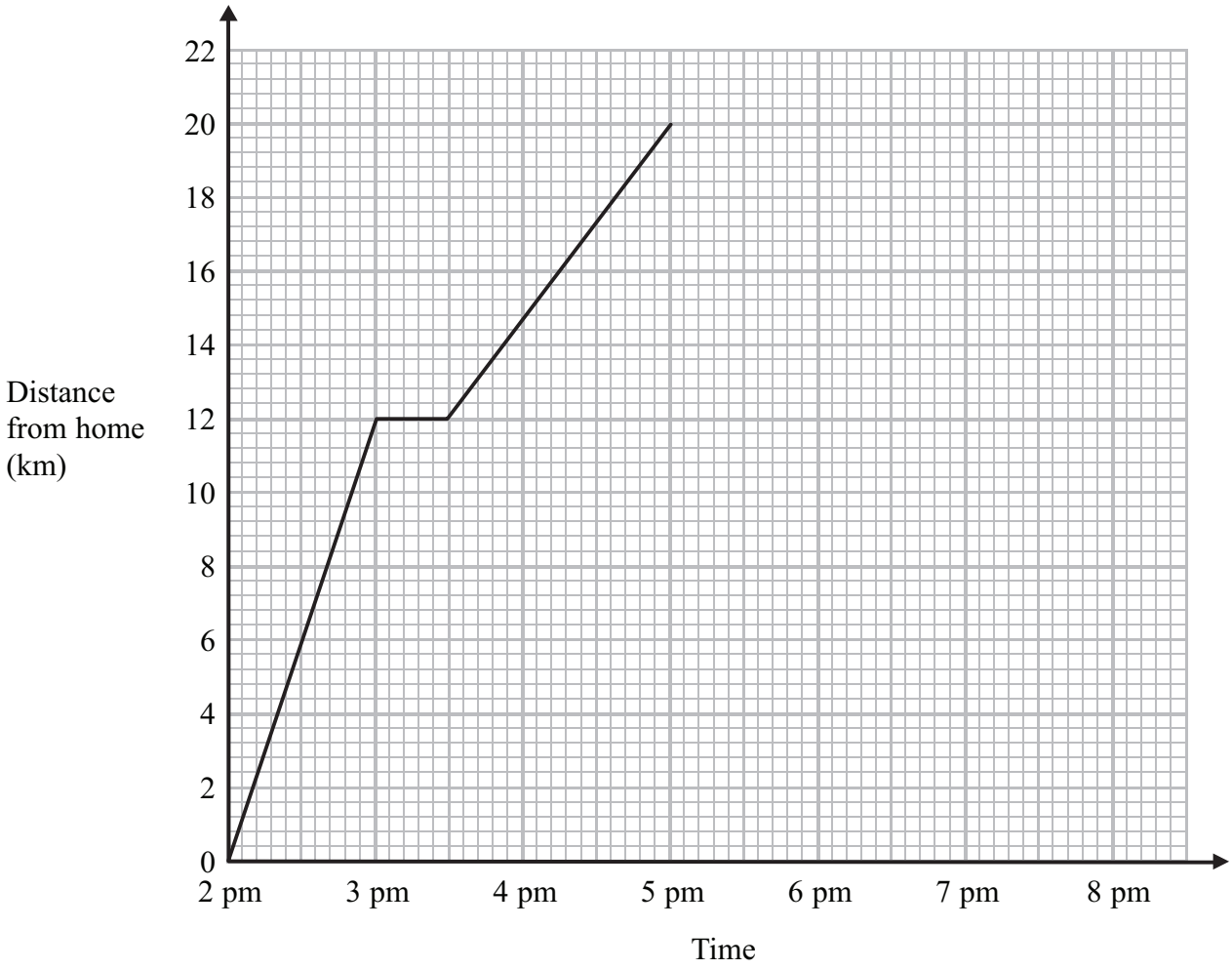
$x =$ ..... $y =$ .....

or $x =$ ..... $y =$ .....

(Total for Question 340 is 6 marks)

341 Simon went for a cycle ride.
He left home at 2 pm.

The travel graph represents part of Simon's cycle ride.



At 3 pm Simon stopped for a rest.

(a) How many minutes did he rest?

..... minutes

(1)

(b) How far was Simon from home at 5 pm?

..... km

(1)

At 5 pm Simon stopped for 30 minutes.
Then he cycled home at a steady speed.
It took him 1 hour 30 minutes to get home.

(c) Complete the travel graph.

(2)

(Total for Question 341 is 4 marks)

342 (a) Expand and simplify $3(x + 4) + 2(5x - 1)$

.....

