WJEC CBAC

GCSE LINKED PAIR PILOT

4364/02

METHODS OF MATHEMATICS
UNIT 2: Methods (Calculator)
HIGHER TIER

A.M. MONDAY, 20 January 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.

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 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 **6**.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	6	
2.	2	
3.	5	
4.	3	
5.	9	
6.	7	
7.	4	
8.	4	
9.	6	
10.	5	
11.	6	
12.	4	
13.	3	
14.	5	
15.	2	
16.	7	
17.	6	
18.	5	
19.	4	
20.	7	
Total	**100**	

Formula List

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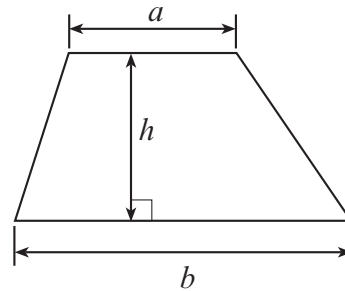
Volume of prism = area of cross-section × length
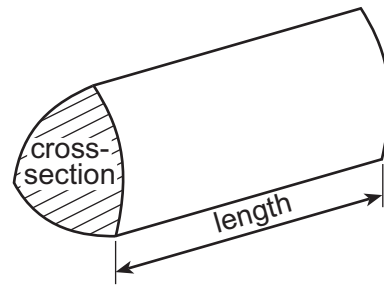
Volume of sphere $= \frac{4}{3}\pi r^3$

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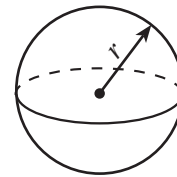
Volume of cone $= \frac{1}{3}\pi r^2 h$

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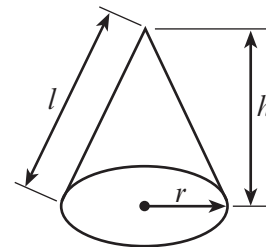
In any triangle ABC

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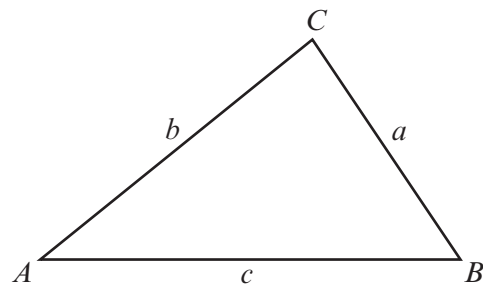
The Quadratic Equation

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. *(a)* Solve $11 = \dfrac{220}{x}$. [1]

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(b) Solve $3(4x - 13) = 45$. [3]

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(c) Solve $\dfrac{x + 4}{12} = 6$. [2]

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2. Find the value of $\sqrt{\dfrac{3}{4 \cdot 2^2 - 3}}$, giving your answer correct to two decimal places. [2]

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3. *(a)* Complete the following table. [3]

Quadrilateral	Number of lines of symmetry	Order of rotational symmetry
Kite		
Parallelogram		
Rhombus		

(b) The area of a circle is $36\pi\,cm^2$.
What is the radius of this circle? [2]

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4. Abbie, Beatrice, Catrin and Debbie all sat the same test.

Name	Test results
Abbie	23 out of 84 marks awarded
Beatrice	Scored approximately 31%
Catrin	Total given was $\frac{1}{3}$ of marks available
Debbie	$\frac{27}{84}$

Compare their test results and complete the table below.
You must show all your working. [3]

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Position	Name
First 1st	....
Second 2nd	....
Third 3rd	....
Fourth 4th	....

5. *(a)* An amount of money is shared by three people in the ratio 2 : 5 : 8.
What fraction of this money is given to the person who receives the smallest share?   [2]

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(b) Percentage change can be calculated by using multipliers.

A final answer is calculated as follows:

- £400 is increased by 26%

- The increased answer is then decreased by 24%

- This gives the final answer

The calculation to work out the final answer can be expressed, using multipliers, as the **product of three numbers**.
Complete the statement below.   [2]

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Final answer = £400 × .... × ....

