Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4370/06

MATHEMATICS – LINEAR
PAPER 2
HIGHER TIER

A.M. TUESDAY, 17 June 2014

2 hours

ADDITIONAL MATERIALS

A calculator will be required for this paper.

A ruler, a protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

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.

If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3·14 or use the π button on your calculator.

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 **2***(a)*.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**5**	
2.	**8**	
3.	**16**	
4.	**5**	
5.	**6**	
6.	**3**	
7.	**4**	
8.	**8**	
9.	**4**	
10.	**6**	
11.	**6**	
12.	**7**	
13.	**6**	
14.	**7**	
15.	**9**	
Total	**100**	

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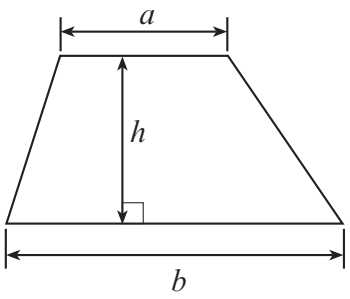
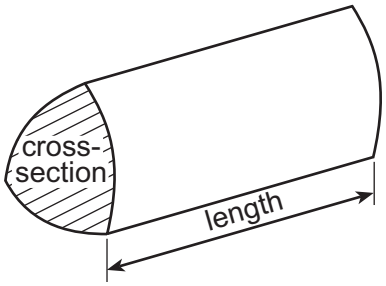
Formula List

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

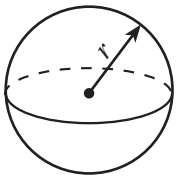


Volume of prism = area of cross-section × length



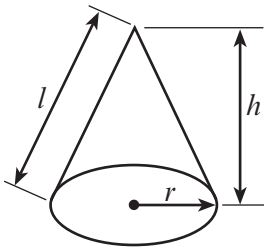
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

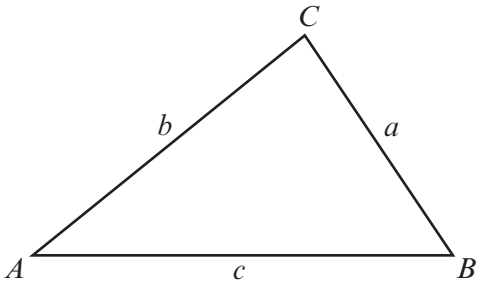


In any triangle ABC

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

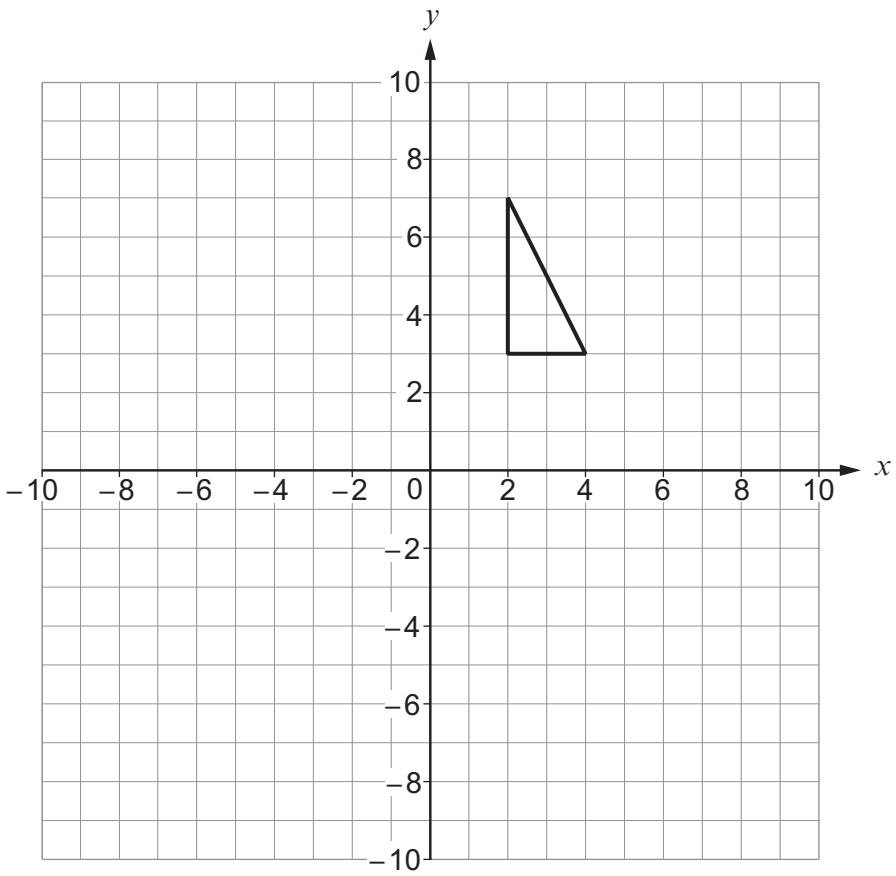
The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

