WJEC CBAC

GCSE

4370/05

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A14-4370-05

MATHEMATICS – LINEAR
PAPER 1
HIGHER TIER

A.M. WEDNESDAY, 5 November 2014

2 hours

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

ADDITIONAL MATERIALS

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

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 **4**(c).

Formula List

Area of trapezium $= \frac{1}{2}(a + b)h$
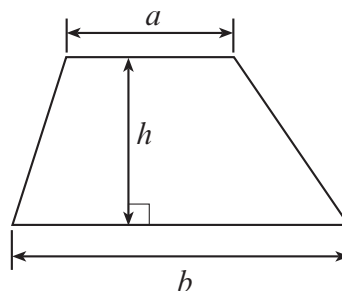
Volume of prism = area of cross-section × length
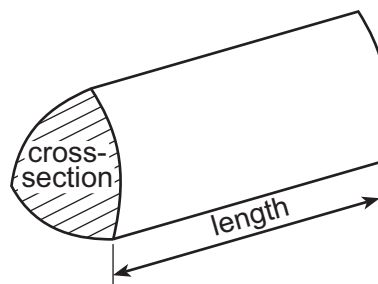
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$
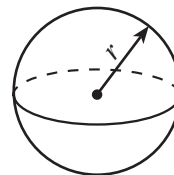
Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$
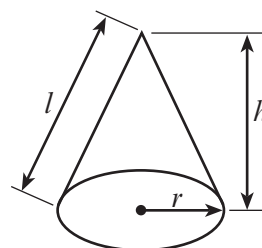
In any triangle ABC

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

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

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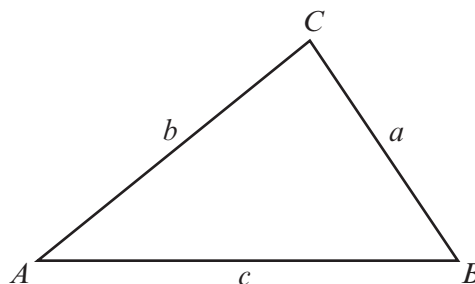
The Quadratic Equation

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.
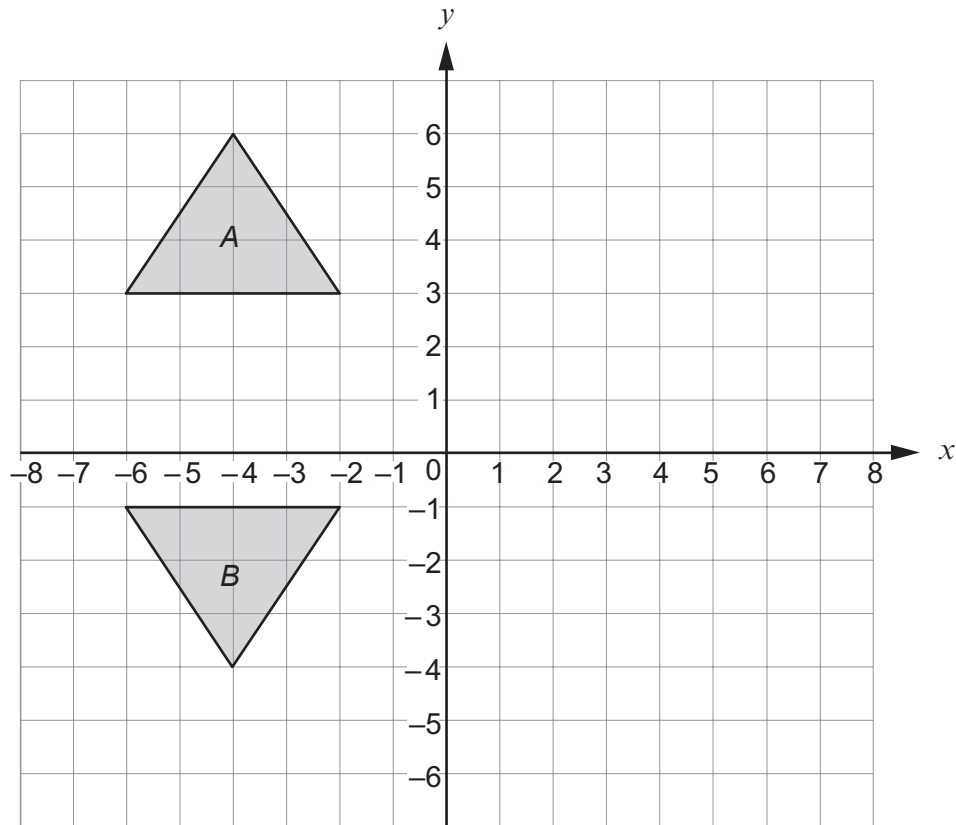
The diagram shows the transformation of triangle *A* to triangle *B*.

