

Surname	Centre Number	Candidate Number
Other Names		0



GCSE LINKED PAIR PILOT

4364/02



W16-4364-02

METHODS IN MATHEMATICS

UNIT 2: Methods (Calculator) HIGHER TIER

A.M. MONDAY, 18 January 2016

2 hours

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

ADDITIONAL MATERIALS

A calculator will be required 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 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.

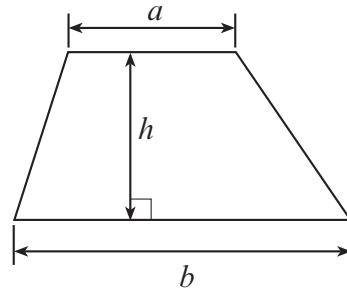
Scale drawing solutions will not be acceptable where you are asked to calculate.

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

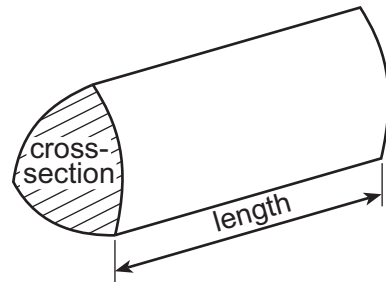
You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question 8.

Formula List

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

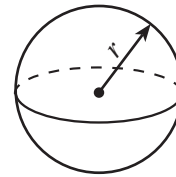


Volume of prism = area of cross-section \times length



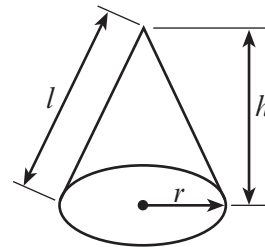
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

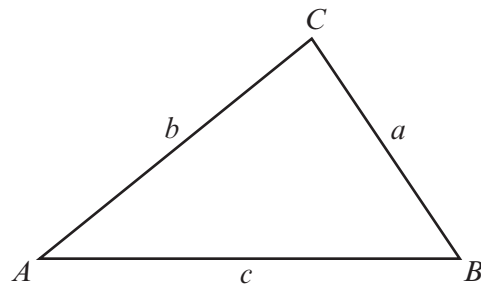


In any triangle ABC

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. (a) Solve $4(3x - 1) = 20$.

[3]

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(b) Solve $x + 14 = 6 + 3x$.

[3]

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(c) Express the following inequality in the form $x < n$, where n is a whole number.

[2]

$$\frac{x}{3} + 4 < 16$$

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2. (a) Water flows into a cylindrical tank at a constant rate.

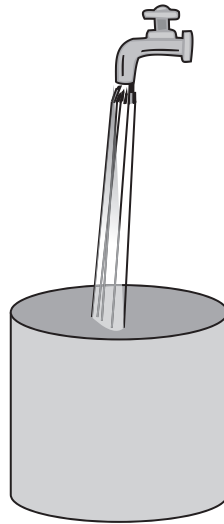


Diagram not drawn to scale

It took 36 minutes to fill the tank to a height of 40 cm.
How long did it take to fill to a height of 5 cm?

[2]

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- (b) The volume of a cuboid is 2400 cm^3 .
Its height is 100 cm.
The length of the rectangular base is **2 cm longer** than its width.

Calculate the length and width of the rectangular base of this cuboid.

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Length is cm

Width is cm

3. (a) Write 661.2 as a percentage of 870. [2]

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- (b) Find the value of $\frac{13 \cdot 4^2 - 2 \cdot 3^5}{7 \cdot 1^2 + \sqrt{5}}$, giving your answer correct to one decimal place. [2]

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- (c) Find the sum of $1\frac{2}{5}$ of 570 and $2\frac{3}{11}$ of 6204. [3]

