

Surname	Centre Number	Candidate Number
Other Names		0



GCSE

4370/05

**MATHEMATICS – LINEAR
PAPER 1
HIGHER TIER**

A.M. TUESDAY, 6 November 2012

2 hours

**CALCULATORS ARE
NOT TO BE USED
FOR THIS PAPER**

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

Take π as 3.14.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

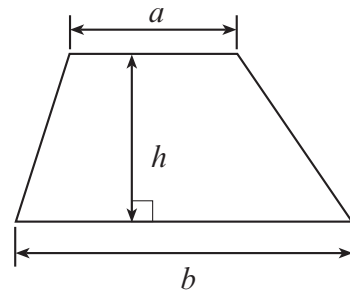
You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question 5(a).

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	5	
2	3	
3	6	
4	9	
5	9	
6	3	
7	4	
8	9	
9	9	
10	4	
11	7	
12	9	
13	3	
14	5	
15	7	
16	8	
TOTAL MARK		

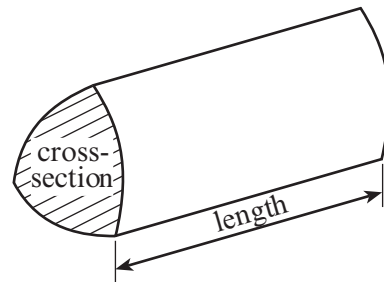
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Formula List

Area of trapezium = $\frac{1}{2}(a + b)h$

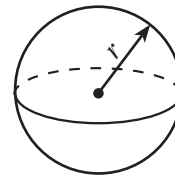


Volume of prism = area of cross-section \times length



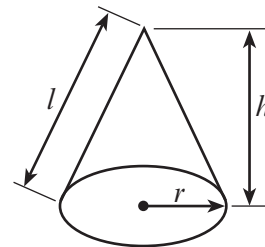
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$

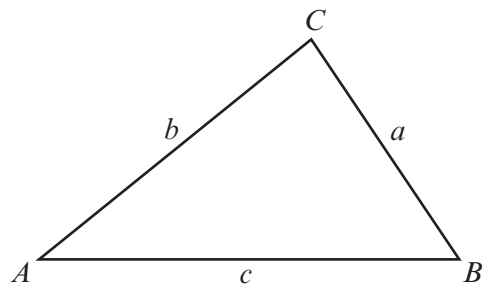


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2}ab \sin C$



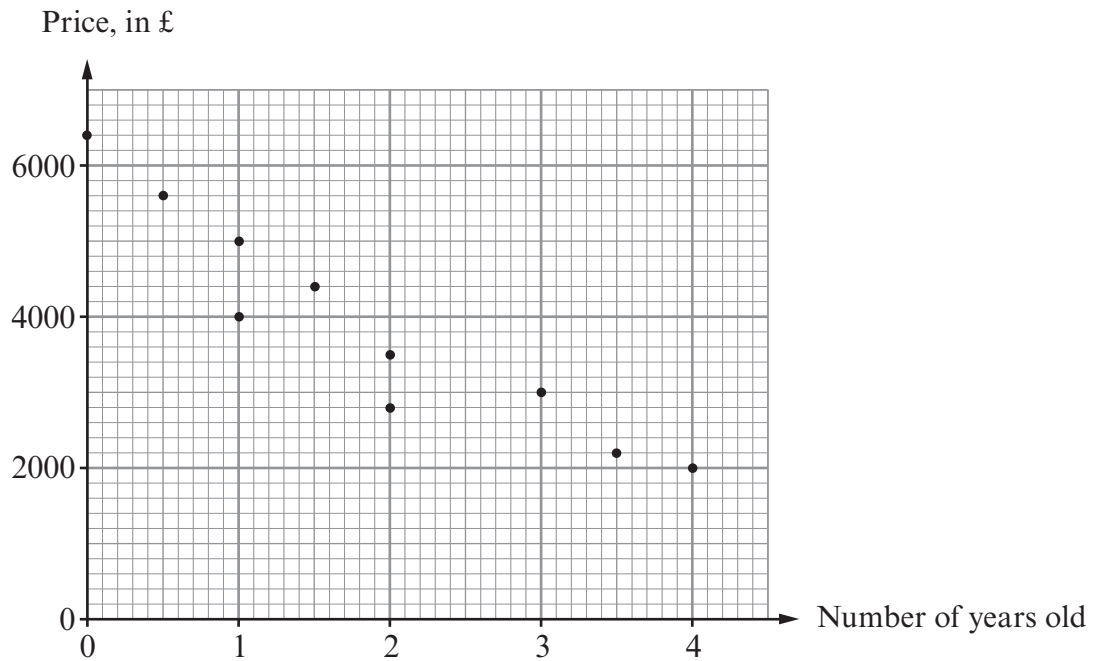
The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

1. The scatter diagram shows the price and age for each of 10 cars of the same make and model.



- (a) Write down the price of the new car.

