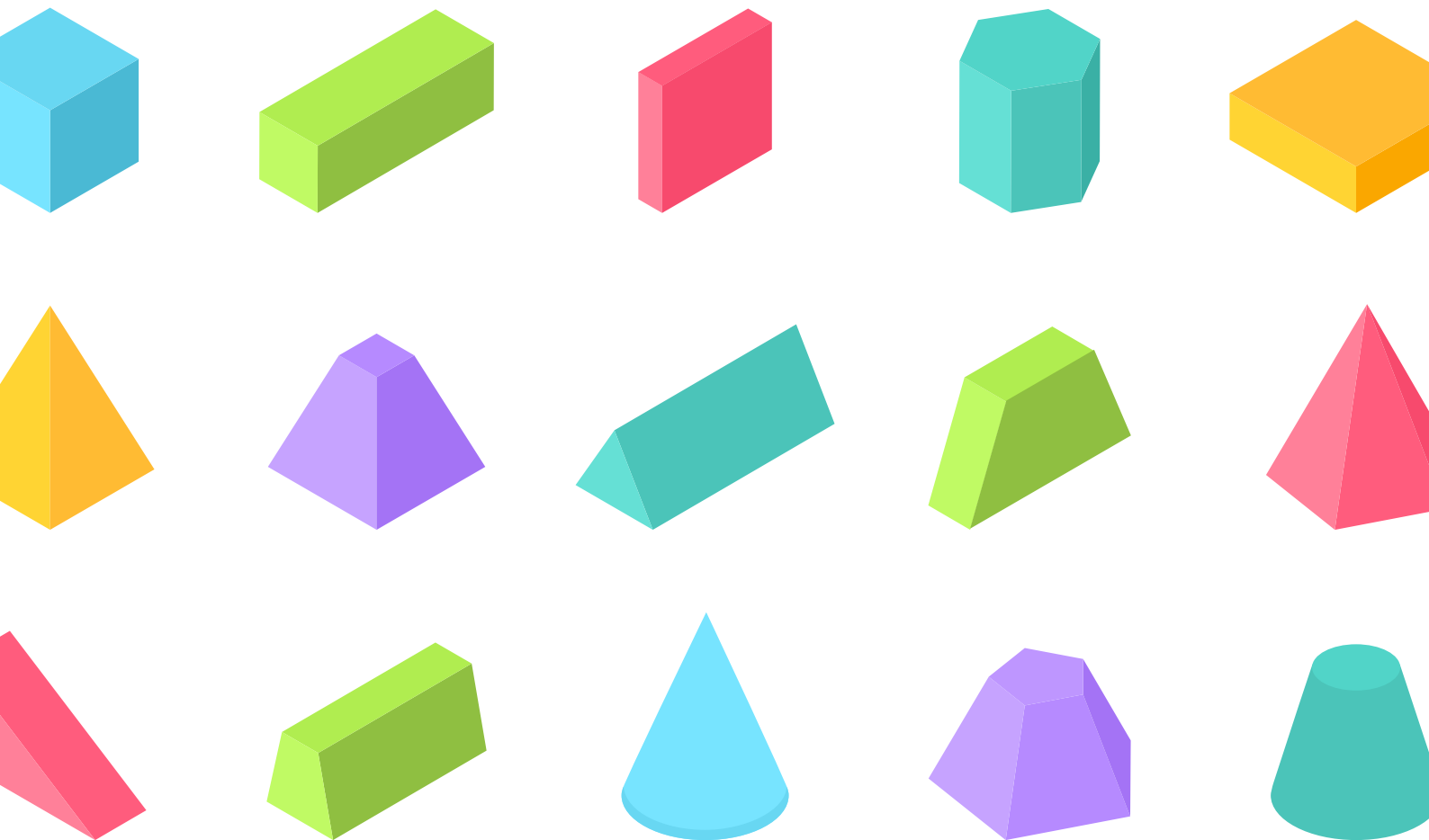


Eduqas GCSE Mathematics Higher Tier

Geometry and Measure Revision Booklet



The questions included in this booklet have been taken from past examination papers used in previous Eduqas examinations.



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Please note that any questions labelled as “Calculator” have been taken from an exam paper where the use of a calculator was allowed. This does not necessarily mean that a calculator is required to answer the question.

Properties of 2D / 3D Shapes: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
Total	2	

#1

The diagram shows a parallelogram, $ABCD$ and the diagonal AC .

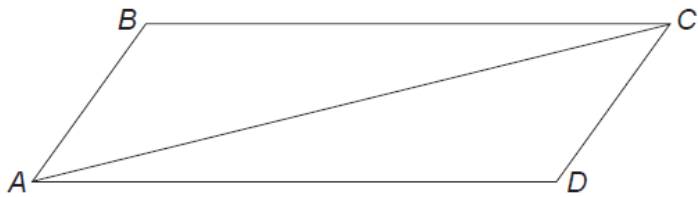


Diagram not drawn to scale

Tick (✓) the **two** correct statements.

[2]

$\angle ABC$ is not equal to $\angle CDA$	
$AB = DC$ and $AD = BC$ and AC is a side of both triangle ABC and triangle CDA	
Triangle ABC is similar to triangle CDA with enlargement scale factor 0.5	
Triangle ABC is not congruent to triangle CDA	
Triangle ABC is congruent to triangle CDA	
AB represents the shortest distance from B to AC	

Question taken from Eduqas examination paper 5300003, May 2022

Angles Properties: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	5	
Total	8	

#1

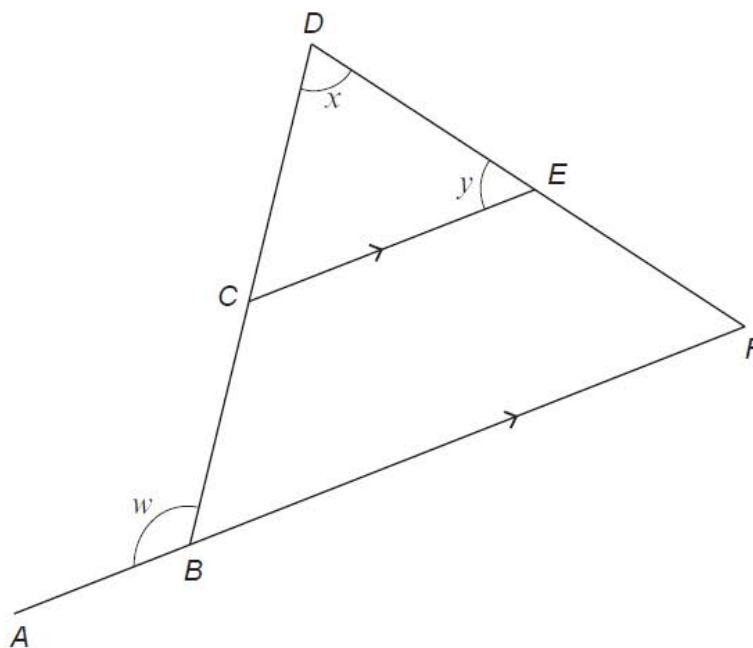


Diagram not drawn to scale

The diagram shows a triangle BDF .
The straight lines CE and ABF are parallel.

Prove that $w = x + y$.

Give a reason for each statement you make in your proof.

[3]

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Question taken from Eduqas examination paper 530003, June 2018

#2

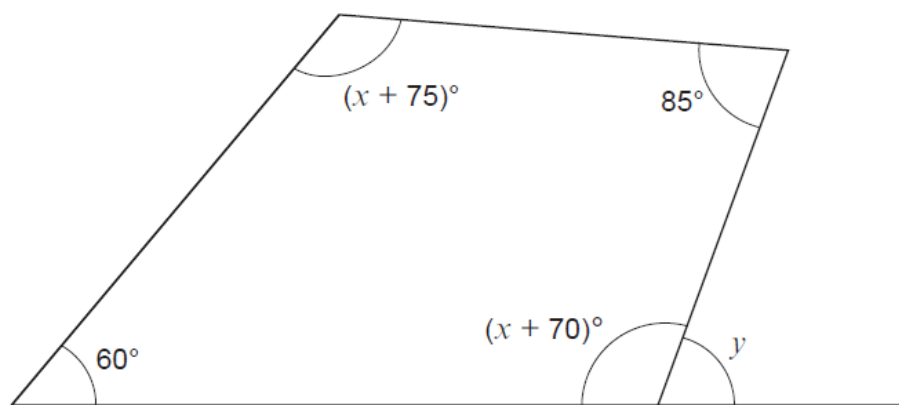


Diagram not drawn to scale

The diagram shows a quadrilateral.

Use algebra to find the size of the exterior angle y .

[5]

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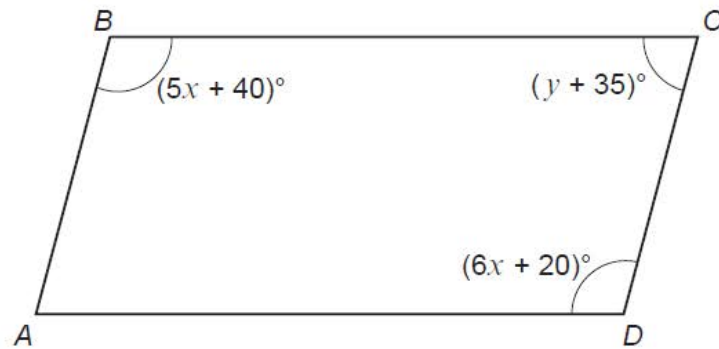
$$y = \text{.....}^\circ$$

Question taken from Eduqas examination paper 530003, May 2023

Angles Properties: Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
Total	5	

#1

 $ABCD$ is a parallelogram.*Diagram not drawn to scale*

Work out the value of x and the value of y .
You must show all your working.

[5]

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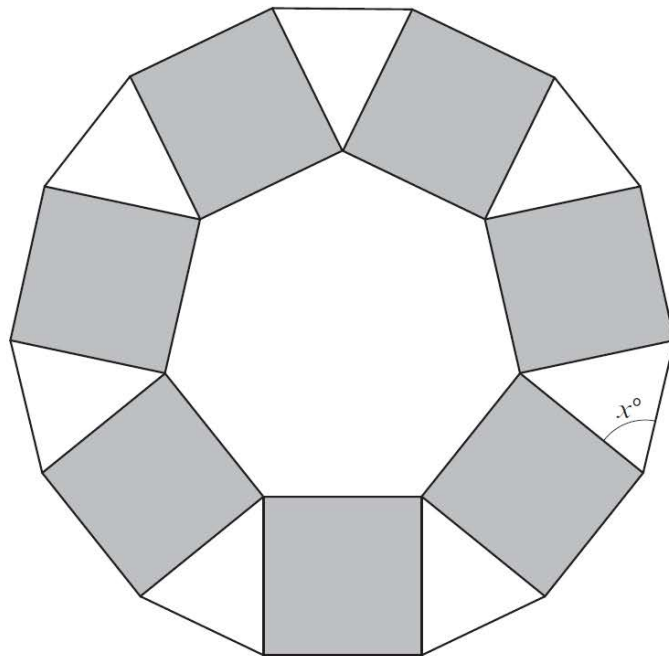
 $x = \dots\dots\dots y = \dots\dots\dots$

Question taken from Eduqas examination paper 530004, November 2020

Interior / Exterior Angles of Polygons: Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	6	
Total	10	

#1



This pattern is made from a regular seven-sided polygon surrounded by squares and isosceles triangles.

Show that the value of x is 64.3 correct to 1 decimal place.

[4]

You must show all your working.

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Question taken from Eduqas examination paper 530004, November 2020

#2

Ben draws an irregular pentagon.
The interior angles of the pentagon he has drawn are all less than 180° .

Ben attempts to express the interior angles of his pentagon using algebra. His expressions are

$$x^\circ, \quad (x + 40)^\circ, \quad (2x - 30)^\circ, \quad 3(x - 40)^\circ \quad \text{and} \quad 3x^\circ.$$

Show that Ben is incorrect.

[6]

Ben is incorrect because

Question taken from Eduqas examination paper 530004, June 2019

Perimeter / Area / Volume: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
#2	5	
#3	6	
Total	11	

#1

(b)

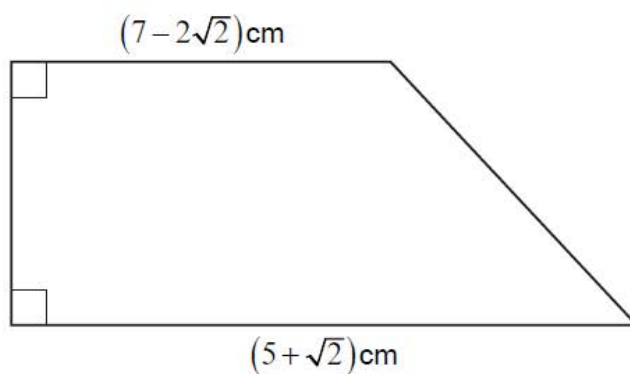


Diagram not drawn to scale

The area of this trapezium is $(6\sqrt{2} - 1)\text{ cm}^2$.

Find the height of the trapezium.
Give your answer in its simplest form.

[5]

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Question taken from Eduqas examination paper 530003, June 2019

#2

A small tank is a cuboid. It has a square base of side 20 cm. The tank contains some liquid but is not full.

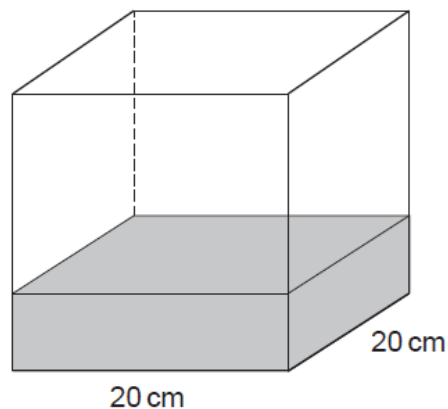


Diagram not drawn to scale

More of the same type of liquid is added to the tank:

- The total mass of the liquid in the tank is now 5400 grams.
- The depth of the liquid has increased by 50%.
- The density of the liquid is 0.9 g/cm^3 .

Calculate the **original** depth of the liquid.

You must show all your working.

[5]

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Question taken from Eduqas examination paper 530003, May 2023

#3

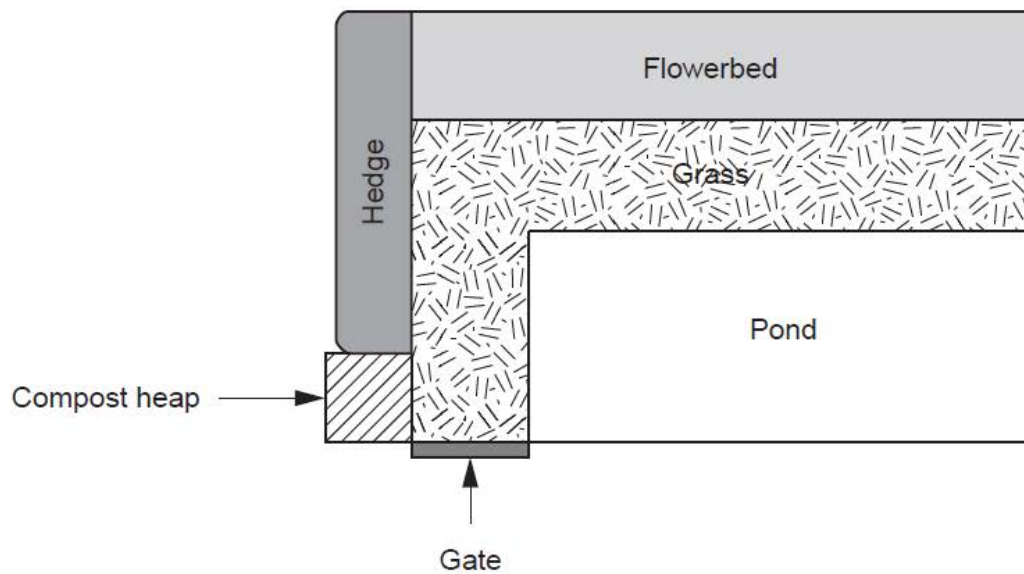


Diagram not drawn to scale

The diagram shows a garden which has:

- an L shaped area of grass,
- a rectangular flowerbed and pond,
- a square compost heap.

The length of each side of the compost heap is 1.2 m.

The ratio of the length of the compost heap to the length of the hedge is 2 : 11.

The length of the gate is 2 m.

The length of the gate is $\frac{1}{4}$ of the length of the pond.

The area of the pond is 28 m^2 .

The perimeter of the flowerbed is the same as the perimeter of the pond.

Find the area of the grass.

[6]

Handwriting practice area consisting of 20 horizontal dotted lines.

Question taken from Eduqas examination paper 5300003, November 2019

Perimeter / Area / Volume: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	5	
#3	9	
Total	17	

#1

- (b) The diagram shows a parallelogram.
It is the cross-section of a prism.

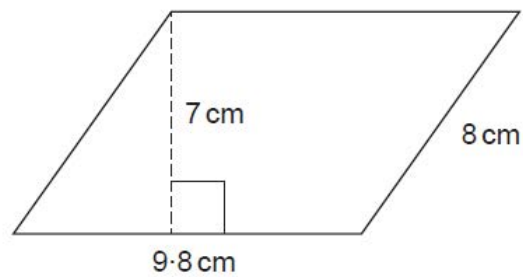


Diagram not drawn to scale

The length of the prism is 16 cm.
Find the volume of the prism.

[3]

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Question taken from Eduqas examination paper 530004, June 2023

#2

The **perimeter** of the rectangle shown below is 232.8 cm.