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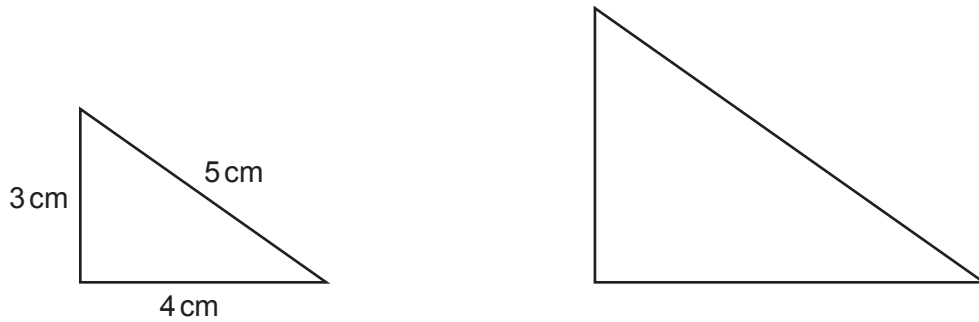
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4. These two right-angled triangles are similar.



Diagrams not drawn to scale

The lengths of the sides of the larger triangle are all 20% longer than the lengths of the corresponding sides of the smaller triangle.

- (a) Calculate the lengths of the sides of the larger triangle. [3]

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- (b) Calculate the areas of both of these triangles. [3]

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5. A long roll of wire is to be cut in the ratio 5 : 6 : 7.



Once it has been cut, explain why you cannot have $\frac{4}{9}$ of the roll as a single piece of wire.
You must show all your working.

[3]

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6. (a) Seven times a whole number, x , subtract twenty-six is greater than forty-four.
What is the least possible value of this whole number?

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- (b) The diagram shows a shape formed by joining a triangle to a square.

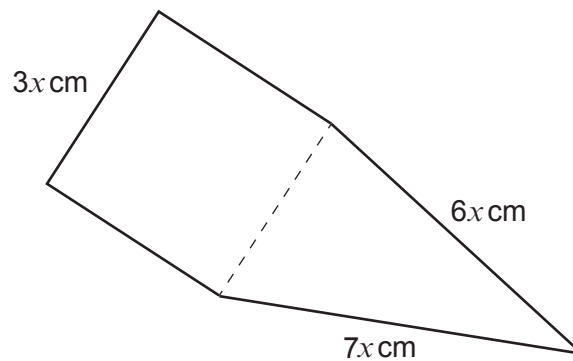


Diagram not drawn to scale

The perimeter of the shape is 1166 cm.

Write down an equation, in terms of x , for the perimeter of the shape.

Solve your equation and write down the length of one of the sides of the square.

[4]