(a) Fully describe a possible transformation of triangle *A* to triangle *B*.　　　　　　[2]

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(b) Rotate triangle *A* through 90° clockwise about the origin.
Label your answer *C*.　　　　　　[2]

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2. *(a)* Solve $\frac{3x}{4} = 36$. [2]

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(b) Solve $\frac{9}{x} = 18$. [1]

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(c) Solve $5x - 12 = 3(x + 6)$. [3]

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(d) Solve the inequality $9x + 5 < 77$. [2]

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(e) Write down the smallest whole number that satisfies the inequality $4x > 45$. [2]

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Smallest whole number is ....

(f) Simplify $10x \times 5x \times 2x$. [1]

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3. *(a)* The product of three consecutive prime numbers is 385.
Find the **sum** of these three prime numbers. [3]

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Sum of these three prime numbers = ...

(b) Express the highest common factor of 24 and 40 as a product of prime numbers in index form. [3]

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Examiner
only

4. Sophie is going on holiday.

(a) Sophie travels a distance of 35 miles in 2 hours 30 minutes through busy traffic.

Calculate Sophie's average speed, in miles per hour. [3]

(b) Sophie's luggage weighs 22lb.

Approximately how much does her luggage weigh in kg? [1]

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

Sophie is due to fly from Glasgow to San Francisco.
She arrives at Glasgow airport on Wednesday at 13:40.
She has to wait 4 hours 25 minutes for her flight.

It takes 13 hours to fly between Glasgow and San Francisco.
She knows that the time in Glasgow is 8 hours ahead of the time in San Francisco.
For example, when it is 10:00 a.m. in Glasgow it is 2:00 a.m. in San Francisco.

On which day and at what time does Sophie expect to arrive in San Francisco airport?
You must show all your working. [5]

Day .... Time ....

5. *(a)* Abhu has an old bike that has been damaged.
The wheels are missing but he still has the frame.

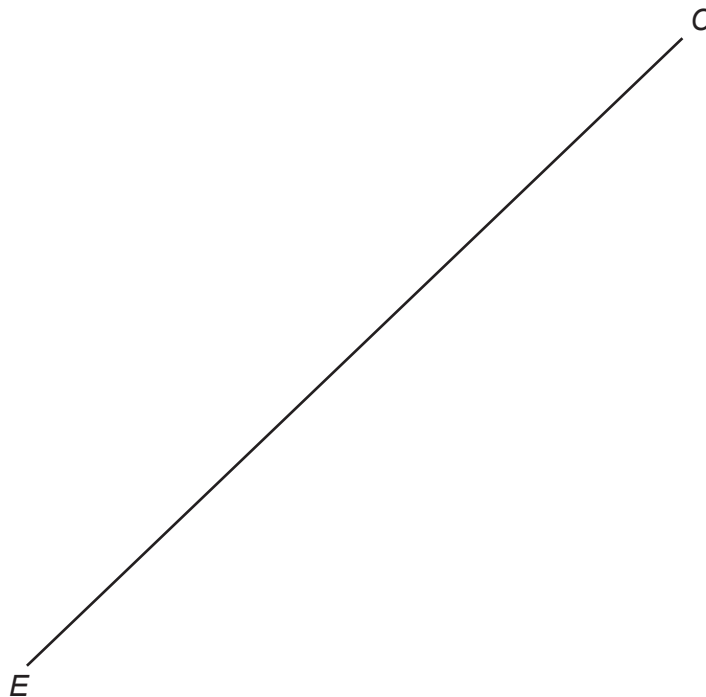He has made a sketch of the damaged frame as shown below.