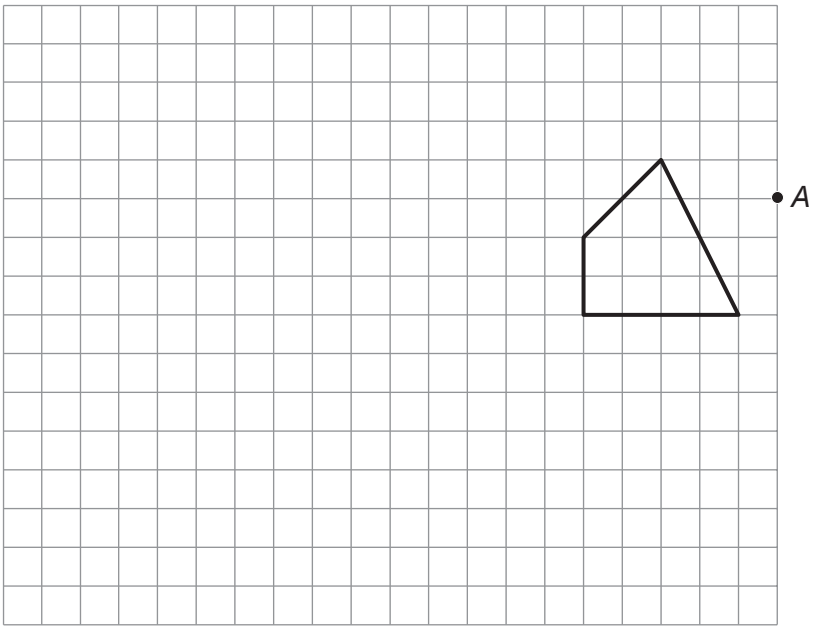
$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Examiner only

1. *(a)* Draw a reflection of the triangle in the line $y = 1$. [2]



(b) Enlarge the shape shown on the grid by a scale factor of 2, using *A* as the centre of the enlargement. [3]



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2. The ruling body for international football has rules for the dimensions of rectangular football pitches.

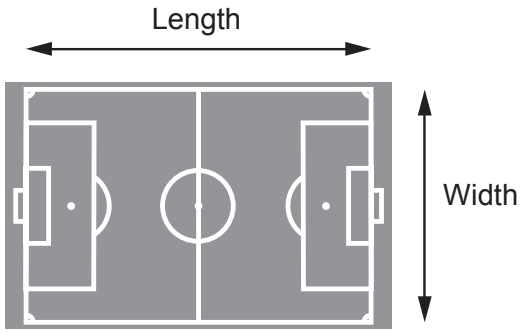

Diagram not drawn to scale

Football pitch dimension rules:

- the minimum width is 45 m
- the maximum width allowed is double the minimum width
- the maximum length is 120 m
- the minimum length allowed is three-quarters of the maximum length

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

Susan says

'The maximum area of a pitch is **at least 50%** greater than the minimum area of a pitch.'

Is Susan correct?
You must show all your working to justify your answer. [6]

Examiner only

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(b) Ceri makes a correct statement.
Complete Ceri's statement below using a decimal, correct to 2 decimal places. [2]

'Minimum area of a football pitch x ..... = maximum area of a football pitch.'

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Examiner only

3. *(a)* In 2013, there were 119 days on which there was rain or snowfall in Moscow.
For what fraction of the number of days in 2013 was there **no** rain and **no** snowfall in Moscow? [1]

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(b) The mean temperature in Moscow for a 12 month period is 4°C.
It is warmest in July, typically 26°C.
What would be the estimate for the mean temperature in Moscow if the temperature for July was not included? [4]

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(c) One year, during the 31 days in March, the temperature was recorded every day at midday.
The results are shown in the table below.