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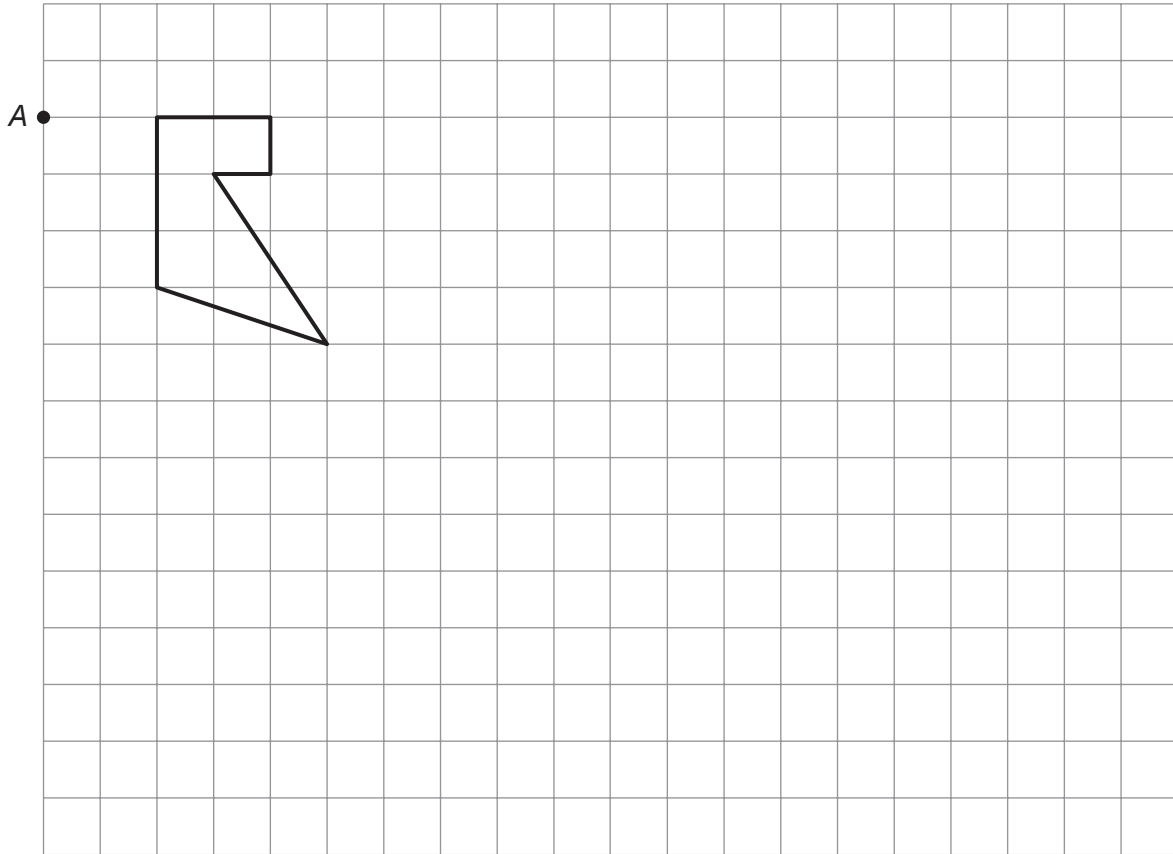
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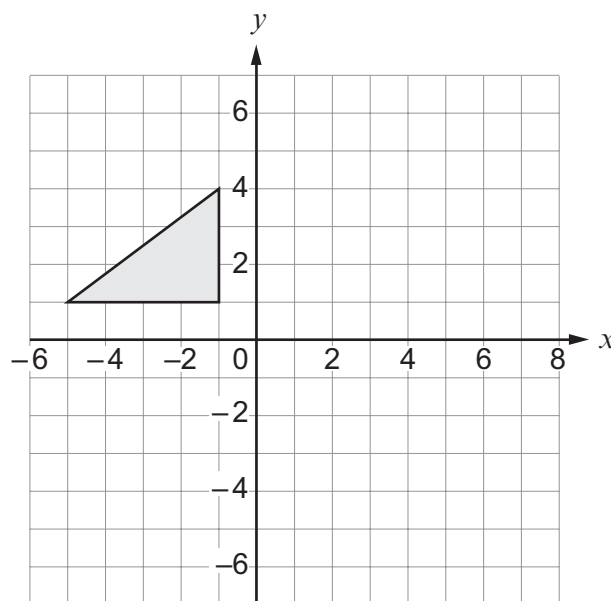
Length of a side of the square is cm

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

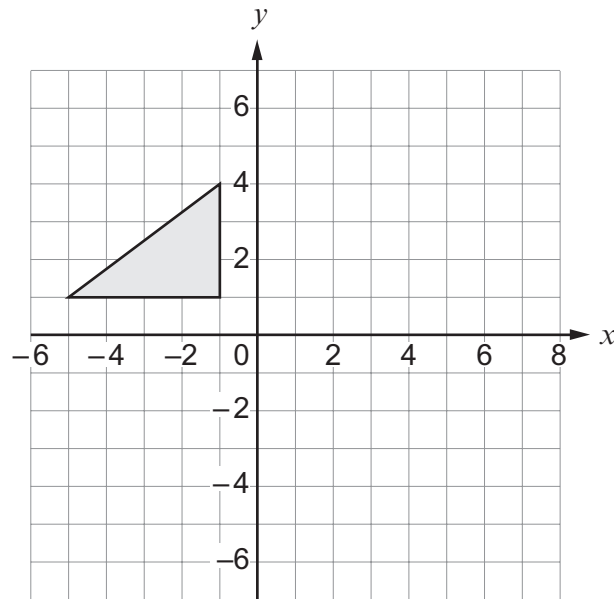


- (b) Reflect the triangle in the line $y = x$. [2]