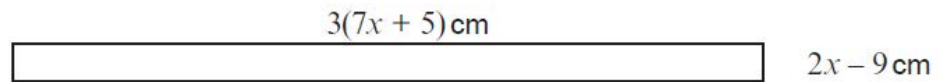


Diagram not drawn to scale

Form an equation in terms of x and solve it.
Hence find the dimensions of the rectangle.

[5]

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Length of the rectangle is cm

Width of the rectangle is cm

Question taken from Eduqas examination paper 530004, November 2018

#3

A square lawn has a side of length 8 m.

A builder is asked to make a path around the outside edge of the square lawn.

- (a) The plan was for a path of width y metres with all the edges of the path being straight.

Find an expression for the area of this path in terms of y .

Give your answer in its simplest form.

[4]

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- (b) Before the builder started, the plan was updated and the following agreed:
- at each corner of the lawn the path should be a quarter circle,
 - the width of the path is to be 1.5 m,
 - the path is to be made of 8 cm thick concrete.

Calculate the volume of the concrete needed for the path.

[5]

Question taken from Edugas examination paper 530004, November 2019

Constructions Using Ruler / Compass: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
#2	6	
Total	11	

#1

The scale diagram below shows a railway station P and two hilltops, A and B .
Two new stations are to be built at R and S .

- (a) Station R is to be
- no more than 6 km from P and
 - the same distance away from A as it is from B .

Using a ruler and a pair of compasses, show accurately on the diagram all the positions where station R may be built.

Scale: 1 cm represents 1 km.

[4]

A •

• B

P •

- (b) A train travelling between station R and station S will always be the same distance away from A as it is from B .
When the train arrives at station S , it will be as near as possible to hilltop A .

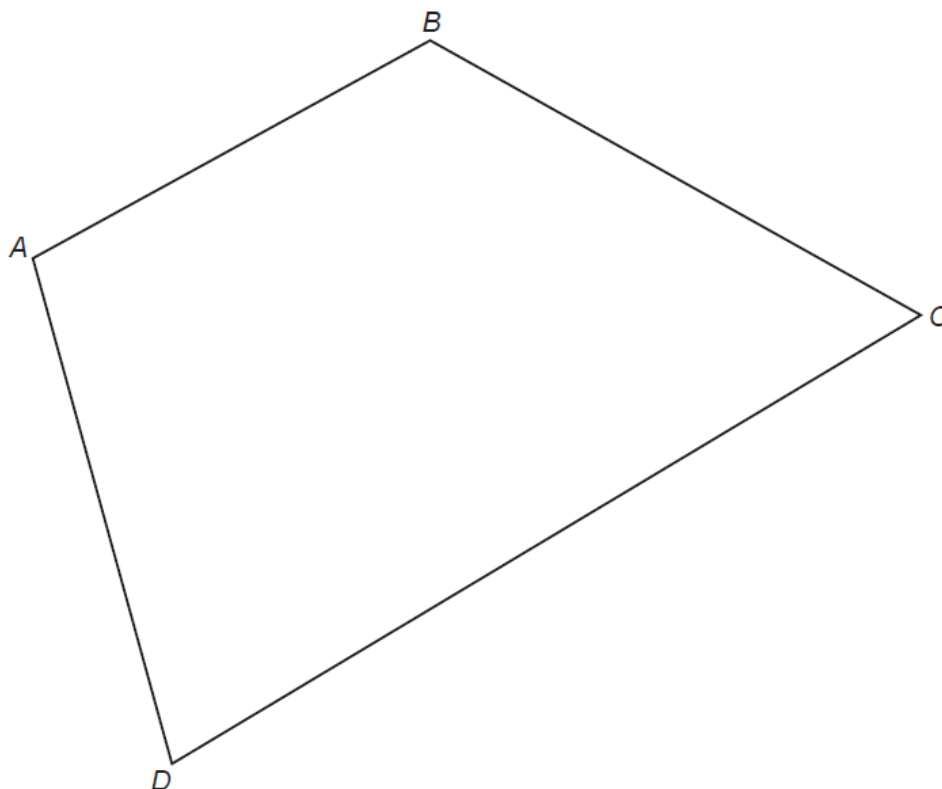
Mark the position of station S on the diagram in part (a).

[1]

Question taken from Eduqas examination paper 5300003, June 2018

#2

The diagram shows a quadrilateral, $ABCD$.



E is the point that is:

- equidistant from A and B ,
- equidistant from AD and DC .

(a) Show accurately the position of point E .
You must use a ruler and a pair of compasses to construct suitable arcs and lines. [5]

(b) EF is the shortest distance from E to AB .

Mark the position of point F on the diagram. [1]

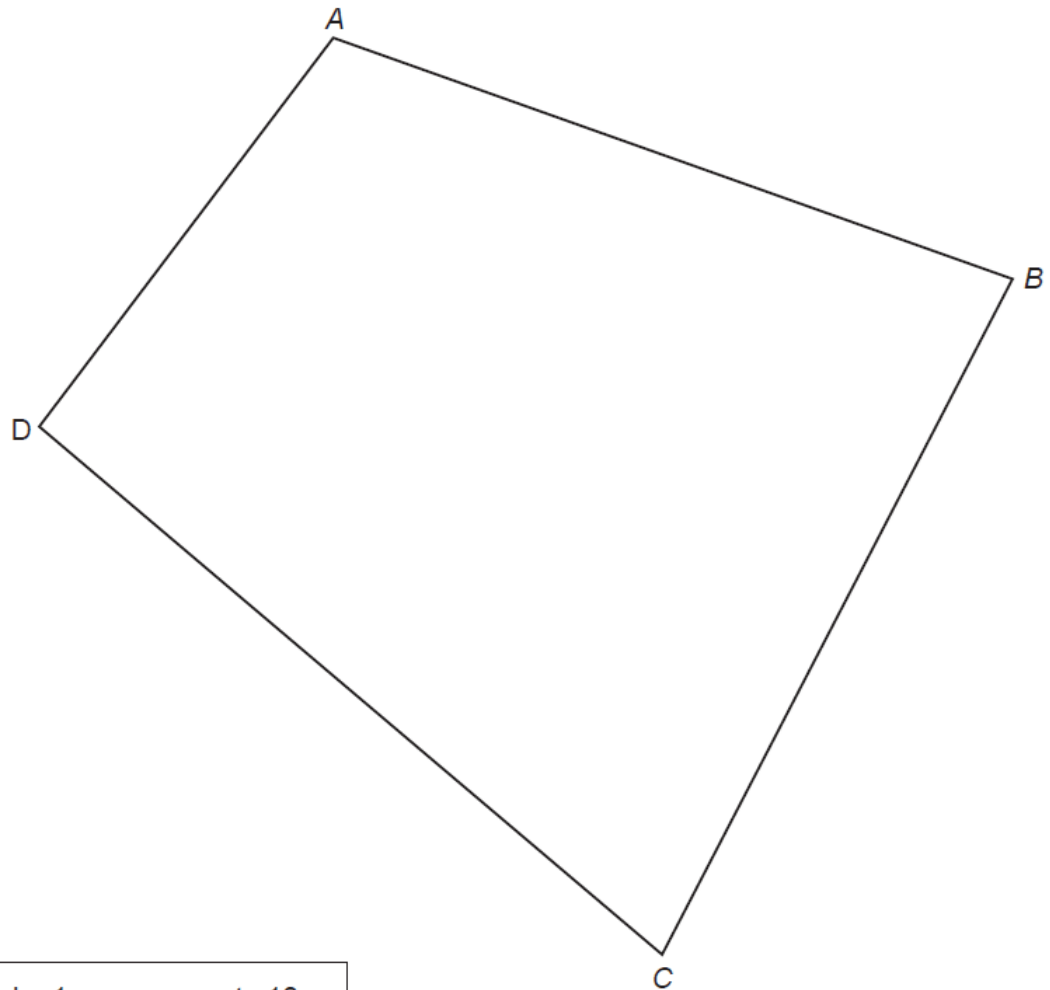
Question taken from Eduqas examination paper 530003, November 2021

Constructions Using Ruler / Compass: Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	4	
#3	5	
#4	5	
#5	6	
Total	24	

#1

The diagram shows a small park with gates at A , B , C and D .
The scale is 1 cm represents 10 m.



A new outdoor gym is to be built in the park.

This should be:

- at least 55 m from the gate at A
- nearer to the gate at B than the gate at C .

Use a ruler and a pair of compasses to show accurately on the diagram the region of the park where the outdoor gym can be built.

Indicate clearly the region that is your answer.

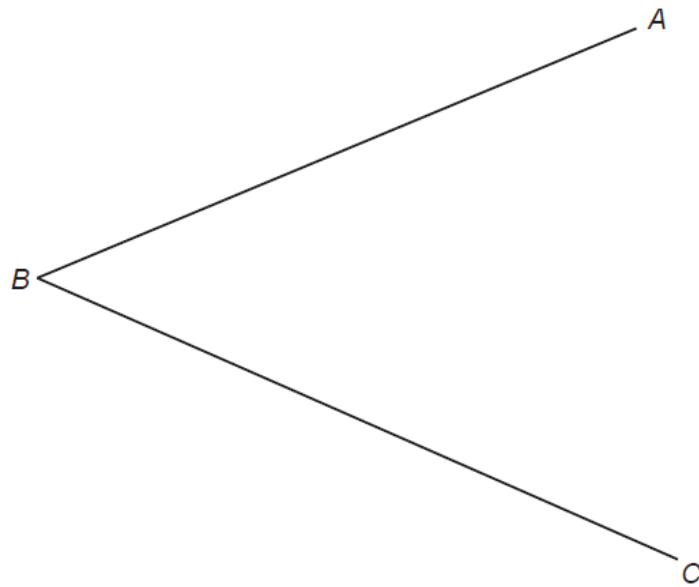
[4]

Question taken from Eduqas examination paper 530004, June 2023

#2

The point D is equidistant from the lines AB and BC .
Point D is also equidistant from the points B and C .

Using only a ruler and a pair of compasses, **construct** suitable arcs and lines to show the position of point D . [4]



Question taken from Eduqas examination paper 5300004, June 2024

#3

Cheng stands at O and rolls a ball along the horizontal ground.

The ball stops at point B , which:

- is equidistant from X and Y ,
- lies on the bisector of angle XOY .

Use a ruler and a pair of compasses to **construct** suitable lines and arcs to show the position of point B .

Construction arcs must be clearly shown.

[5]

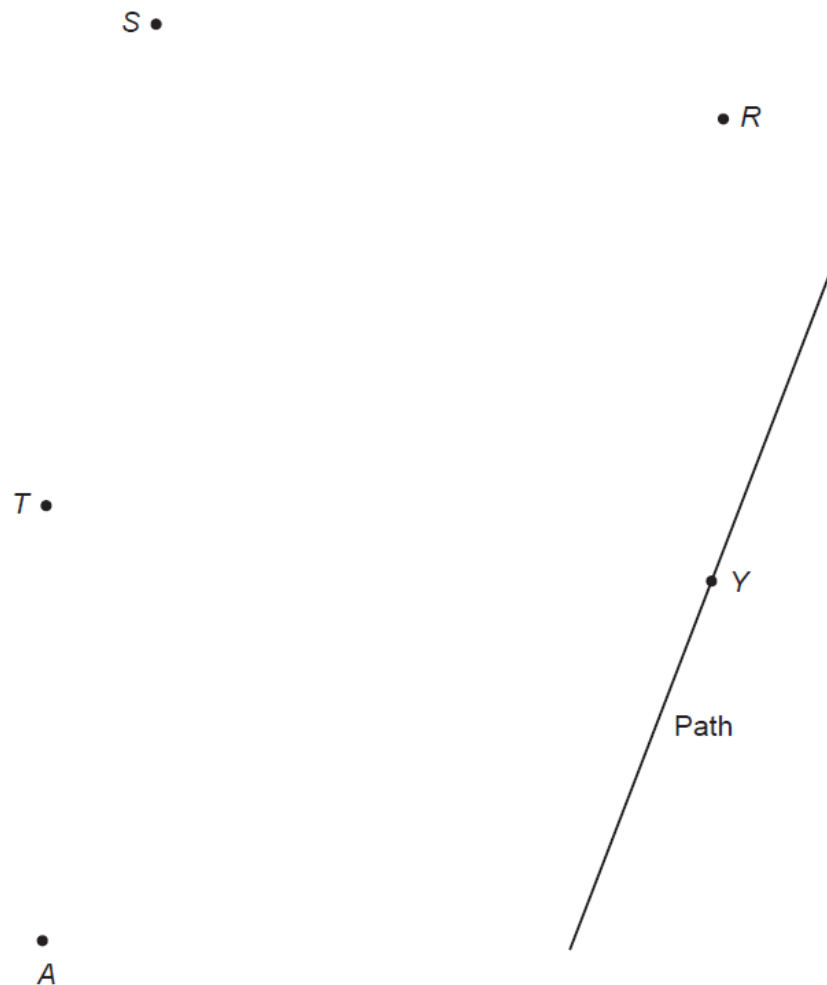
X •

• Y

O •

Question taken from Eduqas examination paper 530004, November 2020

#4



David is trying archery for the first time.
He stands at A and tries to shoot an arrow at the target T but misses.

The arrow lands at a point X such that:

- X is equidistant from S and R ,
- XY is perpendicular to the path.

Construct accurately the position of X and measure by how many degrees David's shot is inaccurate.

You must use a ruler and a pair of compasses to construct suitable arcs and lines.

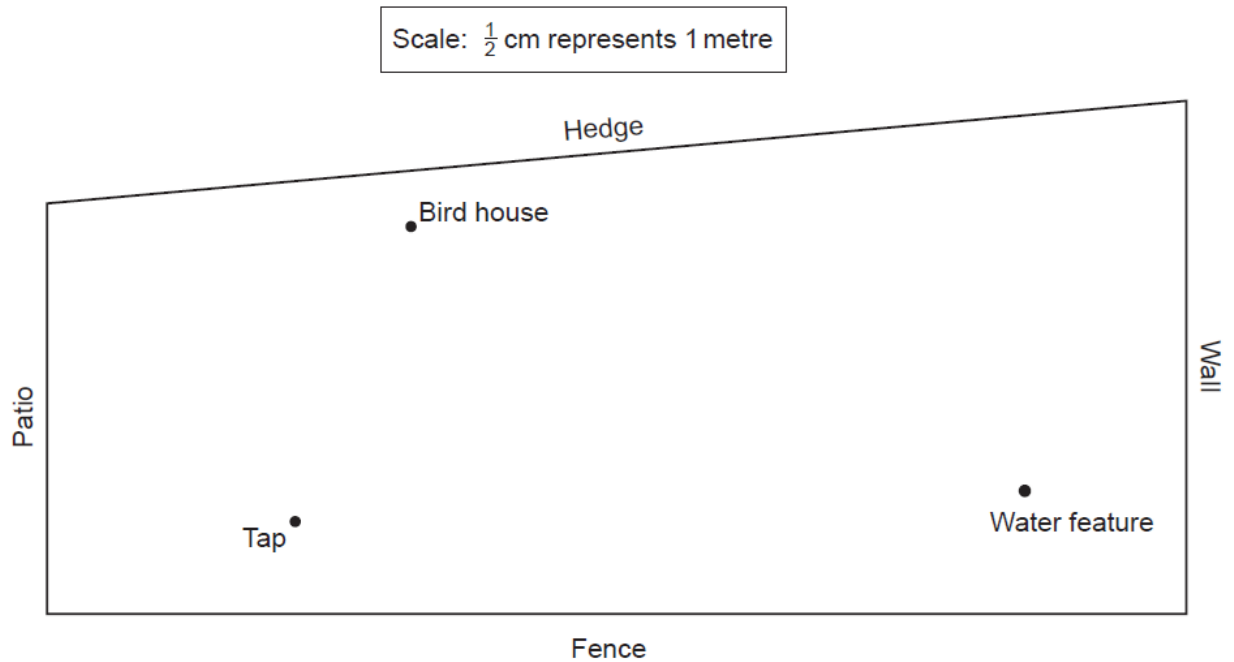
[5]

David's shot is inaccurate by $^{\circ}$

Question taken from Eduqas examination paper 530004, June 2022

#5

The diagram below shows a scale drawing of Amy's garden. The garden is enclosed by a fence, a patio, a hedge, and a wall. In Amy's garden there is a tap, a bird house and a water feature.



Amy is going to spread grass seed on part of her garden.

The grass seed will be spread over the region that satisfies the following conditions:

- at least 8 metres from the water feature
- nearer to the bird house than the tap
- nearer to the hedge than the wall.

On the diagram, clearly indicate the region that is to be spread with grass seed.

You must use a ruler and a pair of compasses to construct suitable arcs and lines.

[6]

Question taken from Eduqas examination paper 530004, November 2023

Plans & Elevations: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	4	
Total	10	

#1

The diagram shows a cylinder.

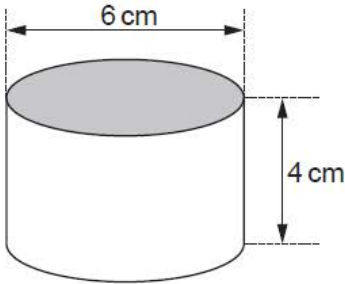


Diagram not drawn to scale

On the 1 centimetre grid below, draw accurately:

- the plan of the cylinder,
- the side elevation of the cylinder.

[3]

Plan

1 centimetre grid for drawing the plan and side elevation of the cylinder.

Side elevation

1 centimetre grid for drawing the plan and side elevation of the cylinder.

Question taken from Eduqas examination paper 530003, November 2019

#2

The diagram shows a cone placed with its circular base on a table.

It has

- base radius 15 cm,
- height 30 cm.