(c) Water flows from a hose pipe at a steady rate into a water tank.

It takes $1\frac{1}{4}$ hours to fill a cylindrical water tank that is 25 cm tall.

25 cm
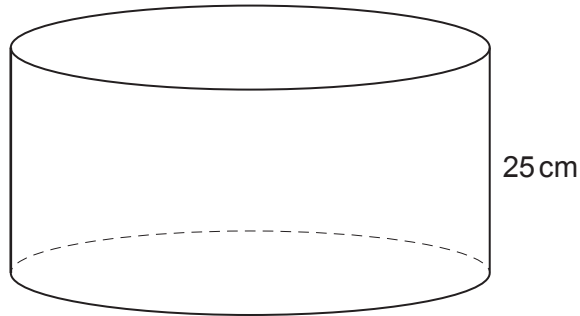
Diagram not drawn to scale

(i) Calculate the time it takes to fill $\frac{2}{5}$ of the tank. [2]

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(ii) What depth is the water in the tank after 20 minutes?
Give your answer correct to 3 significant figures. [3]

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6. *You will be assessed on the quality of your written communication in this question.*

$2x$ cm

$(x - 6)$ cm

$(x - 8)$ cm

$(2x + 8)$ cm

Diagram not drawn to scale

The **perimeter** of the trapezium is 132 cm.

Calculate the height of the trapezium.
You must show all your working. [7]

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7. *(a)* The number b is double the number c.
Use this information to write an equation in terms of b and c. [1]

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(b) When five times a whole number n is added to seven, the total is less than fifty-two.
Write down an inequality which is satisfied by n and rearrange it in the form $n < a$
where a is a whole number. [3]

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8. *(a)* Rotate the rectangle through 90° clockwise about the origin. [2]
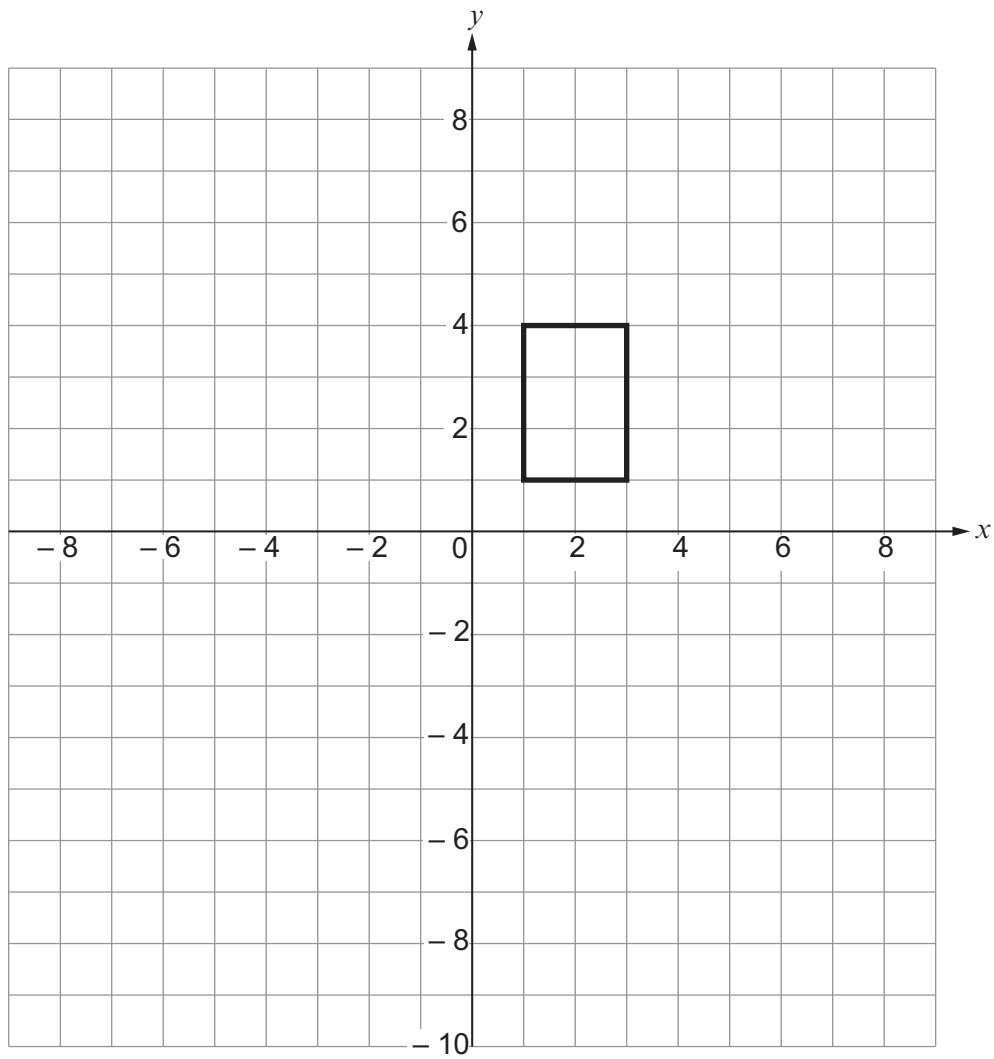
(b) Enlarge the rectangle by a scale factor of -2 using the origin as the centre of enlargement. [2]