Midday temperature, t, in °C	Number of days
$-12 \leqslant t < -10$	1
$-10 \leqslant t < -8$	3
$-8 \leqslant t < -6$	5
$-6 \leqslant t < -4$	8
$-4 \leqslant t < -2$	4
$-2 \leqslant t < 0$	10

Calculate an estimate for the mean midday March temperature in Moscow.
You must show all your working. [4]

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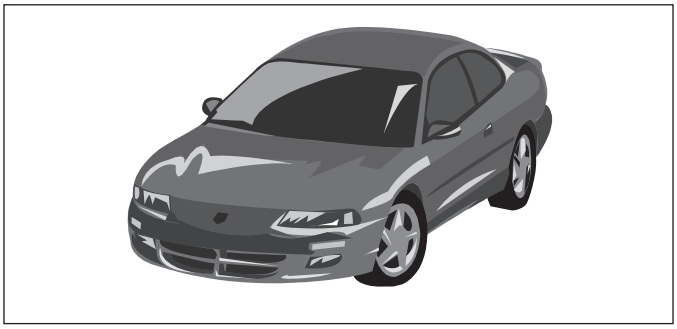
(d) Boris bought a car in Moscow for 251 850 Russian roubles.



(i) Each year, the value of Boris's car depreciates by 10% of its value at the start of the year.
At the end of two years, by how much has the value of Boris's car depreciated? [4]

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(ii) The exchange rate for Russian roubles when Boris bought his car was £1 = 50.37 Russian roubles.

At the same time, Angharad bought a car in Wales.
Angharad paid £5250 for her car.

How much more than Boris did Angharad spend on buying her car?
Give your answer in pounds. [3]

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4. The table shows some of the values of $y = x^3 + 6$ for values of x from –2 to 3.

(a) Complete the table by finding the value of y for x = –1 and x = 2. [2]

x	–2	–1	0	1	2	3
$y = x^3 + 6$	–2		6	7		33

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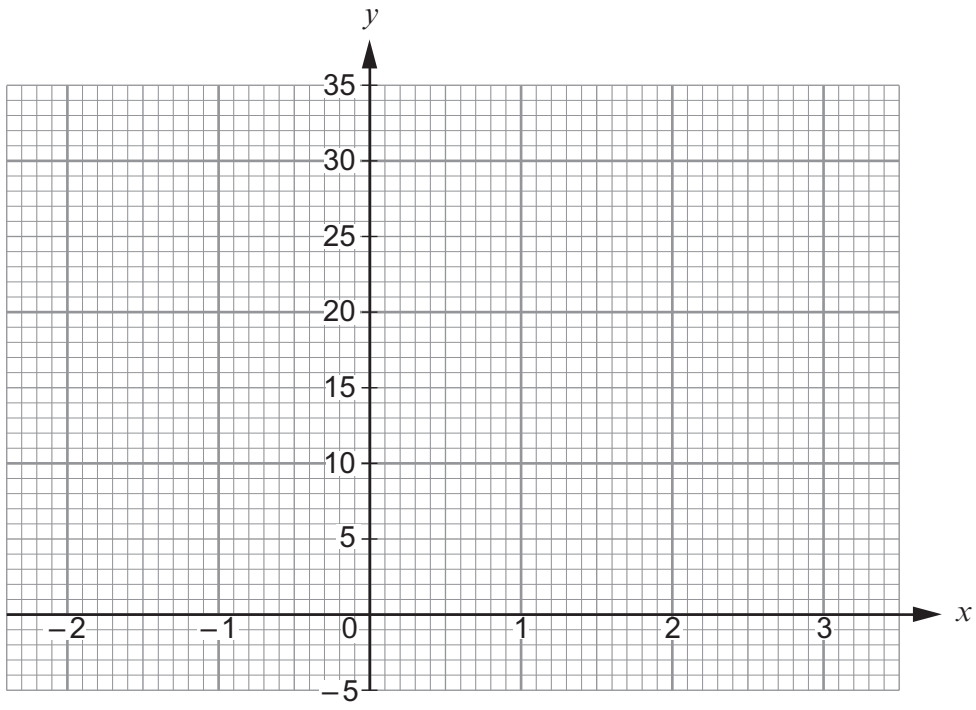
(b) On the graph paper below, draw the graph of $y = x^3 + 6$ for values of x from –2 to 3. [2]