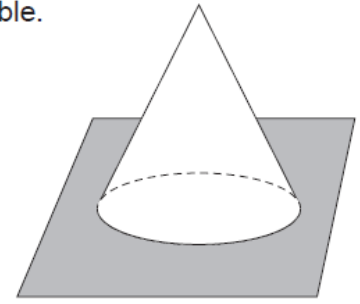


Diagram not drawn to scale

- (b) On the 1 cm grid opposite, make an accurate scale drawing of the plan and side elevation of this cone.

Use the ratio

actual cone : scale drawing = 5 : 1.

[4]

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Plan



Side elevation



Question taken from Eduqas examination paper 5300003, May 2022

Similarity & Congruency: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	6	
Total	6	

#1

(a) Four triangles are shown in the diagram below.

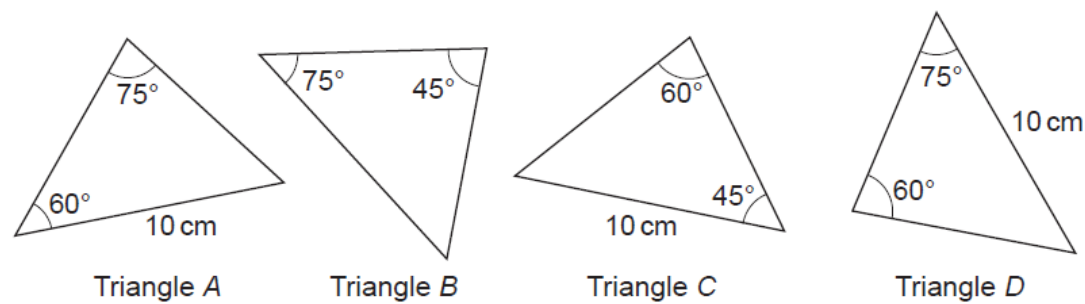


Diagram not drawn to scale

For each of the following statements choose 'True', 'False' or 'Need more information'.
Tick **one** box for each statement. [2]

Statement	True	False	Need more information
Triangle A is congruent to Triangle B			
Triangle C is congruent to Triangle D			
Triangle A is congruent to Triangle C			

(b) Is it possible to draw an isosceles triangle with an exterior angle of 60°?
Tick the appropriate box and show working to explain your reason. [2]

Yes ☐ No ☐

Reason:

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- (c) Two triangles are shown in the diagram below.

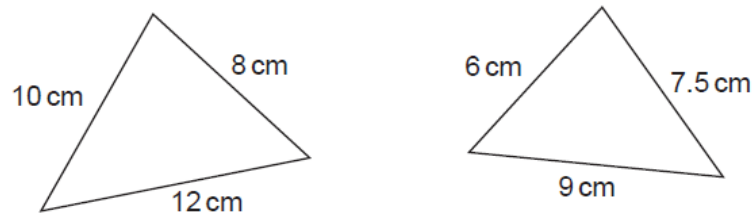


Diagram not drawn to scale

Show that the two triangles are mathematically similar.

[2]

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Question taken from Eduqas examination paper 530003, November 2024

Similar Shapes: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	5	
Total	9	

#1

(a) Shabana is moving to a new house and is using boxes to pack.

(i)



Shabana has two mathematically similar packing boxes and says,

"The ratio of the lengths of two of my boxes is 2 : 3 so the ratio of their volumes must be 4 : 9."

Give a reason why Shabana is incorrect and state the correct ratio of the volumes. [2]

Reason

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Correct ratio :

(ii)

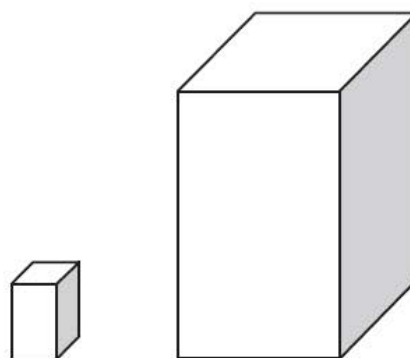


Diagram not drawn to scale

Shabana has two different square-based boxes where:

- the ratio of the lengths of the sides of the squares is 1 : 3,
- the ratio of their heights is 1 : 4.

How many of the small boxes can the large box hold? [2]

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Question taken from Eduqas examination paper 5300003, June 2019

#2

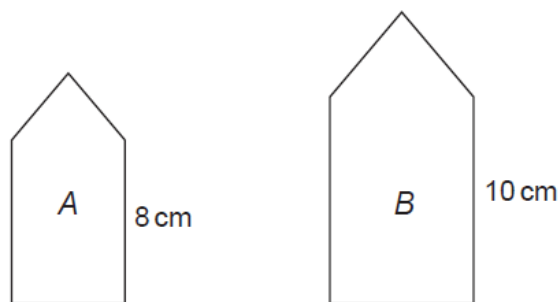


Diagram not
drawn to scale

- (a) Shape A is similar to shape B.
The area of shape A is 128 cm^2 .

Calculate the area of shape B.

[3]

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- (b) Shape A is the uniform cross-section of prism A.
Shape B is the uniform cross-section of prism B.
Prism A and prism B are similar.

Write the following ratio in its simplest form.

volume of prism A : volume of prism B = :

[2]

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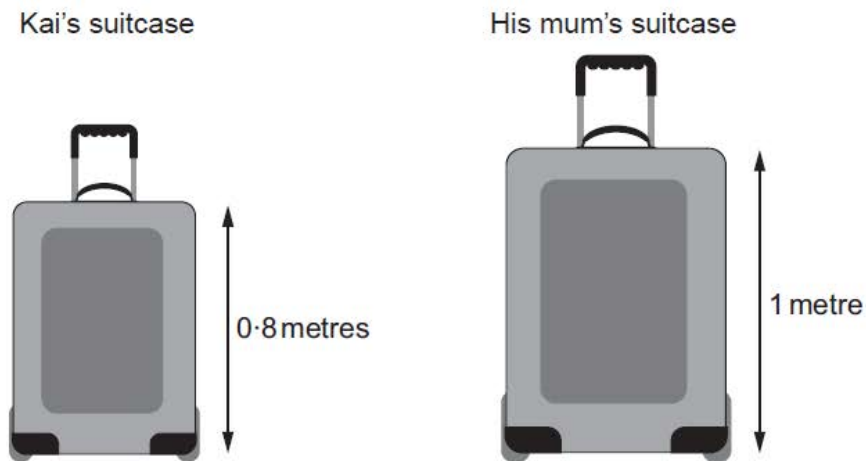
Question taken from Eduqas examination paper 530003, November 2022

Similar Shapes: Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	2	
#3	3	
#4	3	
Total	10	

#1

Kai and his mum have mathematically similar suitcases.
Kai's suitcase is smaller than his mum's suitcase.



Diagrams not drawn to scale

The label on Kai's suitcase says it holds 66 litres.
What should the label on his mum's suitcase say it holds?

[2]

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His mum's suitcase holds litres.

Question taken from Eduqas examination paper 530004, June 2018

#2

- (b) Two mathematically similar ice cream cones are shown below.

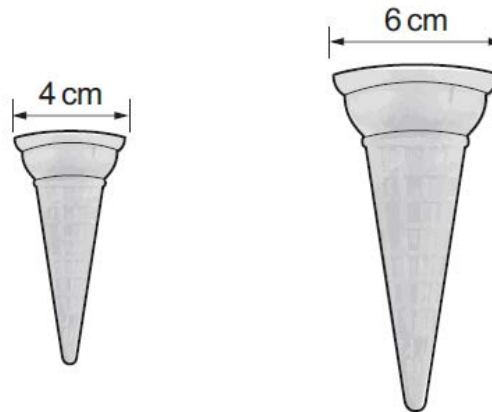


Diagram not drawn to scale

The smaller cone has a volume of 40 cm^3 .

Calculate the volume of the larger cone.

[2]

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Question taken from Eduqas examination paper 5300004, November 2018

#3

- (b) The radii of two spheres are in the ratio $2 : 7$.
The volume of the smaller sphere is 10.4 cm^3 .

Calculate the volume of the larger sphere.

[3]

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Question taken from Eduqas examination paper 5300004, November 2019

#4

(b) Cones A and B are mathematically similar.

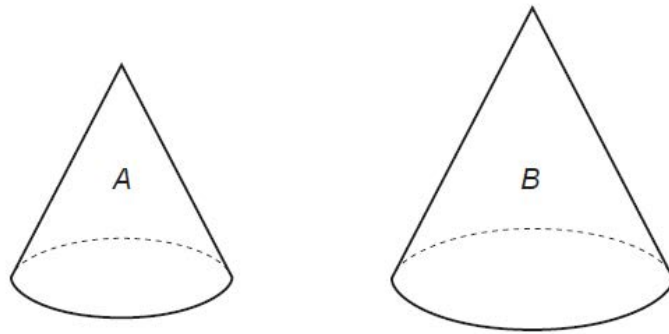


Diagram not drawn to scale

The diameter of the base of cone A is 12 cm.

The diameter of the base of cone B is 18 cm.

The total surface area of cone A is 300 cm^2 .

Calculate the total surface area of cone B .

[3]

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Question taken from Eduqas examination paper 530004, November 2020

Converting Units: Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	8	
Total	9	

#1

(a) Circle the correct conversion of 7 m^3 to cm^3 .

[1]

0.00007

0.07

700

70 000

7 000 000

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Question taken from Eduqas examination paper 530004, November 2022

#2

(a) Wayne says, ' 6.5 m^2 is the same as 650 cm^2 , because there are 100 cm in 1 metre.'

Maria says, ' 6.5 m^2 is the same as $65\,000 \text{ cm}^2$ '

Explain why Maria is correct.

[1]

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- (b) (i) The area of the water surface of Maria's pond is 6.5 m^2 .
She measures the depth of the pond in 5 different places using a measuring stick.
The 5 depths recorded by Maria are 120 cm, 120 cm, 130 cm, 140 cm and 140 cm.

Maria buys a liquid treatment for pond water. The instructions state:

Use 0.5 litres of this treatment for every 1800 litres of pond water.

Calculate an **approximate** value for the quantity of the liquid treatment Maria needs to use in her pond.

You must give units at each stage of your working and give your answer in litres.

You must show all your working.

[5]

..... litres

- (ii) Explain any decision you made in calculating an approximate value for the quantity of the liquid treatment needed.
What could be done to improve the accuracy of this value? [2]

Explanation of decision:

Improvement:

Question taken from Eduqas examination paper 5300004, June 2018

Transformations: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	5	
#3	5	
Total	13	

#1

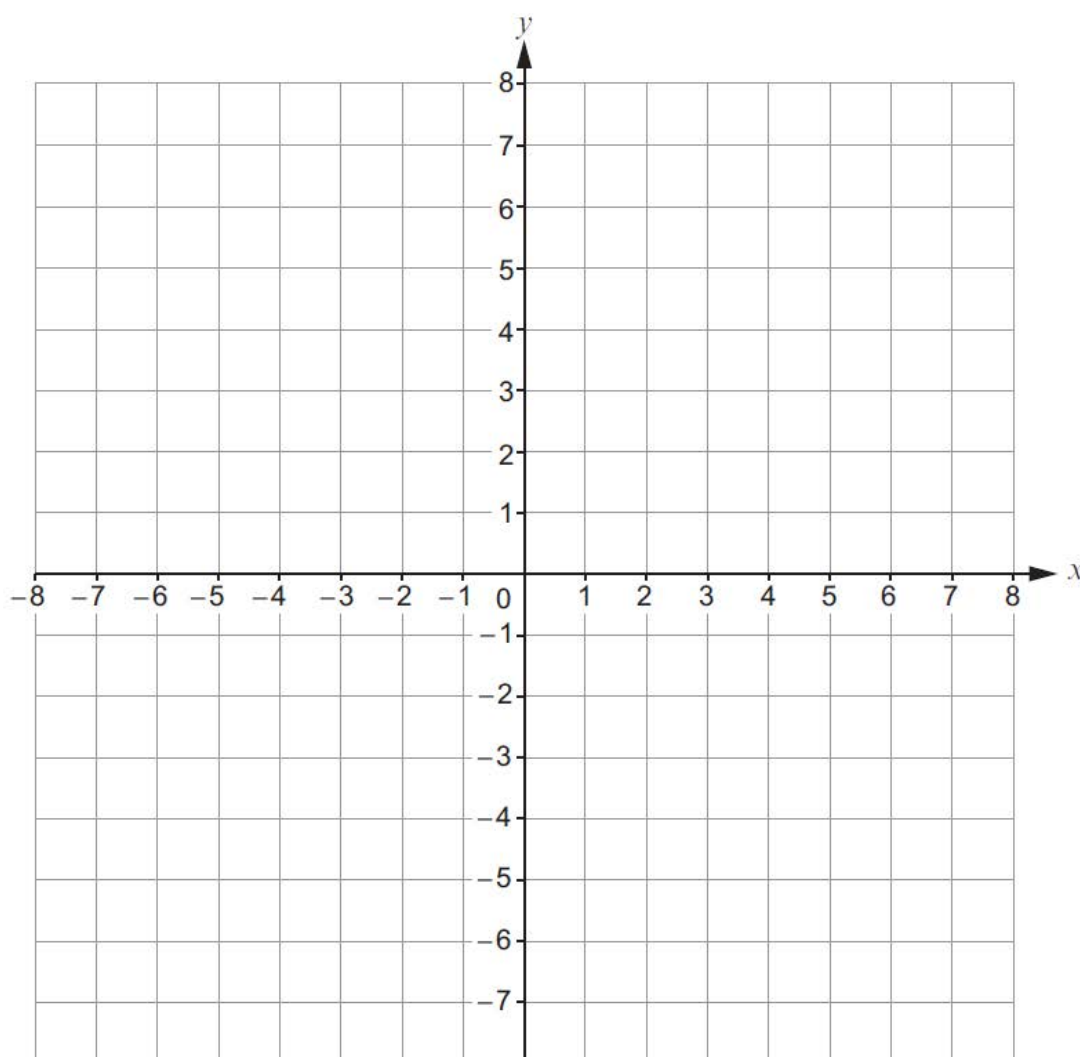
A scalene triangle is

rotated 90° clockwise about $(0, 0)$ then translated through $\begin{pmatrix} 4 \\ 0 \end{pmatrix}$.

Describe the **single** transformation that is equivalent to these 2 transformations.

[3]

You may use this blank grid to help you.



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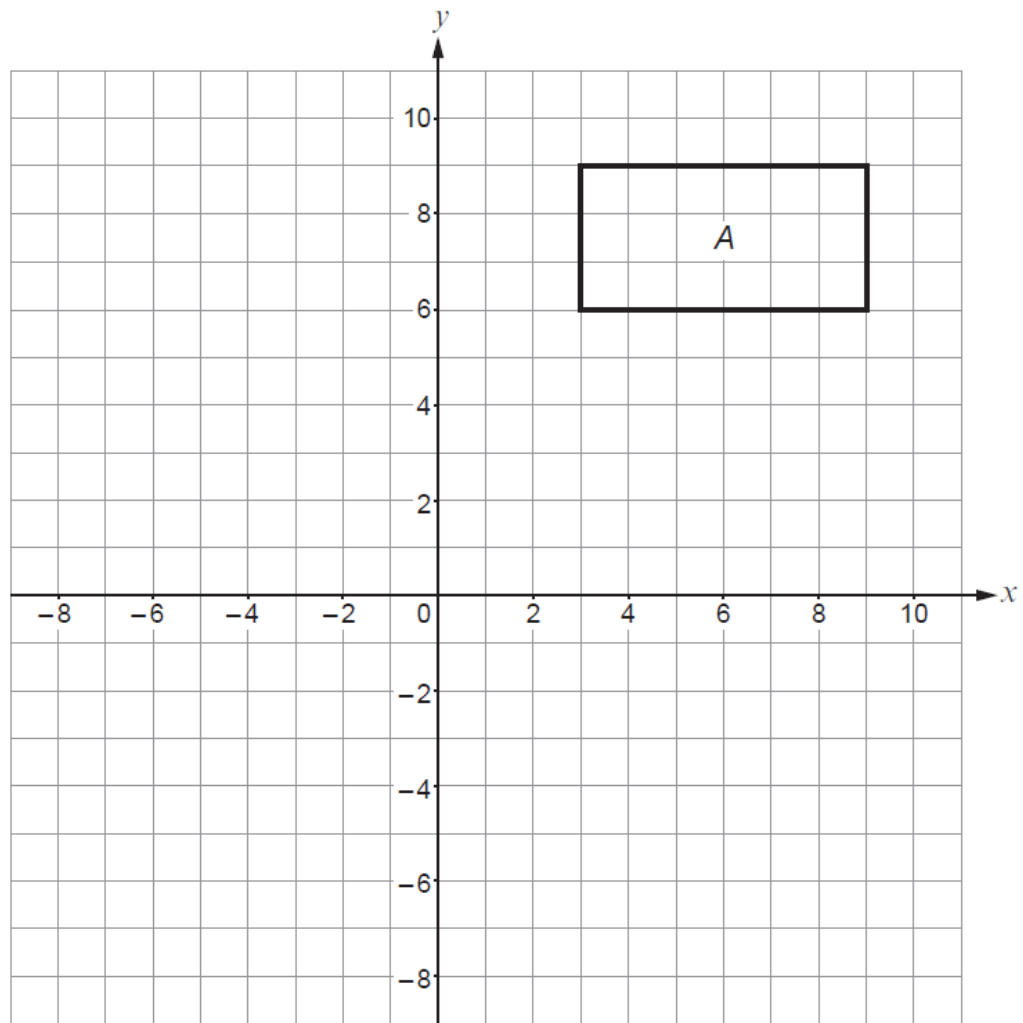
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Question taken from Eduqas examination paper 5300003, June 2018