..... [1]

- (b) Write down the price of the oldest car.

..... [1]

- (c) Draw, by eye, a line of best fit on the scatter diagram.

[1]

- (d) Write down the type of correlation shown by the scatter diagram.

..... [1]

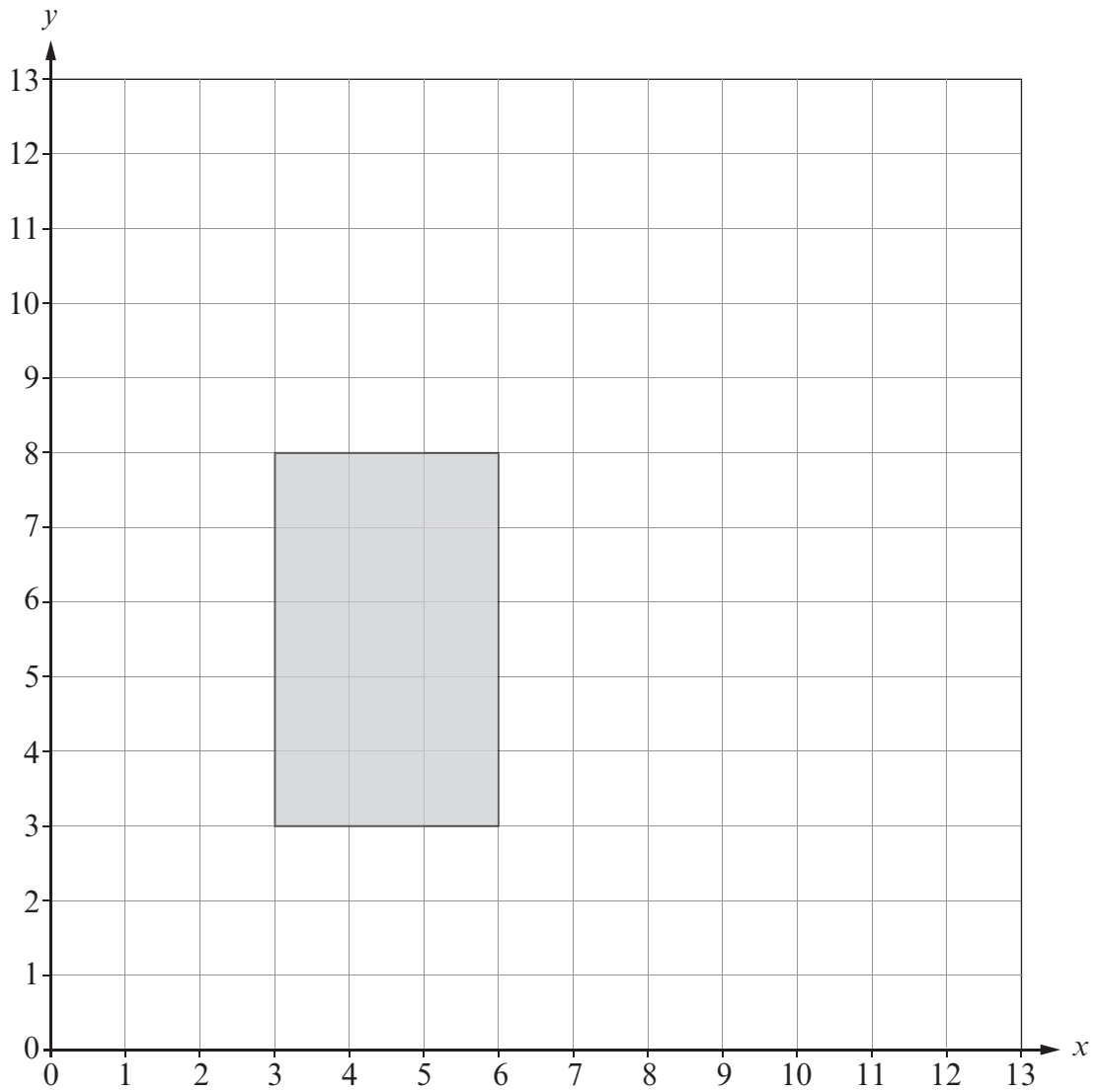
- (e) Estimate the price of a $2\frac{1}{2}$ year old car of the same make and model.