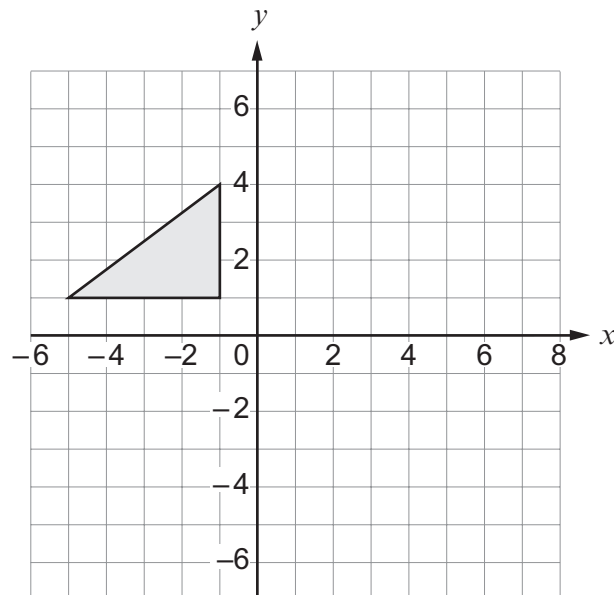
- (c) Translate the triangle shown below by $\begin{pmatrix} 2 \\ -1 \end{pmatrix}$.

[1] Examiners only



- (d) Rotate the triangle shown on the grid below through 90° clockwise about $(0, -1)$.

[2]



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

In May, a bag of potatoes cost £1.40.

From May to June, the price of a bag of potatoes increased by 15%.

From June to July, the price of a bag of potatoes decreased by 18%.

From July to August, the price of a bag of potatoes increased by 2%.

Calculate the price of a bag of potatoes in August.

You must show all your working.

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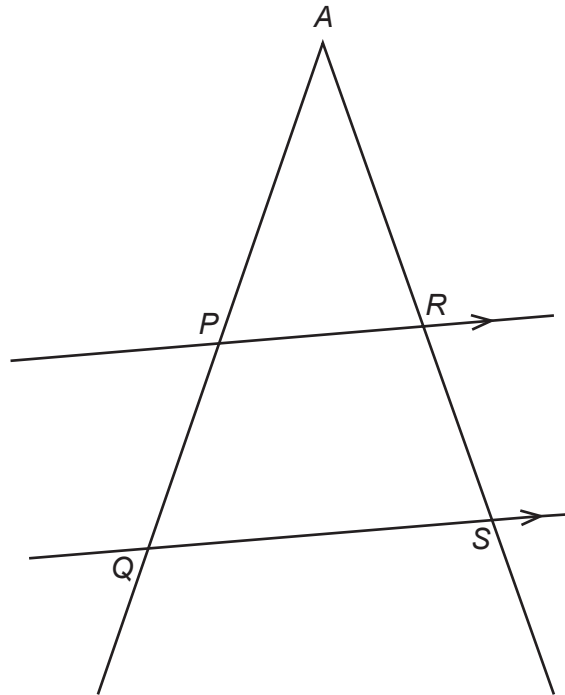


Diagram not drawn to scale

Given that $AP = PQ = 11$ cm and $AR = 14$ cm, calculate AS .

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10. The area of a circle is $169\pi \text{ cm}^2$.
Calculate the diameter of the circle.

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11. The diagram shows 2 rectangles.

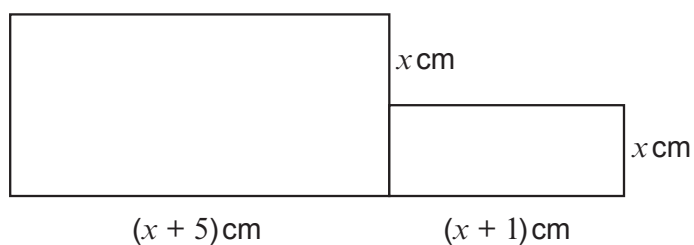


Diagram not drawn to scale

Prove that the total area of the two rectangles, in cm^2 , is given by:

[3]

$$3x^2 + 11x$$

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12. Evaluate $\frac{5.2 \times 10^{-6} + 4.5 \times 10^{-5}}{9.4 \times 10^{-11}}$.

Give your answer, in standard form, correct to 2 significant figures.

[2]

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13. The tetrahedron shown below has 4 faces.

