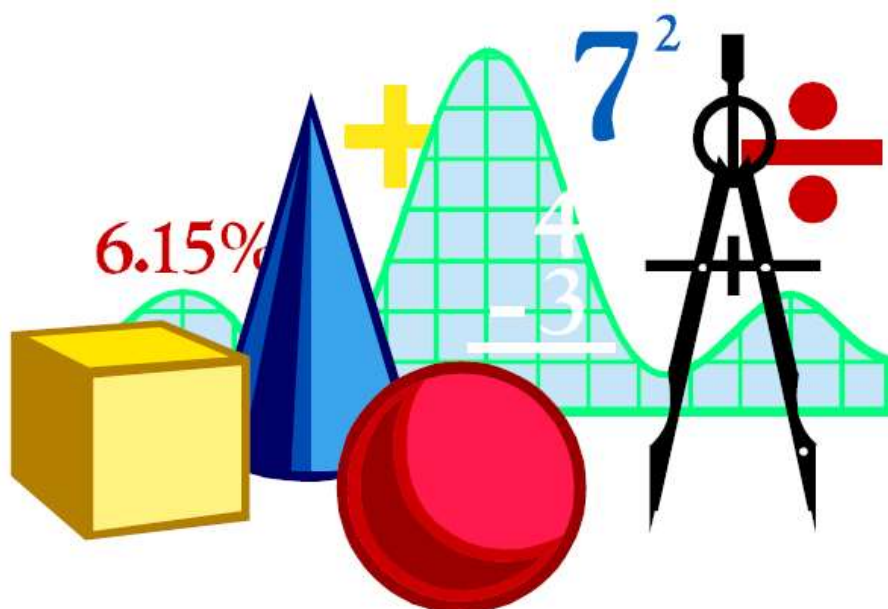




Preparing for A-Level Mathematics

Y11 to Y12 Transition Booklet

Summer 2020



Thank you for choosing to study A-Level Mathematics at The Quest Academy!

Course Structure

The course is split into two strands (Pure Maths and Applied Maths) and 6 modules in total:

	Pure Mathematics (two thirds)	Applied Mathematics (one third)	
		Statistics (one sixth)	Mechanics (one sixth)
Y12	$P1 = \frac{4}{12}$	$S1 = \frac{1}{12}$	$M1 = \frac{1}{12}$
Y13	$P2 = \frac{4}{12}$	$S2 = \frac{1}{12}$	$M2 = \frac{1}{12}$

Assessment

As you probably expect, the course involves written examinations as the sole means of assessment. We will help you prepare for your final external exams by doing:

- End-of-topic assessments regularly, to give you feedback on how to improve your learning of specific topics
- Summative assessments at the end of each module (P1, S1, etc)
- AS Mock exams at the end of Y12 (P1 sat as 1 paper and S1/M1 sat as 1 paper)
- At least two full A-Level Mocks in Y13 before you do the **three external papers at the end of Year 13**: Pure 1, Pure 2 and Applied.

COVID-19 Disruption

Due to the COVID-19 pandemic, you will have suffered severe disruption to your learning this year. The Mathematics Department is keen to ensure this does not put you at a disadvantage on the A-Level course. We have therefore prepared an extended version of the booklet we would normally issue as Transition Work.

Preparation for the course

1. Please complete all questions in this booklet, for submission in the first week of term in September. Some of these questions are specifically designed to be a challenge so you may get stuck but we expect you to at least attempt to solve each one.
2. Join the Google Classroom before the start of term:
 - Go to <https://classroom.google.com/>
 - Sign in using your main personal email address (the one you have downloaded to your phone)
 - Enter the class code **etbiktn** to join the 'Y12 2020-2021 Maths A-Level Class'.
 - You will be able to access resources (including support for the Transition Work and some solutions to check your work), information and "meet" your future fellow classmates through this site.

What to bring on the first day

- A scientific calculator, a lever-arch folder, lined paper and a set of dividers with at least 8 dividers
- Your Transition Work, completed on separate lined paper or on the printed booklet, with full working out
- Your Results Sheet (with your GCSE Maths grade on it, as issued to you by your secondary school)

There will be a Baseline Test in September – this Transition Work will be vital preparation for this.

Questions? Ask through Google Classrooms or by emailing Ms Joomun (Head of Mathematics at Quest) at rjoomun@thequestacademy.org.uk.

Algebraic Fractions (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	
Total Marks:	

1. a) Express as a single fraction.

$$\frac{m+1}{n+1} - \frac{m}{n}$$

Simplify your answer.

a) [2]

b) Using your answer to part (a), prove that if m and n are positive integers and $m < n$, then

$$\frac{m+1}{n+1} - \frac{m}{n} > 0$$

[2]

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

[3]

3. 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.

[4]

4. Given that

$$2x - 1 : x - 4 = 16x + 1 : 2x - 1$$

find the possible values of x .

[5]

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

[2]

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

[4]

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

$x = \dots\dots\dots$ [3]

8. 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.

[3]

9. Show that $\frac{2w+4}{w^2-25} \times \frac{w+5}{w^2+3w+2} \times (3w^2-16w+5)$

Simplifies to $\frac{aw+b}{cw+d}$ where a, b, c and d are integers.

[5]

10. Show that

$$\frac{4}{x-3} - \frac{2}{x+1} = \frac{2(x+5)}{(x-3)(x+1)}$$

[3]

11. Show that $\frac{2x+1}{3} + \frac{5x-2}{2}$ simplifies to $\frac{19x-4}{6}$

[2]

Algebraic Proof (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	
Total Marks:	

1. Prove algebraically that

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

for all positive integer values of n .

[3]

2. c is a positive integer.

Prove that $\frac{6c^3 + 30c}{3c^2 + 15}$ is an even number.

[3]

3. a) Prove that the sum of four consecutive whole numbers is always even.

[3]

b) Give an example to show that the sum of four consecutive integers is not always divisible by 4.

[2]

4. 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

[6]

5. 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.

[3]

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

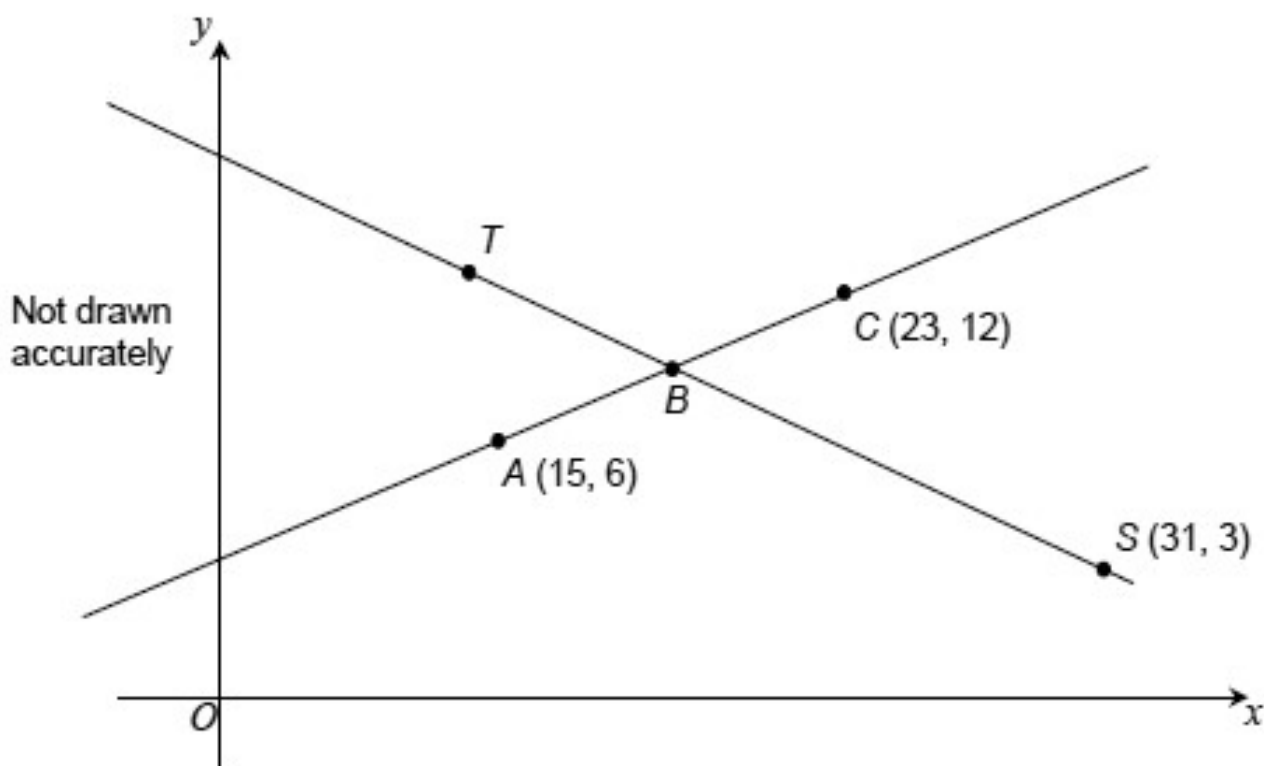
[4]

Coordinates (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	
Total Marks:	

1. Two straight lines are shown.



B is the midpoint of AC.

TB : BS = 2 : 3

Work out the coordinates of T.

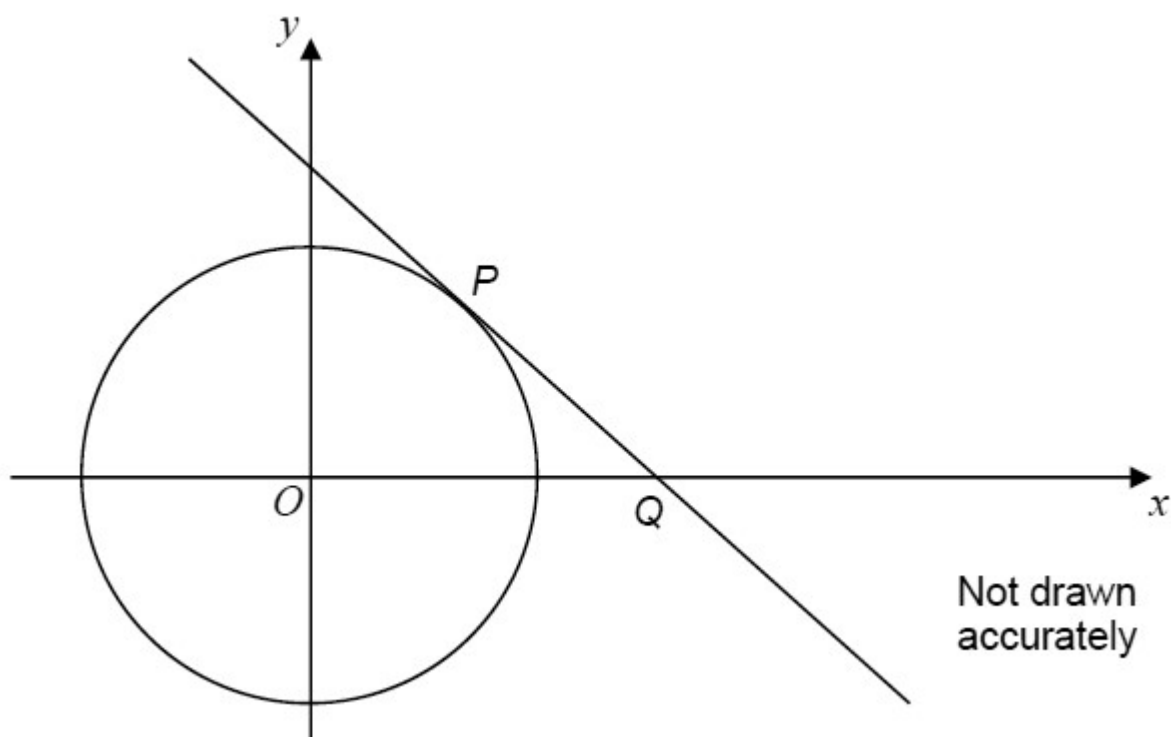
[4]

Equation of a circle (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	
Total Marks:	

1. The diagram shows the circle $x^2 + y^2 = 10$



P lies on the circle and has x -coordinate 1
 The tangent at P intersects the x -axis at Q .
 Work out the coordinates of Q .

[5]

2. A circle has equation $x^2 + y^2 = 4$

Circle the length of its radius.

2

4

8

16

[1]

3. The line l is a tangent to the circle $x^2 + y^2 = 40$ at the point A .

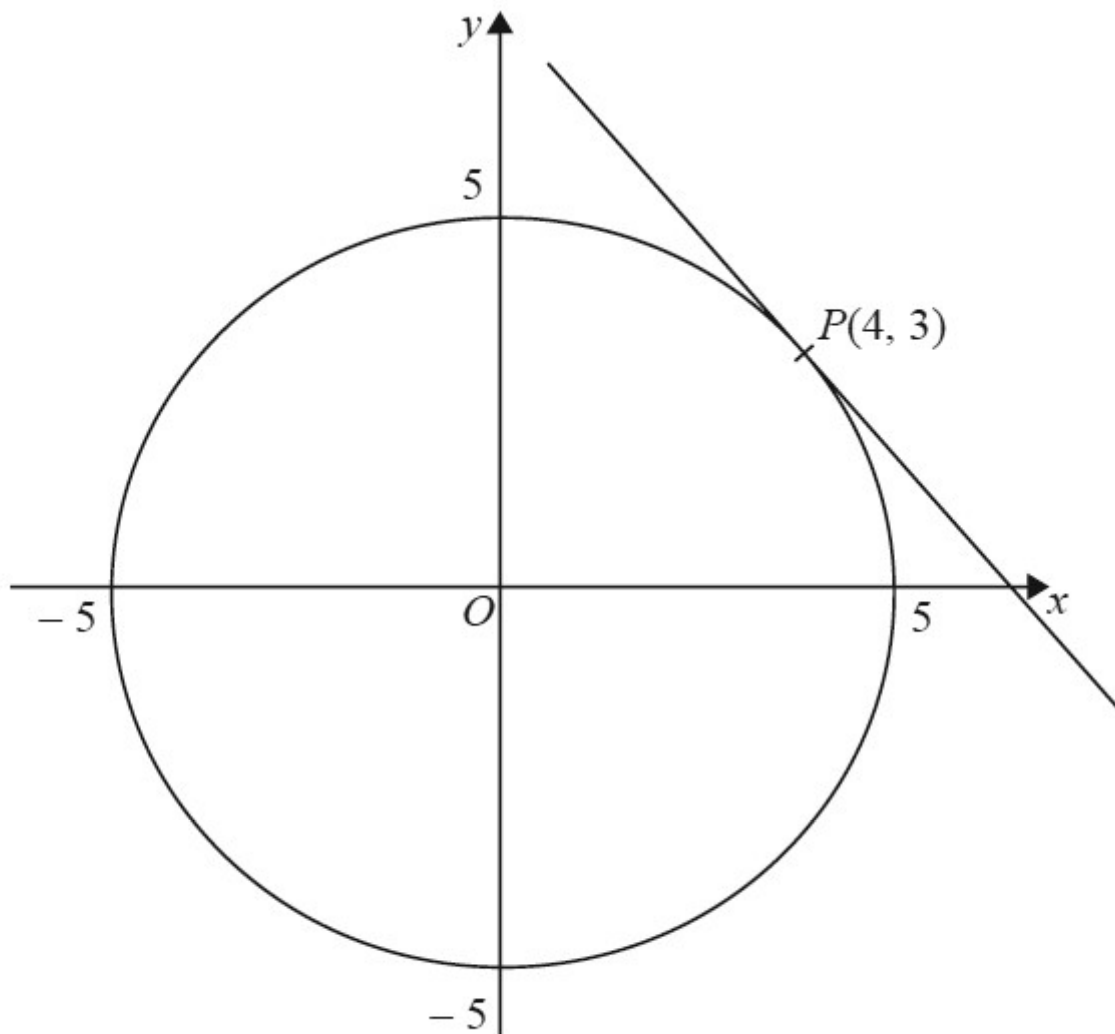
A is the point $(2, 6)$.

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

Work out the area of triangle OAP .

[5]

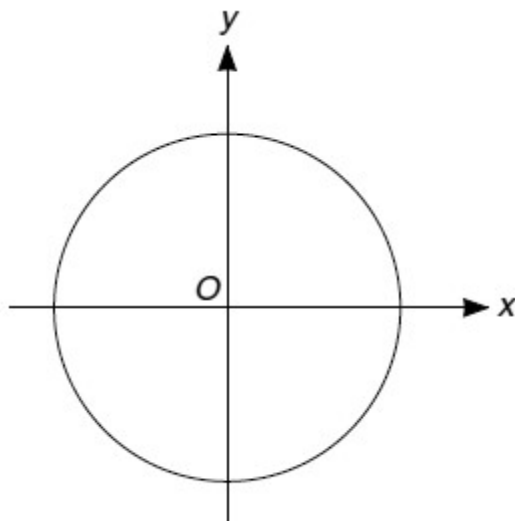
4. Here is a circle, centre O , and the tangent to the circle at the point $P(4, 3)$ on the circle.



Find an equation of the tangent at the point P .

[3]

5. (a) The diagram shows a circle, centre O.



The circumference of the circle is 20π cm.

Find the equation of the circle.

a) [4]

b) The line $10x + py = q$ is a tangent at the point $(5, 4)$ in another circle with centre $(0, 0)$.

Find the value of p and the value of q .

b) $p =$

$q =$

[4]

6. A circle has equation $x^2 + y^2 = \frac{1}{4}$

Circle the length of its radius.

[1]

☐ $\frac{1}{16}$

☐ $\frac{1}{8}$

☐ $\frac{1}{4}$

☐ $\frac{1}{2}$

Equation of a Straight Line (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	
Total Marks:	

1. The line L_1 is shown in the diagram below.

The line L_2 , which is not shown, is perpendicular to L_1 .