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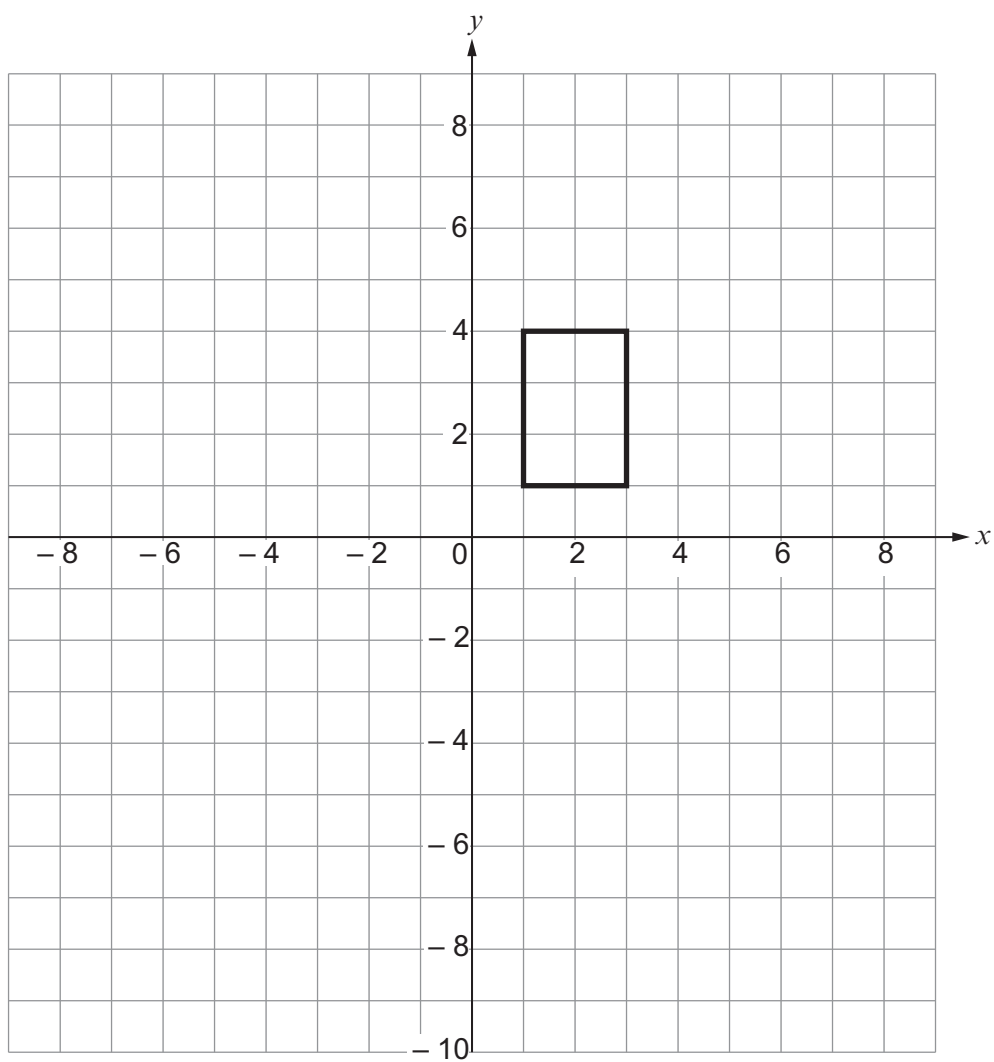
9. *(a)* Calculate the perimeter of a semi-circle with a diameter of 6·2 cm. [3]
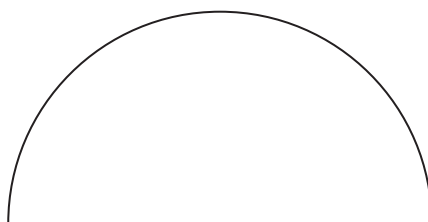
Diagram not drawn to scale