(c) Faye wants to solve the equation $x^3 + 6 = 10$ by first drawing a line on the graph above.
Show how Faye would do this on the graph above.
You do not need to find the solution of the equation. [1]

Examiner only

5. Claudia was given the following information.

UK Income Tax

April 2013 to April 2014

taxable income = gross income – personal allowance

- personal allowance is £9205
- basic rate of tax: 20% on the first £32 255 of taxable income
- higher rate tax: 40% is payable on all taxable income over £32 255

During the tax year 2013 to 2014, Claudia's gross income was £52 250.

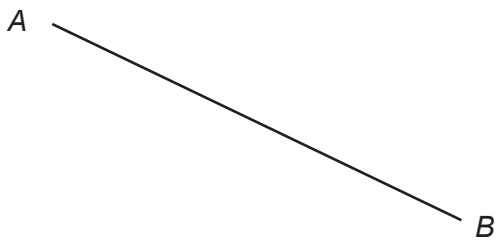
Calculate the total amount of tax that Claudia should pay.
You must show all your working. [6]

Examiner only

6. Shade the region that satisfies both of the following conditions.

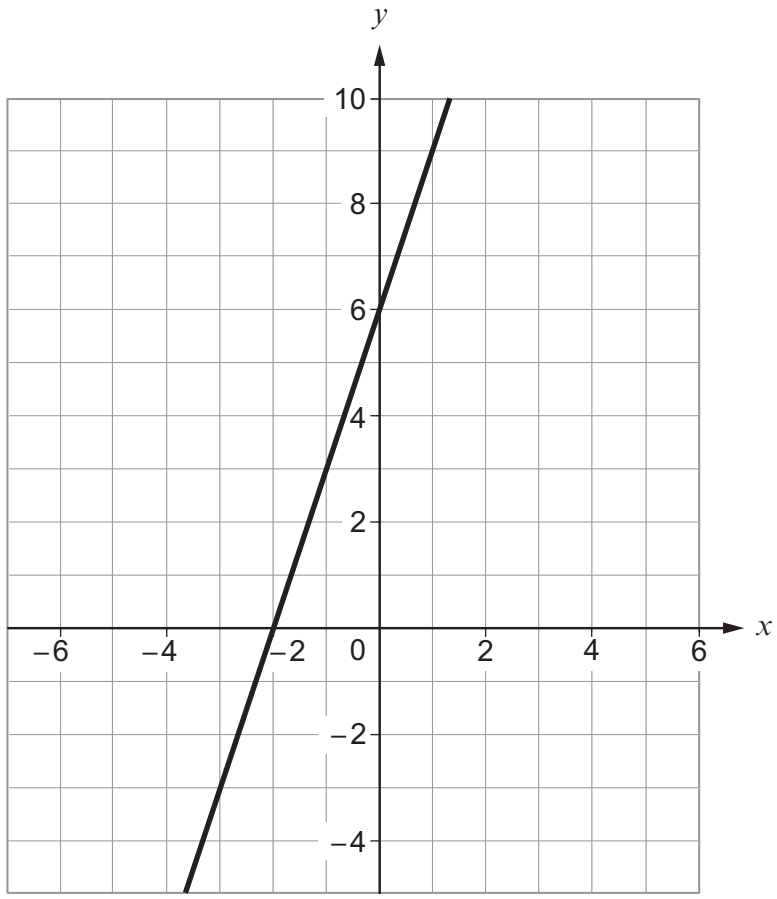
(i) The points are less than 4 cm from *B*.

(ii) The points are nearer to *B* than to *A*. [3]



Examiner only

7. *(a)* Find the equation of the straight line shown in the following diagram. Write your answer in the form $y = mx + c$. [2]



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Equation of the straight line is $y =$ ..... $x +$ .....