#2

(a)



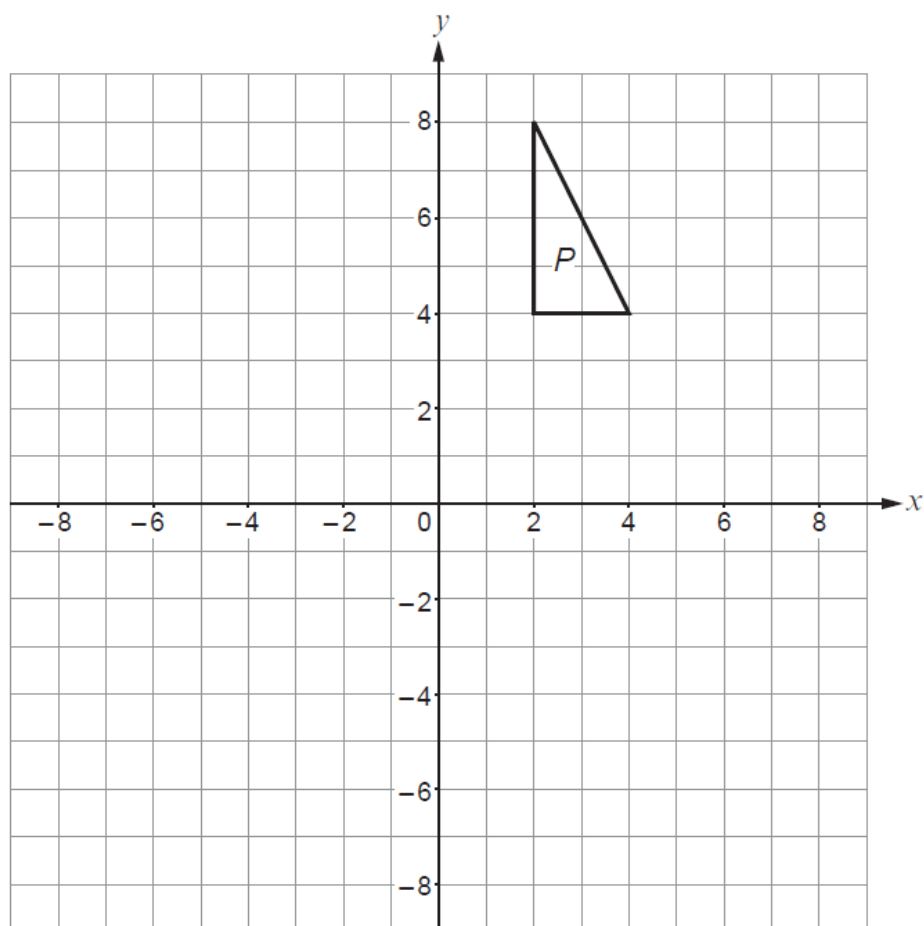
Draw the enlargement of rectangle *A* with scale factor $\frac{1}{3}$ and centre (0, 0).

[2]

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(b)



Triangle P is reflected in the line $y = x$.
The image is triangle Q .

Triangle Q is reflected in the line $y = -x$.
The image is triangle R .

Describe a **single** transformation that maps triangle P to triangle R .

[3]

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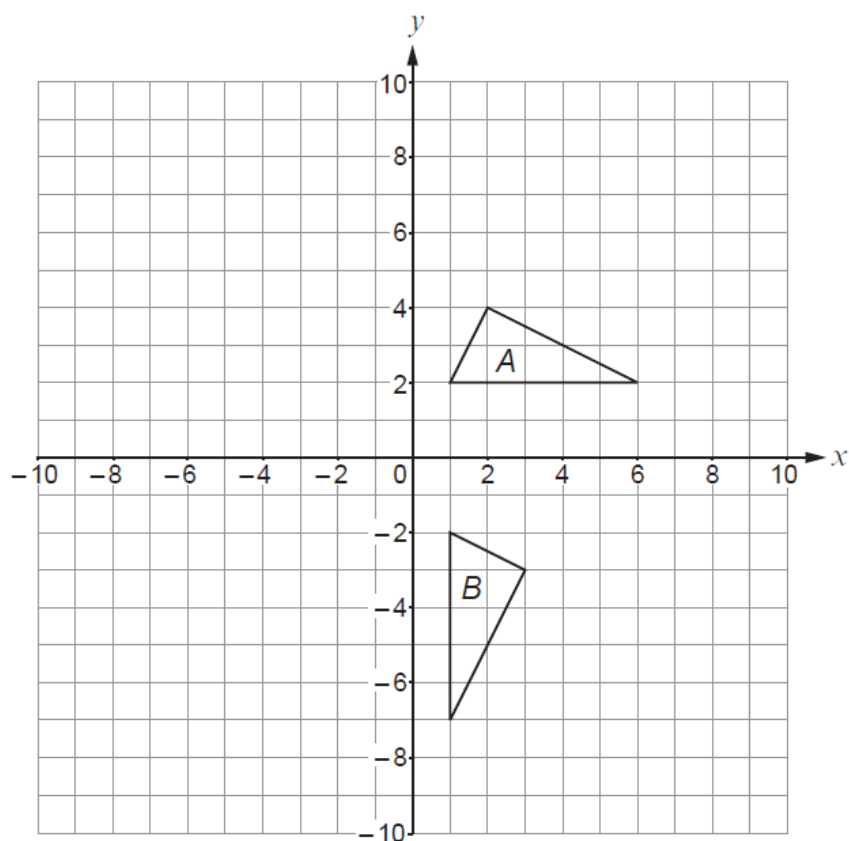
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Question taken from Eduqas examination paper 5300003, May 2023

#3



- (a) Describe the **single** transformation that maps triangle *A* to triangle *B*. [3]

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- (b) Triangle *C* was mapped to triangle *A* using an enlargement, scale factor $\frac{1}{3}$, centre (5, 1).

Draw triangle *C* on the grid above. [2]

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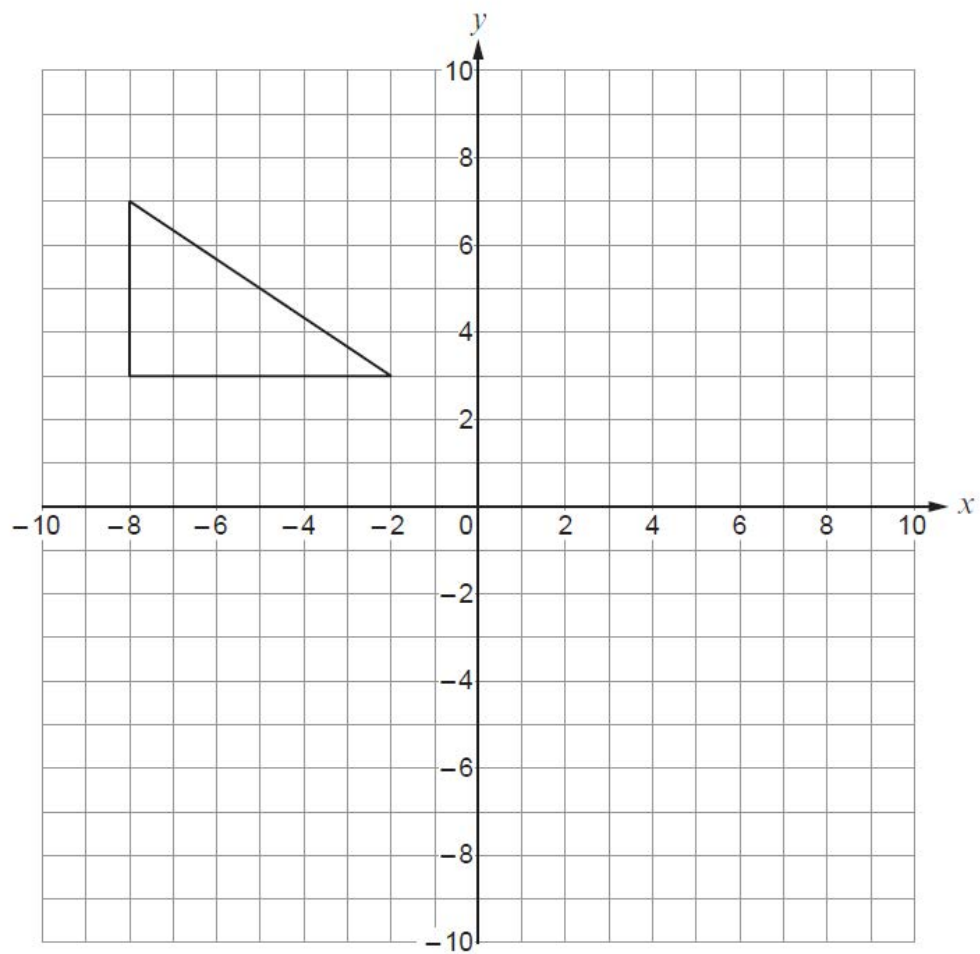
Question taken from Eduqas examination paper 5300003, November 2022

Transformations: Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	4	
#3	6	
Total	12	

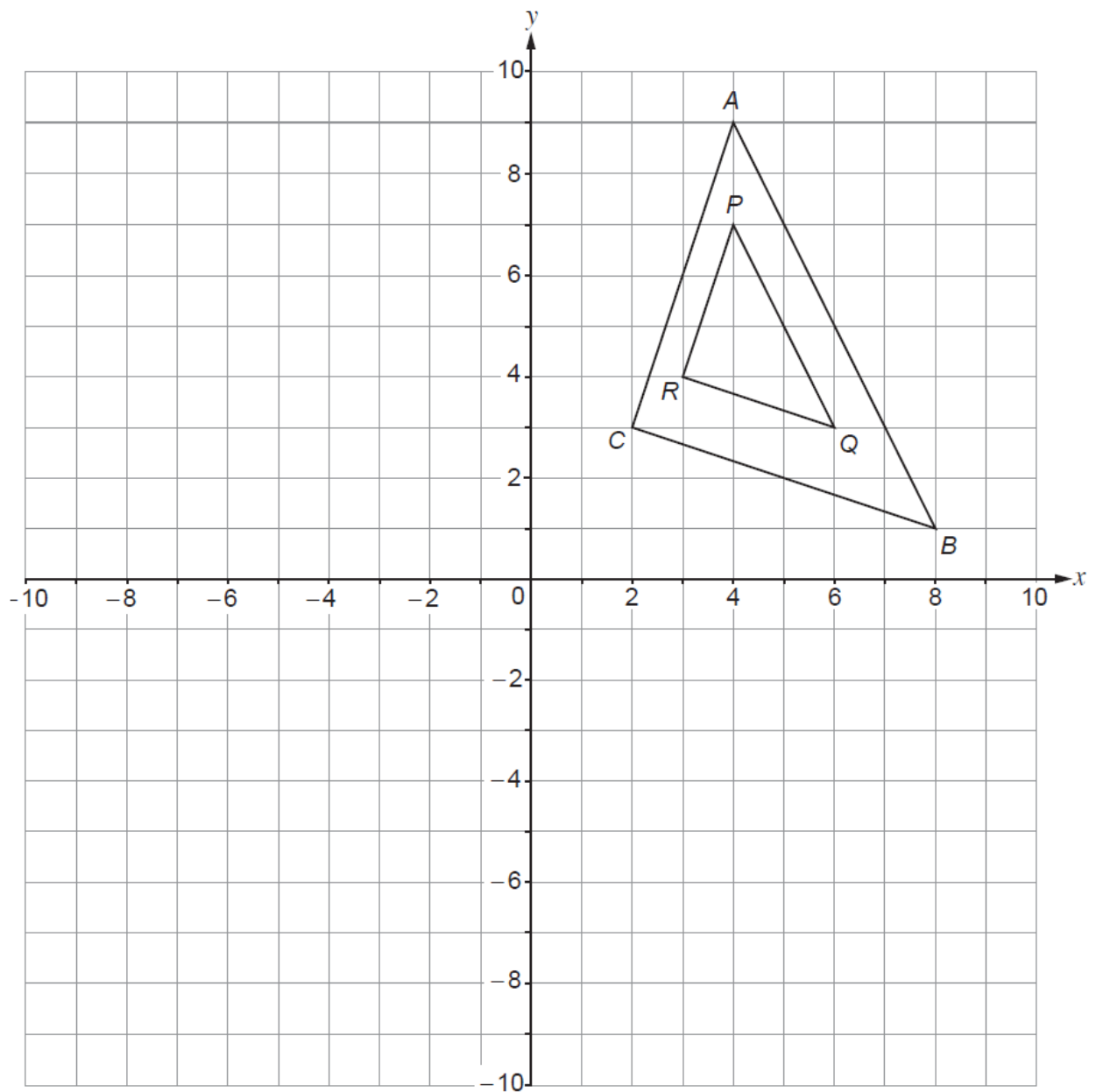
#1

- (c) Enlarge the triangle, shown on the grid below, by a scale factor of $-\frac{1}{2}$ with $(2, 1)$ as the centre of the enlargement. [2]



Question taken from Eduqas examination paper 530004, June 2019

#2



- (a) Describe the single transformation that maps triangle ABC to triangle PQR . [2]

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- (b) On the grid above, draw the enlargement of triangle ABC , scale factor -1 , centre $(0, 3)$. [2]

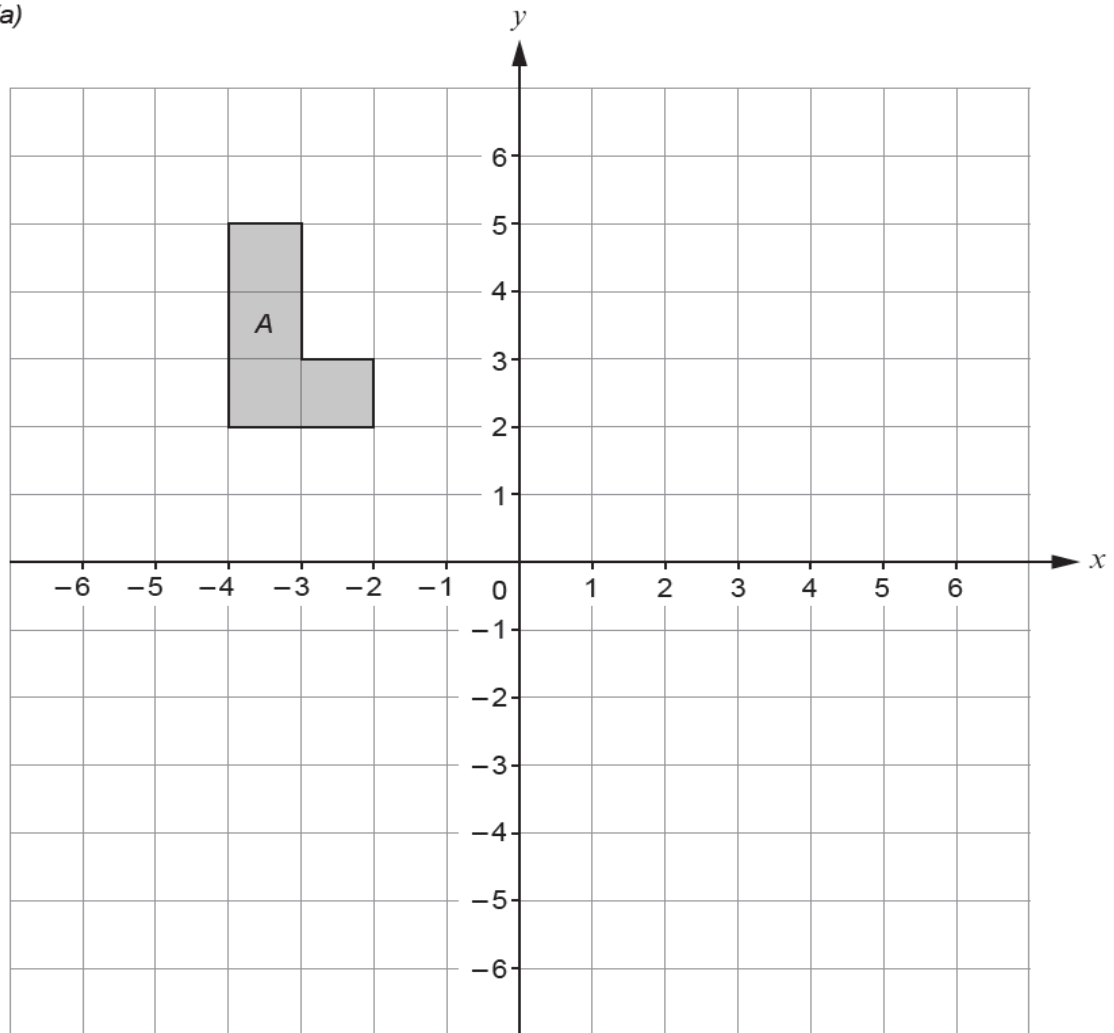
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Question taken from Eduqas examination paper 530004, June 2022

#3

(a)



$\mathbf{p}$ and $\mathbf{q}$ are translation vectors with

$$\mathbf{p} = \begin{pmatrix} 3 \\ -5 \end{pmatrix} \text{ and } \mathbf{q} = \begin{pmatrix} 1.5 \\ 2 \end{pmatrix}.$$

Shape A is mapped to shape B using $\mathbf{p} + 2\mathbf{q}$.