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2. (a) Translate the rectangle shown 6 units to the right and 3 units up.

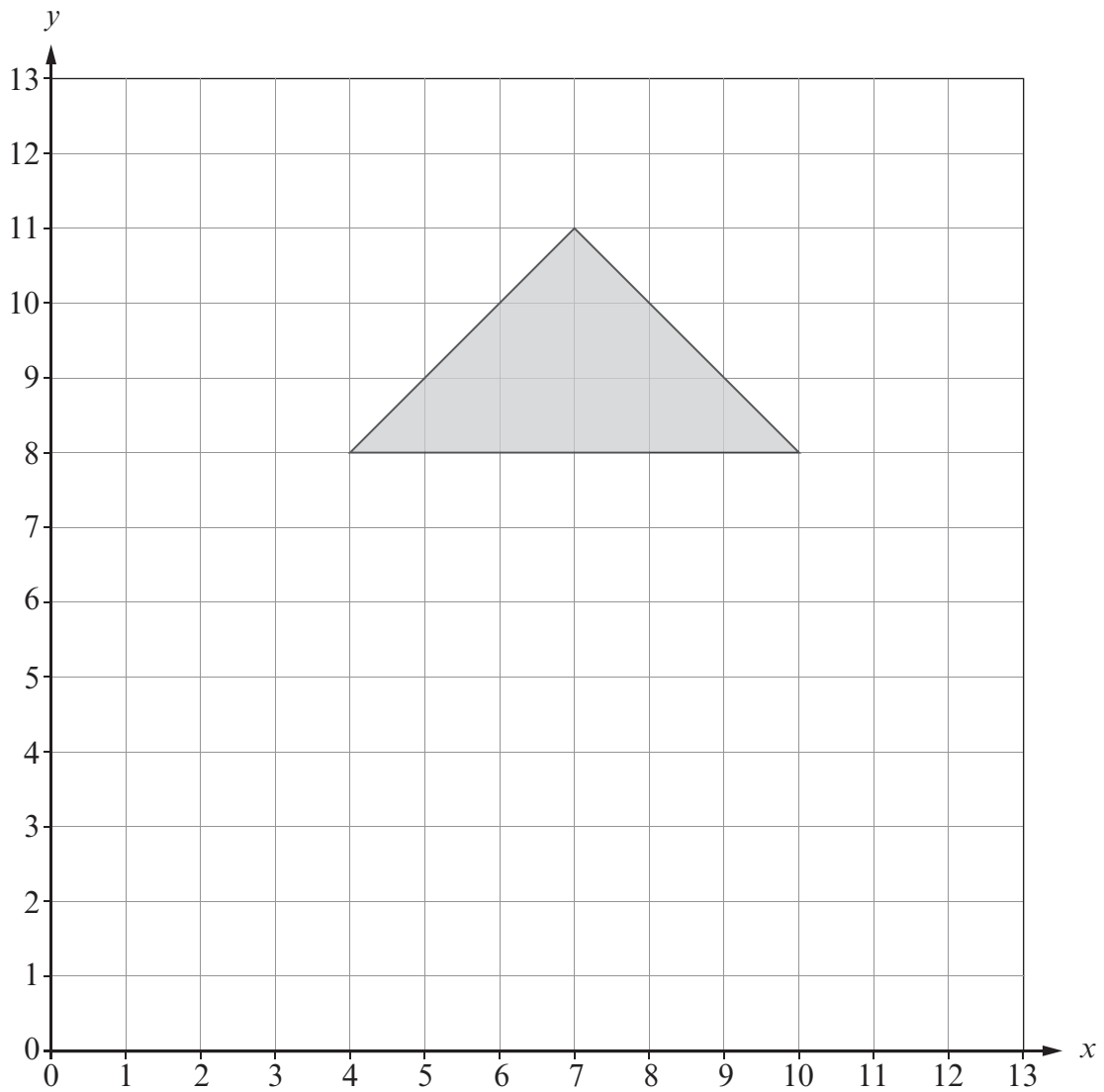
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[1]



(b) Draw a reflection of the triangle in the line $y = 6$.

[2]



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3. One day, Aled travels on his bike to the gym.
Below is a description of his journey.