(2)

(b) Expand and simplify $(2x + 1)(x - 4)$

.....

(2)

(c) Factorise completely $6y^2 - 9xy$

.....

(2)

(Total for Question 342 is 6 marks)

343 $-3 < n \leqslant 1$

n is an integer.

(a) Write down all the possible values of n.

.....

(2)

(b) Solve the inequality $3p - 7 > 11$

.....

(2)

(Total for Question 343 is 4 marks)

344 $A = 4bc$

$A = 100$
$b = 2$

(a) Work out the value of c.

.....

(2)

$$m = \sqrt{\frac{k+1}{4}}$$

(b) Make k the subject of the formula.

.....

(3)

(Total for Question 344 is 5 marks)

345 (a) n is an integer.

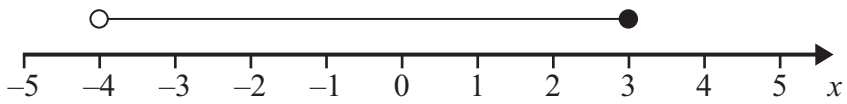
$$-1 \leqslant n < 4$$

List the possible values of n.

.....

(2)

(b)



Write down the inequality shown in the diagram.

.....

(2)

(c) Solve $3y - 2 > 5$

.....

(2)

(Total for Question 345 is 6 marks)

346 (a) Factorise $x^2 + 7x$

.....

(1)

(b) Factorise $y^2 - 10y + 16$

.....

(2)

*(c) (i) Factorise $2t^2 + 5t + 2$

.....

(ii) t is a positive whole number.

The expression $2t^2 + 5t + 2$ can never have a value that is a prime number.

Explain why.

.....

.....

.....

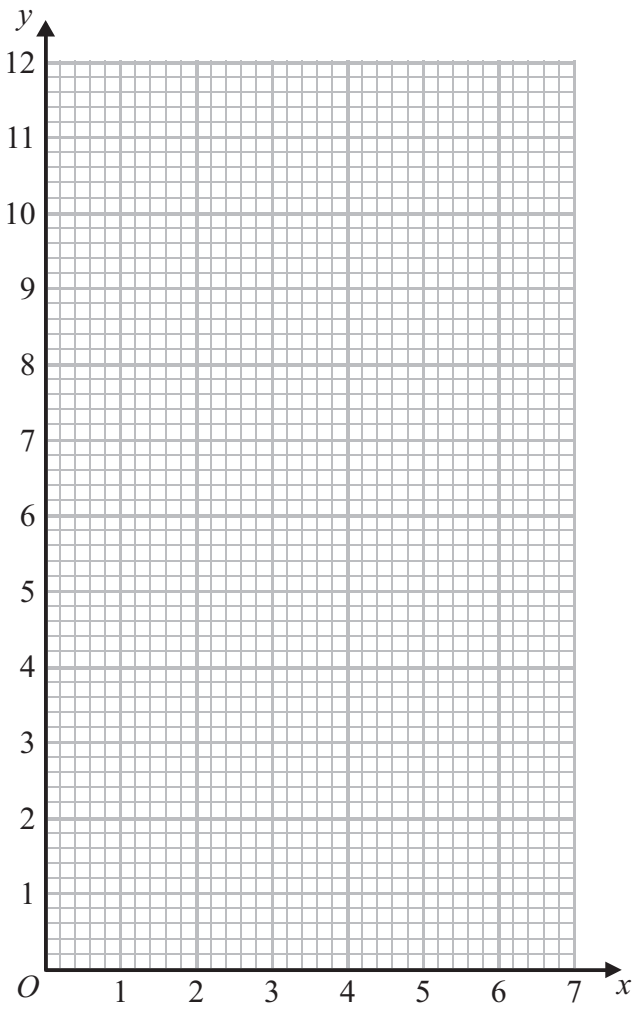
(3)

(Total for Question 346 is 6 marks)

347 (a) Complete the table of values for $y = \frac{6}{x}$

x	0.5	1	2	3	4	5	6
y		6	3		1.5		1

(2)



(b) On the grid, draw the graph of $y = \frac{6}{x}$ for $0.5 \leqslant x \leqslant 6$

(2)

(Total for Question 347 is 4 marks)

348 Simplify $\frac{x+1}{2} + \frac{x+3}{3}$

.....

(Total for Question 348 is 3 marks)

349 (a) Solve $2x^2 + 9x - 7 = 0$

Give your solutions correct to 3 significant figures.

.....