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(b) Calculate the volume of a cylinder radius 4·5 cm and height 10·3 cm.
State the units of your answer. [3]

Diagram not drawn to scale

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Examiner only

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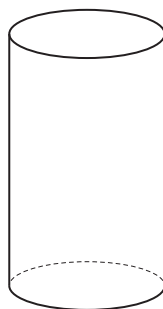
10. The diagram shows a right-angled triangle.

2·3 cm

4·6 cm
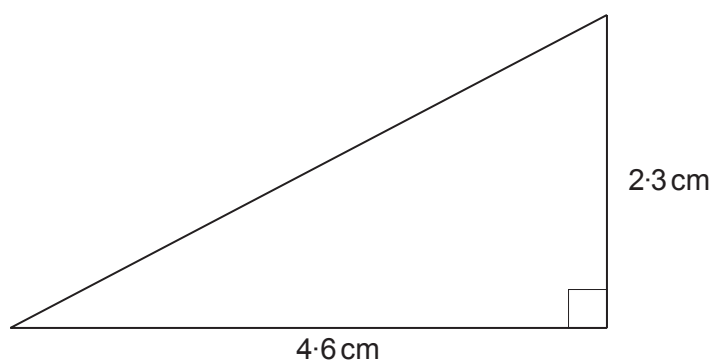
Diagram not drawn to scale

(a) Calculate the area of the right-angled triangle. [2]

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(b) Calculate the length of the hypotenuse. [3]

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11. Solve the following equations.
Give **both** your answers in **standard form** correct to **2 significant figures**.

(a) $\dfrac{x}{3 \cdot 4 \times 10^{-2}} = 4 \cdot 5 \times 10^{6}$ [3]

(b) $y + 5 \cdot 5 \times 10^{6} = 1 \cdot 2 \times 10^{8}$ [3]