08:00	Leaves home
08:15	Stops at a friend's house on the way to the gym
08:36	Leaves his friend's house
09:00	Arrives at the gym
11:00	Leaves the gym
11:30	Arrives home

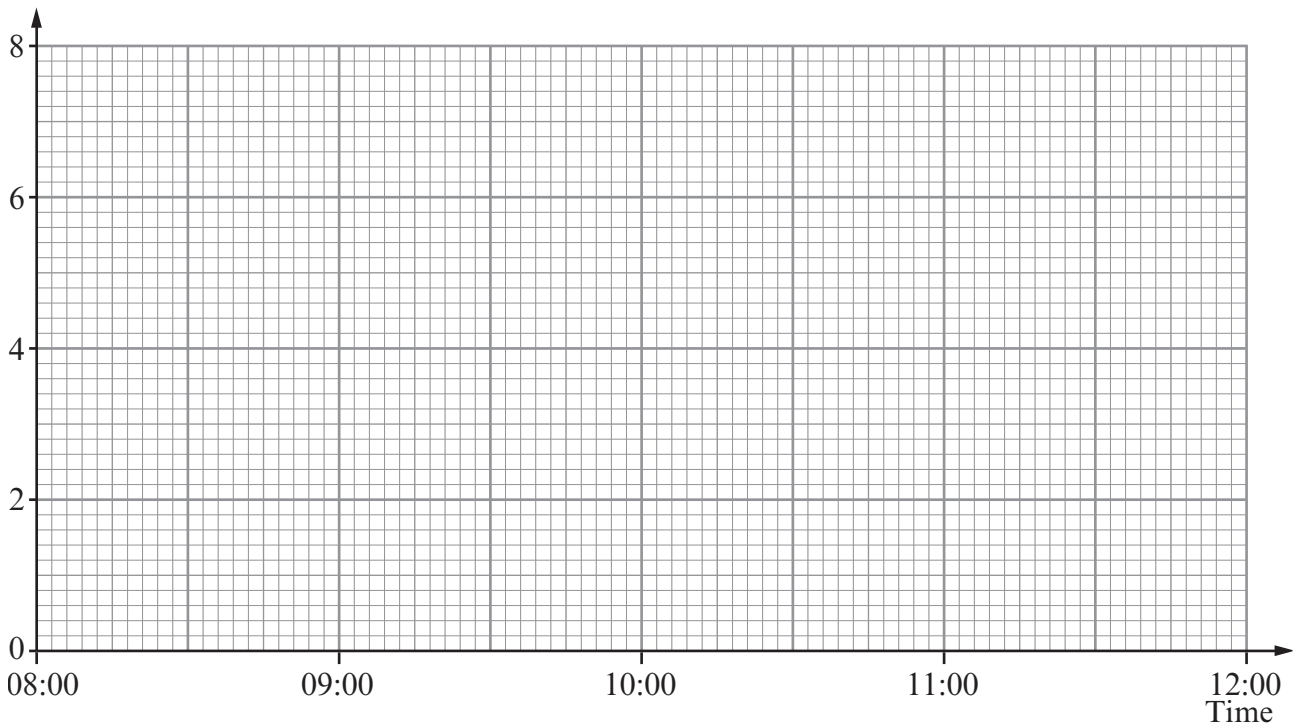
Aled's friend lives on his route to the gym.

Aled lives $2\frac{1}{2}$ miles away from his friend.

It is a further 3 miles from Aled's friend's house to the gym.

- (a) Use the information about Aled's journey to draw a travel graph on the graph paper below.

Distance, in miles,
from Aled's home



[4]

- (b) Calculate Aled's average speed, in mph, for his journey home.

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[2]

4. (a) Solve $6x - 7 = 2x + 21$.

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[3]

(b) Factorise $24x + 3$.

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[1]

(c) Factorise $x^2 - 6x$.

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[1]

(d) Expand $2x(x^3 + 6)$.

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[2]

(e) Solve $\frac{x}{3} + 15 = 25$.

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[2]

- 5. A community hall has a large number of rectangular tables and a large number of chairs. The tables can seat up to 3 people along each of the longer sides and 1 person at each end.

A street party is being organised using the community hall's tables and chairs. Tables are joined and placed in a long straight line. Tables meet edge to edge to form the line.

(a) *You will be assessed on the quality of your written communication in this part of the question.*

What is the least number of tables needed to seat 164 people?

You must show all your working and explain how you arrive at your answer.