(3)

(b) Solve $\frac{2}{y^2} + \frac{9}{y} - 7 = 0$

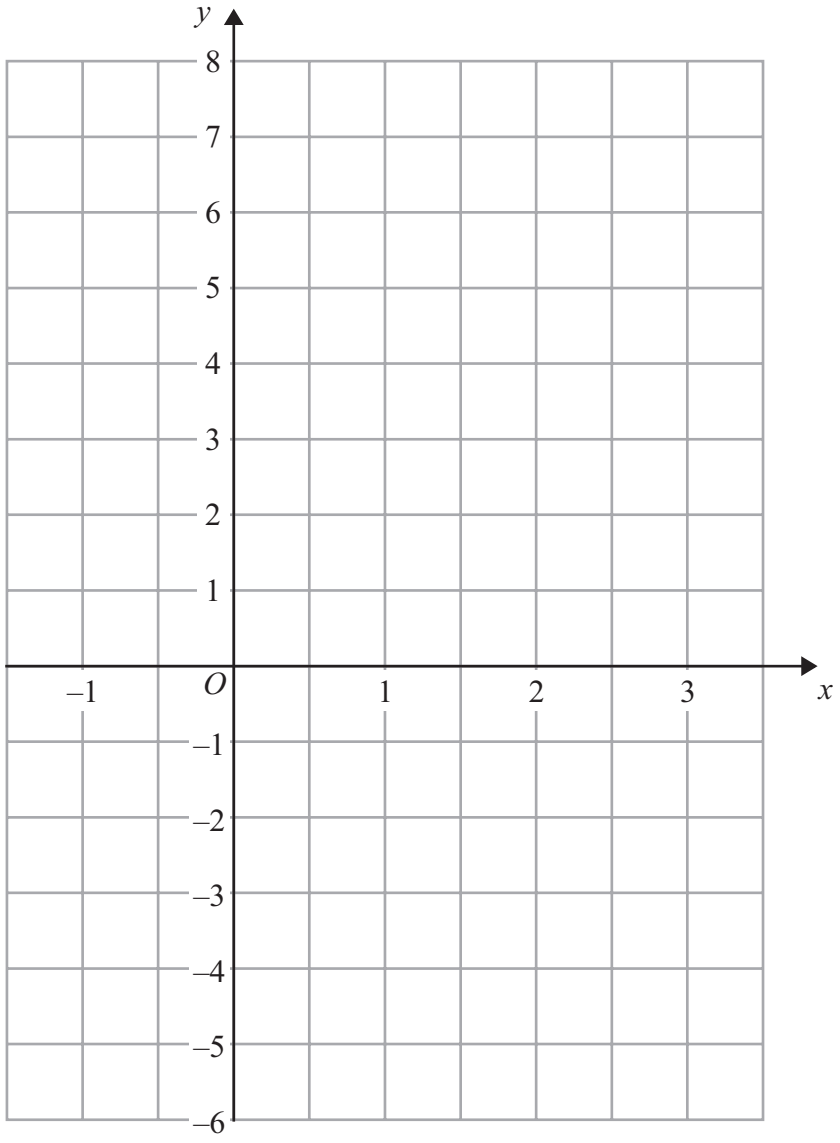
Give your solutions correct to 3 significant figures.

.....

(2)

(Total for Question 349 is 5 marks)

350 On the grid, draw the graph of $y = 3x - 2$ for values of x from -1 to 3



(Total for Question 350 is 3 marks)

351 m is an integer such that $-2 < m \leqslant 3$

(a) Write down all the possible values of m.

.....

(2)

(b) Solve $7x - 9 < 3x + 4$

.....

(2)

(Total for Question 351 is 4 marks)

352 (a) Expand and simplify $(p + 9)(p - 4)$

.....

(2)

(b) Solve $\frac{5w - 8}{3} = 4w + 2$

$w =$ .....

(3)

(c) Factorise $x^2 - 49$

.....

(1)

(d) Simplify $(9x^8y^3)^{\frac{1}{2}}$

.....

(2)

(Total for Question 352 is 8 marks)

353 $p^2 = \dfrac{x - y}{xy}$

$x = 8.5 \times 10^9$
$y = 4 \times 10^8$

Find the value of p.
Give your answer in standard form correct to 2 significant figures.

.....

(Total for Question 353 is 3 marks)

354 Make t the subject of the formula $2(d - t) = 4t + 7$

$t =$ .....

(Total for Question 354 is 3 marks)

355 Prove that

$$(2n + 3)^2 - (2n - 3)^2 \text{ is a multiple of } 8$$

for all positive integer values of n.

(Total for Question 355 is 3 marks)

356 Solve $3x^2 - 4x - 2 = 0$

Give your solutions correct to 3 significant figures.

.....

(Total for Question 356 is 3 marks)