12. Triangles *ABC* and *PQR* are similar.
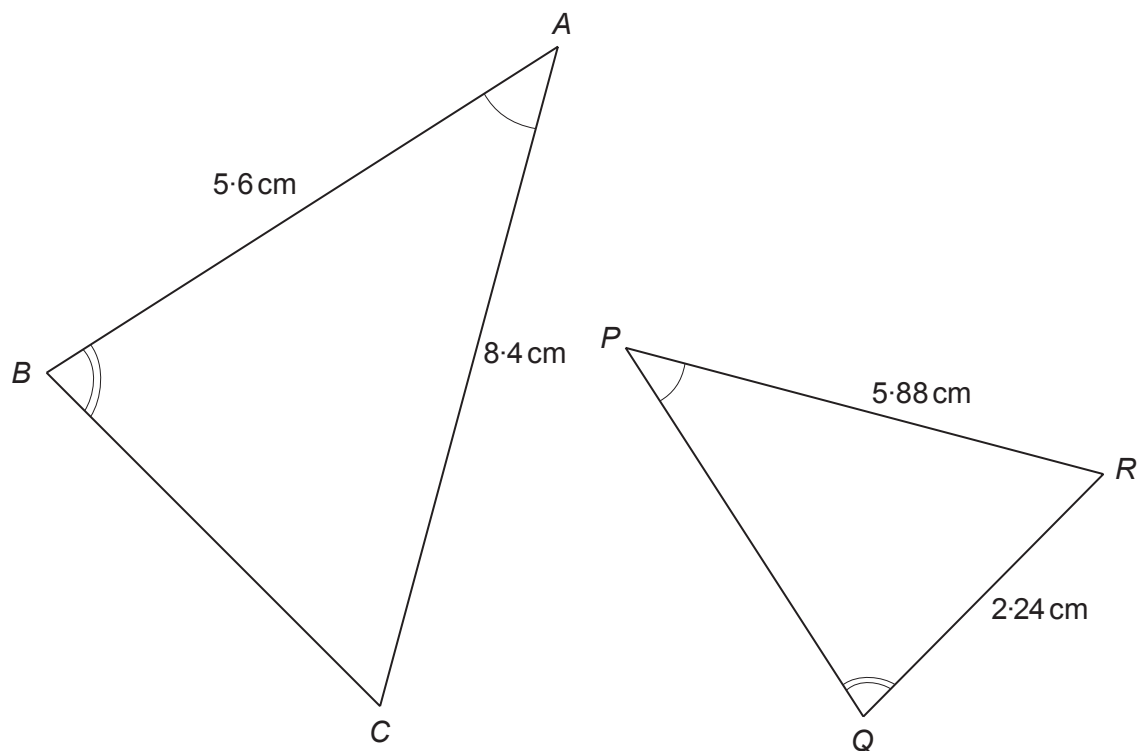
Diagrams not drawn to scale

Showing all your working, calculate the length of the following sides.

(a) PQ [2]

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(b) BC [2]

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13. The two triangles drawn below are not drawn to scale.
Thomas says the triangles are similar but not necessarily congruent.
Is Thomas correct or not?
Explain your answer. [3]

72°   68°

72°   40°

Diagrams not drawn to scale

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14. Use an algebraic method to solve the following simultaneous equations. [5]