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[6]

(b) There are n people sitting around a straight line of tables. There are no empty seats.

Write an expression in terms of n for the least number of tables needed to seat these people.

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[3]

6. Roz and Simon each throw a fair dice.
Calculate the probability that the sum of the two numbers obtained is 4.

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[3]

7. Seven **single digit numbers** have a median of 6 and a range of 8.
The mode of the seven numbers is 3.
Find the seven numbers.
Write your single digit numbers in order in the boxes.

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[4]

8. (a) Estimate the value of $\frac{48 \times 21}{199}$.

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[2]

- (b) Given that $46 \times 345 = 15870$, find the value of $\frac{1587}{460}$.

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[1]

- (c) Write down the value of a half of $\frac{3}{8}$. Give your answer as a fraction.

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(d) Express 240 as a product of prime factors using index notation.

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(e) Evaluate the reciprocal of 0.9 and state whether this is greater or less than 0.9.

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[2]

9. (a) Expand and simplify $(2x + 5)(3x - 4)$.

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- (b) Factorise $2x^2 + x - 3$ and hence solve $2x^2 + x - 3 = 0$.

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[3]

- (c) Simplify $\frac{(x + 5)^8}{(x + 5)^2}$.

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(d) Write down the n th term of the sequence 5, 8, 13, 20, 29, ...

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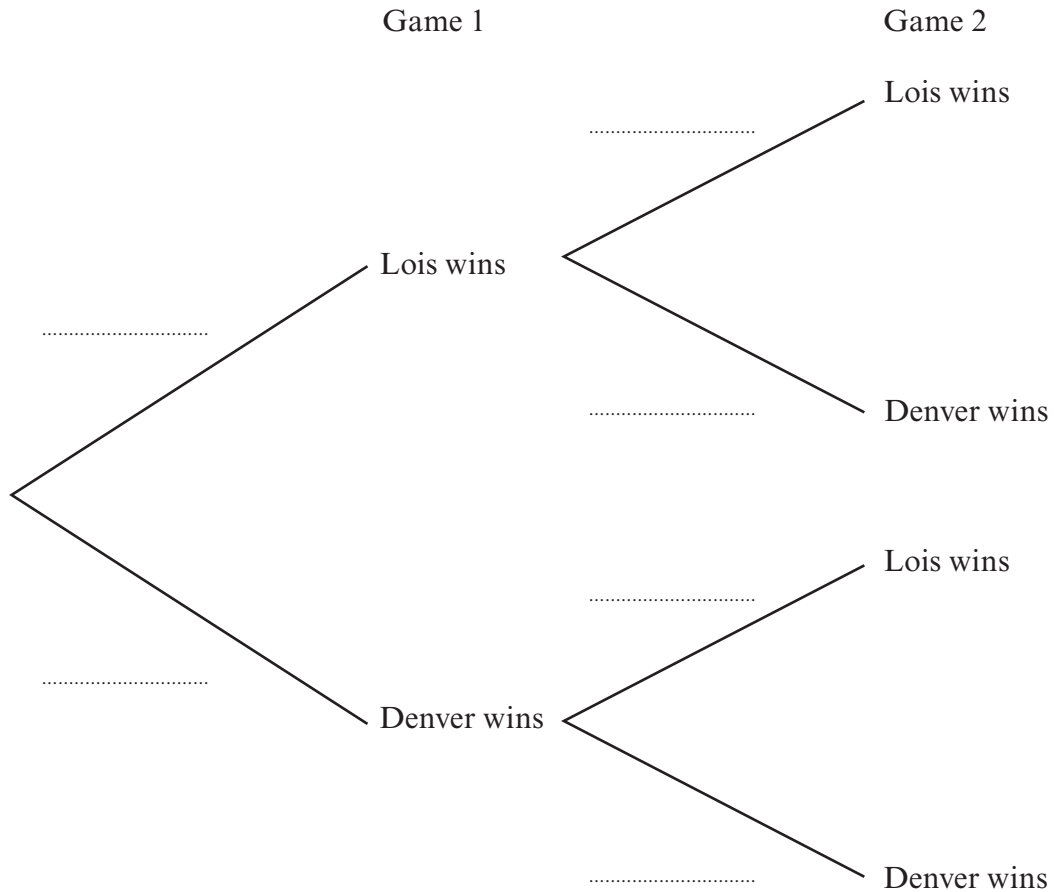
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[2]

10. Whenever Lois and Denver play a game of Bubble on their computer, the probability that Lois wins is 0.3. No game of Bubble ever ends in a draw.