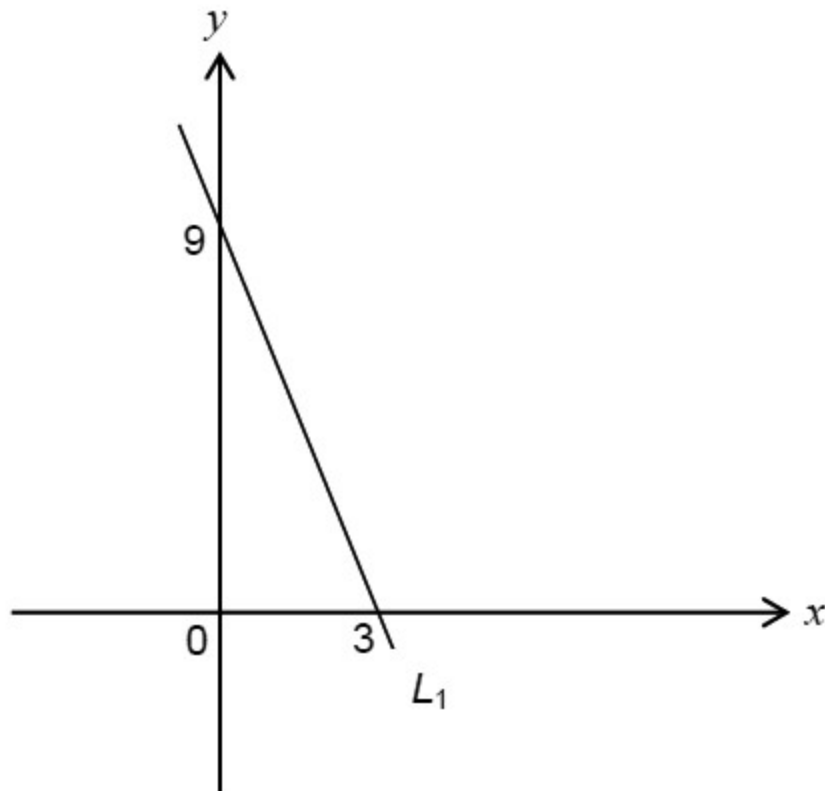


Diagram not drawn to scale

(i) Find the gradient of L_1 .

[2]

(ii) Write down the gradient of L_2 .

[1]

- (b) The two straight lines L1 and L2 intersect at the point (1, 6).
Find the equation of L2 and write it in the form $ax + by + c = 0$.

[4]

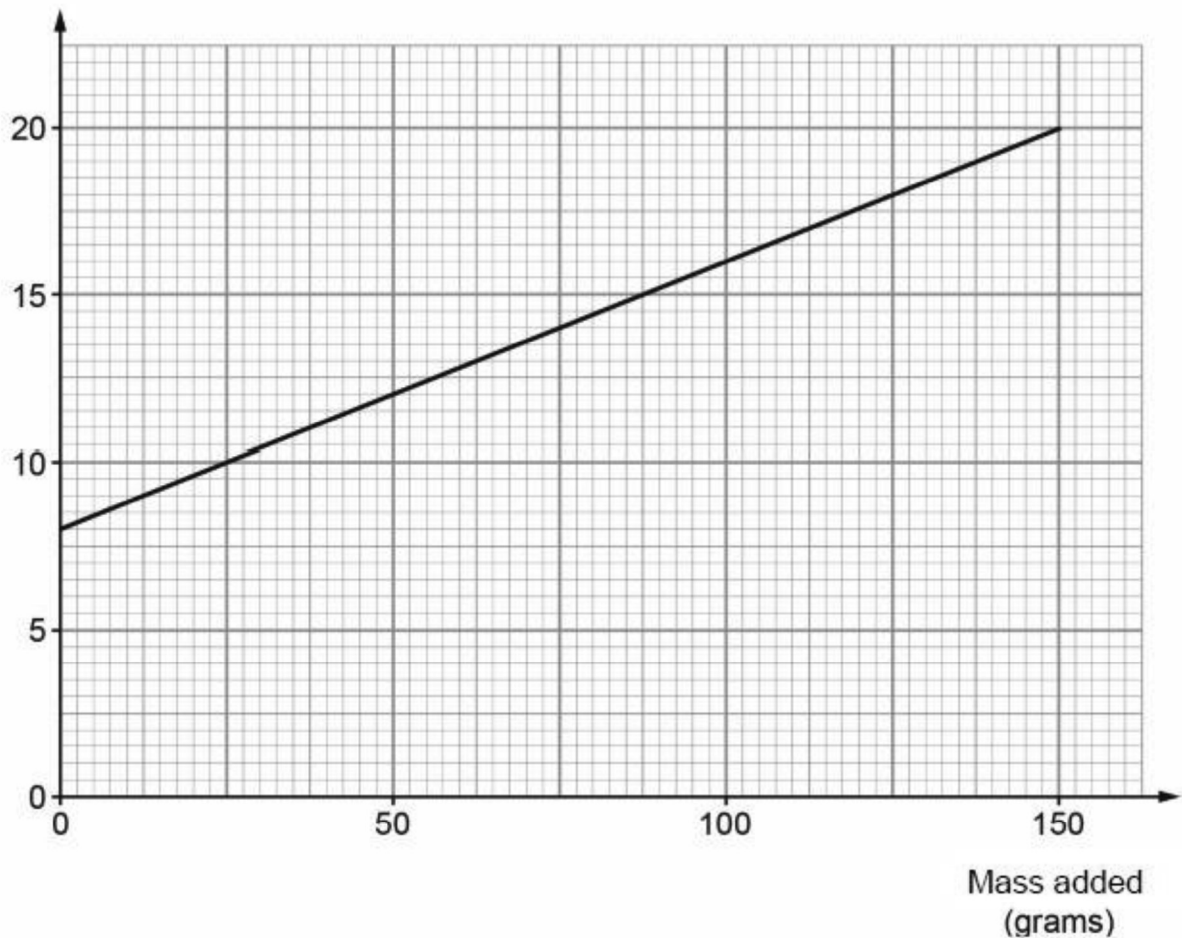
2. In an experiment, the mass added to the end of a vertical spring is gradually increased.



Diagram not drawn to scale

At the end of the experiment, a computer produced the graph shown below.

Length of spring (mm)



(a) Write down the length of the spring without any mass added.

[1]

(b) (i) Calculate the gradient of the straight line drawn on the graph.

[2]

(ii) Explain what the gradient of this graph tells you in relation to the experiment.

[1]

(c) The straight line stops before the right-hand edge of the graph paper.

Why do you think this might be?

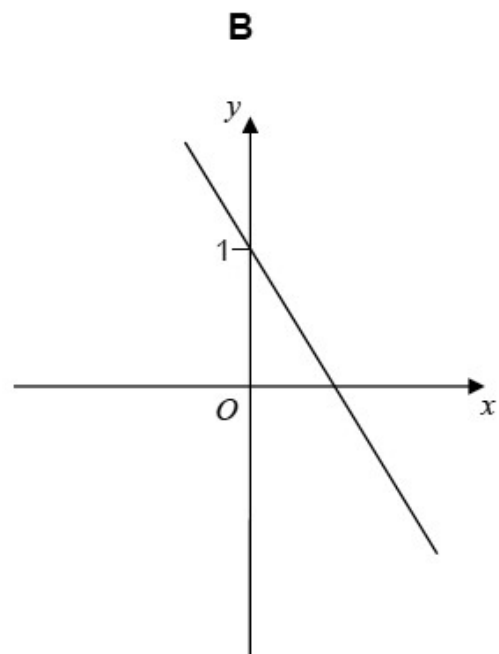
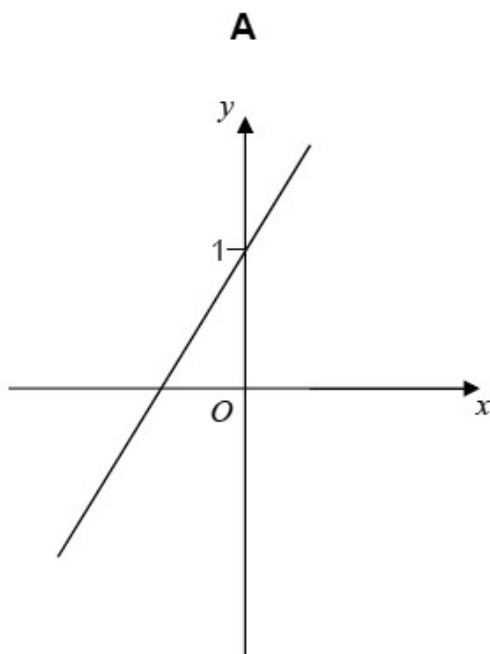
[1]

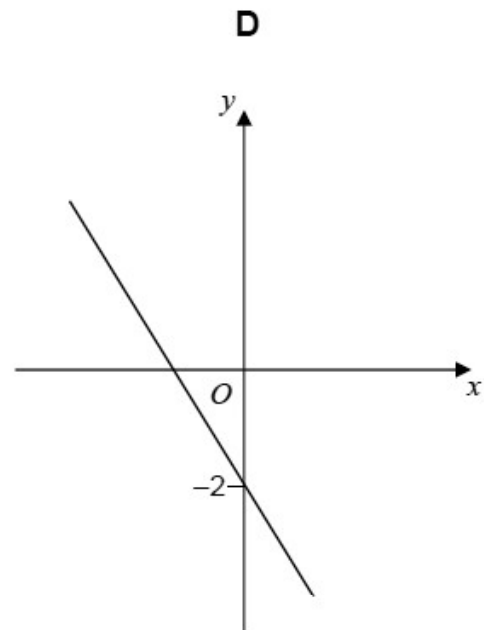
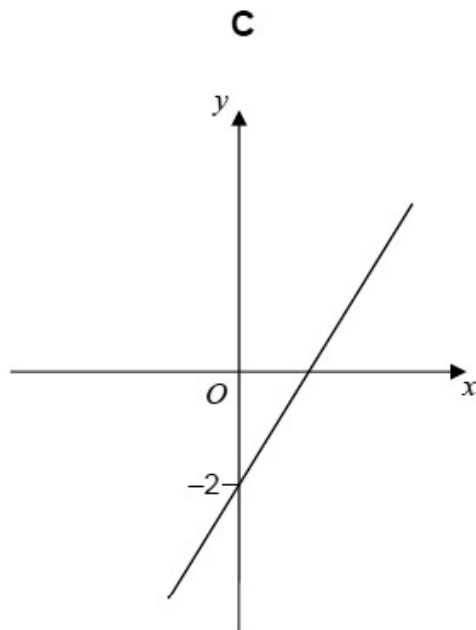
3. One of these graphs is a sketch of $y = 1 - 2x$

Which one?

Circle the correct letter.

[1]





4. $A(-2, 1)$, $B(6, 5)$ 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.

[5]

5. Circle the equation of a line that is parallel to $y = 5x - 2$

$y = 2x - 5$

$y = 5x + 2$

$y = 3x - 2$

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

[1]

6. Show that line $3y = 4x - 14$ is perpendicular to line $4y = -3x + 48$.

[4]

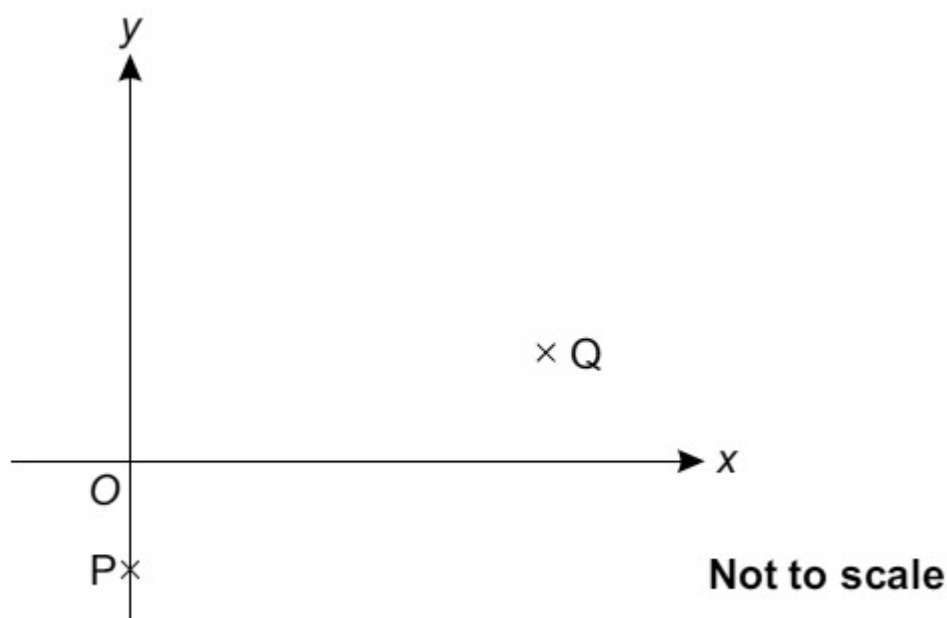
7. A straight line goes through the points (p, q) and (r, s) , where

- $p + 2 = r$
- $q + 4 = s$.

Find the gradient of the line.

..... [3]

8. 10 P has coordinates $(0, -1)$ and Q has coordinates $(4, 1)$.



a) Find the equation of line PQ.

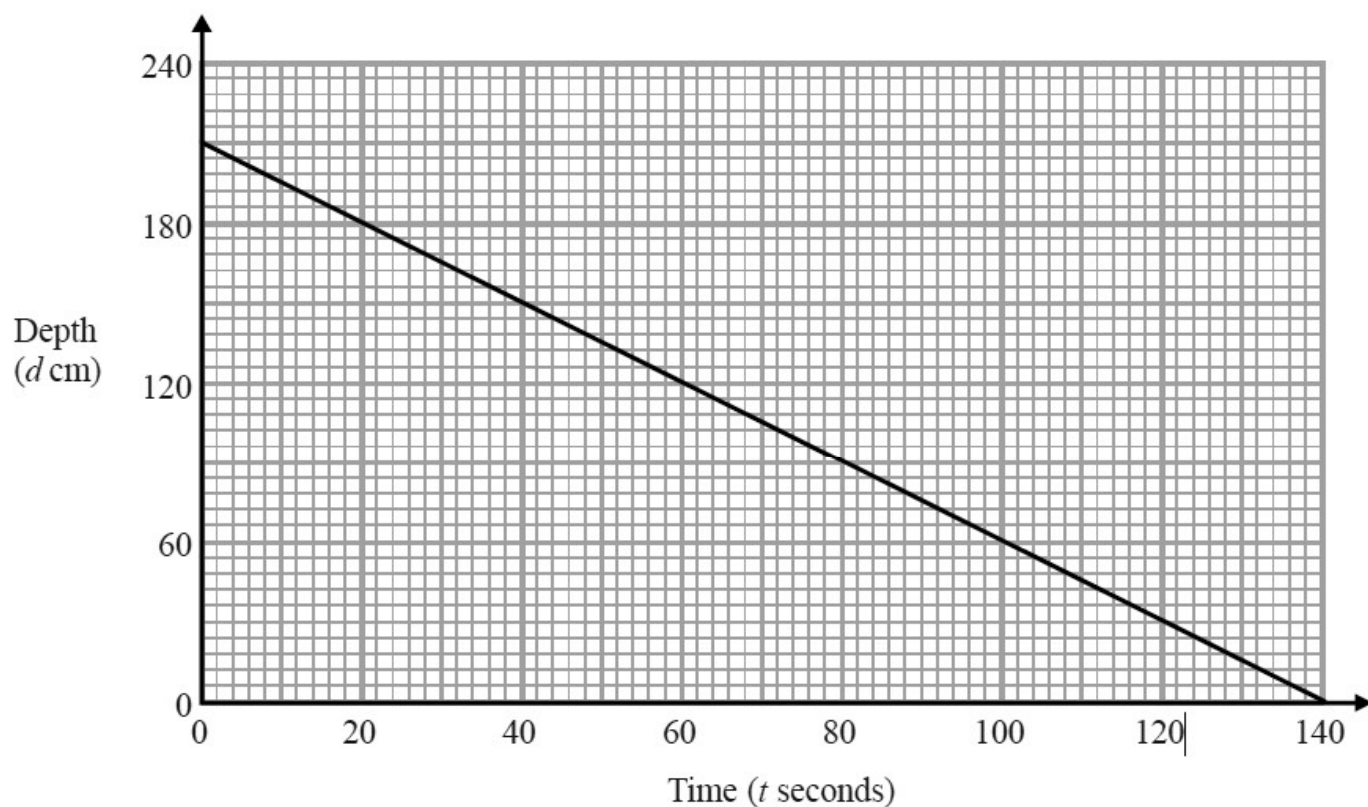
a) [3]

b) P and Q are two vertices of rectangle PQRS.