Diagram not drawn to scale
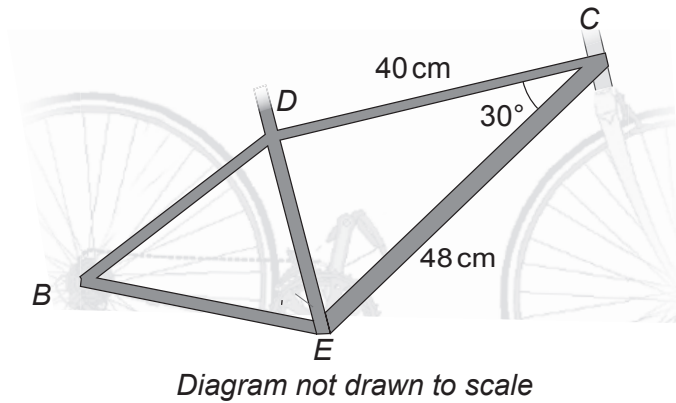
Abhu needs to know the actual length *DE* so that he can buy a new part.

Using a pair of compasses and a ruler only, construct a scale drawing of triangle *DCE*.
Use a scale of 1 cm to represent 4 cm.
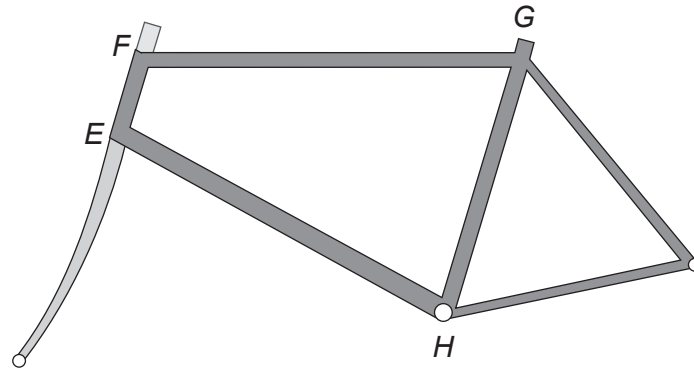You must show all your construction lines.

Hence find the actual length of *DE*. [5]

Actual length of *DE* = ...

(b) Abhu's friend Val has a bike frame for sale.
The diagram below is a scale drawing of Val's bike frame.

Abhu believes that *FE* is parallel to *GH*.
Use your protractor to show that Abhu is correct.
You must give reasons for your answer.

[2]

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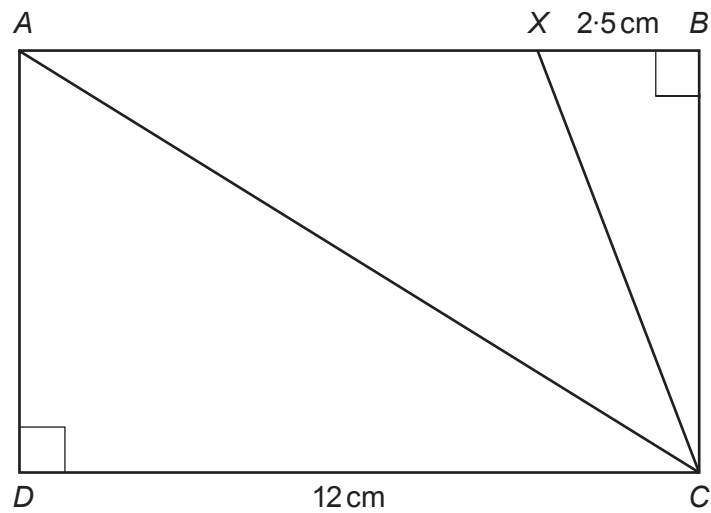
6. The diagram shows a rectangle *ABCD*.