(a) Complete the following tree diagram to show the probabilities of what can happen when Lois and Denver play two games of Bubble.



[2]

(b) Calculate the probability that Denver wins both games of Bubble.

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[2]

11. A rectangular lawn has a length of 9 m and a width of 5 m.
 A builder is asked to make a path of width x metres around the outside edge of the rectangular lawn.

(a) All the edges of the path are straight.
 Find an expression for the area of the path in terms of x .
 Give your answer in its simplest form.

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[4]

(b) At the corners of the lawn it is possible to curve the outer edge of the path and still keep the width of the path equal to x metres.
 Find an expression for the area of this path in terms of x and π .
 Give your answer in its simplest form.

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[3]

12. The table shows values of $y = -x^2 + 8x - 12$ for values of x from 1 to 8.

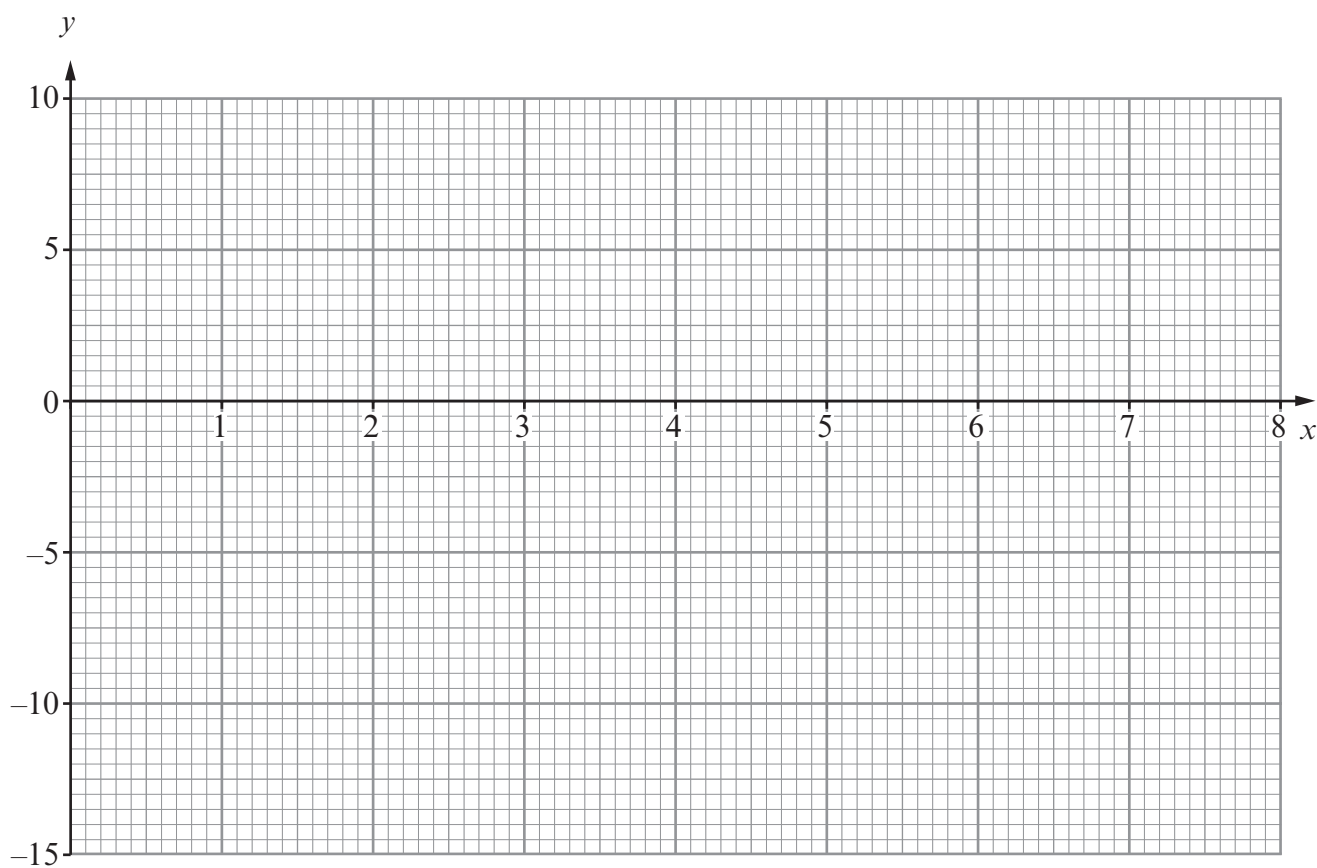
x	1	2	3	4	5	6	7	8
$y = -x^2 + 8x - 12$	-5	0	3	4	3	0		

(a) Complete the table above.