Find the equation of line QR.

b) [3]

9. The graph shows the depth, d cm, of water in a tank after t seconds.



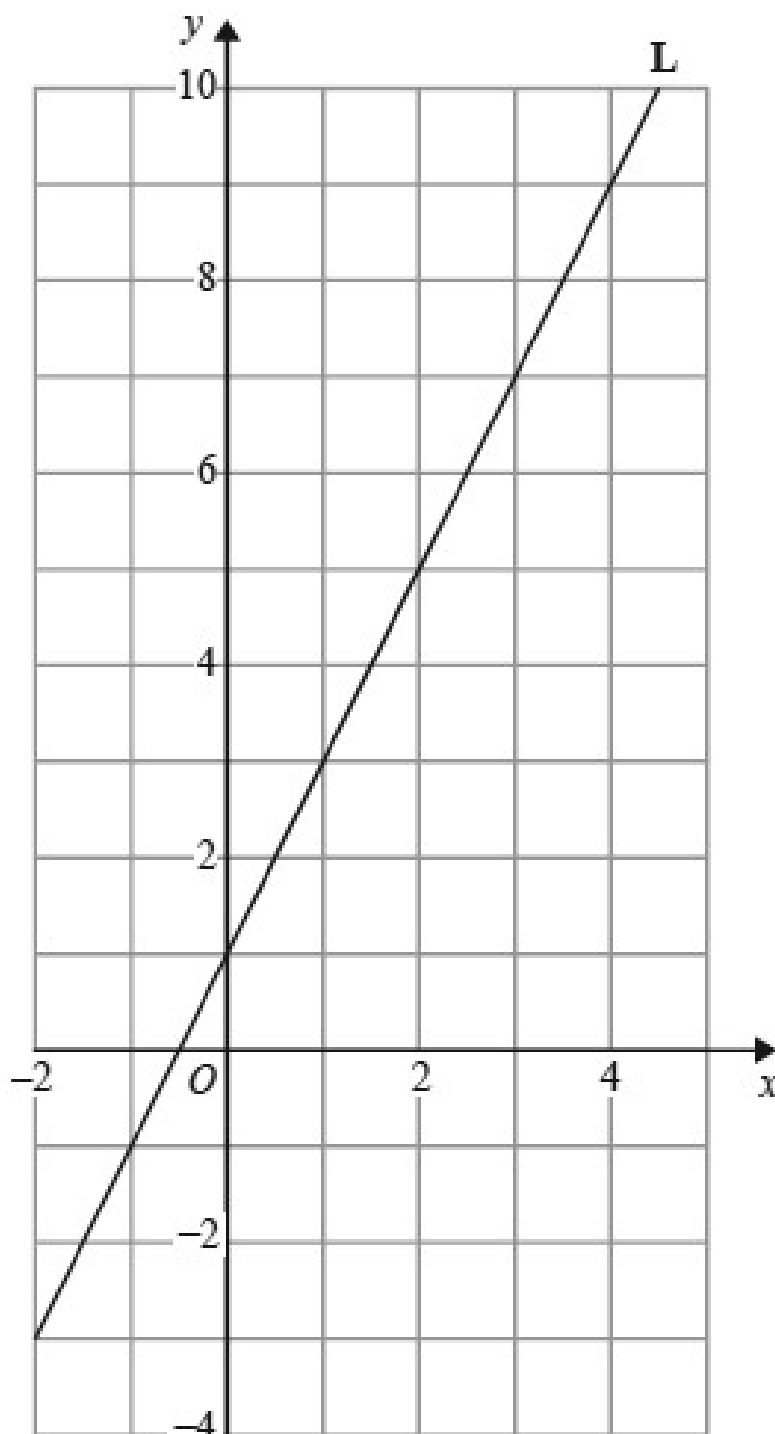
a) Find the gradient of this graph.

..... [2]

b) Explain what this gradient represents.

[1]

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



Find an equation for the straight line **L**.

Give your answer in the form **$y = mx + c$**

11. 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..... [1]

12. Circle the equation of the x-axis.

$x + y = 0$

$x - y = 0$

$x = 0$

$y = 0$

[1]

13. The line l is a tangent to the circle $x^2 + y^2 = 40$ at the point A .

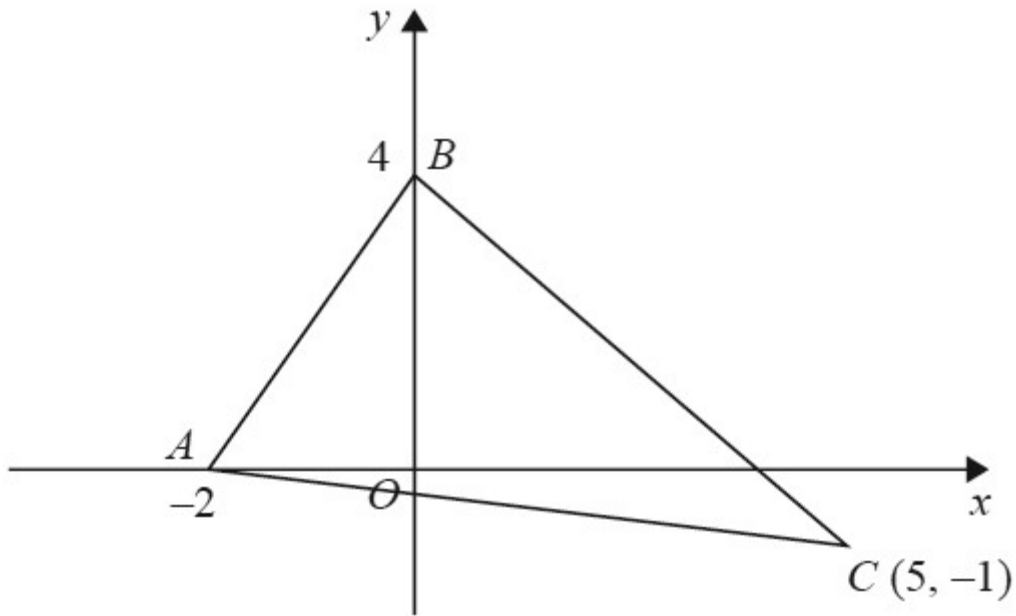
A is the point $(2, 6)$.

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

Work out the area of triangle OAP .

[5]

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



[4]

15. Work out the equation of the line that
is parallel to the line $y = 5x - 3$
passes through $(-2, -4)$

[3]

16. A straight line has equation $y = 6 - 2x$
Circle the gradient of the line.

[1]

-2

2

2x

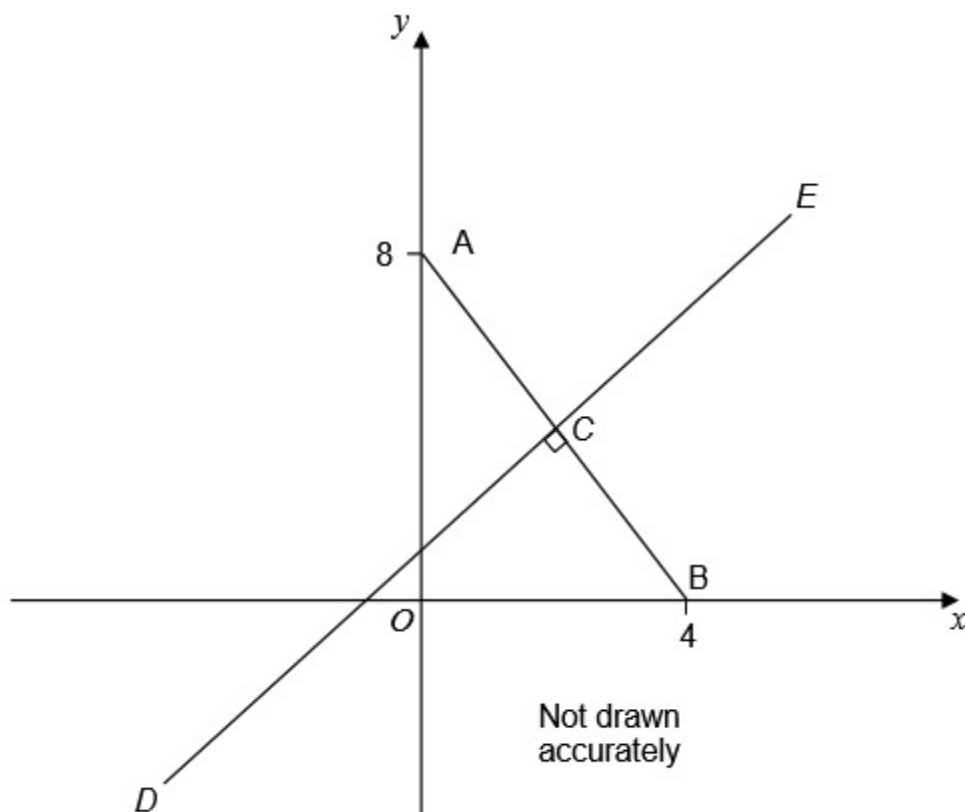
6

17. ACB is a straight line.

A is the point $(0, 8)$, and B is the point $(4, 0)$

C is the midpoint of AB .

Line DCE is perpendicular to line ACB .



Work out the equation of line DCE .

[5]

Factorising/Expanding/Solving Polynomials (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	
Total Marks:	

1. Factorise the following expressions.

a) $6x^2 + 8x$

[2]

b) $x^2 - 100$

[1]

2. Express $x^2 + 12x + 14$ in the form $(x + a)^2 + b$, where a and b are whole numbers to be found.

[2]

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

[2]

4. Factorise fully $20x^2 - 5$

[2]

5. Circle the equation with roots 4 and -8

$4x(x - 8) = 0$ $(x - 4)(x + 8) = 0$

$x^2 - 32 = 0$ $(x + 4)(x - 8) = 0$

[1]

6. Factorise $y^2 + 7y + 6$

[2]

7. $2x^2 - 6x + 5$ can be written in the form $a(x - b)^2 + c$

where a , b and c are positive numbers.

(a) Work out the values of a , b and c .

$a =$ _____
 $b =$ _____
 $c =$ _____
 [3]

(b) Using your answer to part (a), or otherwise, solve $2x^2 - 6x + 5 = 8.5$

[3]

8. (a) Find the interval for which $x^2 - 7x + 10 \leq 0$

(a) $\leq x \leq$ [3]

(b) The point $(-3, -4)$ is the turning point of the graph of $y = x^2 + ax + b$, where a and b are integers.

Find the values of a and b .

(b) $a =$ $b =$ [3]

6. $y = 6x^4 + 7x^2$ and $x = \sqrt{w + 1}$.

Find the value of w when $y = 10$.

Show your working.

[6]

7. Factorise $3x^2 + 14x + 8$

[2]

11. a) Write $x^2 + 10x + 29$ in the form $(x + a)^2 + b$.

a) [3]

b) Write down the coordinates of the turning point of the graph of $y = x^2 + 10x + 29$.

b) (..... ,) [1]

12. a) Expand and simplify.

$$(x + 7)(x + 2)$$

a) [2]

b) Factorise completely.

$$2x^2 - 6xy$$

b) [2]

c) Solve.

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

c) [3]

13. Factorise $x^2 + 3x - 4$

[2]

14. Factorise $y^2 + 27y$

..... [1]

15. Expand and simplify $(y + 5)(y - 4)$

[2]

16. $x(x + 4) \equiv x^2 + 4x$

For how many values of x is $x(x + 4)$ equal to $x^2 + 4x$?

Circle your answer.

[1]

0 1 2 all

17. Factorise fully $9a^2 - 6a$

[2]

18. Write $x^2 + 2x - 8$ in the form $(x + m)^2 + n$

where m and n are integers.

[2]

19. 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]

20. Solve $x^2 - 6x - 8 = 0$

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

..... [3]

21. Show that

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

for all values of x .

[3]

22. Expand and simplify $(2x + 5)(2x - 5)(3x + 7)$

[3]

23. Expand and simplify $(2x + 5y)(3x - 8y)$

[3]

24. $2x^2 - 20x + c \equiv a(x - b)^2 + 3b$

Work out the value of c .

[3]

25. $(3x + 1)(x - 2) + ax + b \equiv 3x^2 + 8x - 5$

Work out the values of a and b .

[4]

26. Write $x^2 - 10x + 29$ in the form $(x - a)^2 + b$

[2]

Forming & Solving Equations (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	
Total Marks:	

1. The diagram below shows a composite shape formed by joining two rectangles.

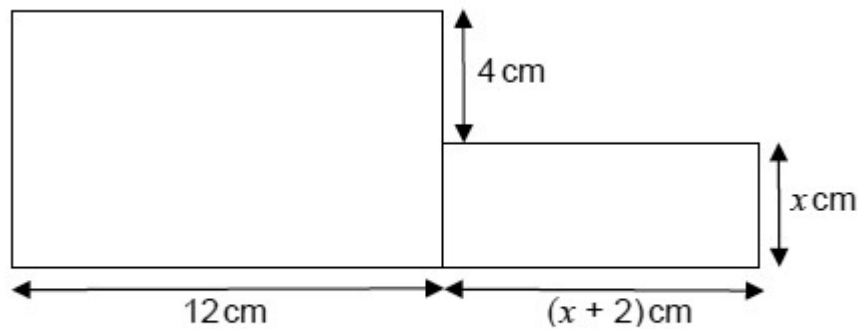


Diagram not drawn to scale

The area of the larger rectangle is 4 times the area of the smaller rectangle.

Calculate the dimensions of the smaller rectangle.

You must justify any decisions that you make.

[7]

2. The diagram shows a square.

All the lengths are measured in centimetres.

Diagram not drawn to scale

Use an algebraic method to find the length of one side of the square.

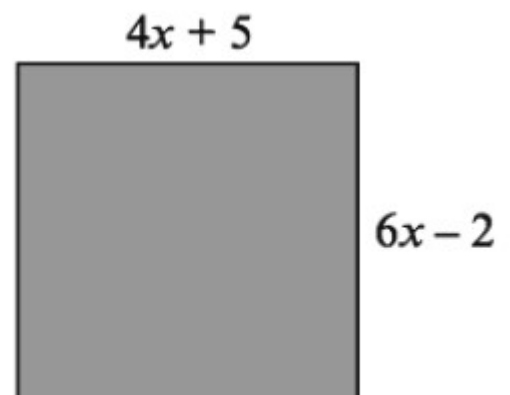


Diagram not drawn to scale

[5]

3. (a) Solve $\frac{3}{x} = 12$

[1]

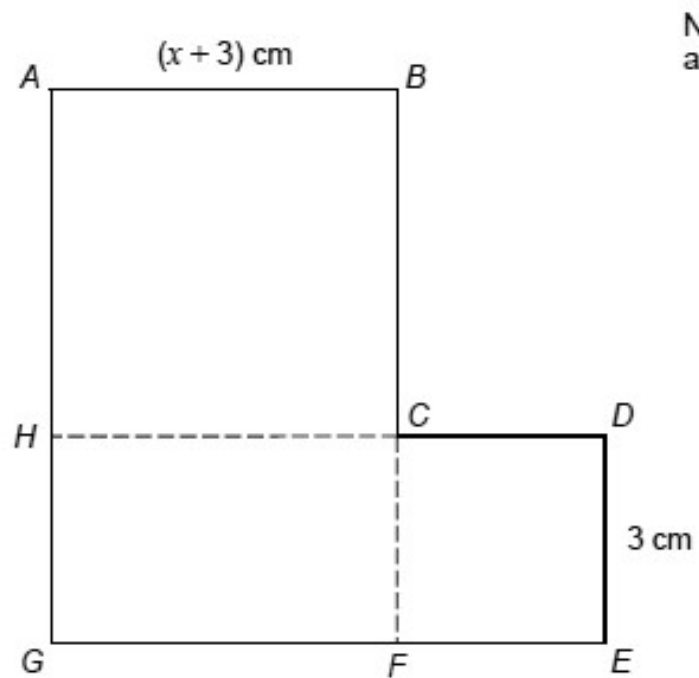
(b) Solve $9x - 4 = 7(x + 2)$.

[3]

4. ABCH is a square.

HCFG is a rectangle.

CDEF is a square.



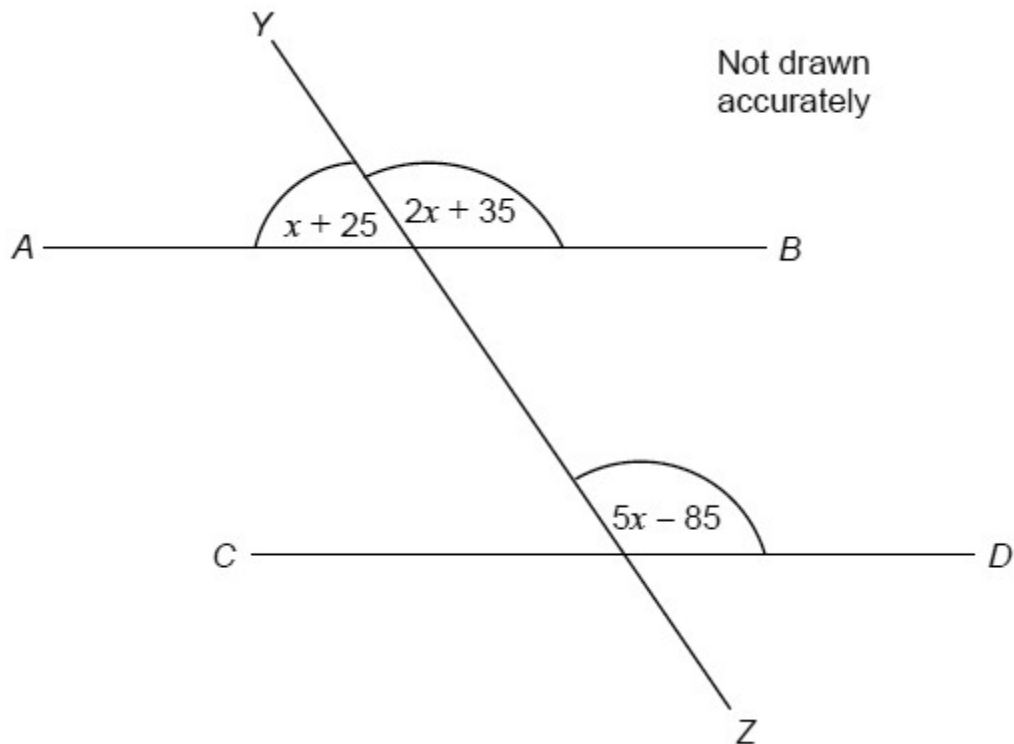
They are joined to make an L-shape.

Show that the total area of the L-shape, in cm^2 , is $x^2 + 9x + 27$

[4]

5. AB, CD and YZ are straight lines.

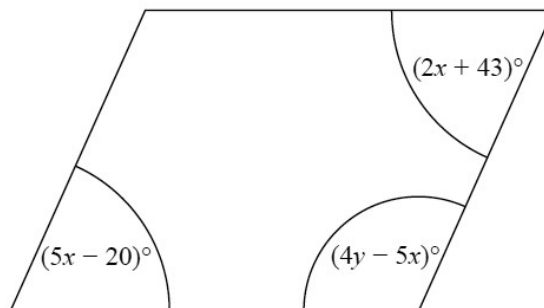
All angles are in degrees.