- (i) Find the column vector which translates shape A to shape B . [2]

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- (ii) Draw and label shape B on the grid on page 8. [2]

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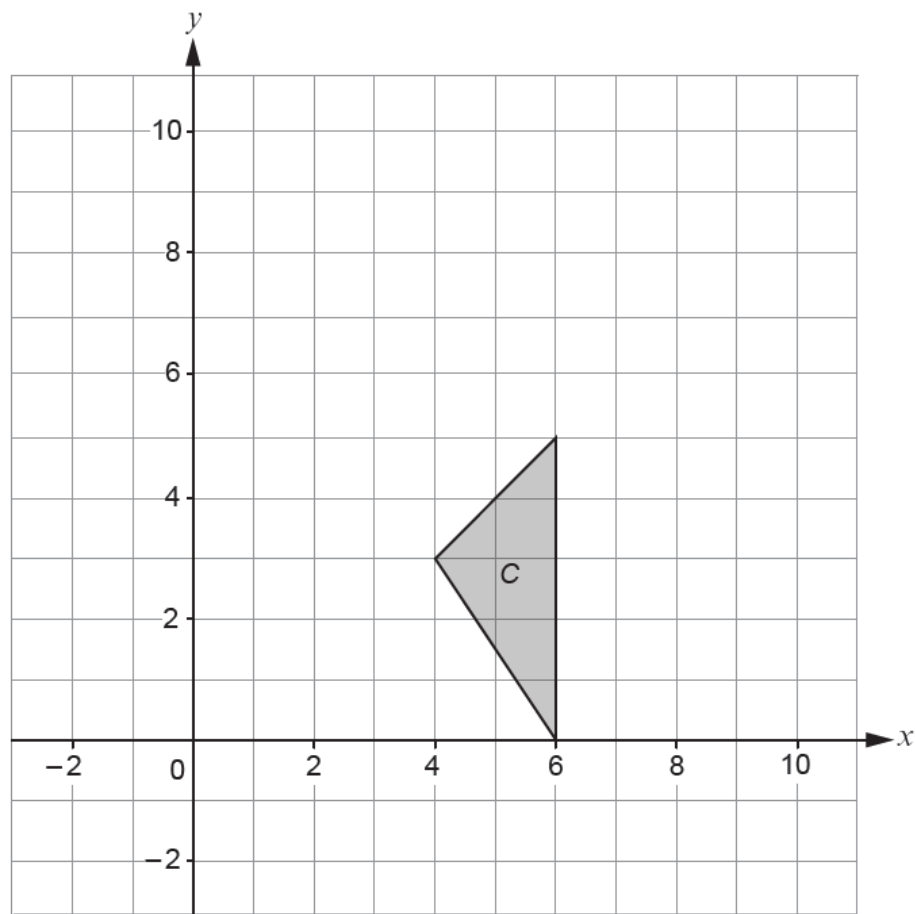
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- (b) Triangle C has vertices with coordinates (4, 3), (6, 5), (6, 0).
After a **single** transformation, the vertices of triangle C are mapped to (3, 4), (5, 6), (0, 6).

Describe the transformation.

[2]

You may use this grid to help you



Transformation:

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Question taken from Eduqas examination paper 530004, November 2021

Pythagoras: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	5	
Total	9	

#1

The diagram shows an equilateral triangle with side $2x$ cm.

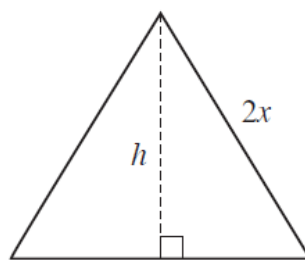


Diagram not drawn to scale

The height of the triangle is h cm.

Find and simplify an expression for h in terms of x .

[4]

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Question taken from Eduqas examination paper 530003, May 2022

#2

- (a) Sam cycled south for 16 km.
He then turned and cycled east.
When he stopped for a rest, the shortest distance back to his starting point was 20 km.

Calculate how many kilometres Sam cycled while travelling east.

[3]

North



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- (b) Sam cycled the 20 km back to his starting point at a constant speed of 25 km/h.

How many minutes did this take?

[2]

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Question taken from Eduqas examination paper 5300003, May 2023

Pythagoras: Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
#2	5	
#3	6	
Total	16	

#1

(b)

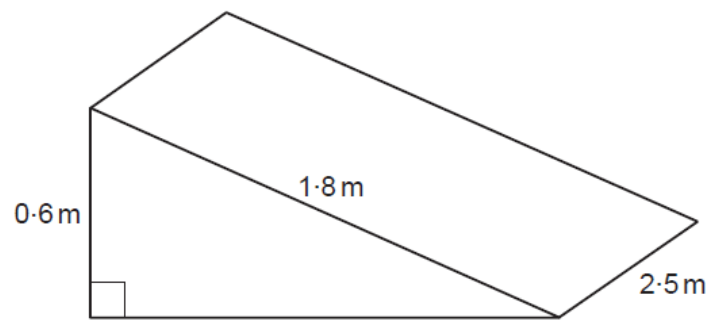


Diagram not drawn to scale

The diagram shows a concrete ramp to a different building.
It was not approved and needs to be completely removed.

The ramp is a triangular prism and is 2.5 m wide.

How many cubic metres of concrete will need to be removed?
You must show all your working.

[5]

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Question taken from Eduqas examination paper 530004, November 2021

#2

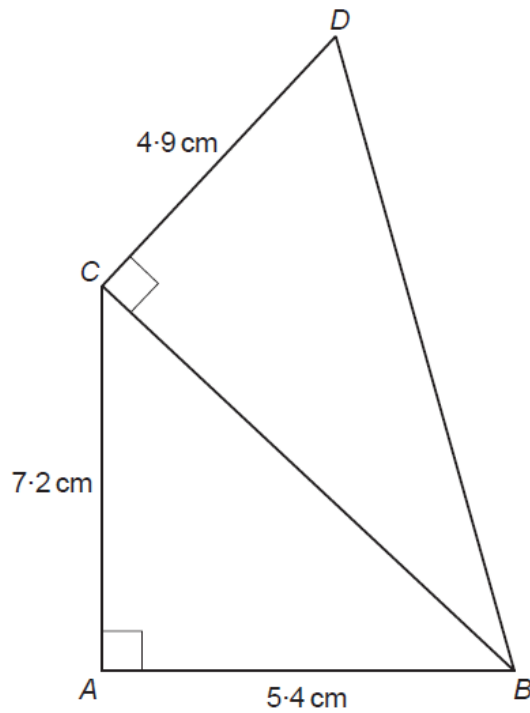


Diagram not drawn to scale

ABC and BCD are right-angled triangles.
 $AB = 5.4$ cm, $AC = 7.2$ cm and $CD = 4.9$ cm.

Calculate the area of triangle BCD .

[5]

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Area of triangle BCD is cm^2

Question taken from Eduqas examination paper 5300004, June 2024

#3

A right-angled triangle and a square are shown below.

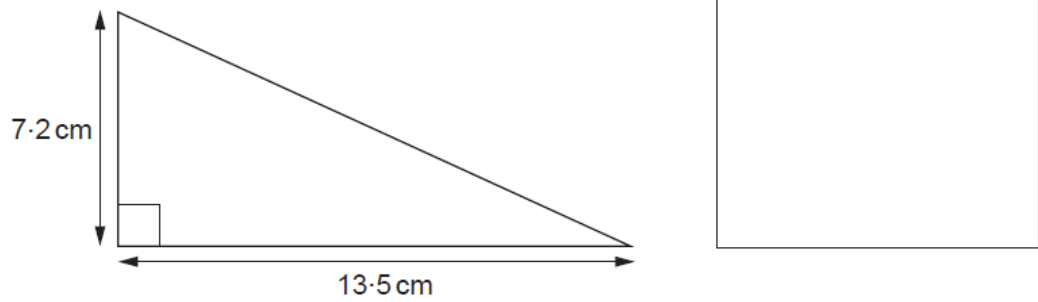


Diagram not drawn to scale

The perimeter of the triangle is equal to the perimeter of the square.

Calculate the area of the square.
You must show all your working.

[6]

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Area of square = cm^2

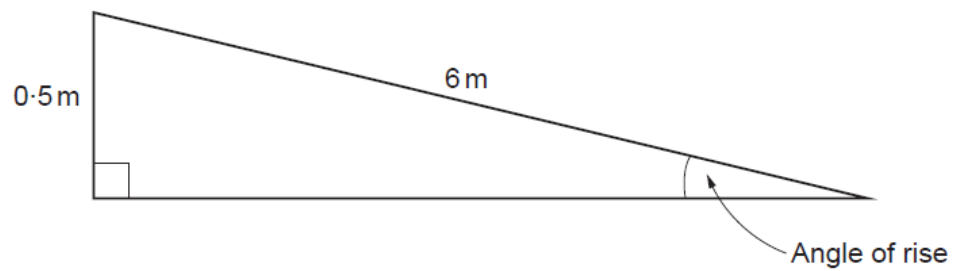
Question taken from Eduqas examination paper 530004, November 2024

Trigonometry: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
#3	4	
#4	4	
#5	4	
#6	5	
#7	6	
#8	6	
#9	7	
#10	7	
Total	49	

#1

- (a) The diagram shows the side view of a design for a ramp to a building.



For the design to be approved, the angle of rise must not be more than 4.8° .

Use calculations to show that the design should be approved.

[3]

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Question taken from Eduqas examination paper 5300004, November 2021

#2

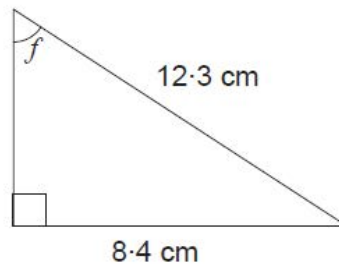


Diagram not drawn to scale

Calculate the size of angle f .

[3]

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Question taken from Eduqas examination paper 530004, June 2019

#3

The diagram below shows a vertical cliff which is 35 metres high.
Pierre is standing at point P.
From point P, the angle of elevation to the top of the cliff is 72° .

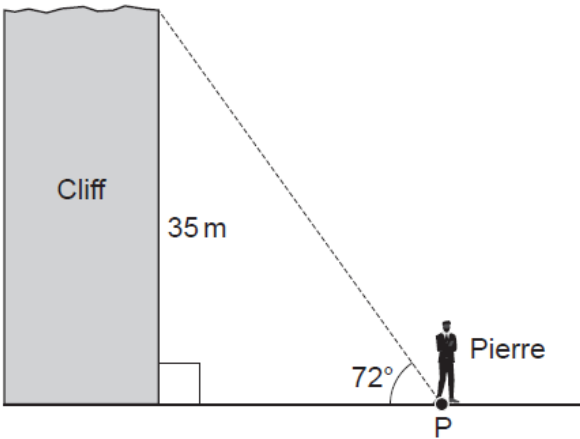


Diagram not drawn to scale

Pierre sees this warning sign.



Warning!
Coastal Erosion.
It is not safe to stand within
10 m of the base of the cliff.

Is Pierre standing a safe distance from the base of the cliff?

[4]

Yes ☐ No ☐

Show how you decide.

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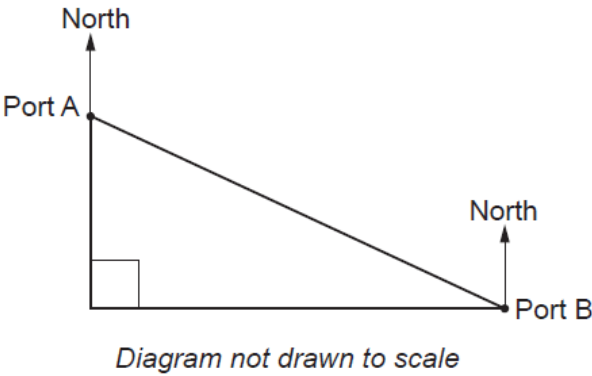
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Question taken from Eduqas examination paper 530004, June 2024

#4

A ship sails 11 km due south from port A.
It then travels 17 km due east and arrives at port B.



Calculate the bearing of port B from port A.

[4]

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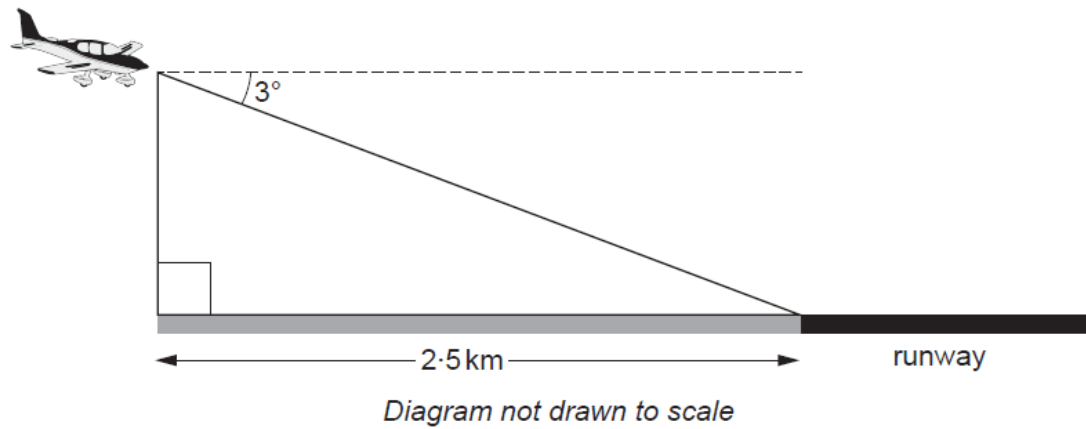
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The bearing of port B from port A is

Question taken from Eduqas examination paper 530004, November 2024

#5



An aircraft is making its final approach ready to land.

The aircraft is:

- flying at 3° to the horizontal,
 - 2.5 km horizontally from the start of the runway,
- as shown on the diagram above.

Calculate the vertical height of the aircraft above the horizontal ground.
You must show all your working.

[4]

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Question taken from Eduqas examination paper 530004, June 2023

#6

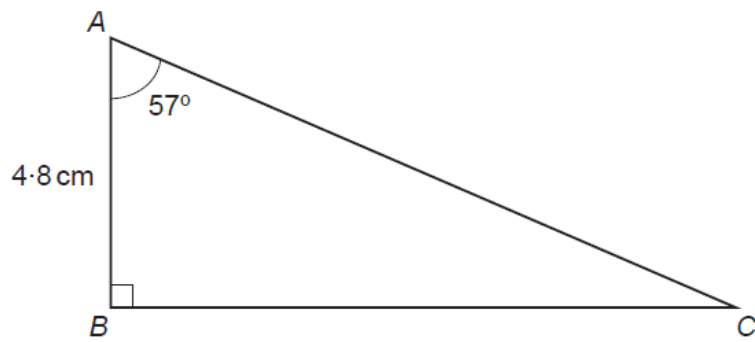


Diagram not drawn to scale

ABC is a right-angled triangle.

$AB = 4.8\text{ cm}$ and $\hat{BAC} = 57^\circ$

Calculate the area of triangle ABC .

[5]

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Area = cm^2

Question taken from Eduqas examination paper 530004, June 2022

A rhombus $ABCD$ is shown with vertices A (left), B (top), C (right), and D (bottom). The diagonals AC and BD intersect at point E . The diagonals are represented by dashed lines. Angle BCO is marked as 35° . Below the rhombus, a horizontal line with arrows at both ends is labeled 12 cm , indicating the length of diagonal AC .

The diagram shows a rhombus, $ABCD$.
 AC and BD intersect at E .
 The length of AC is 12 cm.
 $\widehat{BCE}$ is 35° .

[6]

Perimeter of $ABCD =$ cm

72

#8

Vaughan cycles down a track from the top of a mountain to the bottom. The track goes down at an angle of 48° to the horizontal. Vaughan is 800 feet above ground level.

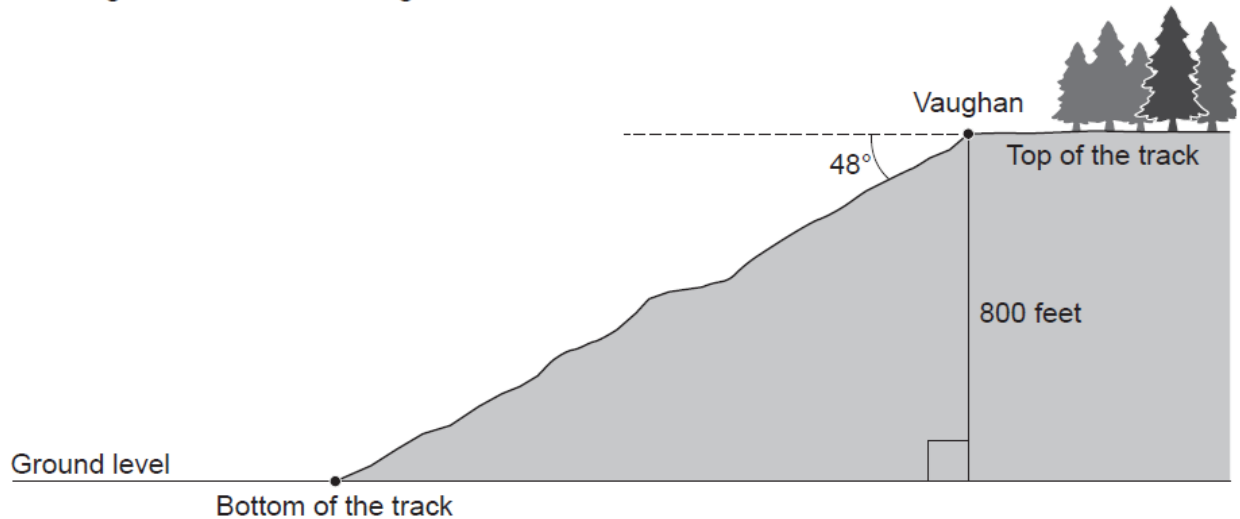


Diagram not drawn to scale

- (a) Vaughan cycles from the top of the track to the bottom of the track. What distance has he cycled?