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 [2]

(b) On the graph paper below, draw the graph of $y = -x^2 + 8x - 12$ for the values of x from 1 to 8.

[2]



(c) Use your graph to write down the solutions of the equation $-x^2 + 8x - 12 = 0$.

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[1]

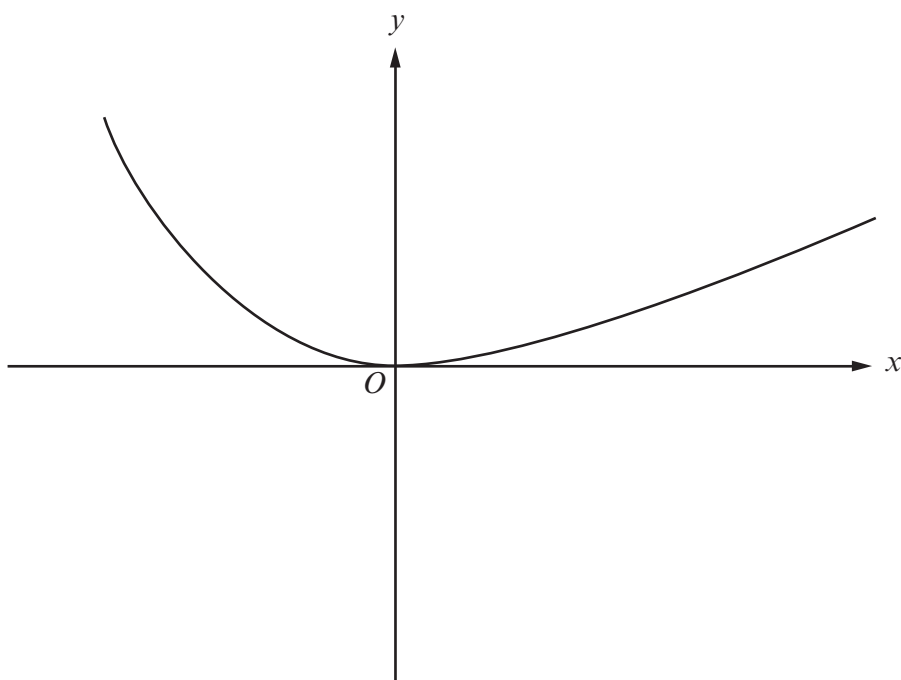
(d) Use the trapezium rule, with the ordinates $x = 2, x = 3, x = 4, x = 5$ and $x = 6$, to estimate the area of the region enclosed by the curve and the x -axis.

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[4]

13. Given that y is inversely proportional to x^2 , and that $y = 10$ when $x = 12$, find an expression for y in terms of x .

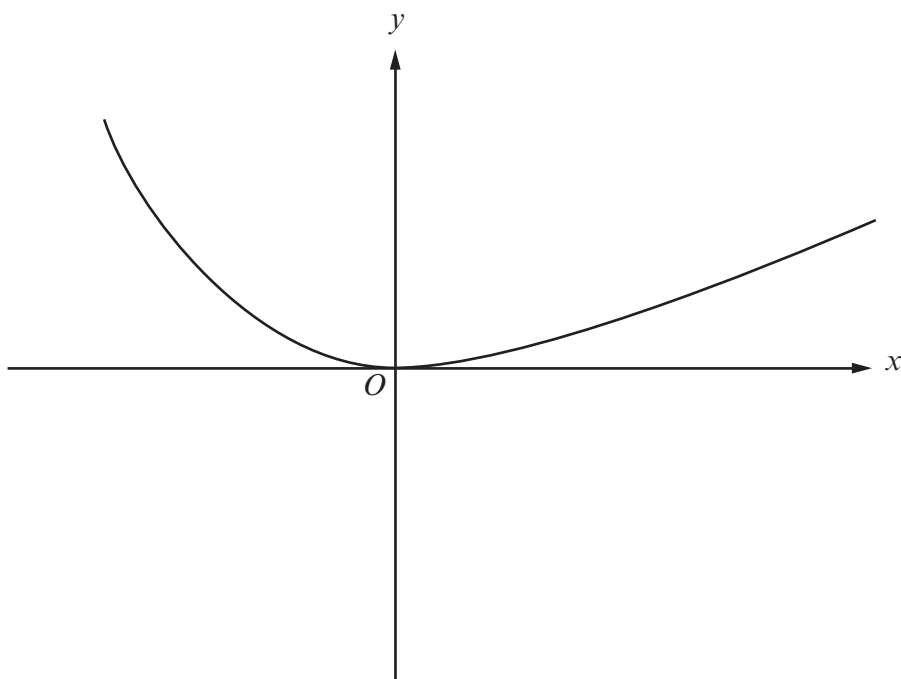
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[3]