Show that AB is parallel to CD.

[4]

6. Here is a parallelogram.



Work out the value of x and the value of y .

$x =$

$y =$

[5]

7. Kieran, Jermaine and Chris play football.

- Kieran has scored 8 more goals than Chris.
- Jermaine has scored 5 more goals than Kieran.
- Altogether they have scored 72 goals.

How many goals did they each score?

Kieran

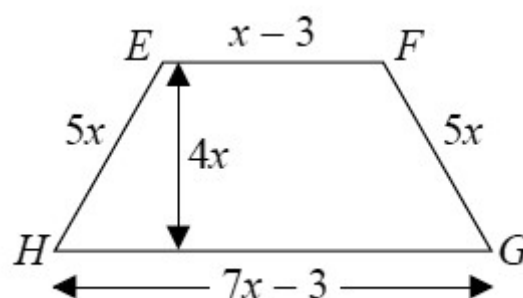
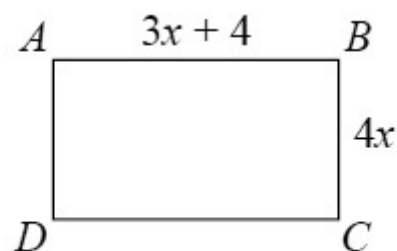
Jermaine

Chris

[5]

8. ABCD is a rectangle.

EFGH is a trapezium.



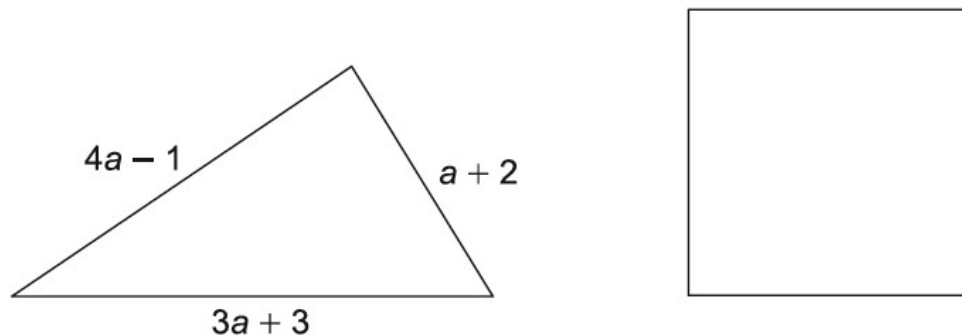
All measurements are in centimetres.

The perimeters of these two shapes are the same.

Work out the area of the rectangle.

..... .cm² [5]

9. The perimeter of the triangle is the same length as the perimeter of the square.



Find an expression for the length of one side of the square in terms of a .

Give your answer in its simplest form.

..... [4]

10. Alexander, Reiner and Wim each watch a different film.

- Alexander's film is thirty minutes longer than Wim's film.
- Reiner's film is twice as long as Wim's film.
- Altogether the films last 390 minutes.

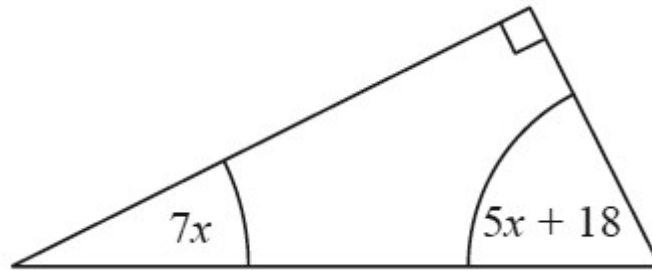
How long is each of their films?

Alexander's film minutes

Reiner's film minutes

Wim's film minutes [4]

11. The diagram shows a right-angled triangle.

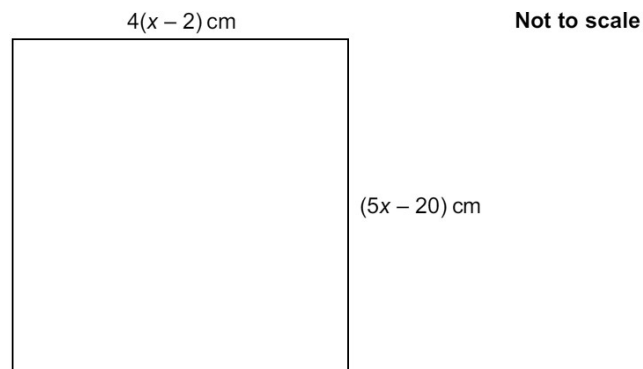


All the angles are in degrees.

Work out the size of the smallest angle of the triangle.

[3]

12. This is a square.

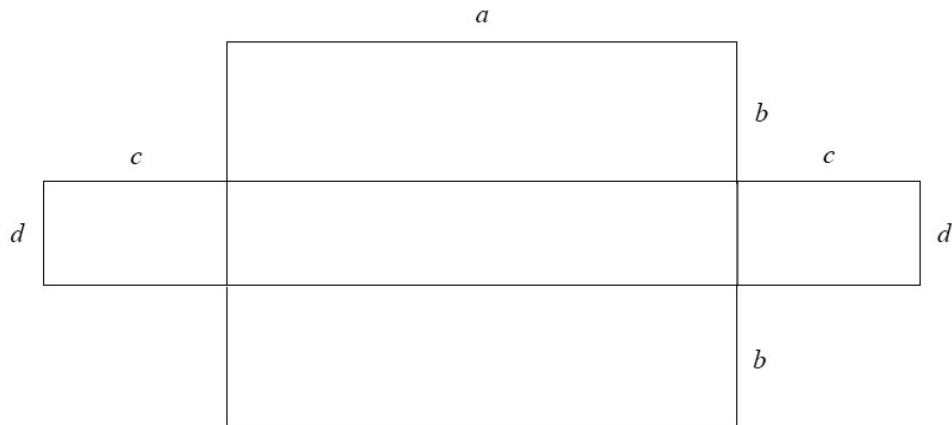


Work out the length of the side of the square.

..... cm [5]

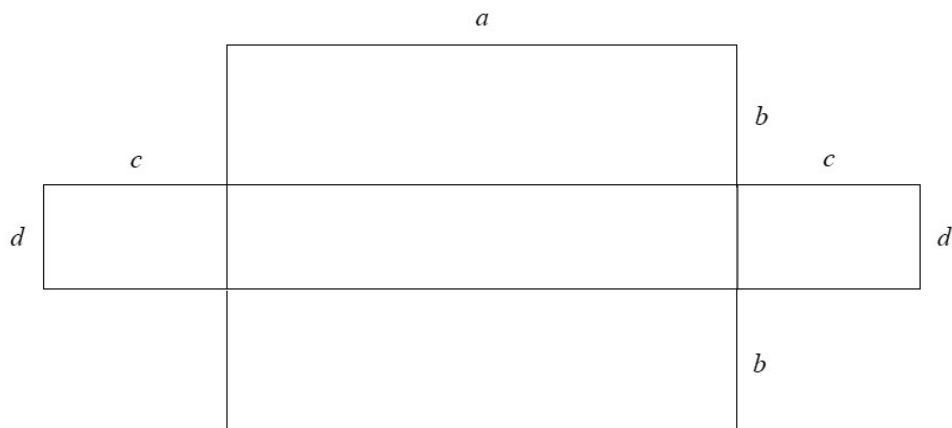
13. A shape is made from rectangles.

(a) On the diagram below shade an area represented by the expression ab



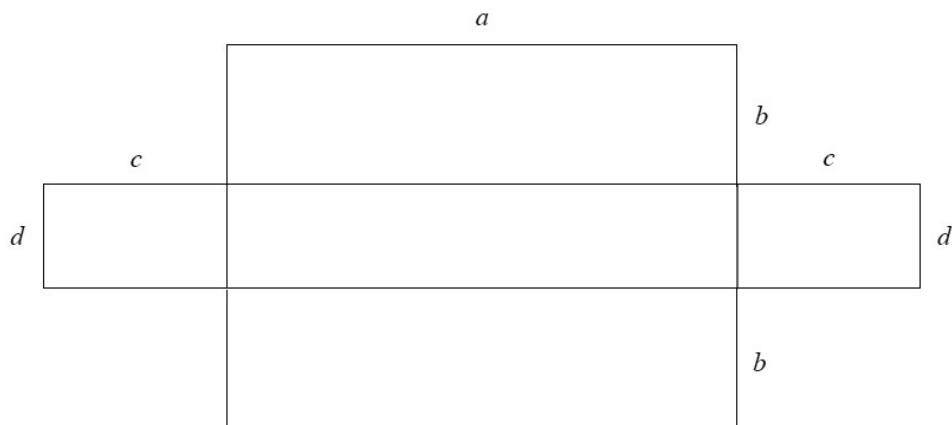
[1]

(b) On the diagram below shade an area represented by the expression $ad + cd$



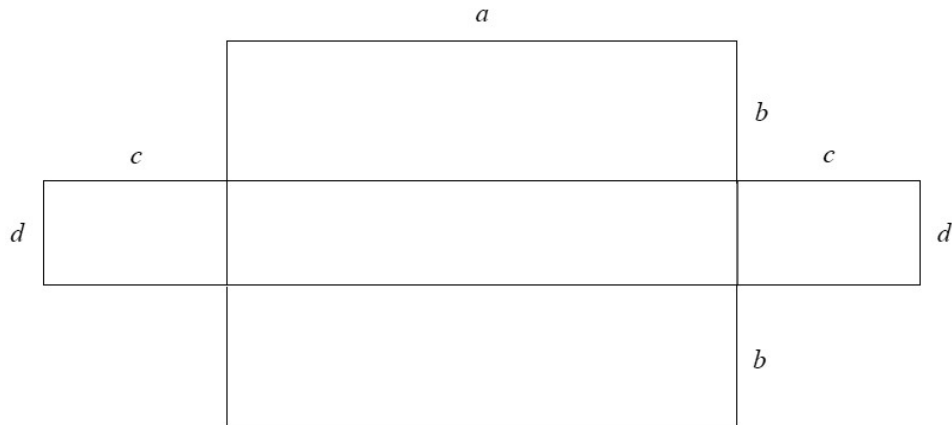
[1]

(c) On the diagram below shade the area represented by the expression $d(a + 2c)$



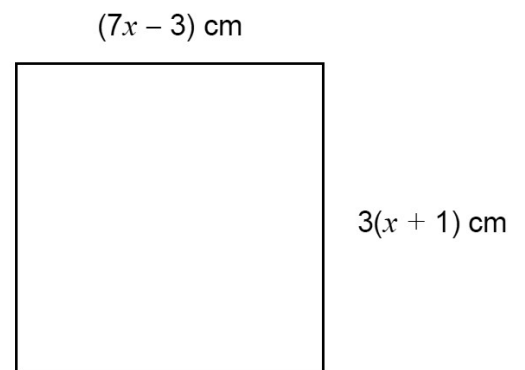
[1]

(d) Write down an expression for the area of the whole shape.



[1]

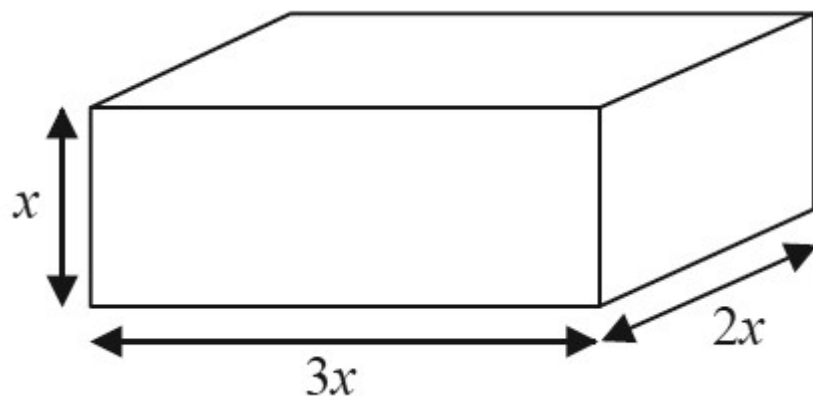
14 The diagram shows a square.



Work out the length of one side of the square.

[4]

15 Here is a cuboid.



All measurements are in centimetres.

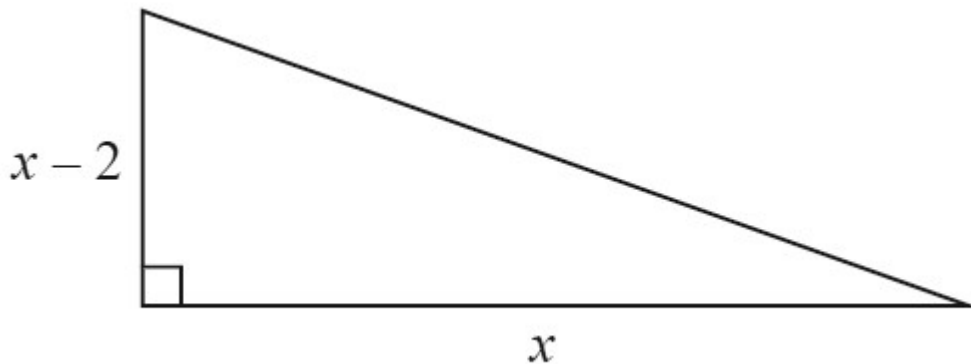
x is an integer.

The total volume of the cuboid is less than 900 cm^3

Show that $x \leq 5$

[3]

16. Here is a right-angled triangle.



All measurements are in centimetres.

The area of the triangle is 2.5 cm^2 .

Find the perimeter of the triangle.

Give your answer correct to 3 significant figures.

You must show all of your working.

..... cm [6]

17. A cuboid has length $x \text{ cm}$.

The width of the cuboid is 4 cm less than its length.

The height of the cuboid is half of its length.

a) The surface area of the cuboid is 90 cm^2 .

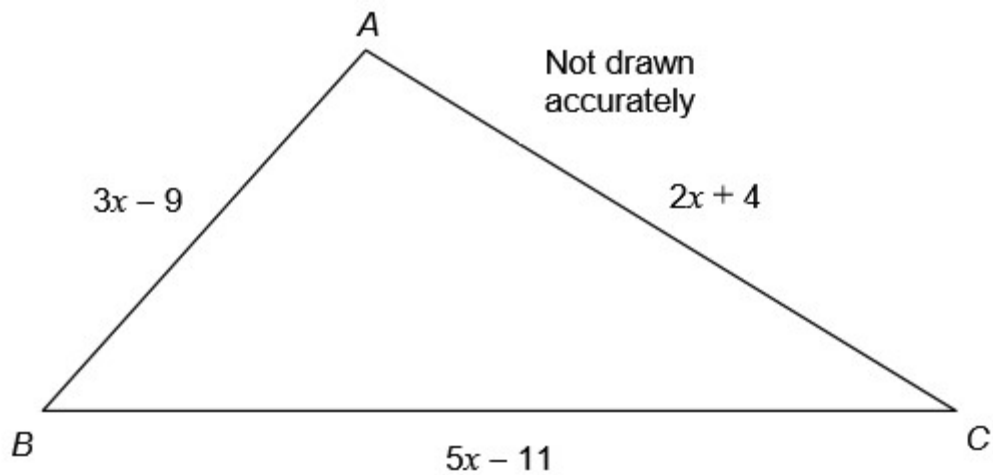
Show that $2x^2 - 6x - 45 = 0$.

[5]

b) Work out the volume of the cuboid.

(b) cm^3 [6]

18. In this question all lengths are in centimetres.



Given $AB : BC = 1 : 2$

show that $AC : BC = 3 : 4$

[5]

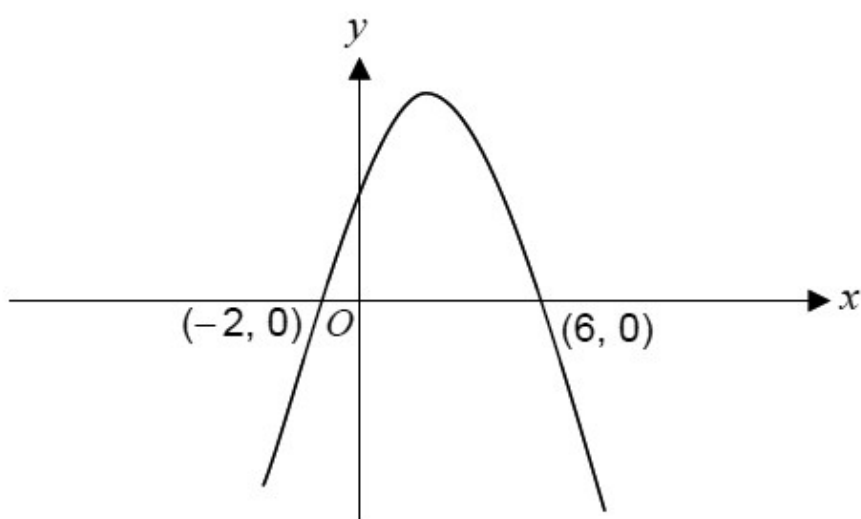
Functions (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	
Total Marks:	

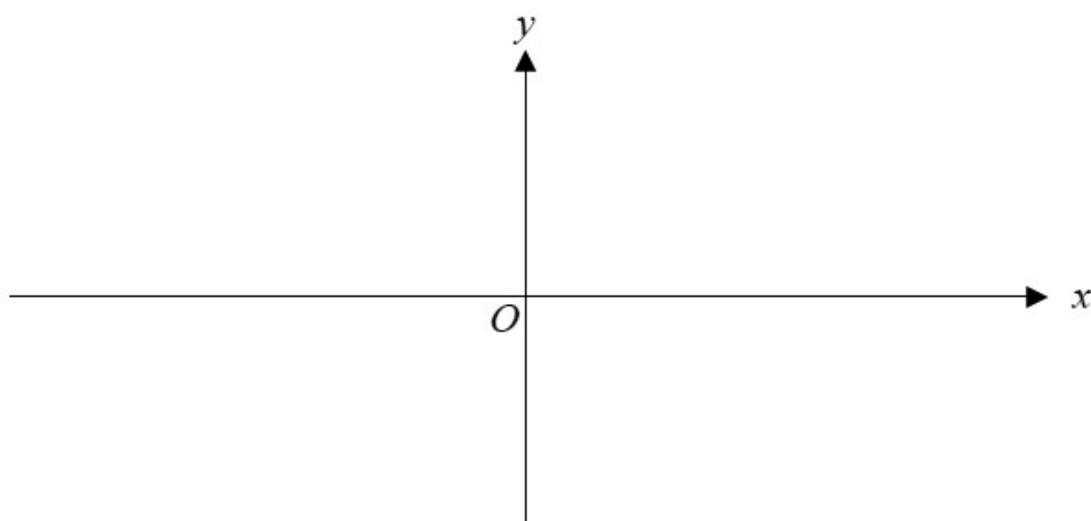
1. (a) The diagram shows a sketch of the graph $y = f(x)$.