Diagram not drawn to scale

Given that XB = 2·5 cm, DC = 12 cm and the area of triangle ADC is 60 cm^2, calculate the area of triangle *XBC*. [4]

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7. *(a)* Solve the following equation. [4]

$$\frac{20 + 3x}{4} + \frac{5 - x}{5} = \frac{13}{4}$$

(b) Factorise $x^2 - 10x + 16$ and hence solve the equation $x^2 - 10x + 16 = 0$. [3]

8. The table shows some of the values of $y = 3x^2 + 2$ for values of x from -2 to 2.

(a) Complete the table by finding the values of y when $x = -2$ and $x = 2$. [1]

x	-2	-1	0	1	2
y		5	2	5	

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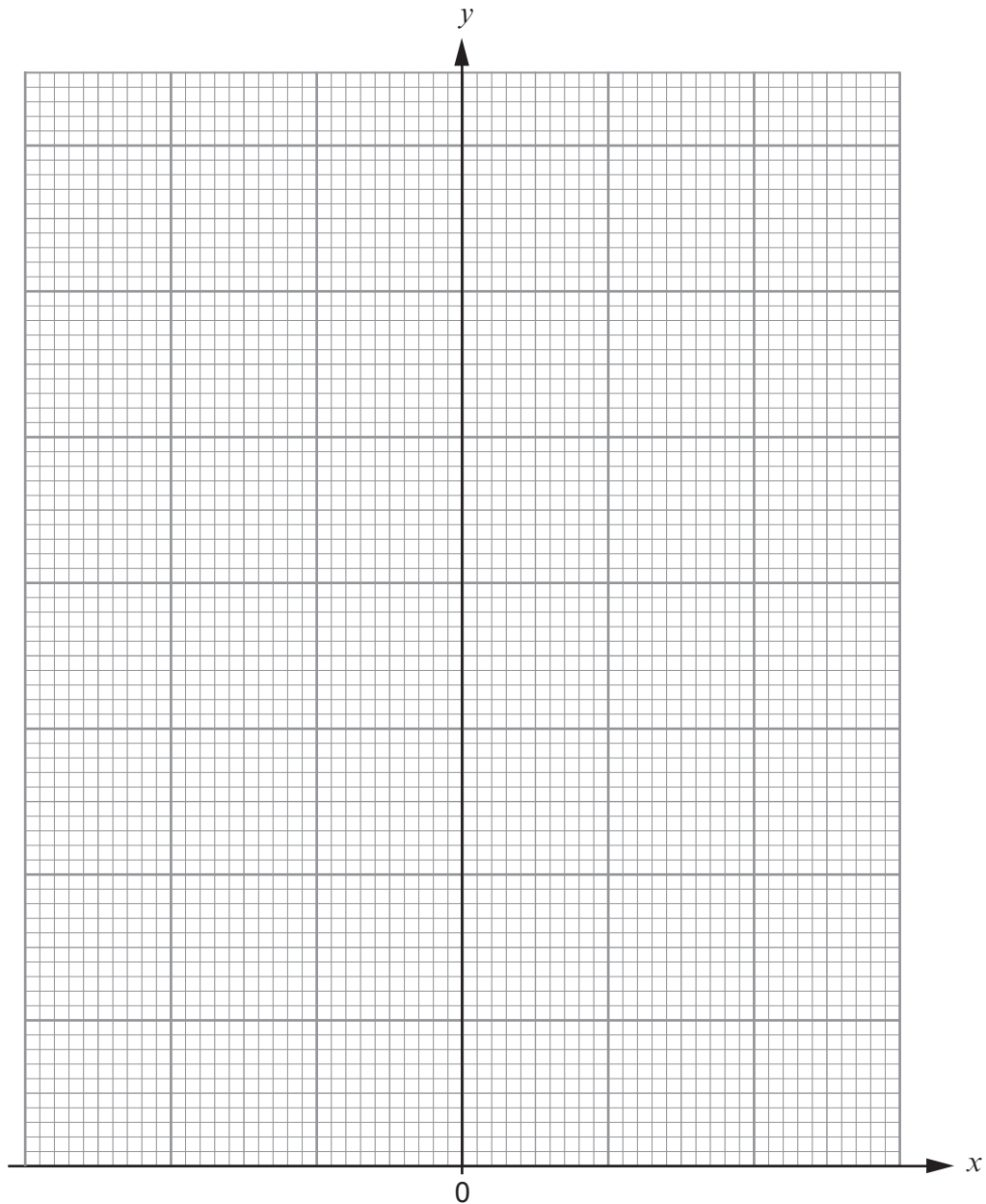...