(b) On the grid above, draw the straight line which has a gradient of –2 and which passes through the point (0, –1). [2]

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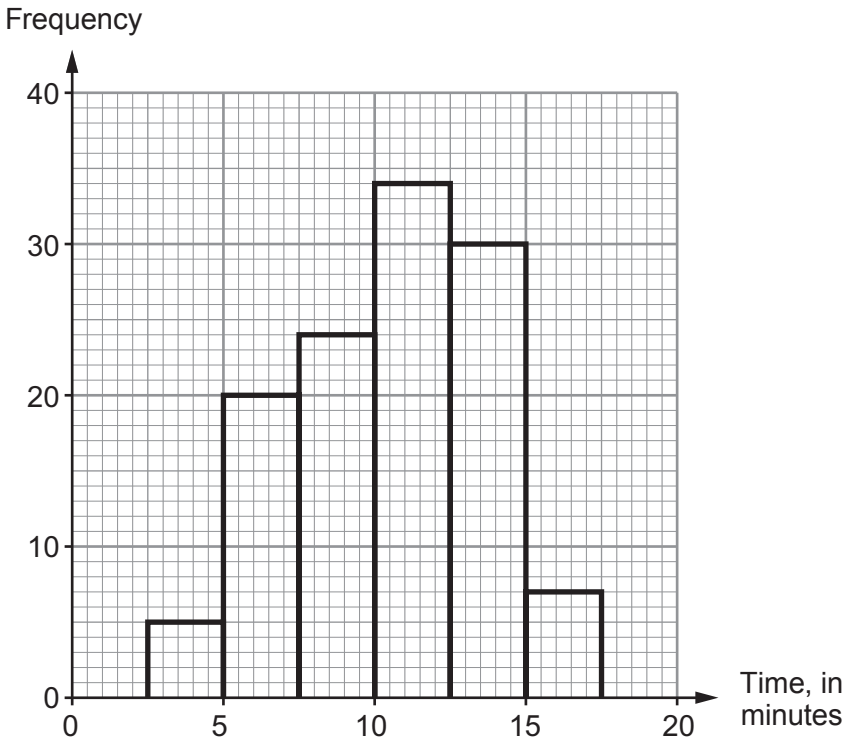
Turn over.

Examiner only

8. A number of people took part in a challenge to swim across a lake.
The grouped frequency diagram shows the times taken to cross the lake.



(a) How many people took between 5 minutes and 12 minutes 30 seconds to swim across the lake? [1]

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(b) Complete the cumulative frequency table for the swimming times. [2]

Time, t in minutes	$t \leqslant 2{\cdot}5$	$t \leqslant 5$	$t \leqslant 7{\cdot}5$	$t \leqslant 10$	$t \leqslant 12{\cdot}5$	$t \leqslant 15$	$t \leqslant 17{\cdot}5$
Cumulative frequency							

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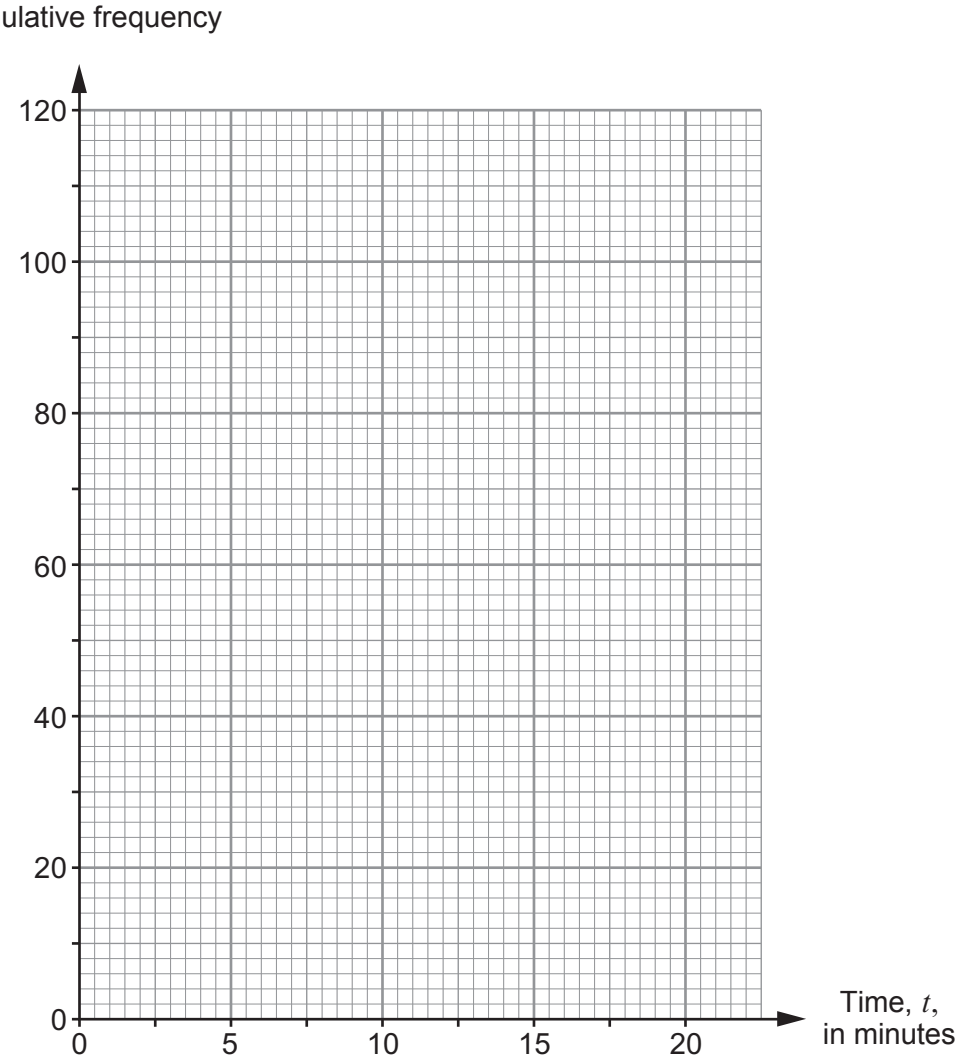
(c) Use the graph paper below to draw a cumulative frequency diagram for the swimming times. [2]