The graph passes through the points $(-2, 0)$ and $(6, 0)$.



Sketch the graph of $y = f(x + 5)$ on the axes below.

You must indicate the coordinates of the points of intersection of the graph with the x-axis.

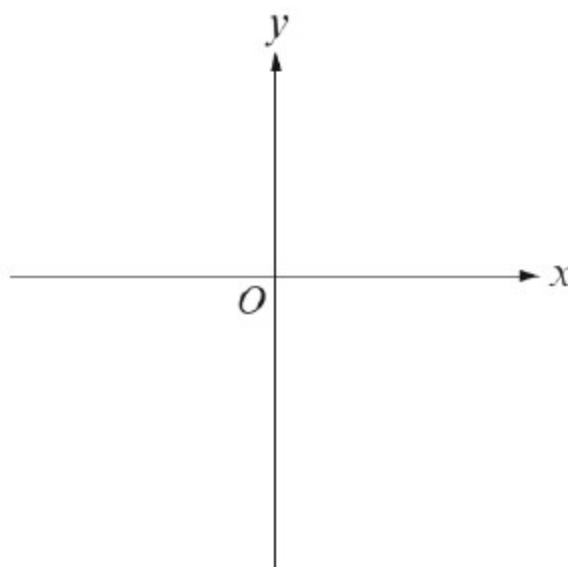
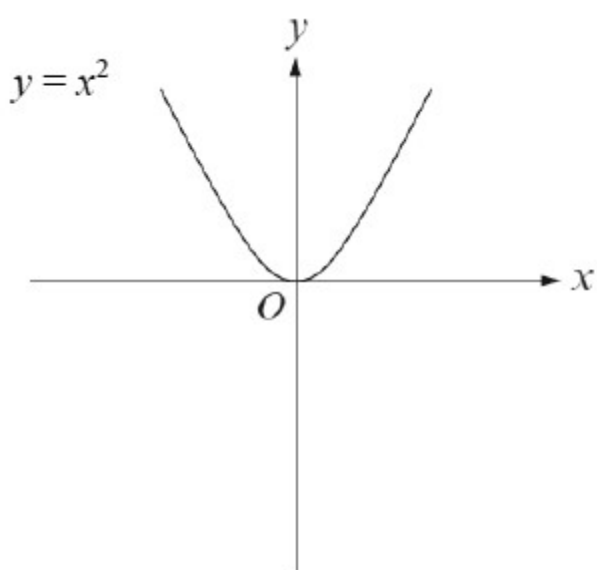


[3]

(b) The diagram below on the left shows a sketch of the graph $y = x^2$.

Sketch the graph of $y = -x^2 + 3$ on the axes on the right.

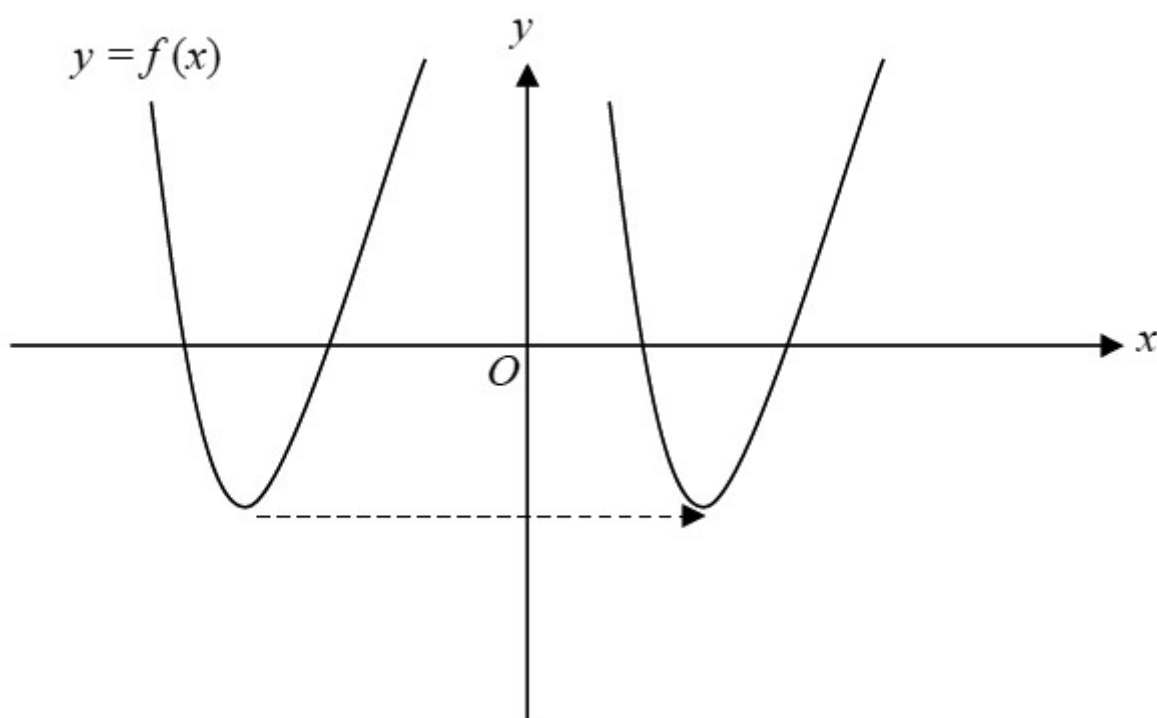
You must indicate the coordinates of the stationary point.



[2]

(c) The function $f(x)$ has been translated, as shown in the diagram below.

Explain why you cannot say exactly what translation was used.



[1]

2. The functions $f(x)$ and $g(x)$ are given by the following:

$$f(x) = 2x$$

$$g(x) = 3 + 2x$$

(a) Calculate the value of $gf(4)$

[2]

(b) Solve the equation $fg(x) = 14$

[4]

3. $f(x) = 3x$

Circle the expression for $f^{-1}(x)$

$$-3x \qquad \frac{3}{x} \qquad \frac{1}{3x} \qquad \frac{x}{3}$$

[1]

4. $f(x) = 2x + c$

$$g(x) = cx + 5$$

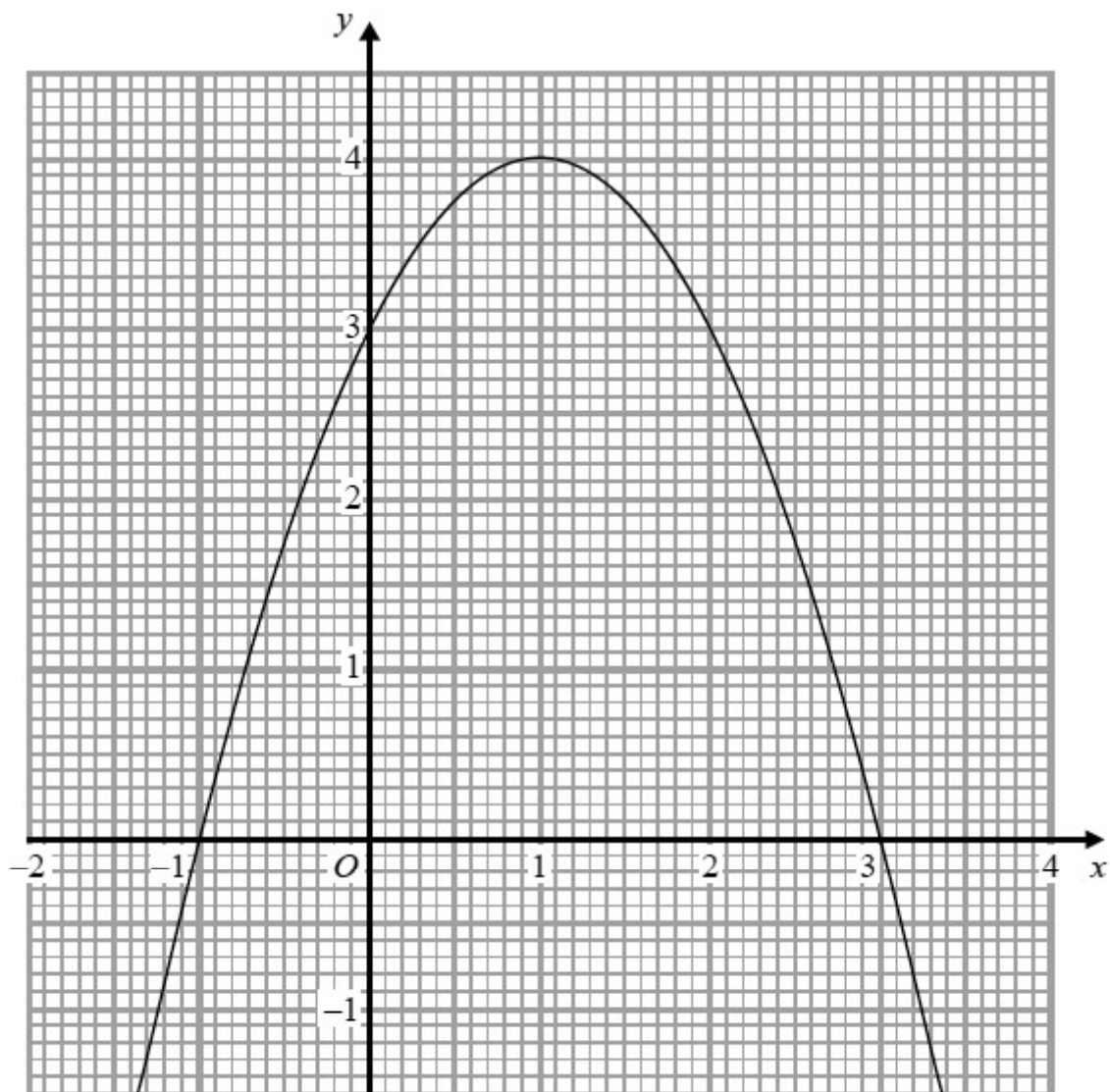
$$fg(x) = 6x + d$$

c and d are constants.

Work out the value of d .

[3]

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



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

(.....,) [1]

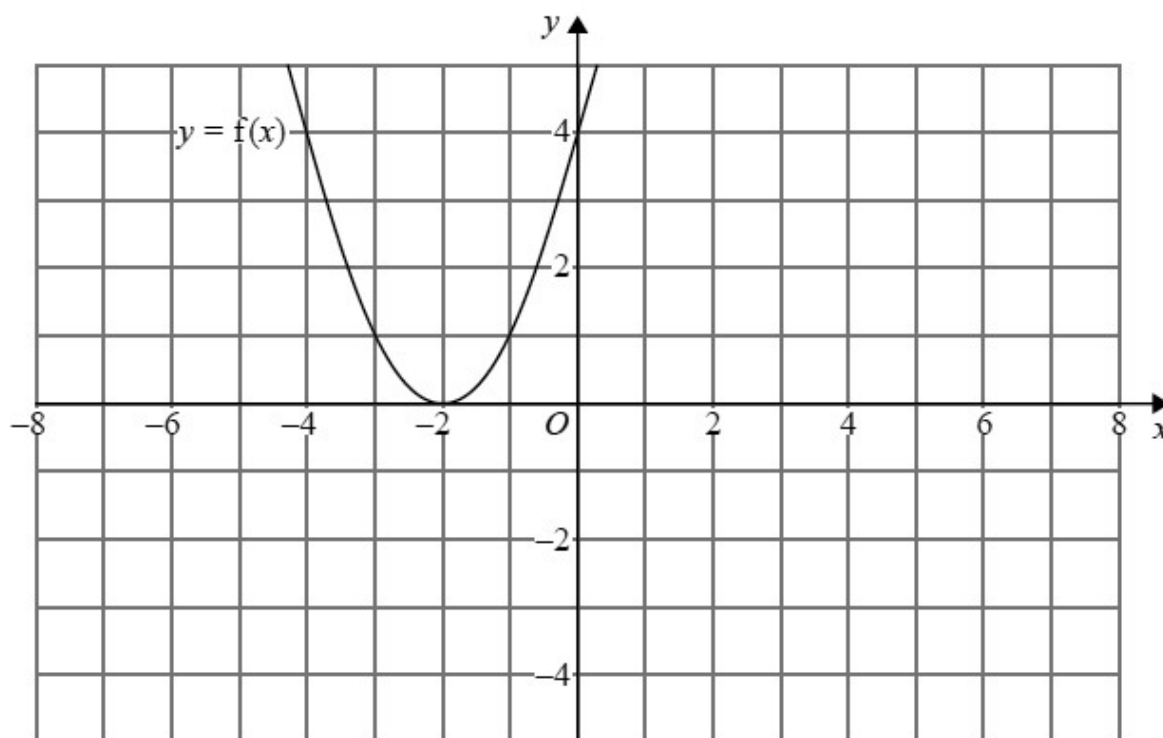
(b) Write down the roots of $f(x) = 2$

..... [1]

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

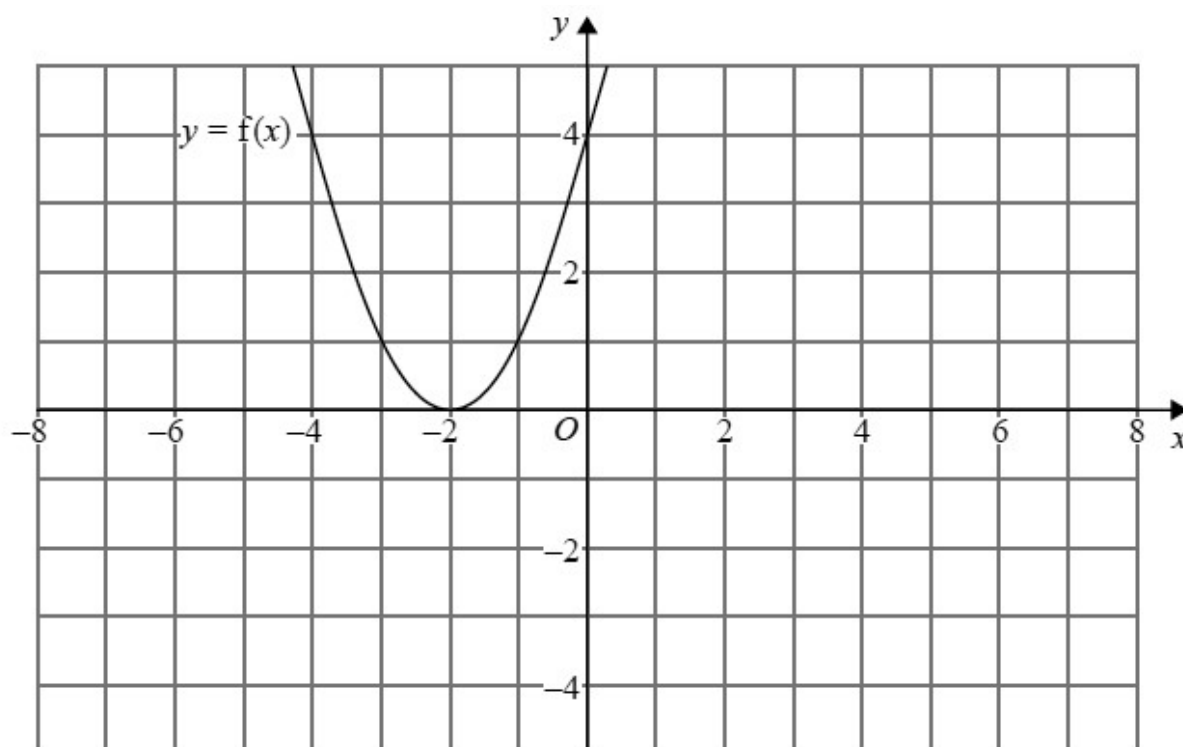
..... [1]

6. 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 $y = -f(x) + 3$

[2]

7. The function f is such that

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

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

$$f^{-1}(x) = \dots\dots\dots [2]$$

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

$$k = \dots\dots\dots [2]$$

8. The curve with equation $y = x^2 - 5x + 2$ is reflected in the x -axis.

Circle the equation of the reflected curve.