(b) Using the graph paper below, draw the graph of $y = 3x^2 + 2$ for values of x between -2 and 2. [3]

(c) Write down the coordinates of the point on $y = 3x^2 + 2$ where the gradient of the curve is zero. [1]

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

(d) When the line $y = 2x + 5$ is drawn between $x = -2$ and $x = 2$, it intersects the curve $y = 3x^2 + 2$ at two points.
Use your graph to find the coordinates of the points of intersection. [3]

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Points of intersection at (..................... , ...) and (..................... , ...)

9. *(a)* A fair dice is thrown twice.

The score is noted each time the dice is thrown.
Calculate the probability of getting at least one six. [3]

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(b) Carwyn has bought a 10-sided dice.

Carwyn was not sure if the dice was a fair dice.
He carried out an experiment.
He recorded the number of sixes he threw in every 10 throws of the dice.

Number of throws	10	10	10	10	10	10	10	10	10	10
Number of sixes	4	3	2	3	2	4	2	4	3	2

He decided to create a table to show the cumulative number of sixes thrown, to calculate the relative frequencies.

Number of throws	10	20	30	40	50	60	70	80	90	100
Number of sixes thrown	4	7	9	12	14	18	20			
Relative frequency of throwing a six	$\frac{4}{10}$	$\frac{7}{20}$	$\frac{9}{30}$	$\frac{12}{40}$	$\frac{14}{50}$	$\frac{18}{60}$	$\frac{20}{70}$			
	0·4	0·35	0·3	0·3	0·28	0·3	0·29			

(i) Complete Carwyn's table opposite. [3]

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(ii) Draw a graph to illustrate the relative frequency of throwing a six on Carwyn's 10-sided dice. [2]

Relative frequency of
throwing a six
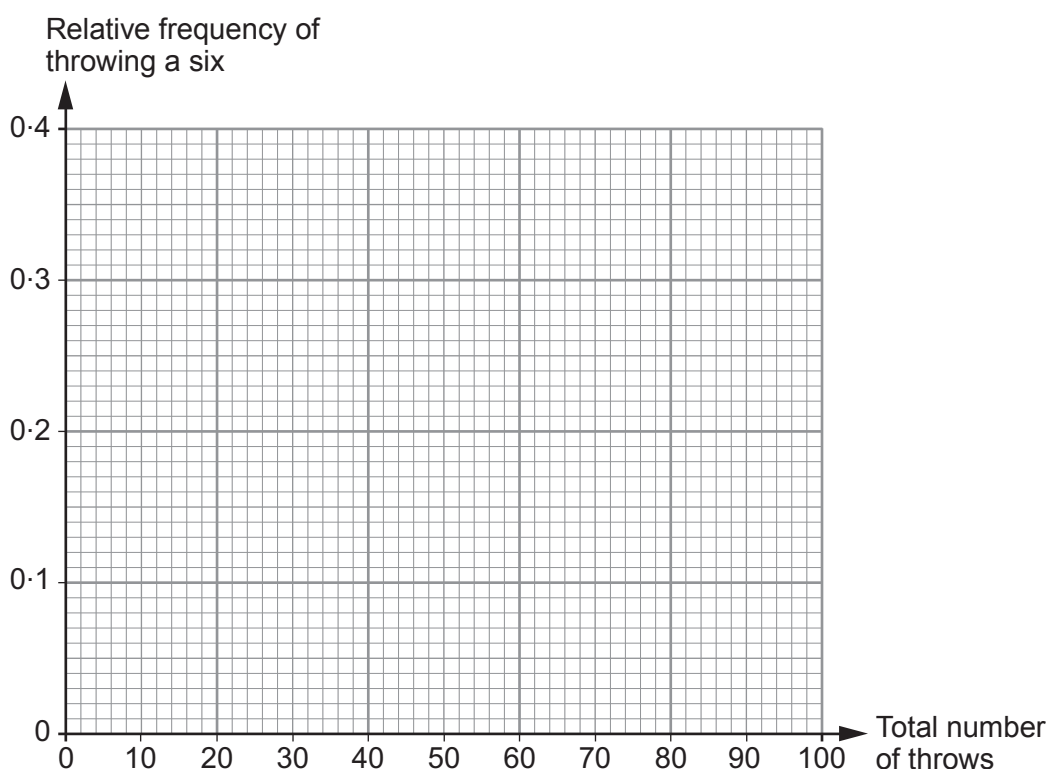
(iii) Using the above results, write down the best estimate for the probability of **not** obtaining a six on Carwyn's dice, giving a reason for your answer. [2]