(d) Use your cumulative frequency diagram to find

(i) an estimate for the median swimming time, [1]

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(ii) an estimate for the inter-quartile range of the swimming times. [2]

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9. A ship leaves port *A* and sails for 6·2 miles on a bearing of 090° to a point *B*.
It then turns and sails on a bearing of 224° until it reaches point *C*, which is due south of port *A*.
Calculate the distance between the point *C* and port *A*. [4]

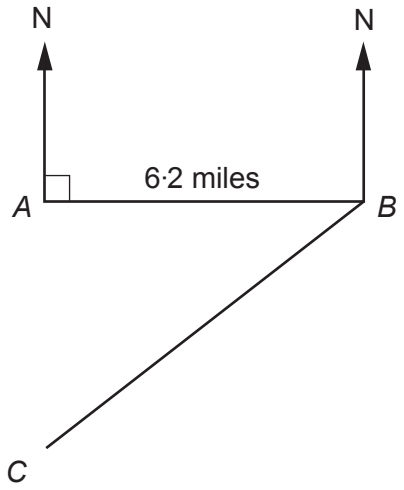

Diagram not drawn to scale

Examiner only

10. *(a)* Factorise and hence solve $x^2 - 4x - 12 = 0$. [3]

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(b) Write down the nth term for each of the following sequences.

(i) 4, 9, 14, 19, 24, ... [2]

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(ii) 2, 5, 10, 17, 26, 37, 50, ... [1]

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Examiner only

11. The probability that Ifor buys a sandwich for lunch is 0·6.
The probability that Ifor buys a sandwich and a drink for lunch is 0·18.
Buying a sandwich for lunch and buying a drink for lunch are independent events.

(a) (i) Find the probability that Ifor buys a drink for lunch. [2]