[1]

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

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

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

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

9. The functions f and g are such that

$$f(x) = 3(x - 4) \text{ and } g(x) = \frac{x}{5} + 1$$

a) Find the value of $f(10)$

$$\dots\dots\dots [1]$$

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

$$\dots\dots\dots [2]$$

c) Show that $ff(x) = 9x - 48$

[2]

10. 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 $y = -f(x + 3)$

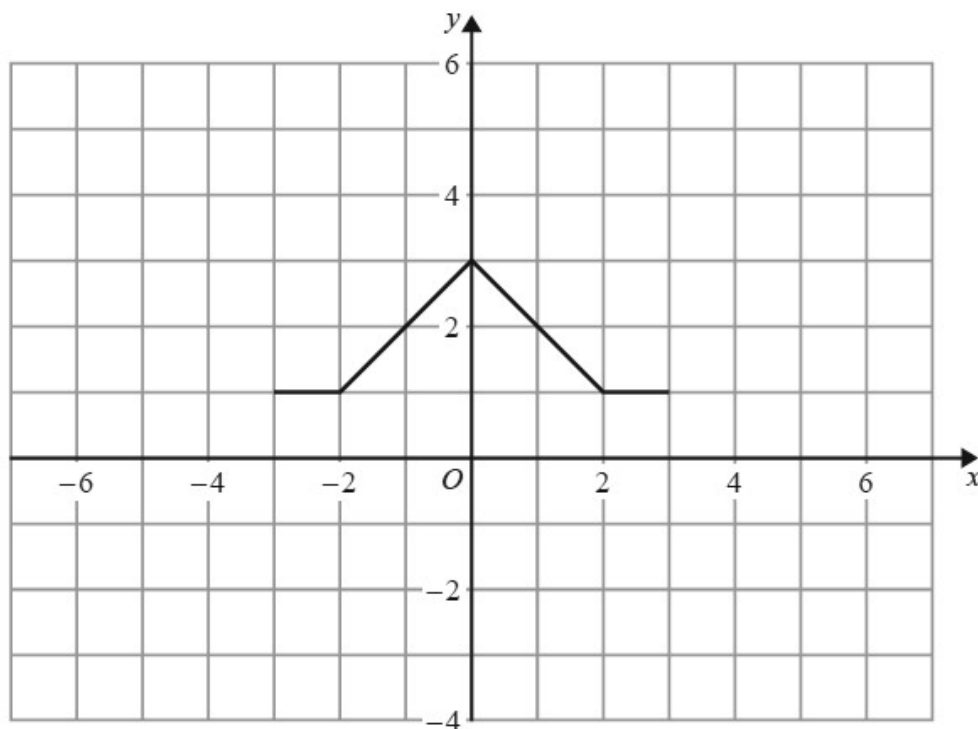
The coordinates of point A are (9, 1)

Find the coordinates of point P.

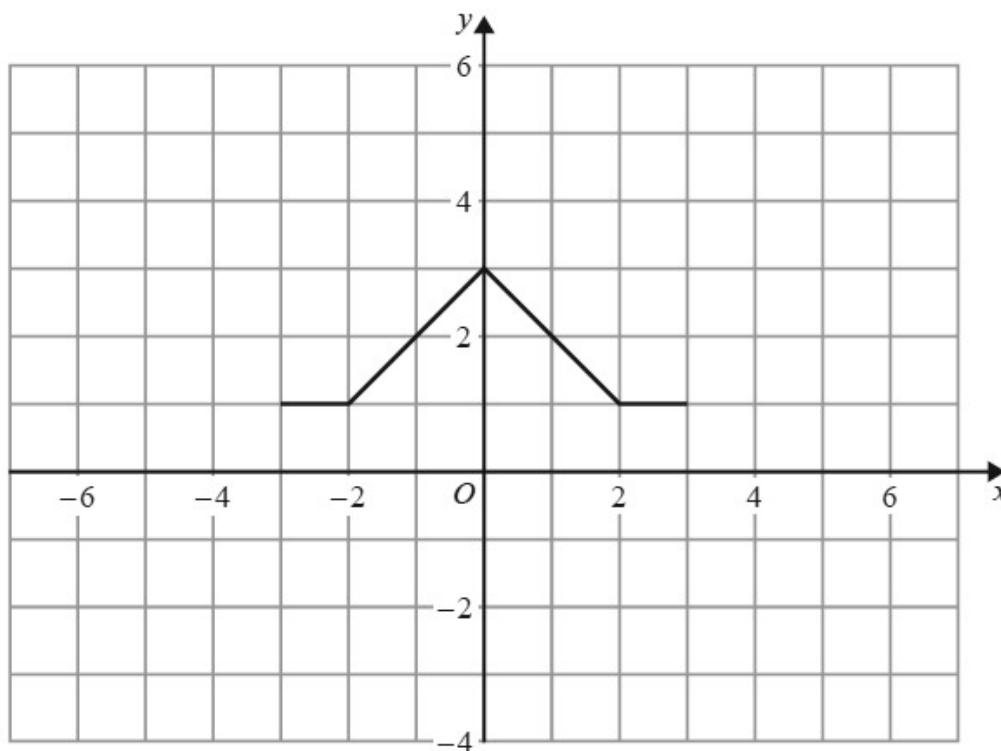
(.....,) [2]

11 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]

12. $f(x) = 3x^2 - 2x - 8$

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

[3]

13. For all values of x , $f(x) = x^2 + 1$ $g(x) = x - 5$

a) Show that $fg(x) = x^2 - 10x + 26$

[2]

b) Solve $fg(x) = gf(x)$

[4]

14. The graph with equation $y = x^2$ is translated by vector $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$

Circle the equation of the translated graph.

[1]

$$y = (x - 2)^2$$

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

$$y = x^2 + 4$$

$$y = x^2 + 2$$

15. For all values of x , $f(x) = \frac{4x-3}{5}$

Work out $f^{-1}(x)$

[3]

Inequalities (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	
Total Marks:	

1. Solve $5x - 2 > 3x + 11$

[2]

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

[3]

3. Solve $6x + 4 > x + 17$

[2]

4. n is an integer with $-5 < 2n \leq 6$

Write down all the values of n

[2]

5. (a) (i) Solve.

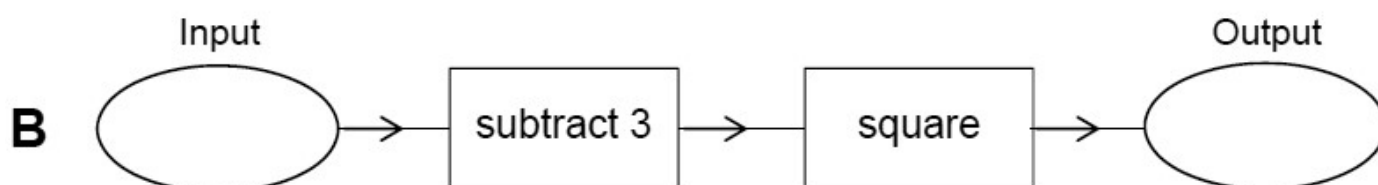
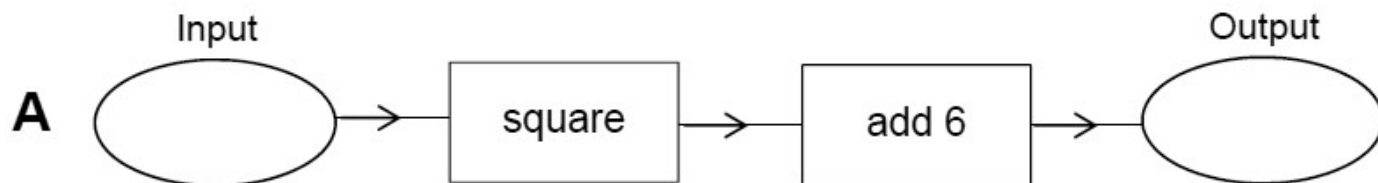
$$5x + 1 > x + 13$$

(a)(i) [3]

(ii) Write down the largest integer that satisfies $5x - 1 < 10$.

(ii) [1]

6. Here are two function machines, A and B.



Both machines have the same input.

Work out the range of input values for which

the output of **A** is less than the output of **B**.

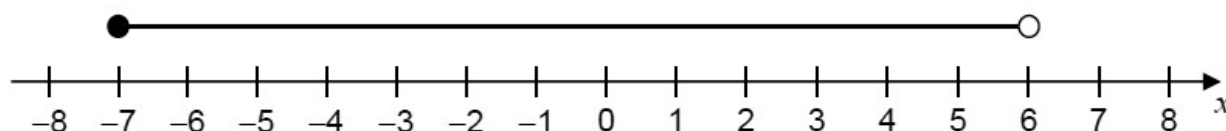
[4]

7. Solve this inequality.

$$5x + 9 > 13$$

..... [2]

8. Circle the inequality shown by the diagram.



$$-7 < x < 6$$

$$-7 \leq x < 6$$

$$-7 < x \ll 6$$

$$-7 \ll x \ll 6$$

[1]

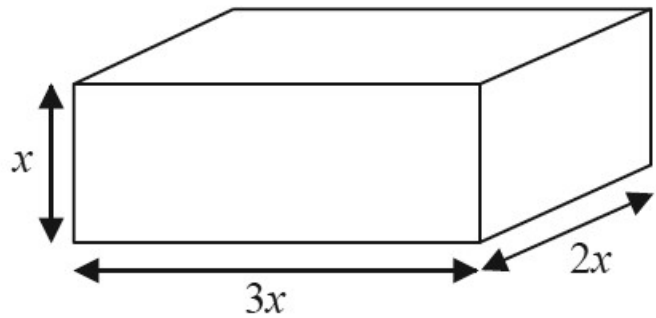
9 Here is a cuboid.

All measurements are in centimetres.

x is an integer.

The total volume of the cuboid is less than 900 cm^3

Show that $x \leq 5$



[3]

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

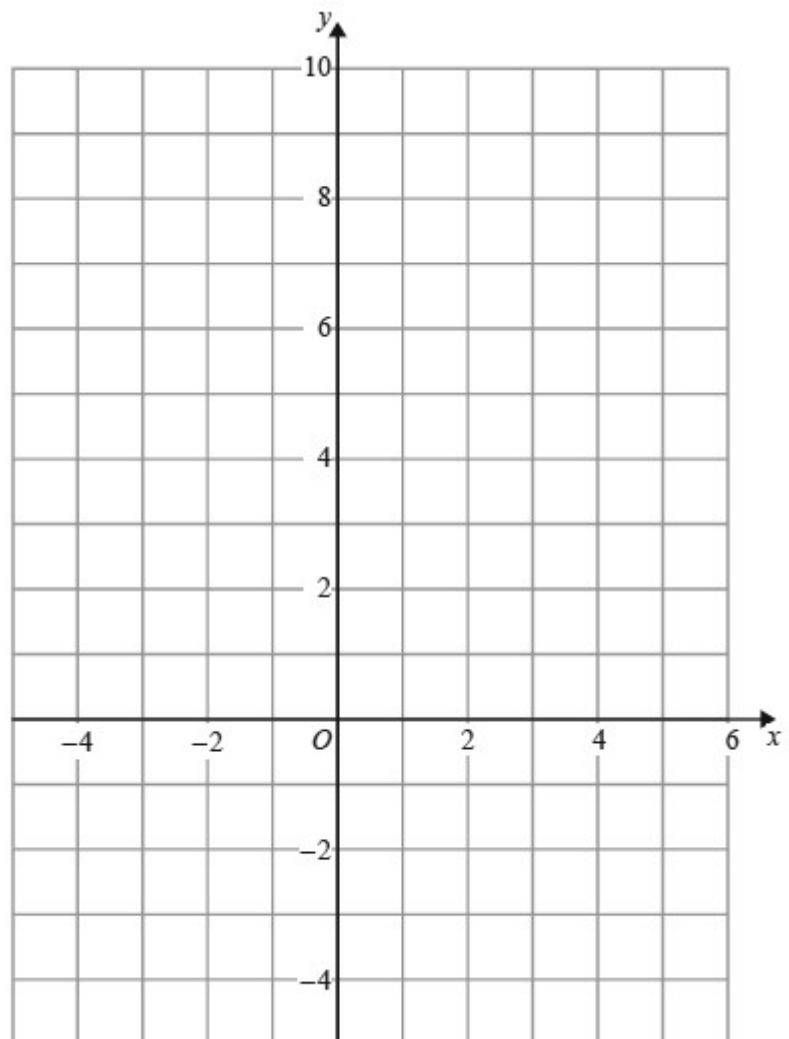
$$x + y < 4$$

$$y > x - 1$$

$$y < 3x$$

Label the region **R**.

[4]



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

[4]

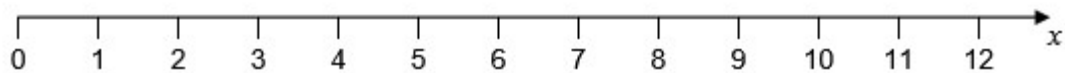
12. a) Solve the inequality $\frac{3x}{2} \leq 9$

[2]

b) Solve the inequality $4(x + 2) > 12$

[2]

c) Represent the solution set that satisfies both answers to parts (a) and (b) on the number line.



[1]

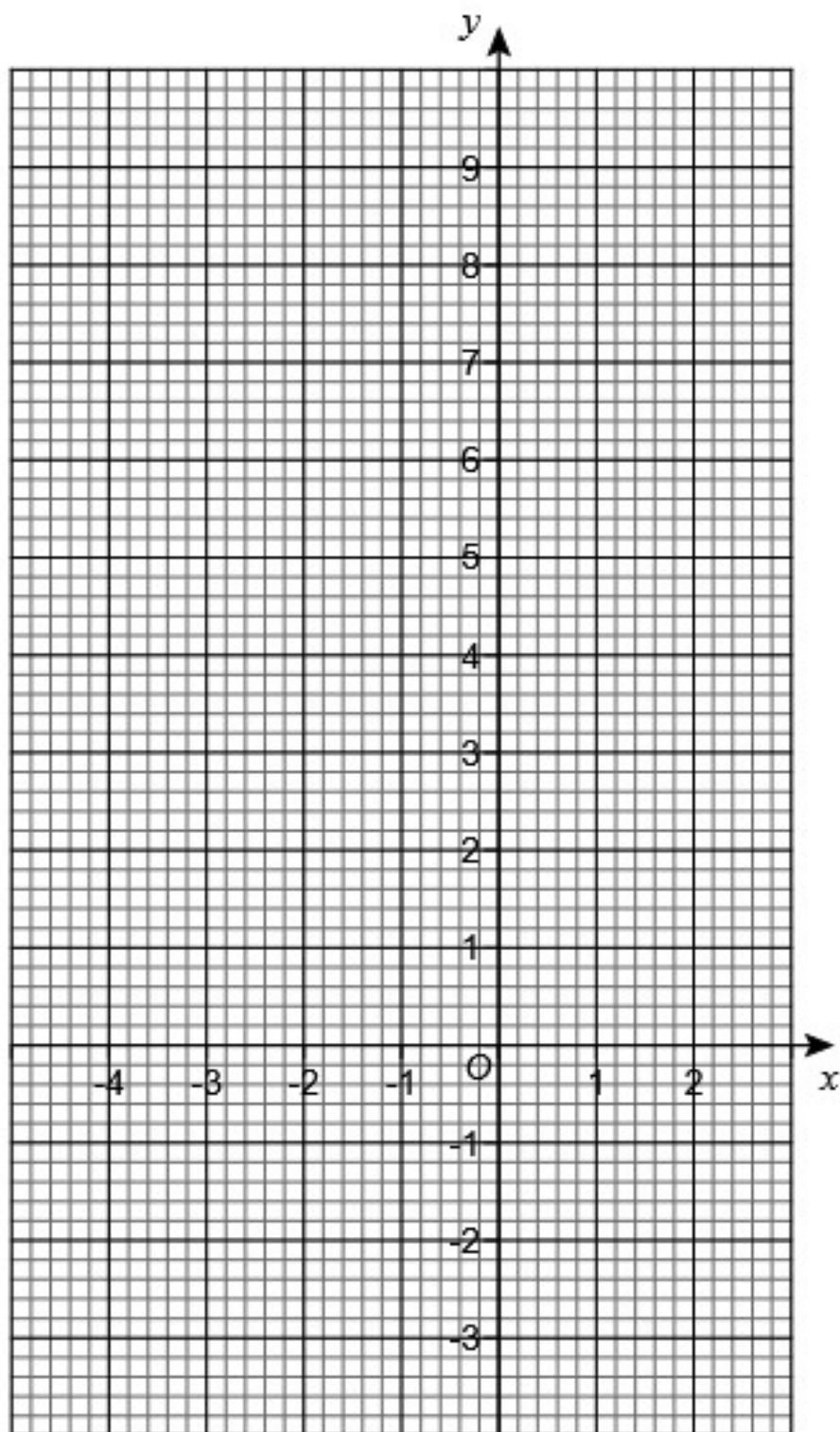
13. The region R satisfies the three inequalities

$$x > -3$$

$$x + y \leq 2$$

$$y \geq \frac{x}{2} - 1$$

Show the region R on the grid.



[4]

Iteration (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	
Total Marks:	

1 (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]

2. An approximate solution to an equation is found using this iterative process.

$$x_{n+1} = \frac{(x_n)^3 - 3}{8} \text{ and } x_1 = -1$$

a) Work out the values of x_2 and x_3

$$x_2 = \underline{\hspace{2cm}}$$

$$x_3 = \underline{\hspace{2cm}} \quad [2]$$

b) Work out the solution to 6 decimal places.