$$3x + 2y = 1 \quad \text{and} \quad 2x = 5(y - 10)$$
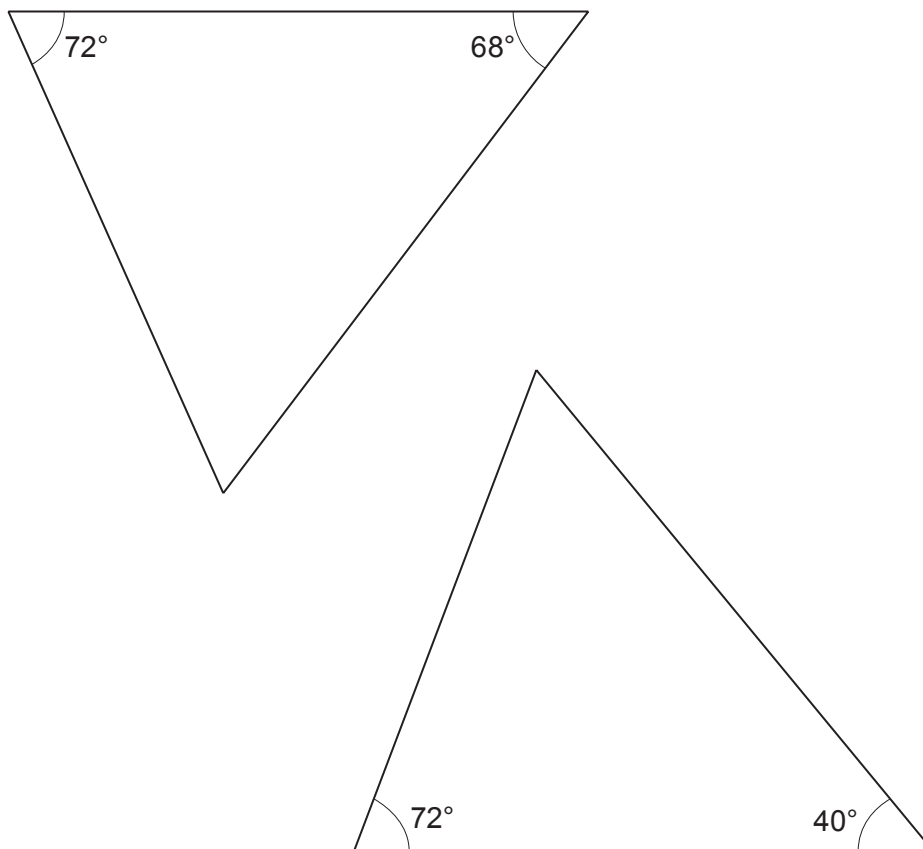
15. Vectors **OA** and **OB** are shown in the diagram below.
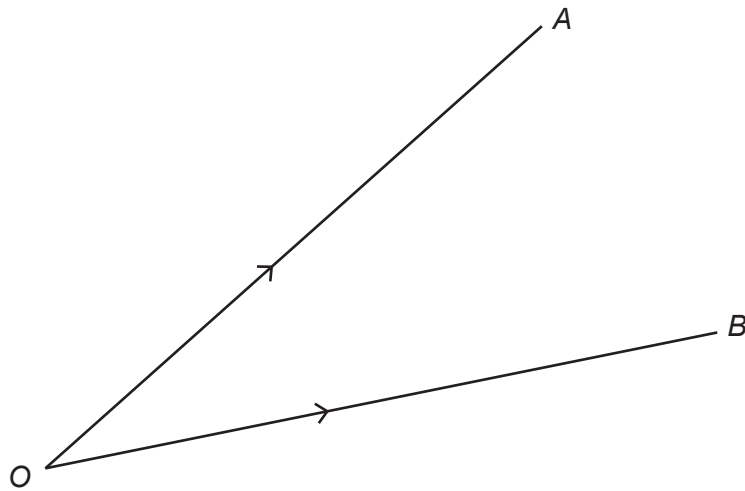
Diagram not drawn to scale

Given that **OA** $= 3\mathbf{x} + 7\mathbf{y}$ and **OB** $= 4\mathbf{x} + 2\mathbf{y}$, express **AB** in terms of $\mathbf{x}$ and $\mathbf{y}$ in its simplest form. [2]

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16. Results of an experiment have demonstrated that there is a relationship between two variables, f and g.
It has been shown that f is inversely proportional to the square of g.

(a) Which one of the following statements best describes the results of this experiment?
You must explain your answer. [2]

Statement A: 'As g increases f increases at an even faster rate.'
Statement B: 'As g reduces, f also reduces.'
Statement C: 'As g increases, f decreases.'
Statement D: 'Variables f and g both change at the same rate.'

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(b) It was found that when f = 4, g = 5.
Write down an equation, in terms of f and g, expressing the relationship found in the experiment. [3]

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(c) Use the equation to complete the following table. [2]

g	$\frac{1}{2}$	5	....
f	....	4	0·01

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17. The diagram below shows a cuboid with $B\hat{C}D = 15°$.