[4]

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The distance Vaughan has cycled is feet.

- (b) (i) State an assumption you have made in answering part (a).

[1]

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- (ii) If your assumption is not correct, what effect would this have on your answer to part (a)?

[1]

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Question taken from Eduqas examination paper 530004, November 2023

#9

- (a) Shireen has a new shed.

The walls of the shed are vertical.
The shed stands on horizontal ground.
The uniform cross-section has one line of symmetry.

The diagram below shows some of the measurements of the cross-section.

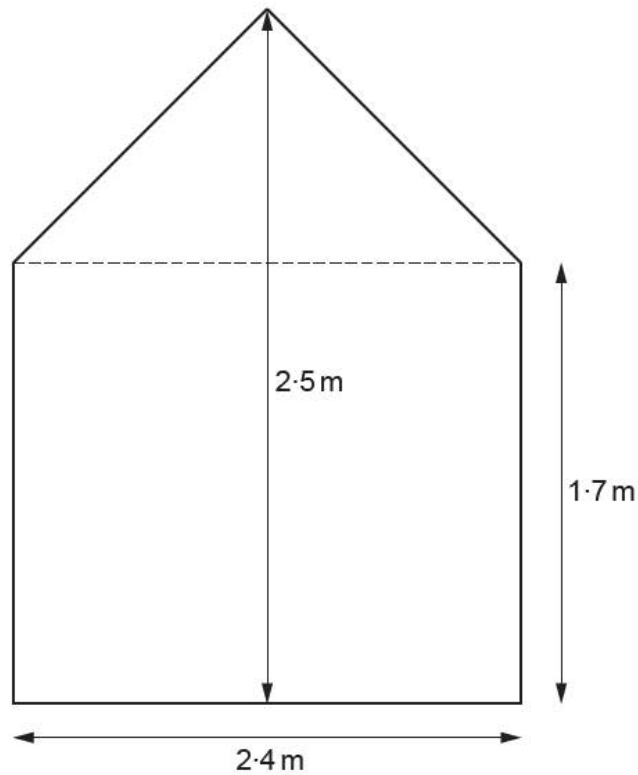


Diagram not drawn to scale

Calculate the size of the angle between the roof of the shed and the horizontal.

[4]

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(b) Petra has a mathematically similar shed.

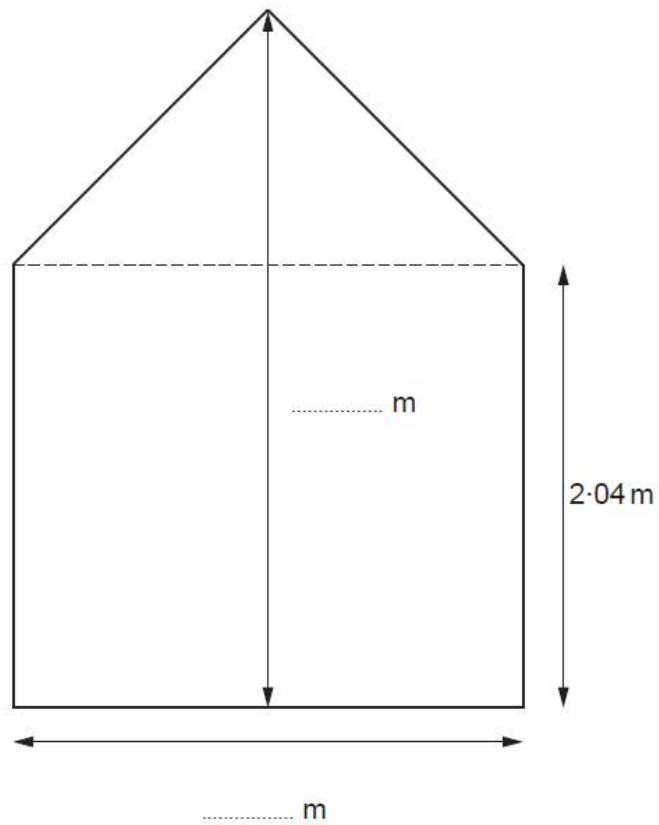


Diagram not drawn to scale

Calculate the two missing measurements on the diagram above.
You must show all your working.

[3]

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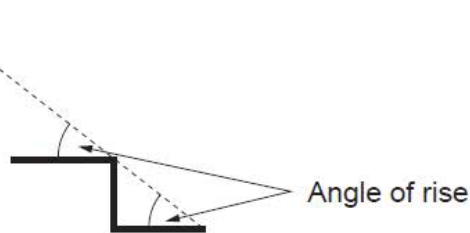
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Question taken from Eduqas examination paper 530004, November 2019

#10

Eleri goes on holiday to visit historic gardens in Italy. In many of the gardens she notices irregular staircases. Each staircase has horizontal steps and vertical rises.

The angle of rise is measured from the horizontal upwards.



- (a) The bottom step on a staircase is 26.4 cm wide with a vertical rise of 24 cm. The second step in this staircase is 39.5 cm wide and has the same angle of rise.

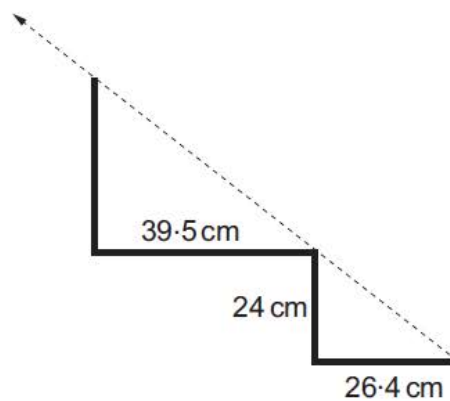


Diagram not drawn to scale

- (i) Calculate the angle of rise.

[2]

- (ii) Hence **use trigonometry** to calculate the vertical rise of the second step in centimetres.

Give your answer correct to 2 significant figures.

You must show all your working.

[2]

(b) Look again at the diagram and your method of using trigonometry, in part (a).

- Show how the vertical rise of the second step could be calculated **without** the use of trigonometry.
You must show all your working.
(A scale drawing is not acceptable, as you are asked to calculate.)
- Evaluate which was the most efficient method of calculating the vertical rise of the second step. [3]

Evaluation:

Question taken from Edugas examination paper 530004, November 2018

Pythagoras / Trigonometry Combined: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
Total	3	

#1

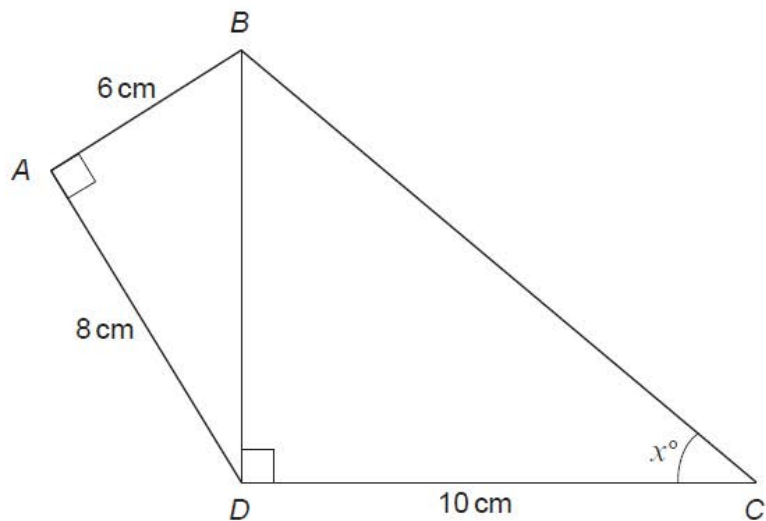


Diagram not drawn to scale

Find the value of x .
You must show all your working.

[3]

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$x =$

Question taken from Eduqas examination paper 530003, November 2019

Pythagoras / Trigonometry Combined: Calculator

Question	Maximum Mark	Mark Awarded
#1	6	
#2	6	
Total	12	

#1

The diagram shows two right-angled triangles.

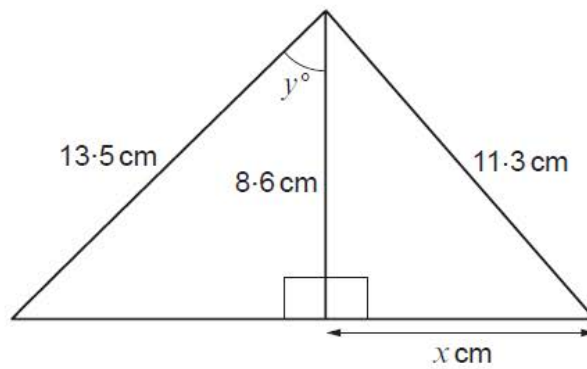


Diagram not drawn to scale

- (a) Calculate the value of x .

[3]

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- (b) Calculate the value of y .

[3]

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Question taken from Eduqas examination paper 530004, November 2020

#2

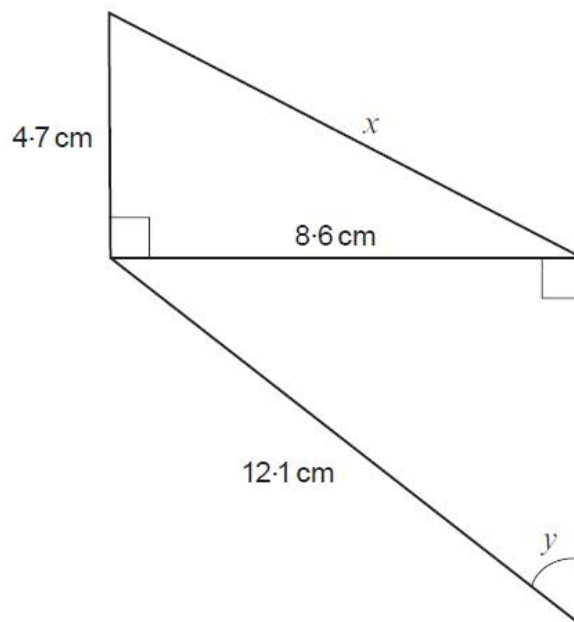


Diagram not drawn to scale

(a) Calculate the length x .

[3]

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(b) Calculate the size of angle y .

[3]

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Question taken from Eduqas examination paper 530004, June 2018

Exact Trigonometric Values: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
Total	2	

#1

- (a) Complete the table below.
Write both missing values in surd form.
The sketch of the equilateral triangle may help you.

[2]

$\sin 30^\circ$	$\frac{1}{2}$
$\cos 30^\circ$	
$\tan 30^\circ$	

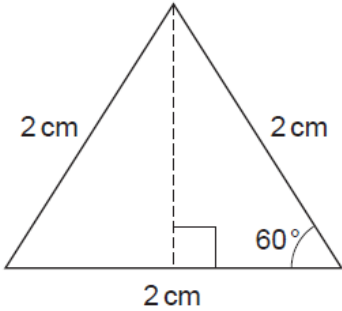


Diagram not drawn to scale

Question taken from Eduqas examination paper 5300003, May 2024

Pythagoras / Trigonometry in 3D: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	6	
Total	6	

#1

- (b) The diagram shows a cuboid.
 A , B , C and D are vertices of the cuboid.
 $BD = 10$ cm, $AC = 12$ cm and $\hat{DBC} = 30^\circ$.

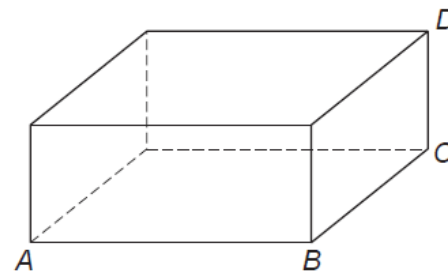


Diagram not drawn to scale

Calculate the distance AD .
 You must show all your working.

[6]

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Question taken from Eduqas examination paper 530003, May 2024

Pythagoras / Trigonometry in 3D: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	5	
Total	8	

#1

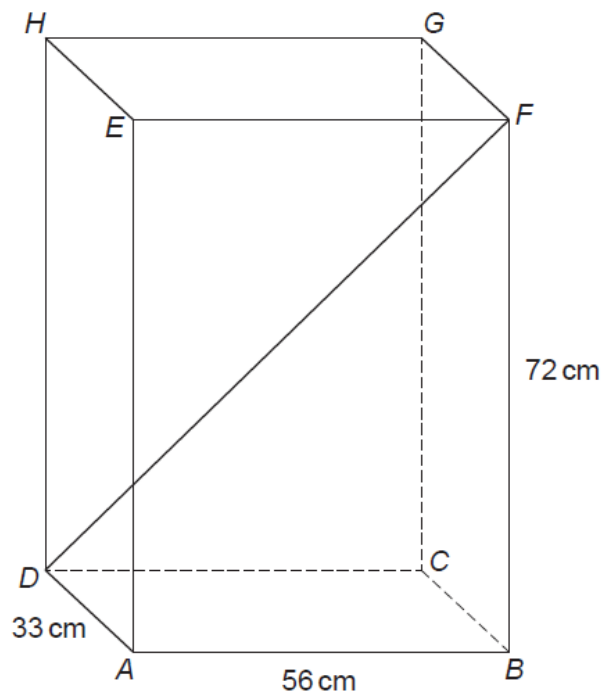


Diagram not
drawn to scale

The diagram shows a cuboid, $ABCDEFGH$.

Calculate the length of the diagonal, DF .

[3]

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Question taken from Eduqas examination paper 530004, November 2022

#2

The diagram below shows a square-based pyramid.
The slant height of each triangular face is 12 cm.

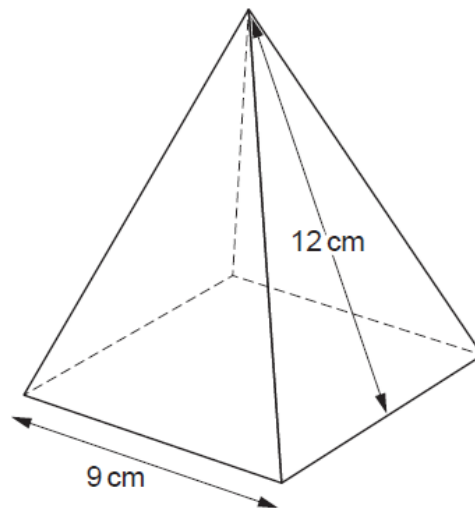


Diagram not drawn to scale

Calculate the volume of the pyramid.
You must show all your working.

[5]

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Volume = cm^3

Question taken from Eduqas examination paper 530004, November 2023

Properties of a Circle: Non-Calculator

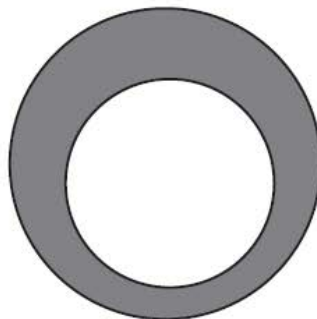
Question	Maximum Mark	Mark Awarded
#1	4	
#2	4	
Total	8	

#1

(a) Simplify $18\pi \div 9\pi$.

[1]

(b) The diagram shows two circles, one inside the other.

*Diagram not drawn to scale*

The radius of the outer circle is 6 cm.

The radius of the inner circle is 5 cm.

Work out the area of the shaded region.

Give your answer in terms of π .

[3]

Area of shaded region = cm^2

Question taken from Eduqas examination paper 530003, November 2020

#2

The shape below consists of a square surrounded by four semi-circles.
The diameter of each semi-circle is 12 cm.

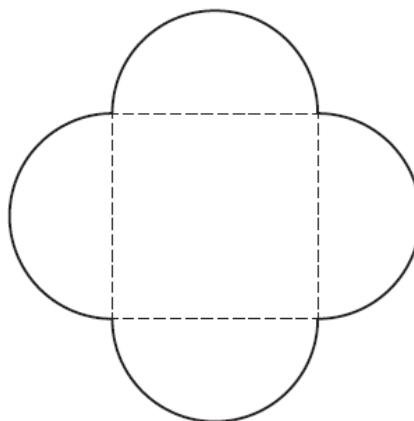


Diagram not drawn to scale

Work out the area of the shape.
Give your answer in the form $a + b\pi$.

[4]

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Area = cm^2

Question taken from Eduqas examination paper 530003, November 2023

Properties of a Circle: Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	4	
#3	4	
#4	5	
#5	5	
#6	5	
#7	6	
#8	8	
#9	8	
Total	49	

#1

The circumference of a circle is 40·841 cm.

Find the area of this circle.
You must show all your working.

[4]

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Area of circle = cm²

Question taken from Eduqas examination paper 5300004, November 2021

#2

Use:

$$\text{Pressure} = \frac{\text{Force (N)}}{\text{Area (cm}^2\text{)}}$$



A cylindrical fish tank stands on horizontal ground.
The base of the fish tank has a radius of 24 cm.
All the base of the fish tank is in contact with the ground.

The fish tank exerts a pressure of 0.97 N/cm^2 on the ground.
What force is exerted on the ground by the fish tank?

[4]

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Force = N

Question taken from Eduqas examination paper 530004, June 2024

#3

- (a) The diagram shows a circle inside a square of side 8.2 cm .

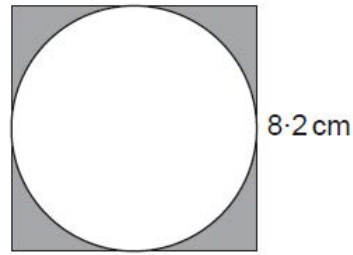


Diagram not drawn to scale

The sides of the square are tangents to the circle.

Find the area of the shaded region.
You must show all your working.

[4]

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Question taken from Eduqas examination paper 530004, June 2023

#4

A circular wheel makes 42 complete turns each minute.

(a) How many degrees does it turn through in one second?