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(iv) Carwyn says that the dice is not a fair dice.
Explain why Carwyn's statement could be true. [1]

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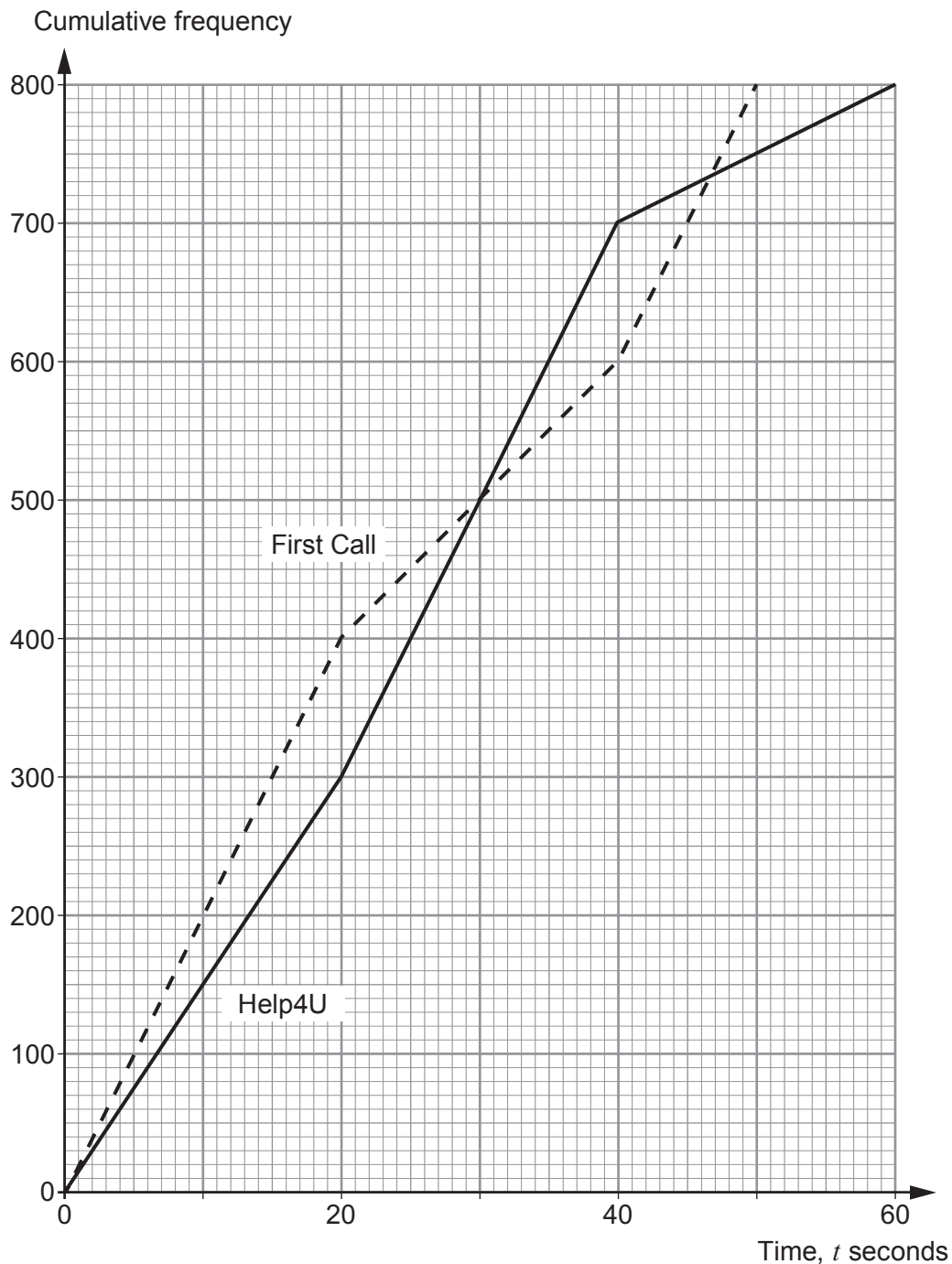
10. Help4U and First Call are two different telephone help lines.
Information was recorded for the first 800 callers of the day for each helpline.