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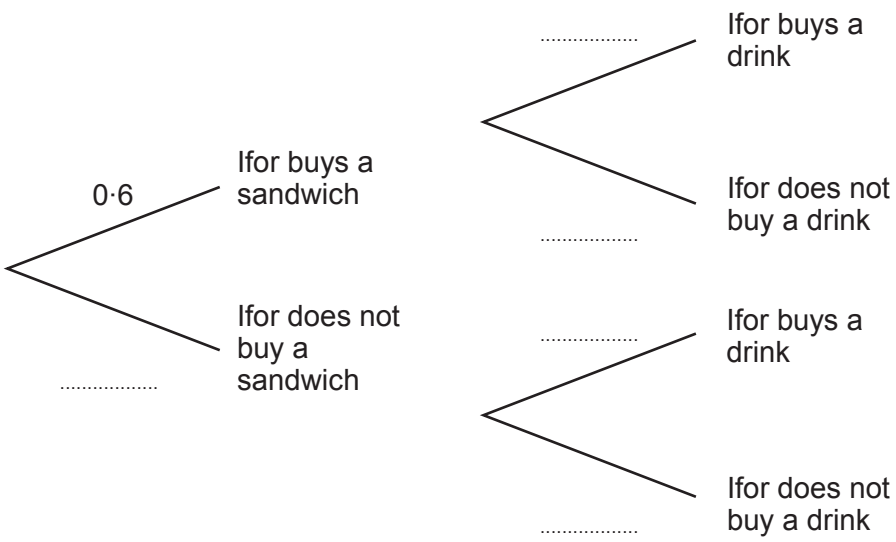
Probability that Ifor buys a drink = ...

(ii) Complete the tree diagram. [2]



(b) Find the probability that Ifor does not buy a sandwich and does not buy a drink at lunchtime. [2]

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Examiner only

12. The diagram shows a parallelogram and a rectangle joined along a common side.

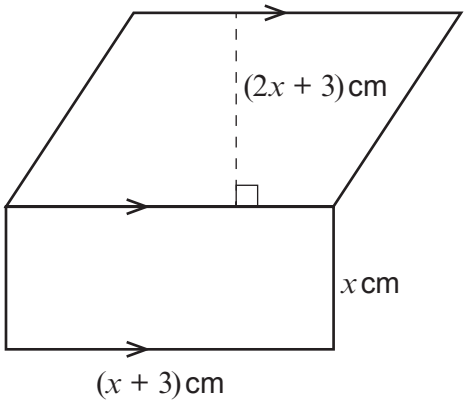

Diagram not drawn to scale

The width of the rectangle is x cm.
The length of the rectangle is $(x + 3)$ cm.
The height of the parallelogram is $(2x + 3)$ cm.
The total area of the parallelogram and the rectangle together is 70 cm^2.

(a) Show that $3x^2 + 12x - 61 = 0$. [3]

(b) Use the quadratic formula to calculate the length of the rectangle.
Give your answer correct to 2 decimal places. [4]

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13.

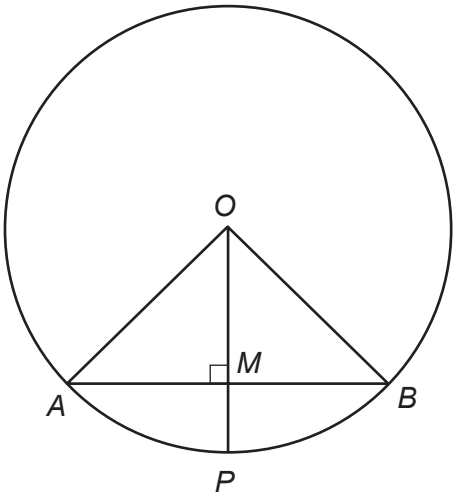

Diagram not drawn to scale

AOB is a sector of a circle, with *OP* perpendicular to *AB* and *AM* = *MB*.
You are given that *AB* = 20·8 cm and *MP* = 1·5 cm.
Calculate the radius of the circle. [6]