[1]

3. 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

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

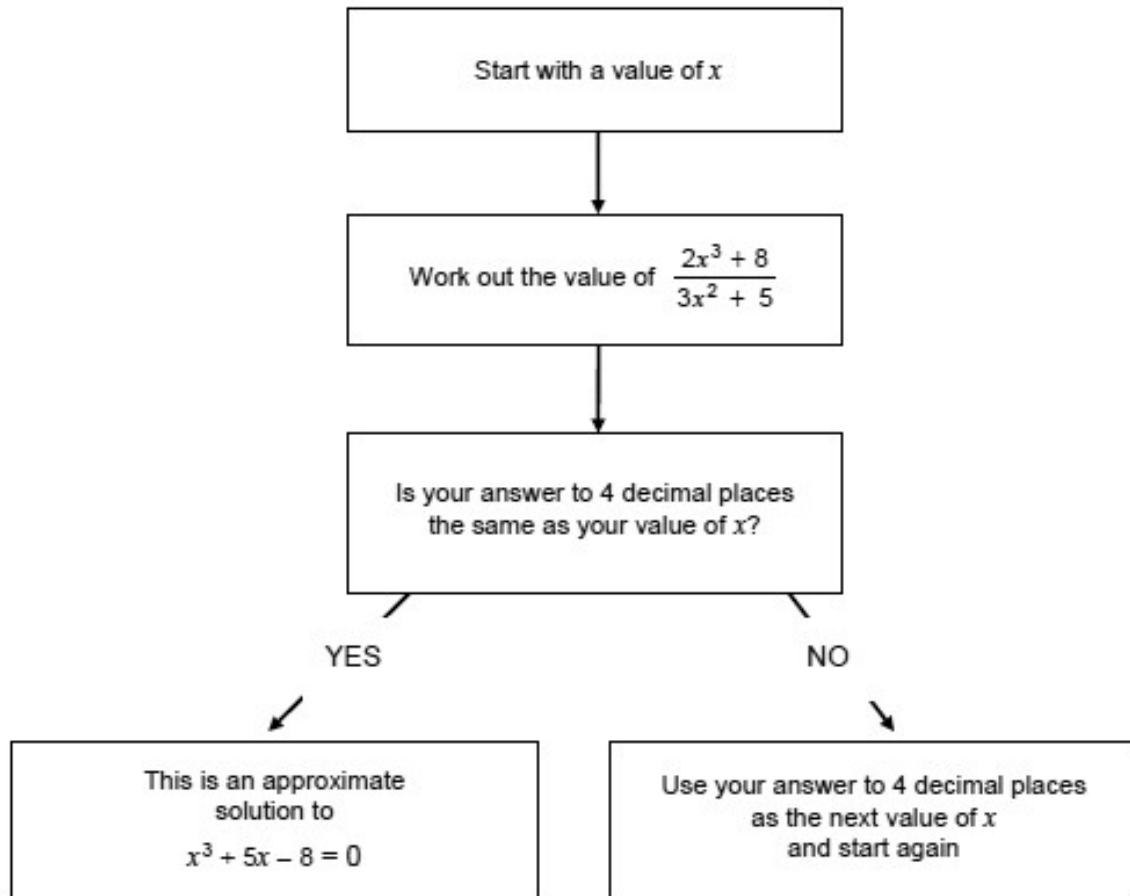
find the values of x_1 , x_2 and x_3

..... [3]

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

[1]

4. This iterative process can be used to find approximate solutions to $x^3 + 5x - 8 = 0$



a) Use this iterative process to find a solution to 4 decimal places of $x^3 + 5x - 8 = 0$
Start with the value $x = 1$

[3]

b) By substituting your answer to part (a) into $x^3 + 5x - 8$
comment on the accuracy of your solution to $x^3 + 5x - 8 = 0$

[2]

5. a) Complete the table for $y = x^3 - 6x - 5$.

x	0	1	2	3	4
y		-10	-9	4	

[2]

b) (i) Between which two consecutive integers is there a solution to the equation

$$x^3 - 6x - 5 = 0?$$

Give a reason for your answer.

A solution lies between $x = \dots\dots\dots$ and $x = \dots\dots\dots$

Because $\dots\dots\dots$

$\dots\dots\dots$ [2]

(ii) Choose a value of x between the two values you gave in part (b)(i).

Calculate the corresponding value of y .

(b)(ii) $x = \dots\dots\dots$

$y = \dots\dots\dots$ [2]

(iii) State a smaller interval in which the solution lies.

(iii) $\dots\dots\dots$ [1]

6. A sequence of numbers is formed by the iterative process $a_{n+1} = (a_n)^2 - a_n$

a) Describe the sequence of numbers when $a_1 = 1$

Show working to justify your answer.

[1]

b) Describe the sequence of numbers when $a_1 = -1$

Show working to justify your answer.

[2]

c) Work out the value of a_2 when $a_1 = 1 - \sqrt{2}$

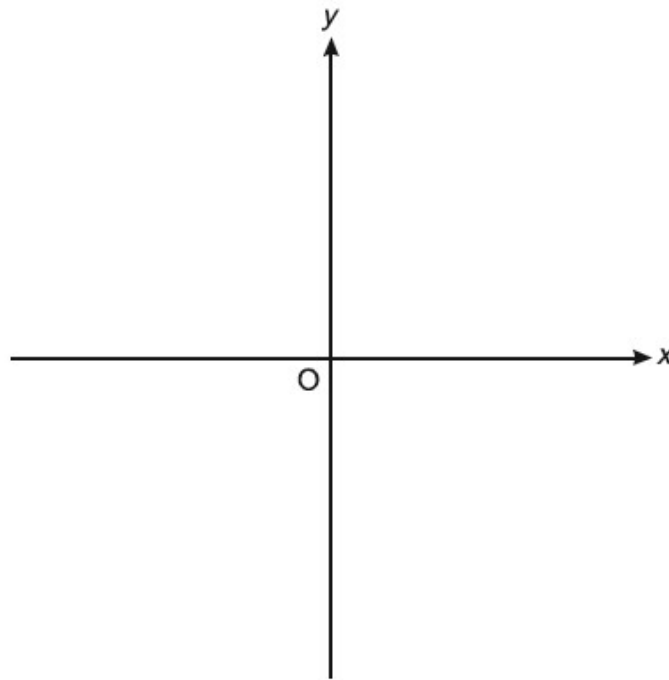
[2]

Quadratic & Cubic Graphs (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

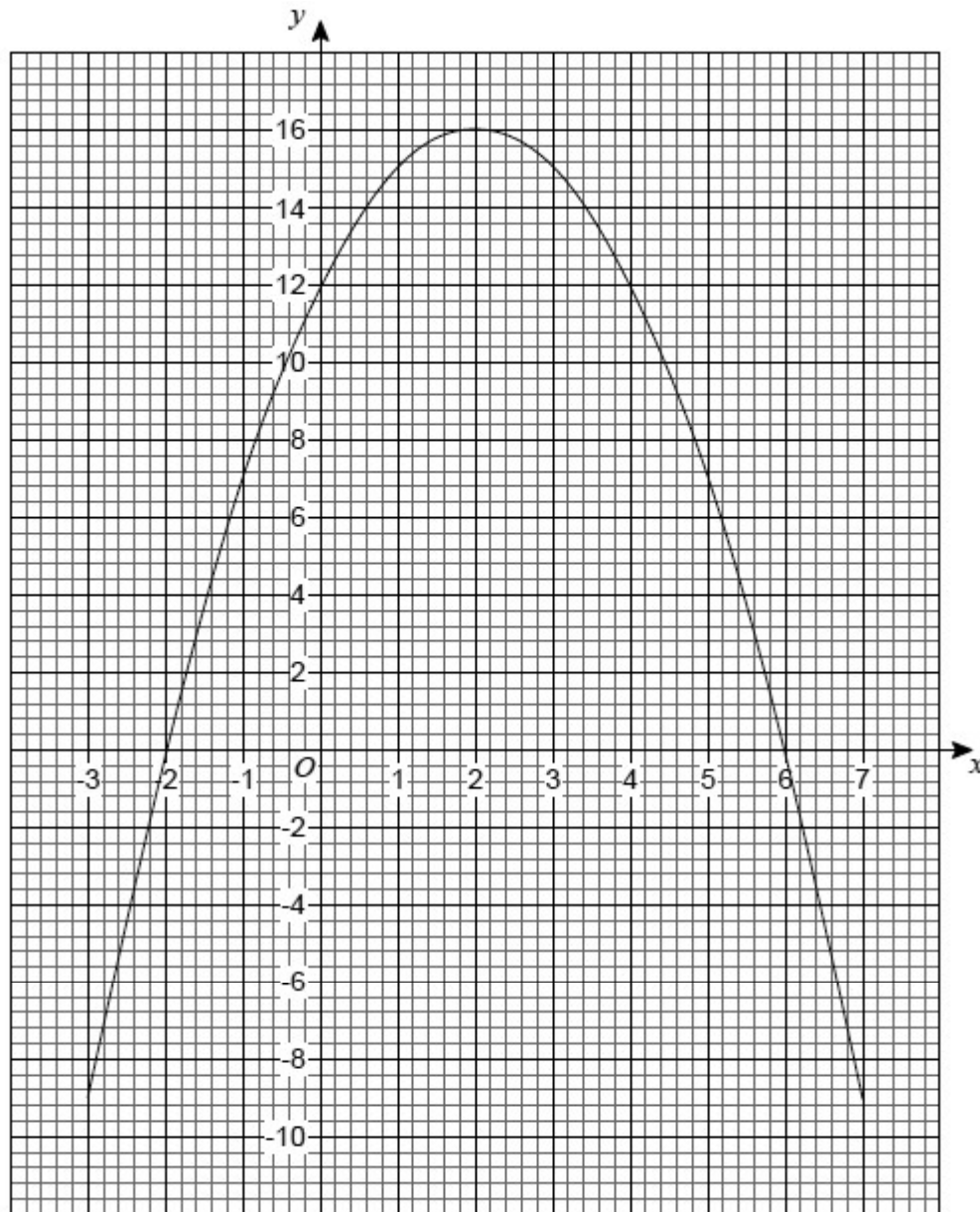
Name:	
Total Marks:	

1. Sketch a graph on the axes below that shows $y = x^3$.



[2]

2. The graph $y = a + bx - x^2$ is shown.



(a) Circle the coordinates of the turning point of the curve.

(-2, 0) (0, 12) (2, 16) (6, 0)

[1]

(b) Circle the value of a .

-2 12 16 6

[1]

(c) Circle the two roots of $a + bx - x^2 = 0$

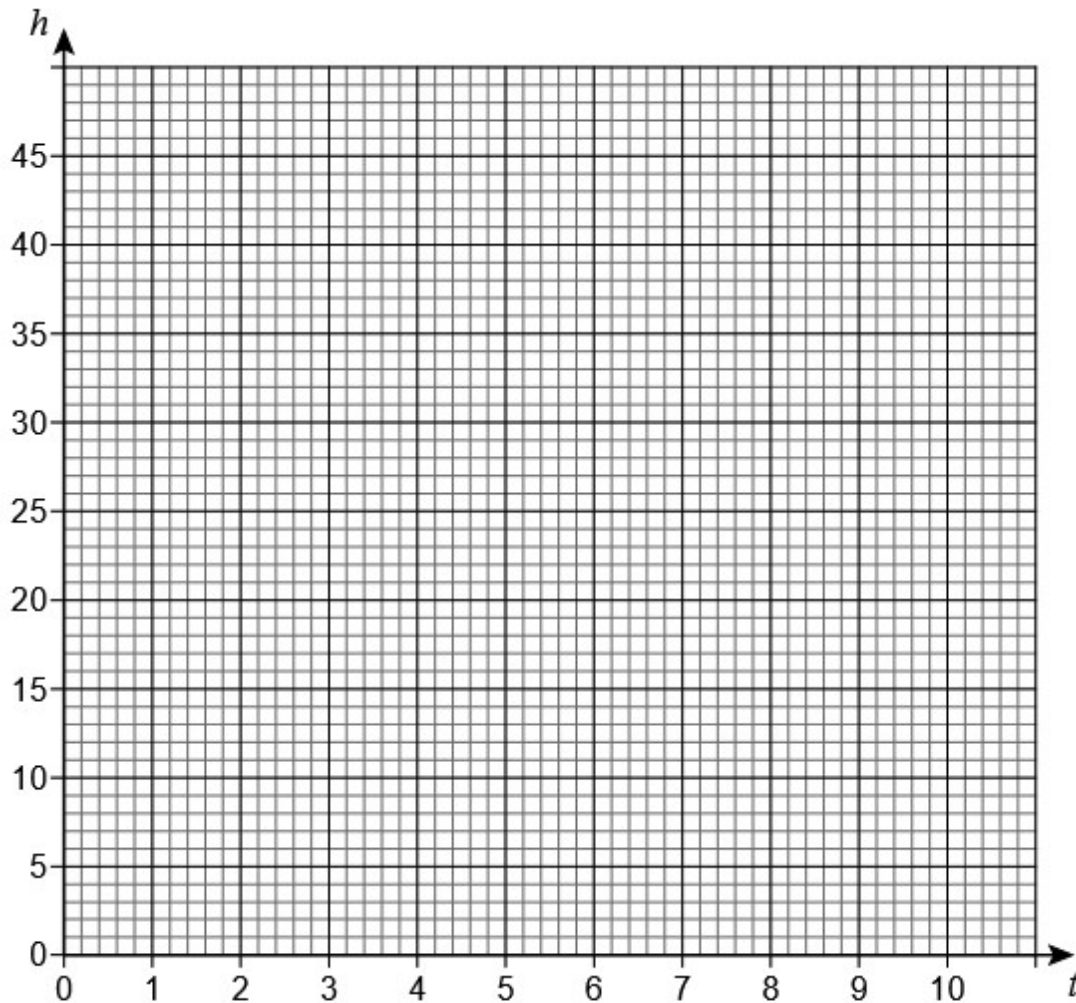
-2 and 6 2 and -6 2 and 6 -2 and -6

[1]

3. The height, h metres, of a particle at time, t seconds, is given by the function

$$\begin{aligned} h &= 0 & 0 \leq t < 2 \\ h &= (14 - t)(t - 2) & 2 \leq t \leq 10 \end{aligned}$$

a) Draw a graph to show the height of the particle in the first 10 seconds.

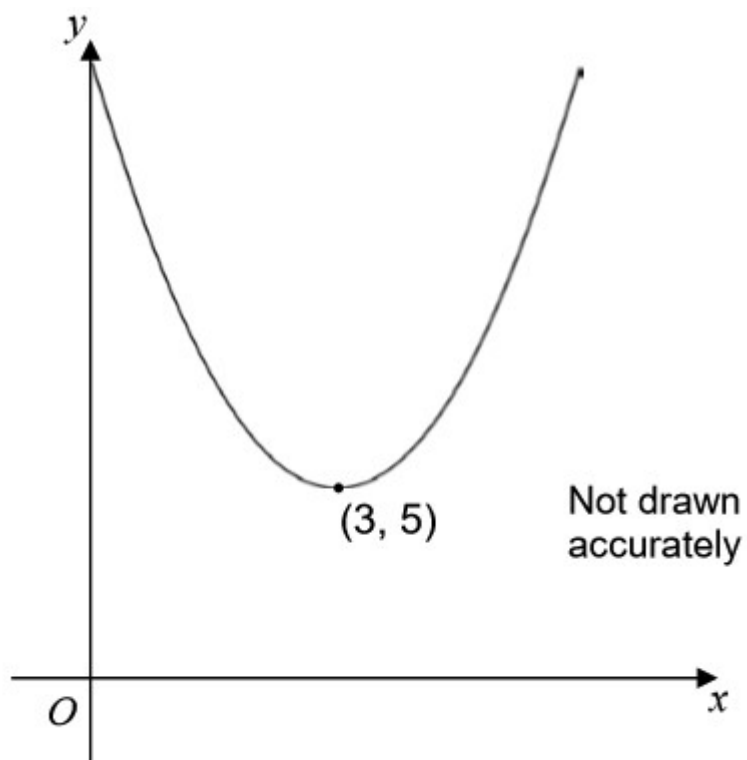


[3]

b) By joining the points on the graph where $t = 3$ and $t = 7$ with a straight line, work out the average rate of change of height between 3 and 7 seconds.

[2]

4. A sketch of $y = x^2 + cx + d$ is shown.



The turning point is (3, 5)

Work out the values of c and d .

[3]

Quadratic Formula (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	
Total Marks:	

1. Use the formula method to solve the equation $2x^2 + 3x - 3 = 0$.

Give your solutions correct to two decimal places.

[3]

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

Give your solutions correct to 3 significant figures.

[3]

3. Use the quadratic formula to solve $5x^2 + 11x - 2 = 0$

Give your solutions to 2 decimal places.

[3]

Sequences (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	
Total Marks:	

1. (a) Find the n th term of the sequence 6, 13, 20, 27, ...

[2]

(b) In a sequence of four numbers, the difference between each number is 7.

The sum of the four numbers is 6.

What are the numbers in the sequence?

You must show all your working.

[3]

2. The n th term of a sequence is $2n + 1$

The n th term of a different sequence is $3n - 1$

Work out the **three** numbers that are

in both sequences

and

between 20 and 40

[3]

3. Which sequence is a geometric progression?

Circle your answer.

1 2 3 4

1 2 4 8

1 2 4 7

1 2 3 5

[1]

4. A sequence is defined by the term-to-term rule $u_{n+1} = u_n \frac{2}{n} - 8u_n + 17$.

(a) Given that $u_1 = 4$, find u_2 and u_3 .

(a) [2]

(b) Given instead that $u_1 = 2$, find u_2 , u_3 and u_{100} .

(b) [3]

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

6 10 14 18

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

..... [2]

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

(b) Is 108 a term of this sequence?

Show how you get your answer.

[2]

6. 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

$a \qquad b \qquad a + b$

(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,

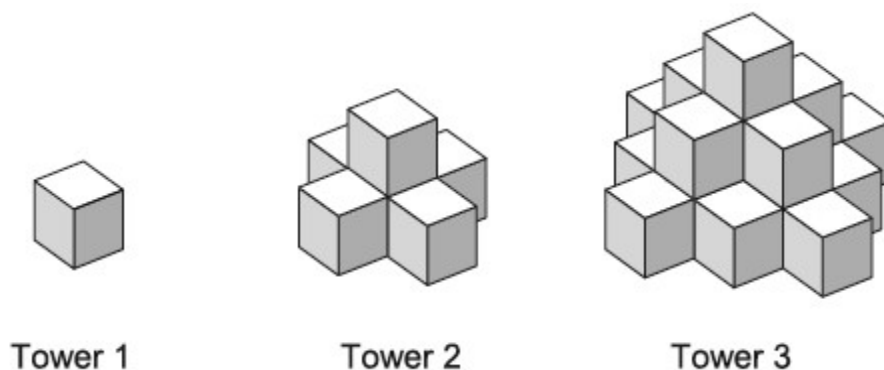
(c) find the value of a and the value of b .