[3]

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(b) (i) State **one** assumption you have made in your answer to part (a).

[1]

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(ii) How would your answer to part (a) change if this assumption was not correct? [1]

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Question taken from Eduqas examination paper 530004, June 2022

#5

- (b) A piece of paper is in the shape of a circle.
The circumference of the circle is 86 cm.

The paper is cut into 2 semi-circles.
Calculate the **perimeter** of one of the semi-circles.

Give your answer correct to the nearest $\frac{1}{10}$ cm.

[5]

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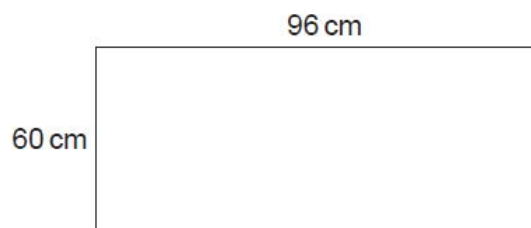
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Question taken from Eduqas examination paper 530004, June 2019

#6

Jan has a large piece of card.
The card has width 60 cm and length 96 cm.



She uses a machine to cut identical circles out of the card.
Each circle has a radius of 6 cm.

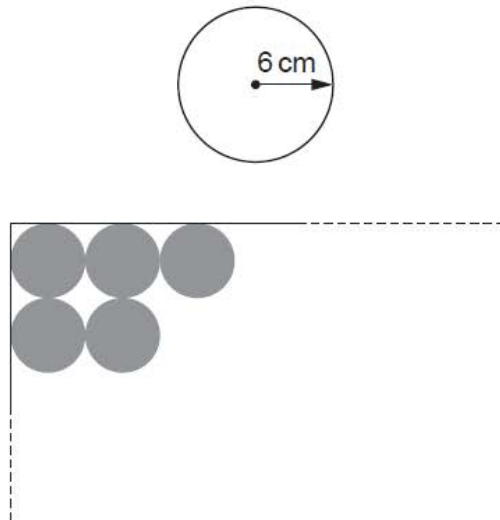


Diagram not drawn to scale

Jan has cut five circles as shown on the diagram above.
She continues in this way to cut as many circles as possible from the card.

- (a) What is the maximum number of circles Jan can cut out of the card? [1]

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- (b) Jan cuts out the maximum number of circles from the card.
What area of card is left over? [4]

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Area of card left over

Question taken from Eduqas examination paper 530004, November 2023

#7

- (b) The diagram shows a shape made from a trapezium and a circle.

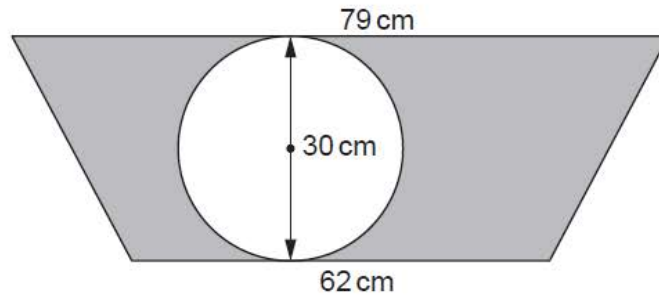


Diagram not drawn to scale

The parallel sides of the trapezium are tangents to the circle.
The diameter of the circle is 30 cm.

The ratio of the white area to the shaded area is as follows.

$$\begin{array}{ccc} \text{white area} & : & \text{shaded area} \\ 1 & : & k \end{array}$$

Find the value of k .

Show all your working and give your answer correct to 1 significant figure.

[6]

Question taken from Edugas examination paper 530004, November 2022

(c) Nadeen used a cutter to make her scones.
The cutter has a circular cross-section, with a diameter of 5 cm.
The depth of the scone mixture cut was 0.8 cm.



- [3]

- Assumption:

[5]

Total surface area cm²

101

#9

Gregor owns a restaurant.

- (a) The diagram shows a circular place mat and a square place mat.



Diagram not drawn to scale

The radius of the circular place mat is 14 cm.

- (i) Calculate the circumference of the circular place mat. [2]

- (ii) The **area** of the square place mat is 25% more than the **area** of the circular place mat.

Calculate the **perimeter** of the square place mat.
Comment on the accuracy of your answer.

[6]

Comment:

Question taken from Edugas examination paper 530004, November 2018

Volume / Surface Area of a Cylinder: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
#2	9	
Total	14	

#1

The solid cylinder shown below has radius 4 cm and height h cm.

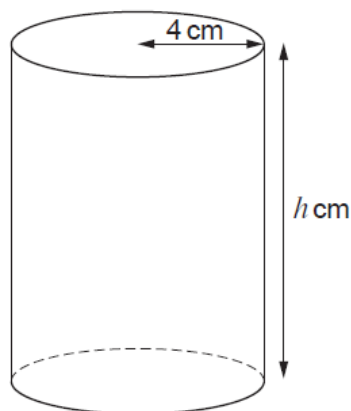


Diagram not drawn to scale

The total surface area of the cylinder is $104\pi \text{ cm}^2$.
Calculate the value of h .

[5]

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Question taken from Eduqas examination paper 530003, November 2024

#2

A cheese factory makes two different types of cheese.
Both types of cheese are in the shape of a cylinder.



- (a) The first cheese has radius 12 cm and height 7 cm.
Work out the total surface area of this cheese.
Give your answer as a multiple of π .

[4]

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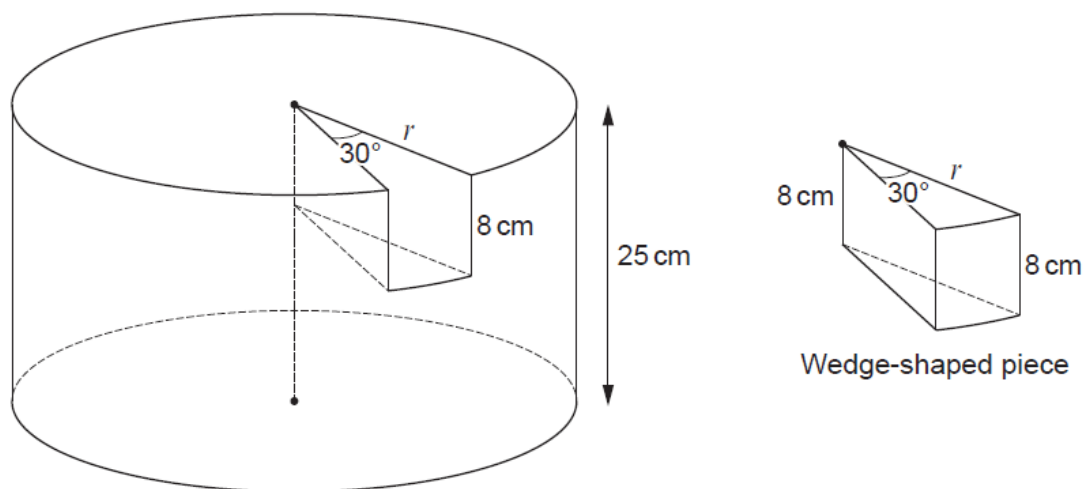
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- (b) The second cheese has radius r cm and height 25 cm.
A cheese taster working at the factory cuts a wedge-shaped piece out of this cheese.
It is cut to the centre of the cheese with an angle of 30° and a depth of 8 cm.

Work out the volume of the wedge-shaped piece as a **fraction** of the whole cheese.
Give your answer in its simplest form.

[5]



Diagrams not drawn to scale

Question taken from Eduqas examination paper 530003, May 2024

Volume / Surface Area of a Cylinder: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
#3	4	
#4	7	
#5	7	
Total	24	

#1

Elijah has a large cylinder of wax.
It has a radius of 7 cm and a height of 21 cm.

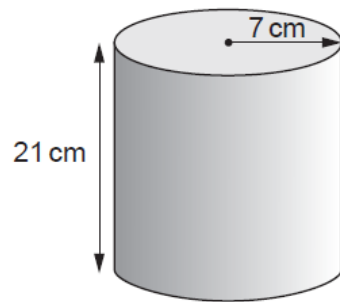


Diagram not drawn to scale

He melts down the large cylinder of wax to make small wax cylinders each with a volume of 102 cm^3 .

How many complete small wax cylinders can Elijah make?

[3]

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Question taken from Eduqas examination paper 530004, November 2024

#2

A cylindrical glass contains 500 cm^3 of water.
The glass has an internal radius of 3.5 cm .

Calculate the height of the water in the glass.



[3]

Question taken from Eduqas examination paper 530004, November 2020

#3

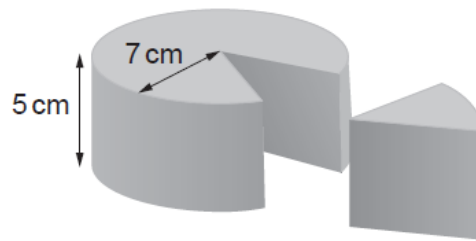


Diagram not drawn to scale

A wedge is cut from a cylinder of cheese of radius 7 cm and height 5 cm.
The volume of this wedge is 154 cm^3 .

What percentage of the whole cheese is this wedge?

[4]

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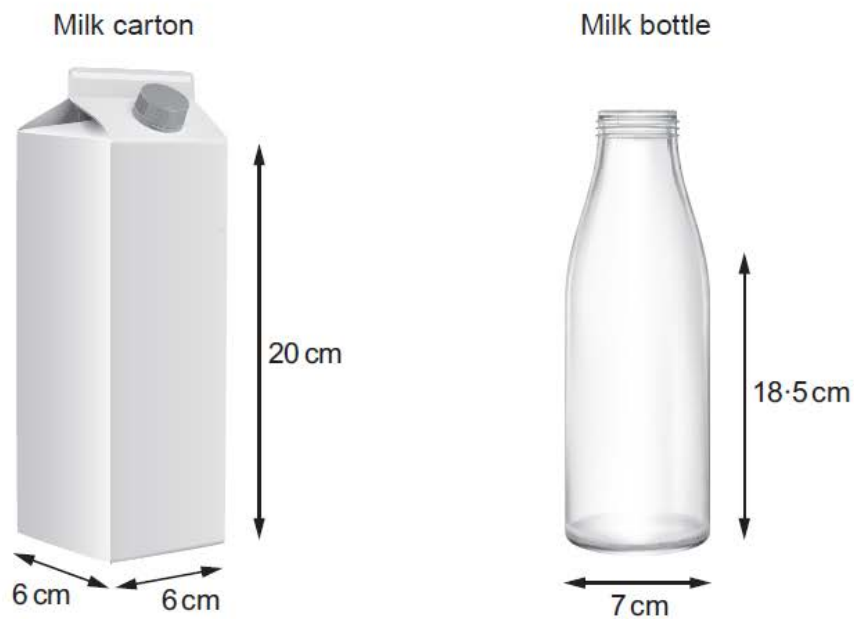
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Question taken from Eduqas examination paper 530004, June 2022

#4

Aled decides to pour milk from a full carton into an empty bottle. The measurements for the carton and the bottle are shown below.



Diagrams not drawn to scale

- (a) Is it possible to pour all the milk from the full carton into the bottle?
You must show all your working and give a reason for your answer.

[5]

Yes

☐

No

☐

Reason:

- (b) (i) When evaluating your result in part (a), what assumption did you make? [1]

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- (ii) If your assumption were **not** true, what impact would this have on your answer? [1]

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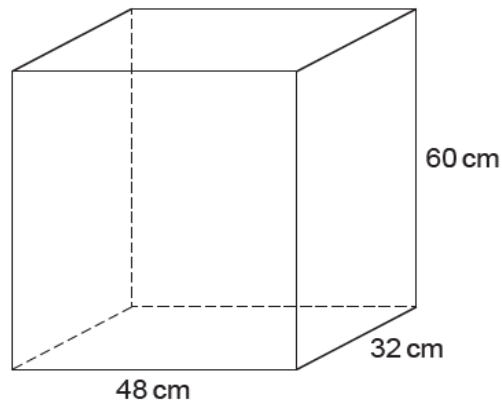
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Question taken from Eduqas examination paper 530004, June 2018

#5

The diagram shows the interior length, width and height of a wooden crate.



**Diagram not
drawn to scale**

Jake fills the crate with solid beeswax cylinders. They each have a length of 32 cm. The cylinders fit tightly in the crate with 8 cylinders in each row. The first two rows are shown in the diagram.

Jake continues to fill the crate in this way.

The density of the beeswax is 0.961 g/cm^3 .

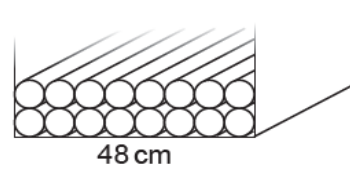


Diagram not drawn to scale

Jake calculates the total mass of the cylinders to be more than 70 kg. Is he correct?

Yes

5

No

Show how you decide.

[7]

Question taken from Edugas examination paper 530004, November 2022

Volume / Surface Area of a Cone / Sphere: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	4	
#3	6	
#4	7	
Total	19	

#1

A sphere has a radius of $\frac{3}{4}$ metre.

Work out the surface area of the sphere.

Give your answer in its simplest form as a multiple of π .

[2]

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Surface area is m^2

Question taken from Eduqas examination paper 530003, November 2018

#2

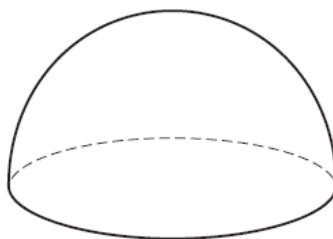


Diagram not
drawn to scale

The volume of a hemisphere is $18000\pi \text{ cm}^3$.

Find the radius of the hemisphere.

[4]

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Question taken from Eduqas examination paper 530003, November 2022

#3

- (b) A cone has a radius of 6 cm and a slant height of 52 cm.

Show that the curved surface area of the cone must be a multiple of 13π .

[2]

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- (c) Jupiter is a planet.



The radius of Jupiter is 7×10^4 km.

You may assume the radius of Jupiter is constant.

Work out the surface area of Jupiter.

Give your answer in the form $k\pi$, where k is in standard form.

[4]

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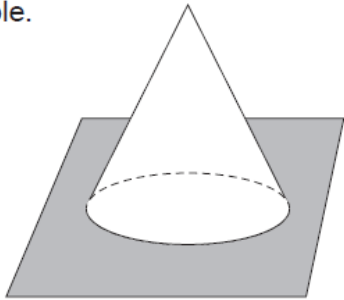
Question taken from Eduqas examination paper 530003, November 2021

#4

The diagram shows a cone placed with its circular base on a table.

It has

- base radius 15 cm,
- height 30 cm.



- (a) Work out the volume of this cone.
Give your answer as a multiple of π .

Diagram not drawn to scale [3]

Volume is cm³

- (b) On the 1 cm grid opposite, make an accurate scale drawing of the plan and side elevation of this cone.

Use the ratio
actual cone : scale drawing = 5 : 1. [4]

Plan



Side elevation



Question taken from Eduqas examination paper 5300003, May 2022

Volume / Surface Area of a Cone / Sphere: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	4	
#3	4	
#4	4	
#5	4	
#6	7	
#7	8	
#8	9	
Total	43	

#1

A solid cone has a base radius of y cm.
The height of the cone is six times its radius.
The cone is made from material which has a density of 7 g/cm^3 .
Write an expression for the mass of the cone in grams.
Give your answer, in terms of y and π , in its simplest form.

[3]

Question taken from Eduqas examination paper 530004, June 2024

#2

A cuboid of copper has a mass of 2150.4 grams and a volume of 240 cm^3 .
A sphere of copper has a radius of $x \text{ cm}$.

Show that the mass, in grams, of the sphere is less than $38x^3$.

[4]

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Question taken from Eduqas examination paper 5300004, June 2022

#3

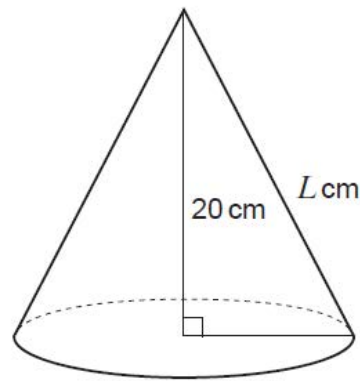


Diagram not drawn to scale

- (a) A cone has vertical height 20 cm.
The volume of the cone is 2400 cm^3 .

Calculate L , the slant height of the cone.

[4]

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Question taken from Eduqas examination paper 530004, November 2020

#4

- (a) The volume of a sphere with a radius of 2.7 cm is equal to the volume of a cuboid. The base of the cuboid has an area of 14.2 cm^2 .

Calculate the height of the cuboid.

[4]

Question taken from Eduqas examination paper 530004, June 2019

#5

- (a) The volume of a cone is equal to the volume of a sphere.
The radius of the cone is four times the radius of the sphere.

Show that the perpendicular height of the cone is a quarter of the radius of the sphere. [4]

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Question taken from Eduqas examination paper 530004, November 2019

#6

A cone has a radius x cm, a perpendicular height $(x + 2)$ cm and a slant height 16.4 cm.