14. (a) The diagram shows a sketch of $y = f(x)$.
On the same diagram, sketch the curve $y = f(x - 2)$.
Mark clearly the coordinates of the point where this curve touches an axis.



[2]

- (b) The diagram shows another sketch of $y = f(x)$.
On the same diagram, sketch the curve $y = -f(x) + 3$.
Mark clearly the coordinates of the point where this curve meets the y-axis.



[3]

15. (a) Express $400^{-\frac{3}{2}}$ as a fraction.

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[2]

(b) Express $0.6\dot{5}\dot{2}$ as a fraction.

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[2]

(c) Simplify $(3 - 5\sqrt{2})^2$ and state whether your answer is rational or irrational.

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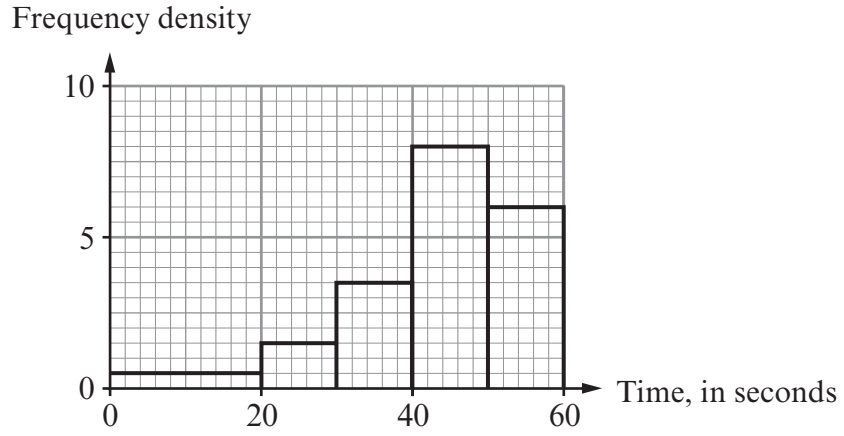
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[3]

16. (a) The time taken to sew a button on a shirt was measured for each child in a group of 200 children.
The histogram below illustrates the results obtained.



Use the histogram to calculate how many of the children took less than 50 seconds to sew a button on a shirt.

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[3]

- (b) The time taken to sew a button on a shirt was measured for each adult in a group of 200 adults.

The following grouped frequency distribution was obtained.

Time, t seconds	$0 < t \leq 20$	$20 < t \leq 30$	$30 < t \leq 40$	$40 < t \leq 50$	$50 < t \leq 60$
Number of adults	20	20	25	35	100

- (i) Find an estimate of the median of this distribution.

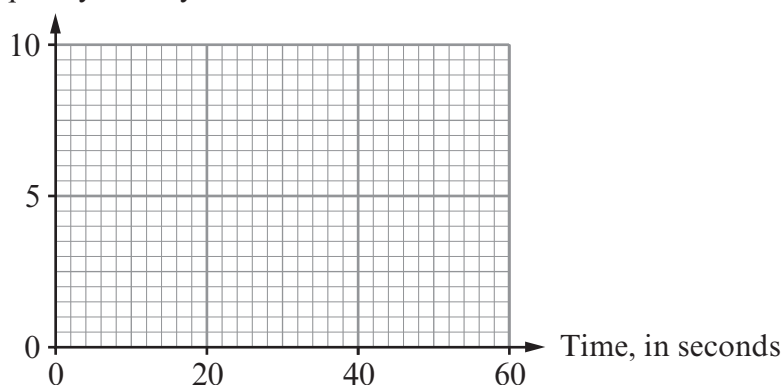
..... [1]

- (ii) Draw the histogram to illustrate the distribution on the graph paper below.

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 [3]

Frequency density



- (c) Using the information from parts (a) and (b), do you think the adults are faster than the children at sewing buttons on shirts? You must give a reason for your answer.

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 [1]