Diagram not drawn to scale

Calculate the size of $A\hat{C}B$. [6]

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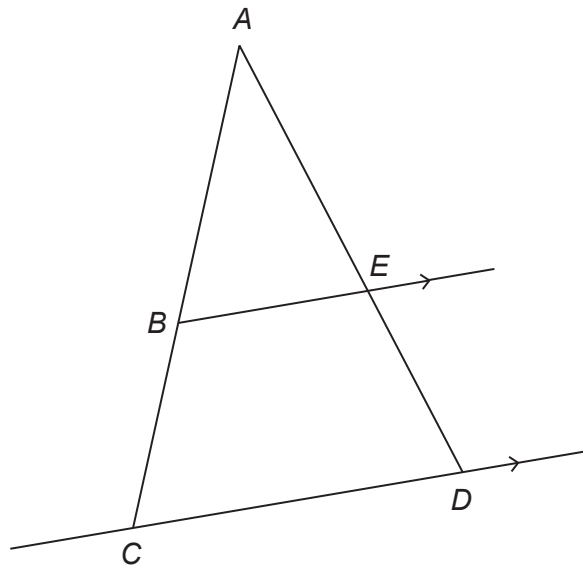
18.

Diagram not drawn to scale

In the diagram above $AE = x$ cm, $ED = y$ cm and $AB = z$ cm.
Starting with the relationship between AB and AC, **prove** that BC can be expressed in terms of x, y and z.
Hence, find an expression for BC in its simplest form. [5]