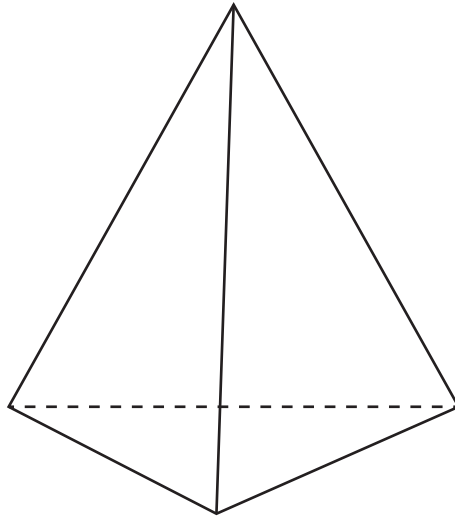


Diagram not drawn to scale

Each edge of this tetrahedron is 46 cm.
Calculate the total area of the 4 faces of the tetrahedron.
Give your answer correct to 4 significant figures.

[5]

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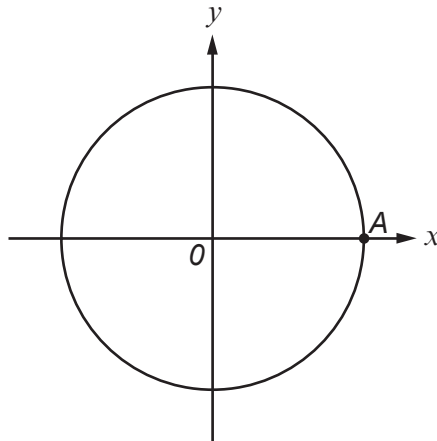
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14. (a) The equation of the circle shown below is $x^2 + y^2 = 49$.

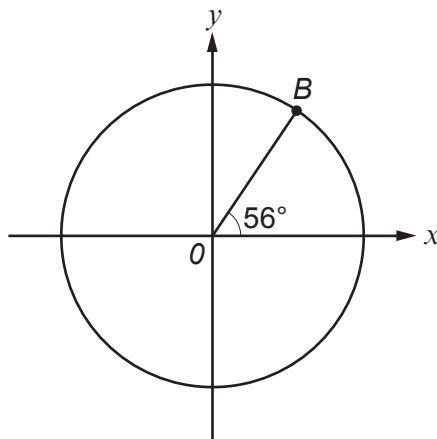


Write down the coordinates of the point A.

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- (b) The radius of the circle shown below is 9 units.



Calculate the x -coordinate of point B .

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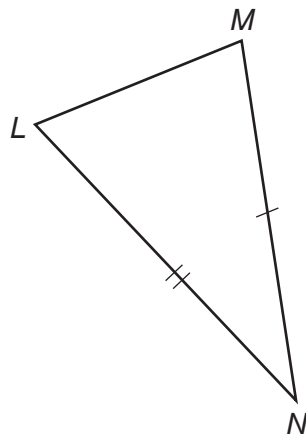
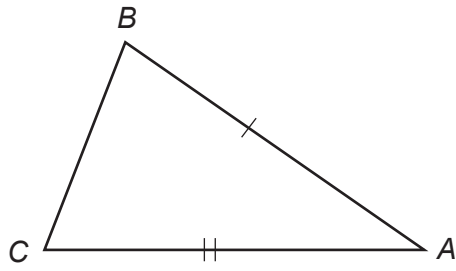
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x -coordinate of point B is

15.



Diagrams not drawn to scale

Ben has marked some information on the triangles.
 The two triangles are actually congruent.
 He now needs to indicate just one other fact on each of the triangles to show this is true.
 Write down one possibility for this other fact.