Examiner only

14. The diagram shows a plan of drains connecting houses at points *A*, *B*, *C*, *P* and *Q*.

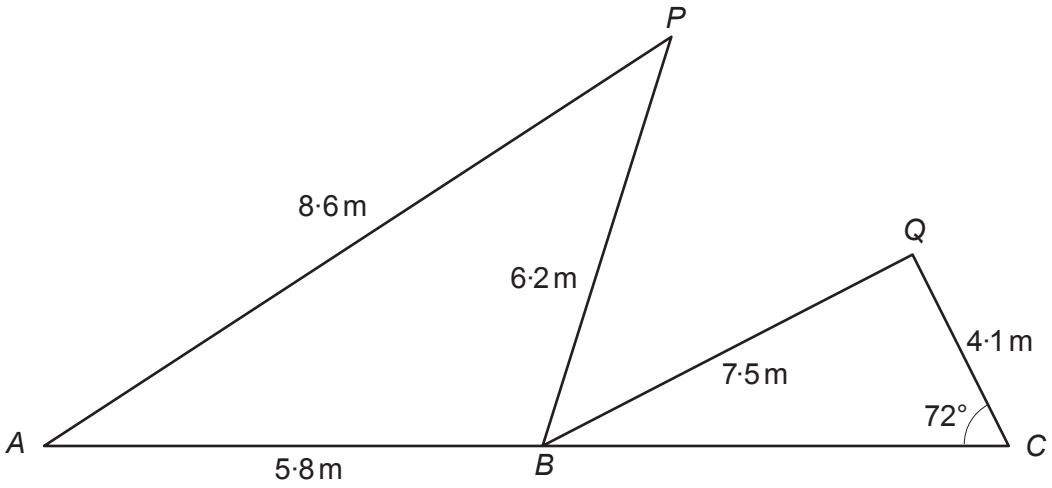

Diagram not drawn to scale

Given that *A*, *B* and *C* lie on a straight line, calculate the size of $P\hat{B}Q$.
Give your answer correct to the nearest degree. [7]

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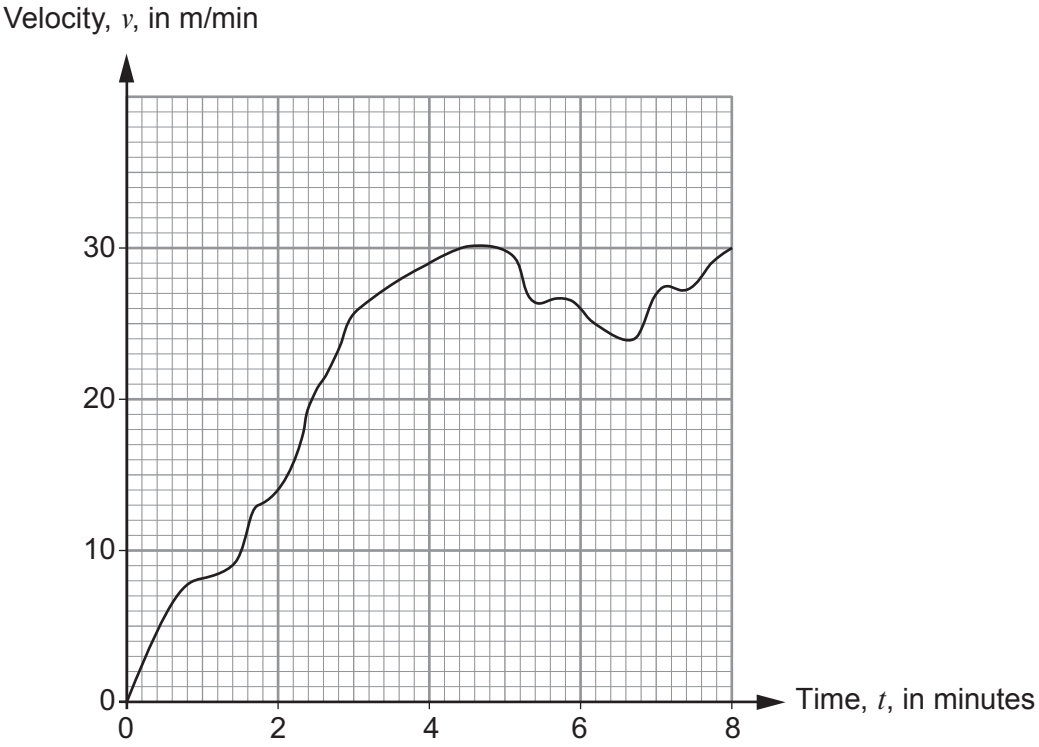
15. Polly carried out an experiment.
She used equipment to record the velocity of an object, v, in m/min for the first 8 minutes of the experiment.

The velocity-time graph is shown below.



(a) Write down the gradient of the curve when $t = 4{\cdot}6$. [1]

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(b) Find an estimate for the acceleration of the object at $t = 3{\cdot}5$. [3]

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(c) (i) Use the trapezium rule, with the ordinates $t = 0$, $t = 2$, $t = 4$, $t = 6$ and $t = 8$, to estimate the area of the region bounded by the curve, the positive time axis and the line $t = 8$. [4]

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(ii) Calculate an estimate for the distance the object travelled in the first 8 minutes of Polly's experiment, giving your answer in kilometres. [1]

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