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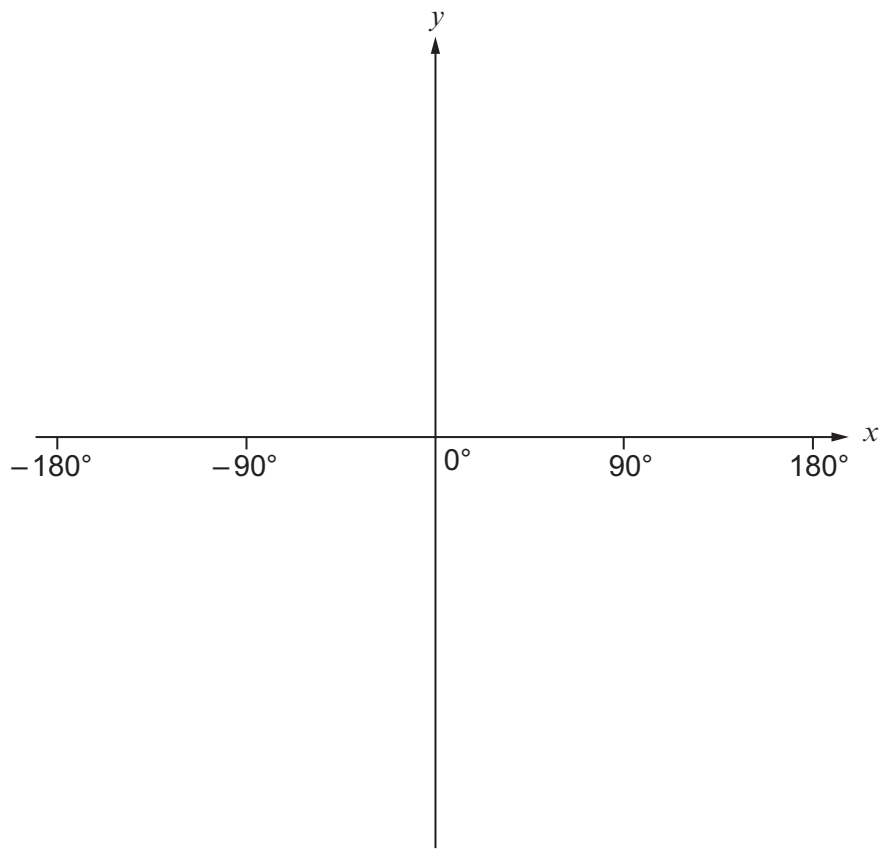
19. Use the axes below to sketch the following graphs.
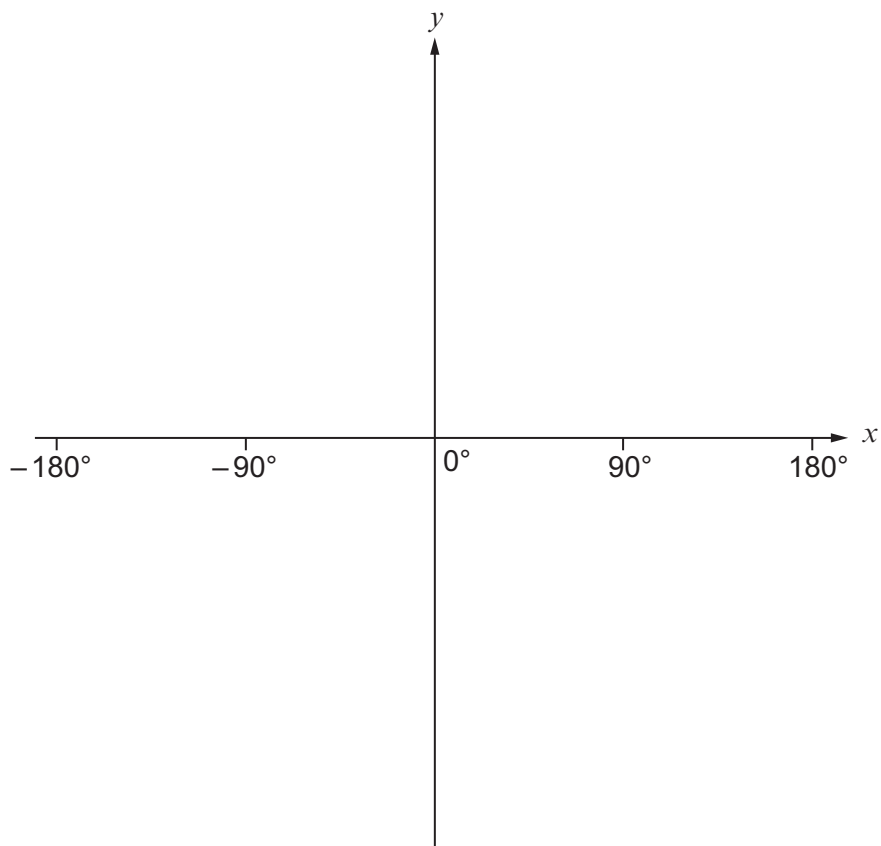You must indicate any additional important values on the axes.

[2]

$y = \cos x$

y

$-180°$ $-90°$ $0°$ $90°$ $180°$ x

$y = \tan x$

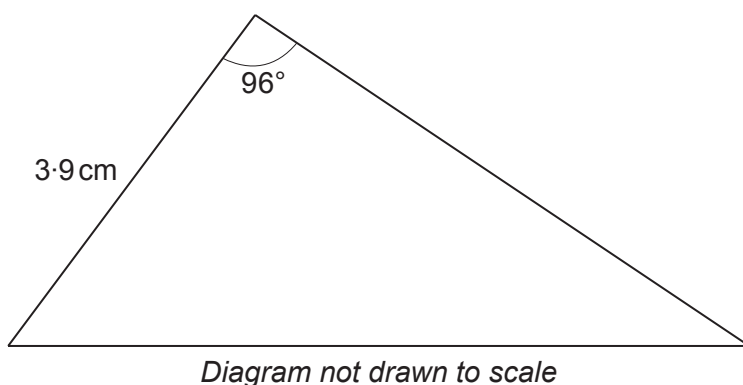[2]

y

$-180°$ $-90°$ $0°$ $90°$ $180°$ x

20.

Diagram not drawn to scale

The area of the triangle shown above is 22·8 cm².
Calculate the length of the longest side of the triangle.

[7]

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END OF PAPER