The cumulative frequency diagram illustrates the time it took for these callers to get through to each of these helplines.

The solid line represents the data for the telephone helpline Help4U.
The dotted line represents the data for the telephone helpline First Call.

(a) How many of the 800 callers to First Call took less than 15 seconds to get through?   [1]

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(b) Help4U were set a target to answer 40% of all calls in less than 25 seconds.
They actually met the target with these 800 calls.
By how many seconds did they beat their target? [3]

(c) Which of the two companies had the lower median time and by how many seconds? [2]

(d) Calculate the interquartile range of the times for each company. [3]

First Call

Help4U

(e) One of these companies was given an award for the speed of answering the telephone.
Which company do you think won the award?
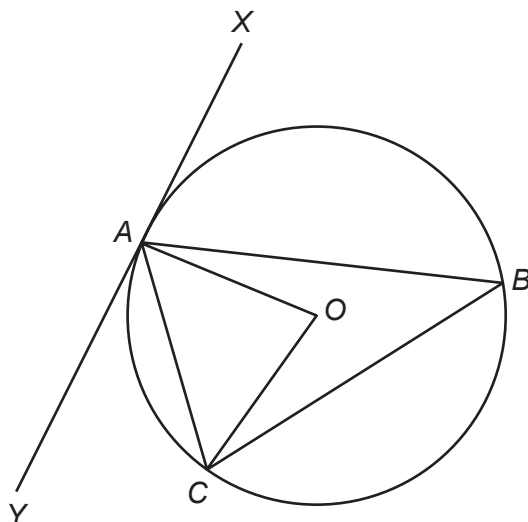You **must** give a reason for your answer. [1]

11. The diagram shows a circle with centre *O*.
The three points *A*, *B* and *C* lie on the circumference of the circle.
The tangent *XAY* touches the circle at *A*.

Diagram not drawn to scale

Given that $A\hat{O}C = 6x°$, find an expression for $Y\hat{A}C$ in terms of x.
You must give a reason for each stage of your working.
Express your answer in its simplest form. [3]

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12. Write each of the following in its simplest form.

(a) $\sqrt{50}$ [1]

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(b) $\sqrt{40} \times \sqrt{20}$ [3]

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(c) $\left(3 + 2\sqrt{5}\right)\left(2 - \sqrt{5}\right)$ [3]