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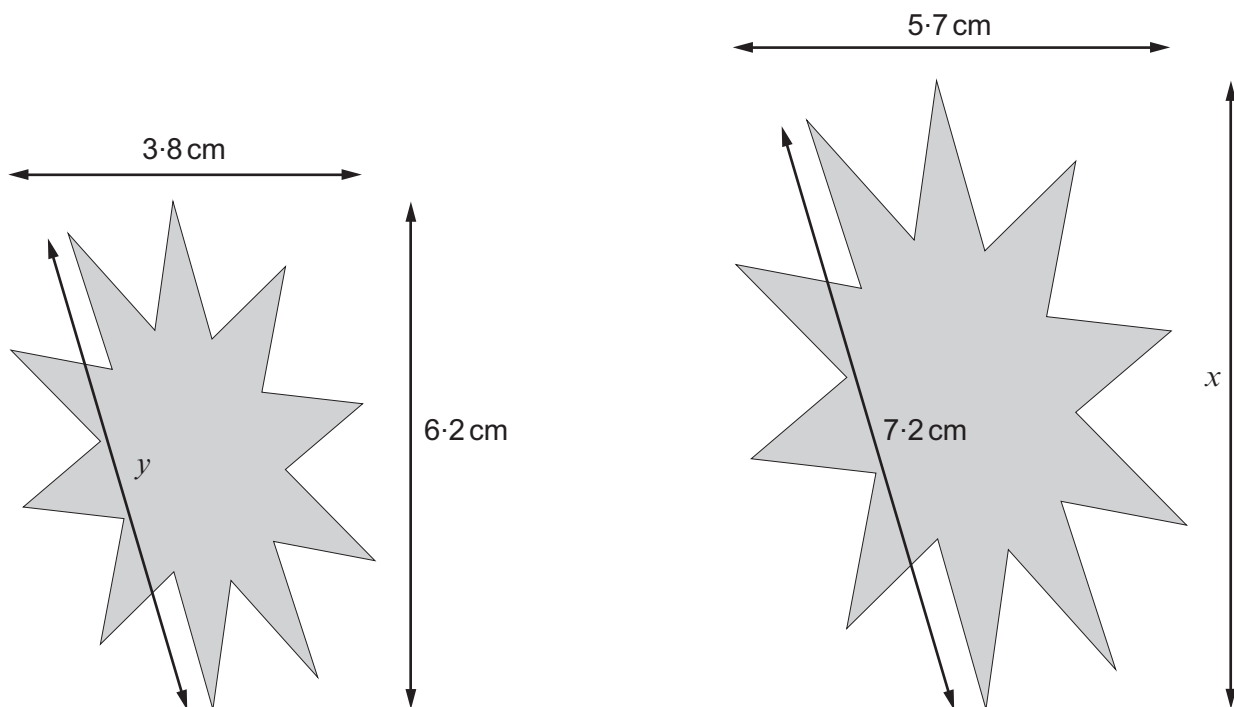
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16. The shapes shown below are similar.



Diagrams not drawn to scale

- (a) Find the lengths x and y .
Show all of your working.

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(b) The area of the smaller shape is 22 cm^2 .
Calculate the area of the larger shape.

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17. (a) Use the formula method to solve $2x^2 + 7x - 3 = 0$.
Give your answer correct to 2 decimal places.

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- (b) Solve the following simultaneous equations using an algebraic method.

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$$\begin{aligned} 2x^2 + xy &= -3 \\ x + y &= 4 \end{aligned}$$

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Labels:

$y = \sin x$

$y = -\sin x$

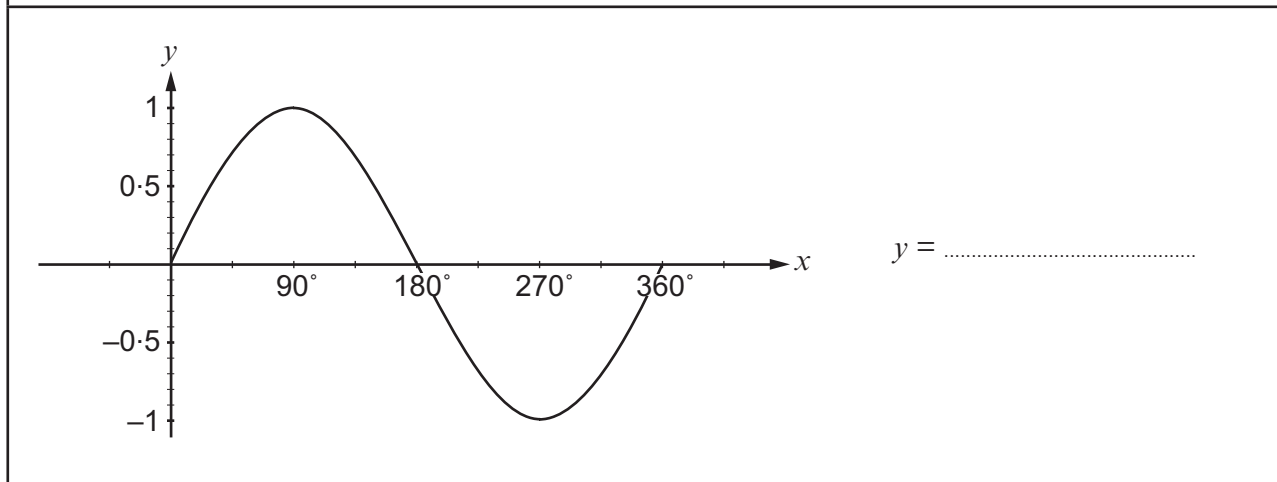
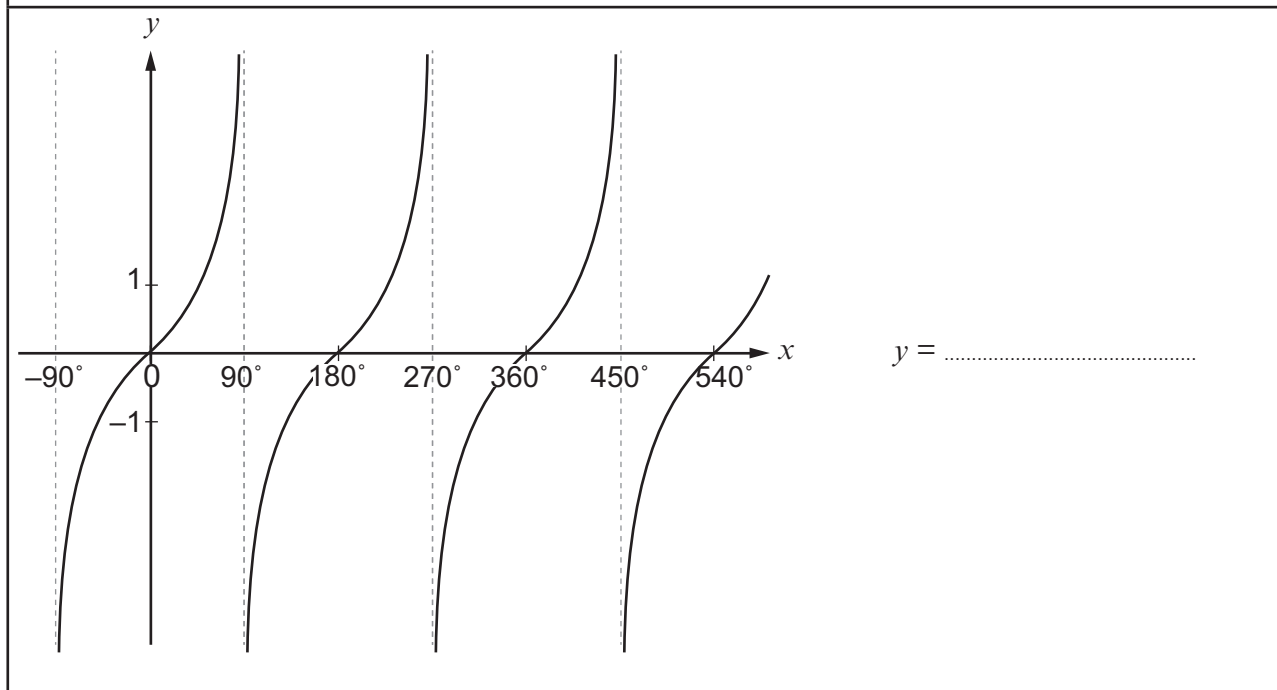
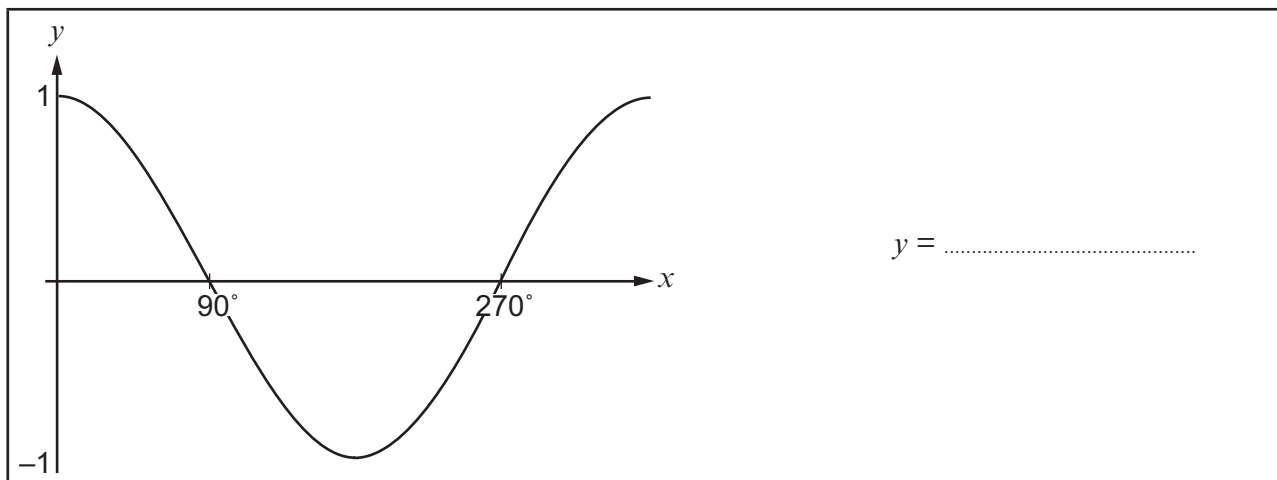
$y = -\cos x$