$a = \dots\dots\dots$

$b = \dots\dots\dots$

[3]

7. Here is a picture of three towers.



Not all the cubes can be seen in the towers.

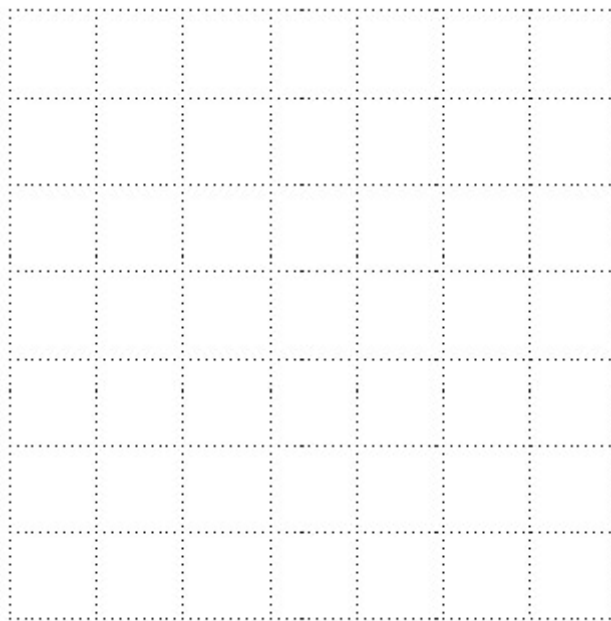
Edith uses 1 cube to build tower 1.

Edith uses 6 cubes to build tower 2. There are 5 cubes on the bottom layer.

a) Write down the total number of cubes in tower 3.

(a) [1]

b) Draw a plan view of the arrangement of cubes Edith will use for the bottom layer of tower 4.



[1]

c) Continue this sequence to show the number of cubes used for the bottom layer of each tower.

Tower 1

Tower 2

Tower 3

Tower 4

1

5

.....

.....

[2]

d) Find an expression for the number of cubes used in the bottom layer of tower ***n***.

(d) [4]

8. This expression can be used to generate a sequence of numbers.

$$n^2 - n + 11$$

(i) Work out the first three terms of this sequence.

(i) , , [2]

(ii) Show that this expression does not only generate prime numbers.

[2]

9. a) The n th term of a sequence is $2^n + 2^{n-1}$

Work out the 10th term of the sequence.

[1]

b) The n th term of a different sequence is $4(2^n + 2^{n-1})$

Circle the expression that is equivalent to $4(2^n + 2^{n-1})$

$$2^{n+2} + 2^{n+1}$$

$$2^{2n} + 2^{2(n-1)}$$

$$8^n + 8^{n-1}$$

$$2^{n+2} + 2^{n-1}$$

[1]

10. a) Find the n th term of this linear sequence.

8

11

14

17

a) [2]

b) Here is a quadratic sequence.

2

14

36

68

The expression for the n th term of this sequence is $pn^2 + qn$.

Find the value of p and the value of q .

b) $p = \dots\dots\dots$

$q = \dots\dots\dots$ [4]

11. Here is a sequence

40

35

30

25

20

Circle the expression for the n th term of the sequence.

$$5n + 35$$

$$5n - 45$$

$$45 - 5n$$

$$n - 5$$

[1]

12 Work out the next term of this quadratic sequence.

4 12 24 40 _____

[2]

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

1 3 7 13 21

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

[3]

14. Here is a sequence.

2 $2\sqrt{7}$ 14 $14\sqrt{7}$

a) Work out the next term.

a) [1]

b) Find the n th term.

b) [3]

c) Find the value of the 21st term divided by the 17th term.

c) [2]

15. Here is a linear sequence.

5 13 21 29

Circle the expression for the n th term of the sequence.

$n + 8$ $5n + 8$ $8n$ $8n - 3$

[1]

Simplify / Expand & Simplify (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	
Total Marks:	

1. Circle the expression that is equivalent to $2a + 5a \times 4a - a$

$a + 20a^2$

$21a^2$

$28a^2 - a$

$2a + 15a^2$

[1]

2. (a) Simplify $(t^3)^2$

..... [1]

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

..... [1]

3. Simplify $5u^2w^4 \times 7uw^3$

..... [2]

4. Write $2(7x + 4) - 4(x + 6) + 1$ in the form $a(bx + c)$

where a , b and c are integers and $a > 1$

..... [3]

5. Simplify fully $(8x^3y^5)^2$

[2]

6. Expand $x(x + 3)$ Circle your answer.

$2x + 3$

$x^2 + 3$

$x^2 + 3x$

$3x^2$

[1]

7. Simplify $(x^5)^2$ Circle your answer.

[1]

$x^{2.5}$

x^7

x^{10}

x^{25}

8. $y = \frac{5\sqrt{x}}{2}$

Circle the expression for y^2

$\frac{25x}{4}$

$\frac{5x}{2}$

$\frac{5x^2}{2}$

$\frac{25x^2}{4}$

[1]

Simultaneous Equations (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	
Total Marks:	

1. Alex bought 3 tins of paint and 4 brushes at a total cost of £23.

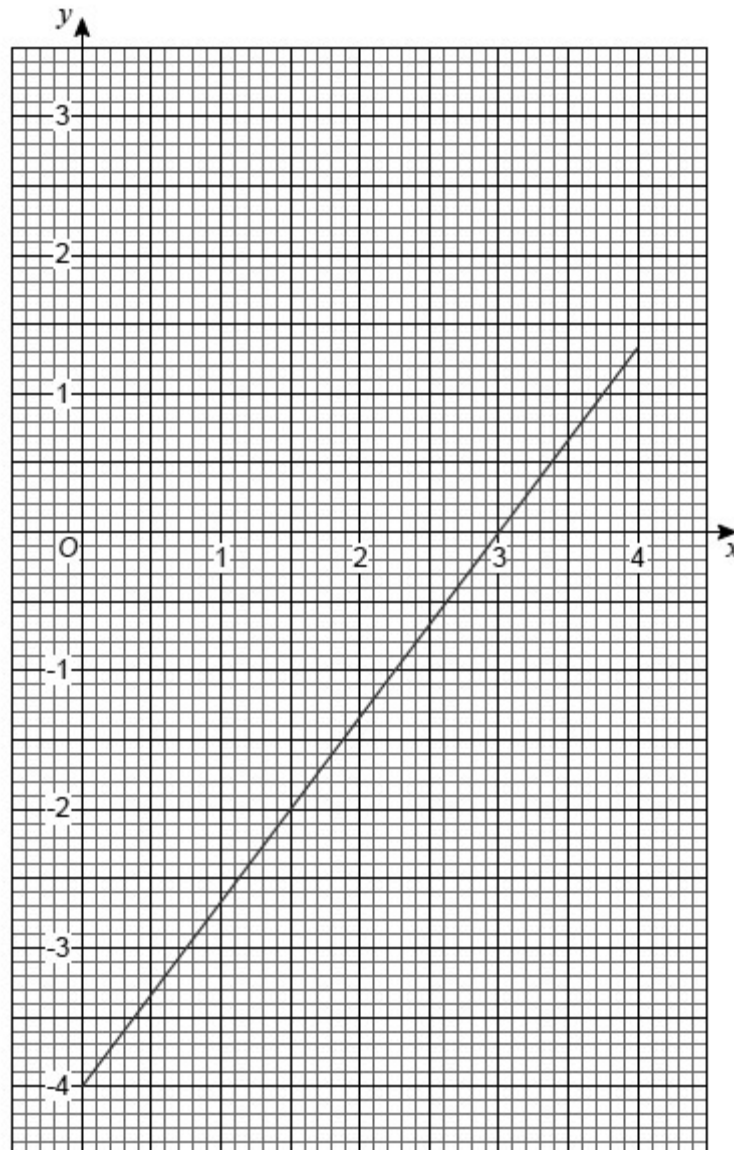
Brian bought 2 tins of paint and 3 brushes at a total cost of £16.

Using an algebraic method, calculate the price of a single tin of paint and the price of one brush.

The price of a single tin of paint =

The price of one brush = [4]

2. Here is the graph of $4x - 3y = 12$ for values of x from 0 to 4



By drawing a second graph on the grid, work out an approximate solution to the simultaneous equations

$$4x - 3y = 12 \text{ and } 3x + 2y = 6$$

[3]

3. Solve algebraically the simultaneous equations

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

$$y - 2x = 5$$

[5]

4. The prices of two phones are in the ratio $x : y$.

When the prices are both increased by £20, the ratio becomes $5 : 2$.

When the prices are both reduced by £5, the ratio becomes $5 : 1$.

Express the ratio $x : y$ in its lowest terms.

..... : [6]

5. Solve.

$$4x + 3y = 5$$

$$2x + 3y = 1$$

$$x =$$

$$y =$$

[3]

3. Eddie and Caroline are going to the school play.

Eddie buys 6 adult tickets and 2 child tickets. He pays £39.

Caroline buys 5 adult tickets and 3 child tickets. She pays £36.50.

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

Adult ticket £

Child ticket £ [5]

7. $2x + 3y = 15.5$

$x + y = 6$

Work out the values of x and y .

$x = \dots\dots\dots$

$y = \dots\dots\dots$

[3]

8. Solve the simultaneous equations

$$2x - 4y = 19$$

$$3x + 5y = 1$$

$$x = \dots\dots\dots$$

$$y = \dots\dots\dots$$

[4]

9. Solve these simultaneous equations algebraically.

$$y = x - 3$$

$$y = 2x^2 + 8x - 7$$

$$x = \dots\dots\dots, y = \dots\dots\dots$$

$$x = \dots\dots\dots, y = \dots\dots\dots [6]$$

10. Solve $5x - y = 5$

$$2y - x^2 = 11$$

You must show your working.

Do not use trial and improvement.

[6]

11. At a concert

3 adult and 4 child tickets cost £23

1 adult and 5 child tickets cost £15

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

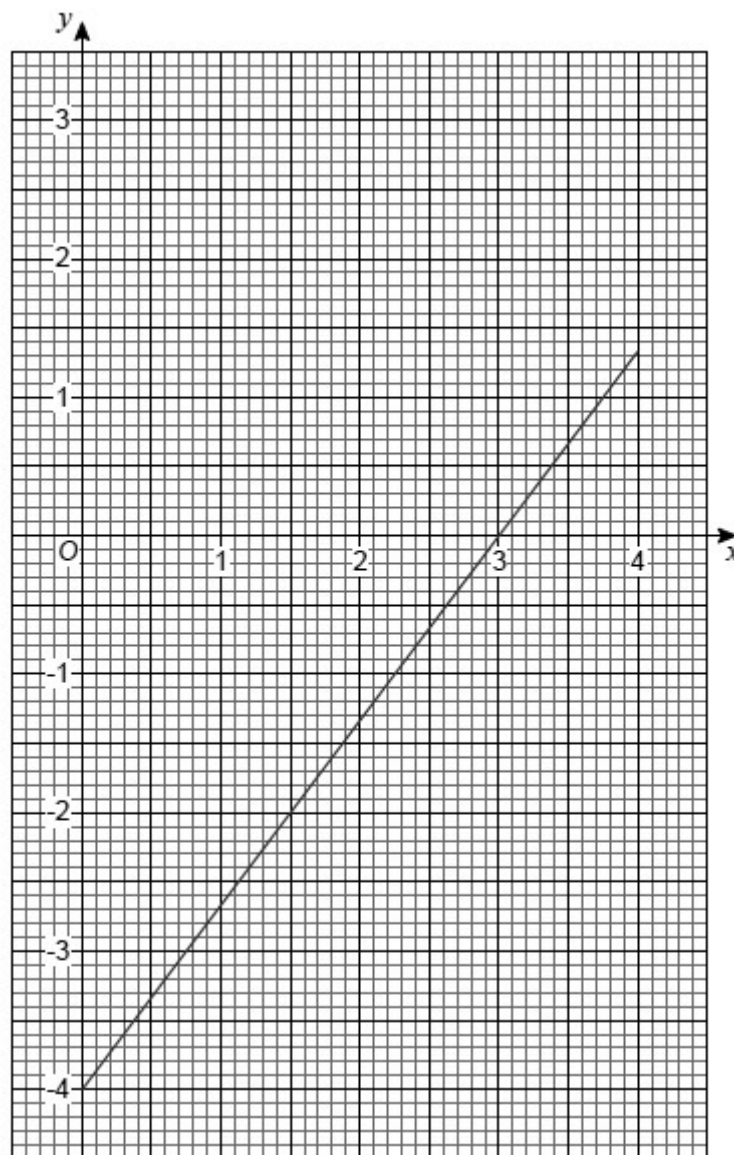
[4]

Straight Line Graphs (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	
Total Marks:	

1. Here is the graph of $4x - 3y = 12$ for values of x from 0 to 4



By drawing a second graph on the grid, work out an approximate solution to the simultaneous equations

$$4x - 3y = 12 \text{ and } 3x + 2y = 6$$

[3]

Substitution/Solving/Rearranging Equations (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	
Total Marks:	

1. Given that $a = 10$, $b = 3$

and $c = -5$, find the value of each of the following expressions.

(a) b^2

[1]

(b) $\frac{ab}{c}$

[1]

(c) $\frac{2bc}{a}$

[1]

2. Kelly is trying to work out the two values of w for which $3w - w^3 = 2$

Her values are 1 and -1

Are her values correct?

You must show your working.

[2]

3. (a) A function is represented by the following function machine.



- (i) A number is input into the machine.
The output is used as a new input.
The second output is 11.

Work out the number that was the first input.

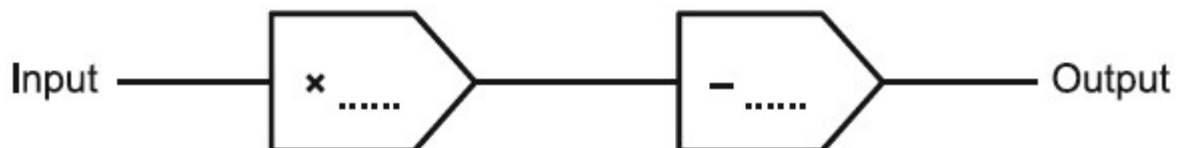
(a)(i) [2]

- (ii) A number is input into the machine.
The output given is the same number.

Work out the number.

(ii) [3]

(b) Another function machine is shown below.



If the Input is 3, the Output is 5.

If the Input is 7, the Output is 25.

Use this information to fill in the two boxes.

[3]

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

[3]

5. Solve.

$$3x^2 = 75$$

$$x = \dots\dots\dots [2]$$

6. Show that $k = \frac{4 + 3j}{5 - j}$ can be rearranged to $j = \frac{5k - 4}{3 + k}$

[4]

7. Solve.

$$4x - 7 = 8 - 2x$$

$$x = \dots\dots\dots [3]$$

8. Rearrange this formula to make x the subject.

$$y = \sqrt{4x - 3}$$

[3]

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

[2]

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

Here is his working.

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

$$5x + 2 = 47$$

$$5x = 45$$

$$x = 94$$

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]

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

..... [2]

12. $m = \sqrt{\frac{k^3 + 1}{4}}$

Make k the subject of the formula.

..... [3]

13. Rearrange $y = \frac{4 - 3x}{x - 5}$ to make x the subject

[4]

14. This formula works out the tax you pay.

$$T = 0.2(E - 10\,600)$$

T is the tax you pay in pounds.

E is the amount you earn in pounds.

Alison pays £5200 tax.

Work out the amount she earns.

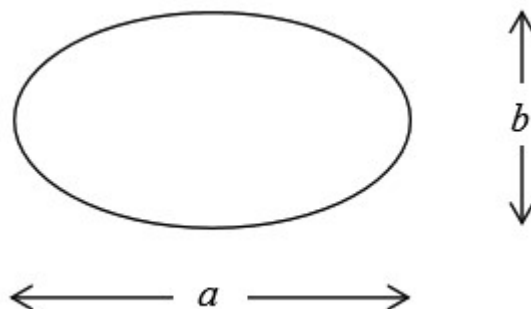
[3]

15. Solve $x^2 = 30.25$

[2]

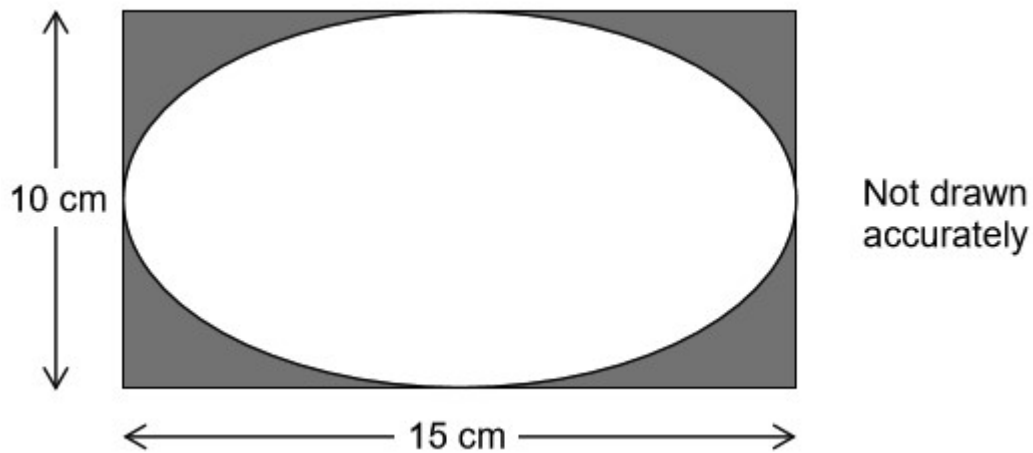
16. The area of an ellipse, width a and height b , is given by

$$\frac{\pi ab}{4}$$



A rectangular photograph measures 15 cm by 10 cm

It is put into a frame as shown.



The part of the photograph that can be seen is an ellipse.

Work out the percentage of the photograph that can be seen.

[3]

17. Rearrange $c = \frac{4-d}{d+3}$ to make d the subject.

[4]