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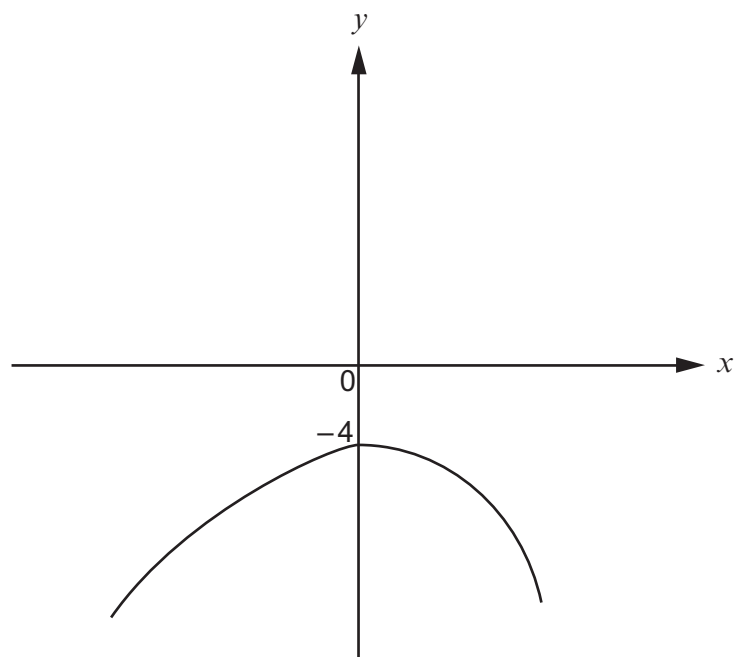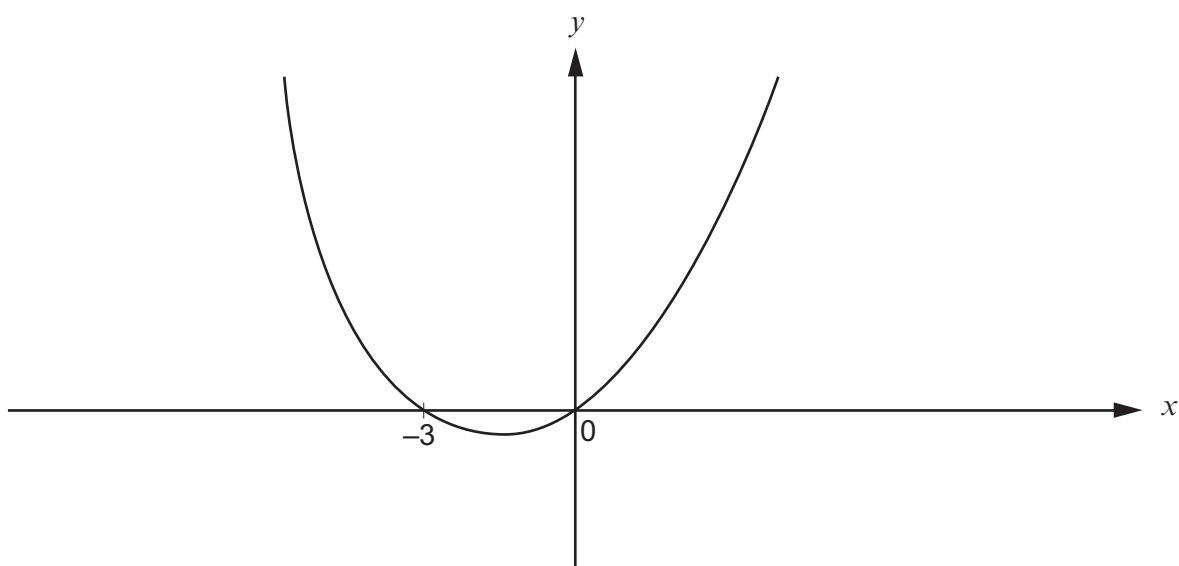
13. *(a)* The diagram shows a sketch of $y = f(x)$.
On the same diagram, sketch the curve $y = -f(x)$.
Mark clearly the coordinates of any point where this curve crosses an axis. [2]

(b) The diagram shows a sketch of $y = g(x + 2)$.
On the same diagram, sketch the curve $y = g(x - 4)$.
Mark clearly the coordinates of the points where this curve crosses the x-axis. [3]

14. Express the following as a single fraction in its simplest form. [5]

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

15.

A	sin46°

B	sin146°

C	sin134°

D	sin314°

E	sin44°

F	sin316°

G	sin224°

H	sin136°

Sallie and Bethan are playing a game by matching cards of equal value.

Sallie matches card A with card D.
Bethan matches card E with card H.

Who is correct?
You must sketch a graph to explain your answer. [3]

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Space for sketch:

END OF PAPER