$y = \cos x$

$y = \tan x$

Insert the correct label, from the list given above, alongside each of the graphs below.

[1]



19. Vectors \mathbf{OM} , \mathbf{OL} and \mathbf{OK} are shown in the diagram below.

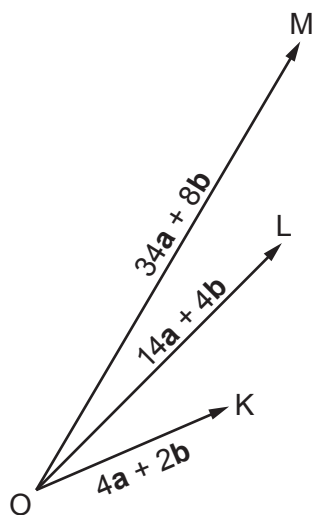


Diagram not drawn to scale

(a) Express \mathbf{KL} in terms of \mathbf{a} and \mathbf{b} in its simplest form.

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(b) Show that $\mathbf{KM} = p \times \mathbf{KL}$, where p is a constant value.
Also write down the value of p .

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(c) What does your answer to (b) tell you about **K**, **L** and **M**?

[1]

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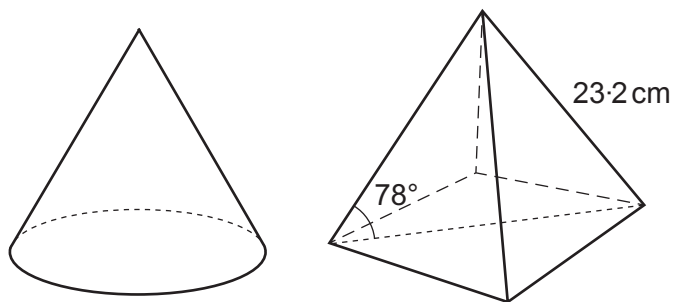
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20. The cone and the square-based pyramid shown below have equal heights and equal volumes.



Diagrams not drawn to scale

In the square-based pyramid, the angle between a diagonal of the base and one of the sloping edges is 78° , as shown in the diagram.

Calculate the radius of the cone.

You are given the following facts:

- Volume of a cone = $\frac{1}{3} \times$ area of the base \times perpendicular height
- Volume of a pyramid = $\frac{1}{3} \times$ area of the base \times perpendicular height

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