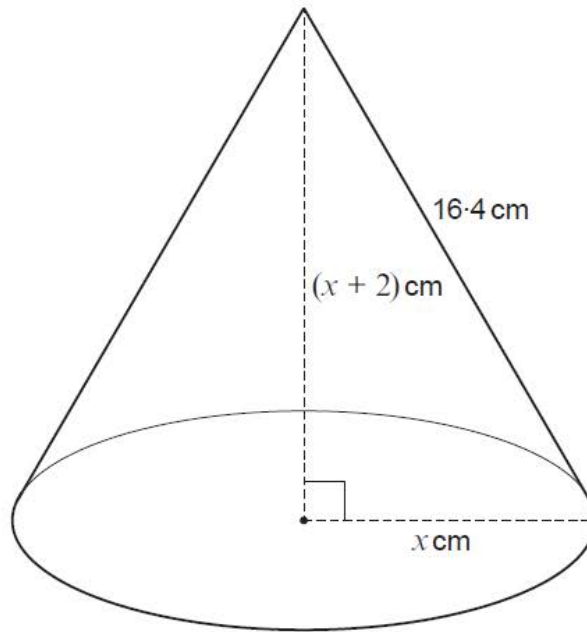


Diagram not drawn to scale

Show that x satisfies the equation $x^2 + 2x - 132.48 = 0$ and calculate the volume of the cone.
You must show all your working. [7]

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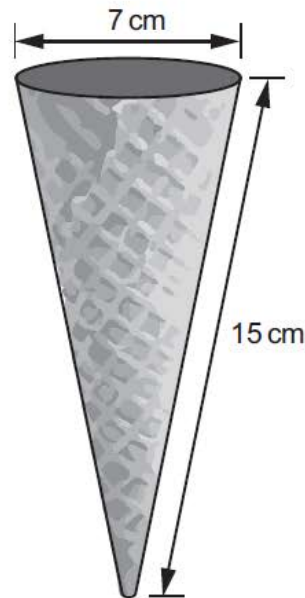
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Question taken from Eduqas examination paper 530004, June 2019

#7

(a)

*Diagram not drawn to scale*

Megan buys ice cream in a 2 litre pack.

- (i) How many cones could Megan fill?
You may assume that each cone is completely filled, level to the top, with ice cream. [7]

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(ii) What **impact** does the assumption have on your answer in (a)(i)?

[1]

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Question taken from Eduqas examination paper 530004, November 2018

#8

The diagram shows a shape made from a cone and a hemisphere. The cone has height 5 cm and base radius $(x + 1)$ cm.

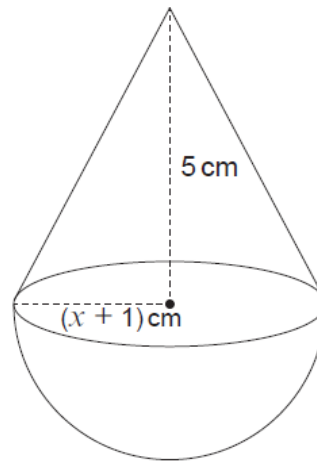


Diagram not drawn to scale

The volume of the shape is $24\pi \text{ cm}^3$.

(a) Show that $2x^3 + 11x^2 + 16x = 65$.

[5]

130

Frustums: Calculator

Question	Maximum Mark	Mark Awarded
#1	7	
#2	8	
Total	15	

#1

An inverted cone is held in a stand.

The radius of the cone is 20 cm and the height of the cone is 50 cm.

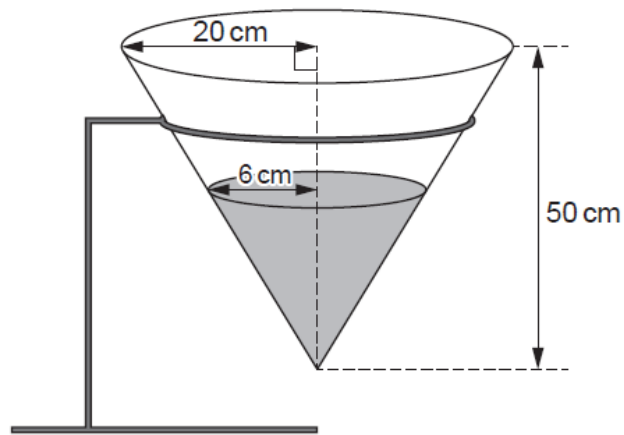


Diagram not drawn to scale

Jake pours some water into this cone.

When he stops, the radius of the surface of the water is 6 cm.

The surface of the water is parallel to the base of the cone.

Rhian then pours water into the cone until it is completely full.

She pours the water at a rate of 1 litre per 10 seconds.

How many seconds does it take Rhian to fill the cone?

[7]

Question taken from Edugas examination paper 530004, June 2023

#2

The diagram shows a candle. It is made by removing a small pyramid of wax from the top of a large pyramid of wax, to expose the wick.

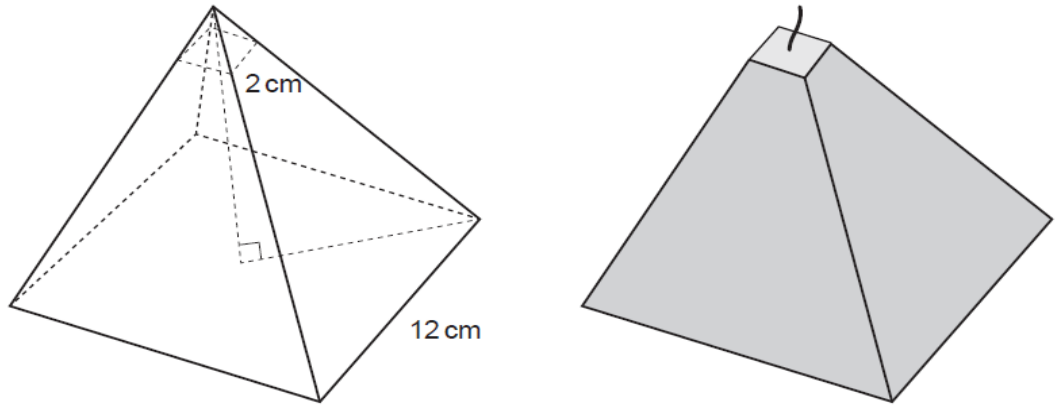


Diagram not drawn to scale

The perpendicular height of the large pyramid is 24 cm.
The base of the large pyramid is a square with sides 12 cm.
The base of the small pyramid that is removed is a square with sides 2 cm.
The density of the candle wax is 0.9 g/cm^3 .

$$\text{Volume of pyramid} = \frac{1}{3} \times \text{area of base} \times \text{perpendicular height}$$

- (a) Calculate the mass of the candle. State one assumption you make.

[7]

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Assumption:

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Mass of candle = grams

(b) Describe the impact of your assumption on your answer to part (a). [1]

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Question taken from Eduqas examination paper 530004, November 2021

Area of a Triangle: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
Total	4	

[4]

136

Area of a Triangle: Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
Total	5	

The diagram shows two triangles on two parallel horizontal lines. The left triangle is a right-angled triangle with its right angle at the bottom-right vertex, indicated by a square symbol. Its base on the bottom line is labeled 8.2 cm. The right triangle has its base on the bottom line labeled 9.8 cm. Both triangles have their top vertices on the top parallel line.

[5]

138

Sine Rule / Cosine Rule / Area of a Triangle: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
#2	5	
Total	10	

#1

The diagram shows a triangle ABC .

$AB = 14\text{ cm}$, $AC = 15\text{ cm}$ and $\hat{BAC} = 37^\circ$.

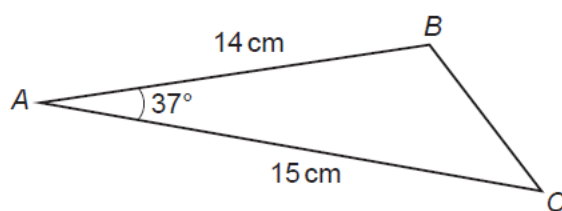


Diagram not drawn to scale

The ratio of the area of the triangle to the area of a circle is $7 : 16\pi$.

Given that $\sin 37^\circ = 0.6$, calculate the radius of the circle.

[5]

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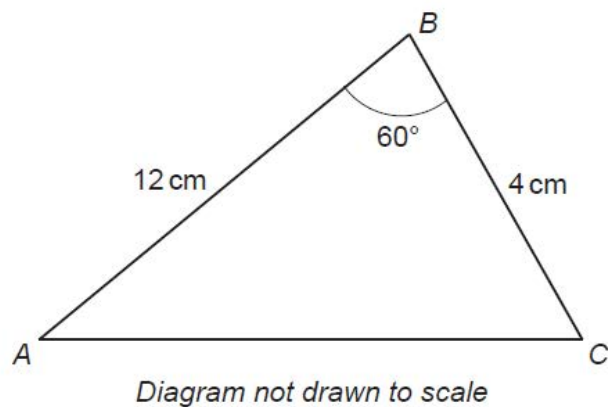
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Question taken from Eduqas examination paper 530003, November 2024

#2



Calculate the length of AC.
Give your answer as a surd in its simplest form.

[5]

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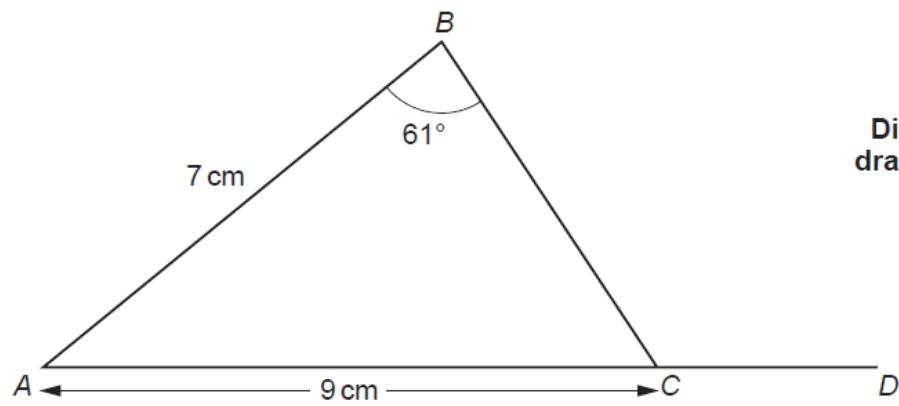
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Question taken from Eduqas examination paper 5300003, November 2020

Sine Rule / Cosine Rule / Area of a Triangle: Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	6	
#3	6	
#4	6	
#5	6	
#6	6	
#7	7	
#8	9	
#9	10	
#10	10	
#11	10	
Total	80	

#1

**Diagram not
drawn to scale**

In triangle ABC , $AB = 7$ cm, $AC = 9$ cm and $\hat{ABC} = 61^\circ$.
 ACD is a straight line.

Find $\hat{BCD}$.

[4]

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Question taken from Eduqas examination paper 530004, November 2022

#2

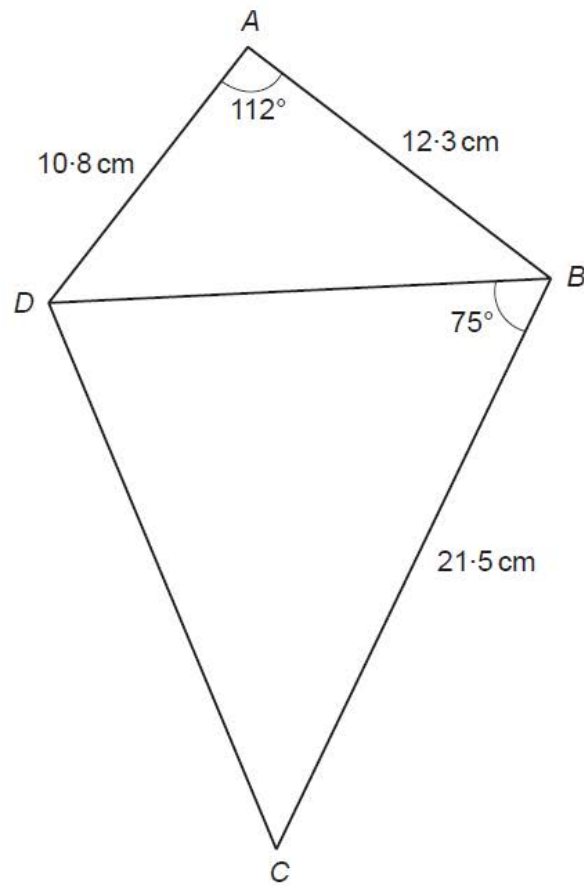


Diagram not drawn to scale

Calculate the area of $ABCD$.

[6]

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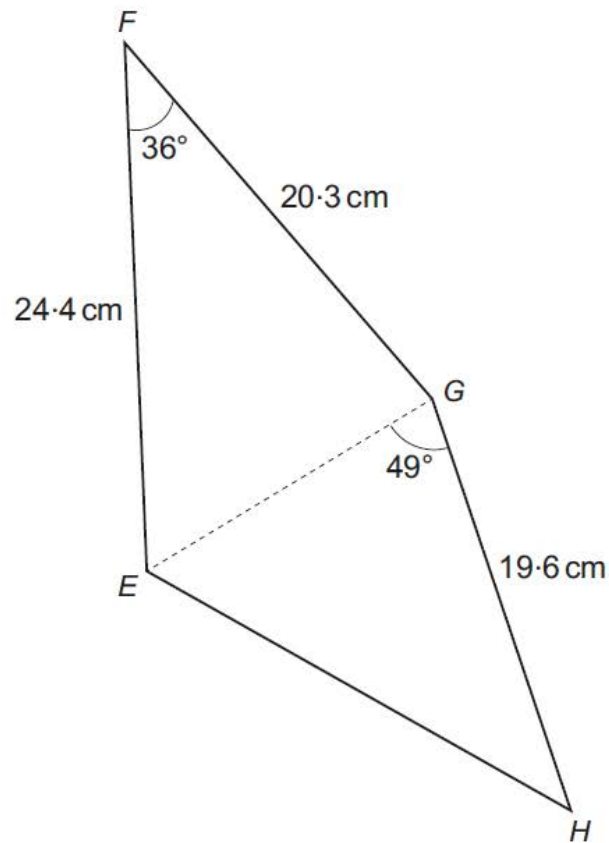
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Question taken from Eduqas examination paper 5300004, November 2019

#3

Quadrilateral $EFGH$ is shown below.*Diagram not drawn to scale*Calculate the area of $EFGH$.

[6]

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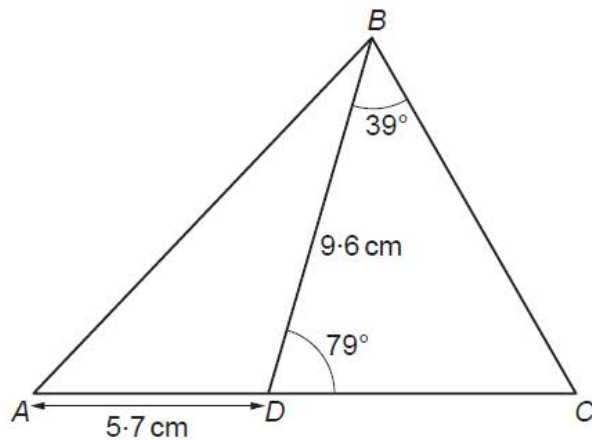
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Question taken from Eduqas examination paper 5300004, November 2018

#4

*Diagram not drawn to scale*

In the diagram, $AD = 5.7$ cm, $BD = 9.6$ cm, $\widehat{BDC} = 79^\circ$ and $\widehat{DBC} = 39^\circ$.

ADC is a straight line.

- (a) Calculate the length of DC .

[3]

- (b) Mona assumes that the values in the diagram are all exact and uses these to work out the area of triangle ABD .
In fact, the lengths are correct but $\widehat{BDC}$ has been **rounded up** to the nearest whole number.

Is Mona's answer too large or too small?

Use calculations to justify your decision.

[3]

Too large

☐

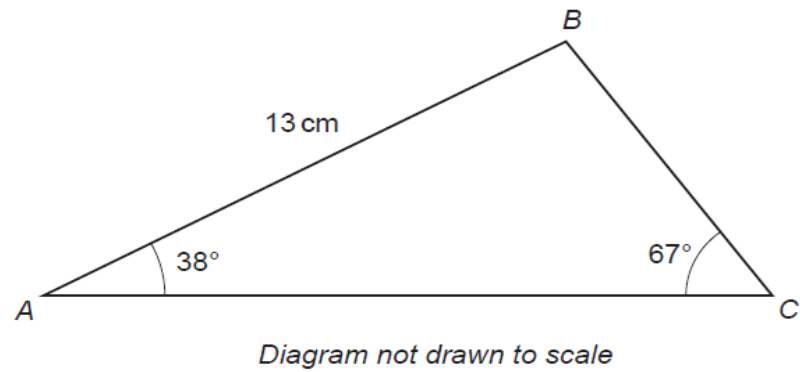
Too small

☐

Question taken from Eduqas examination paper 530004, November 2020

#5

(a)

Calculate the length of BC .

[3]

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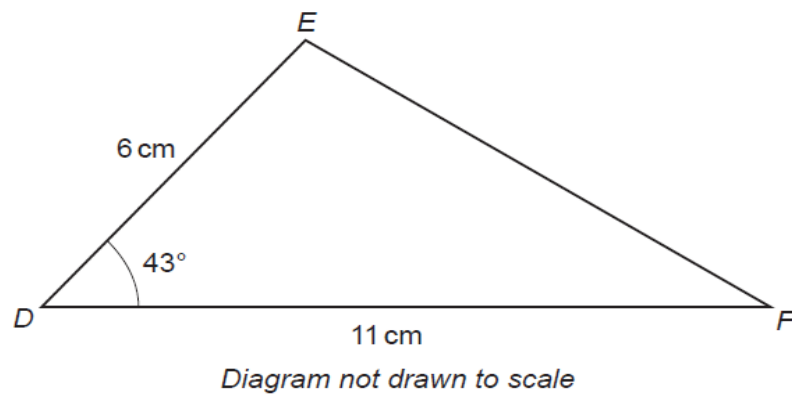
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(b)

Calculate the length of EF .

[3]

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Question taken from Eduqas examination paper 530004, June 2023

#6

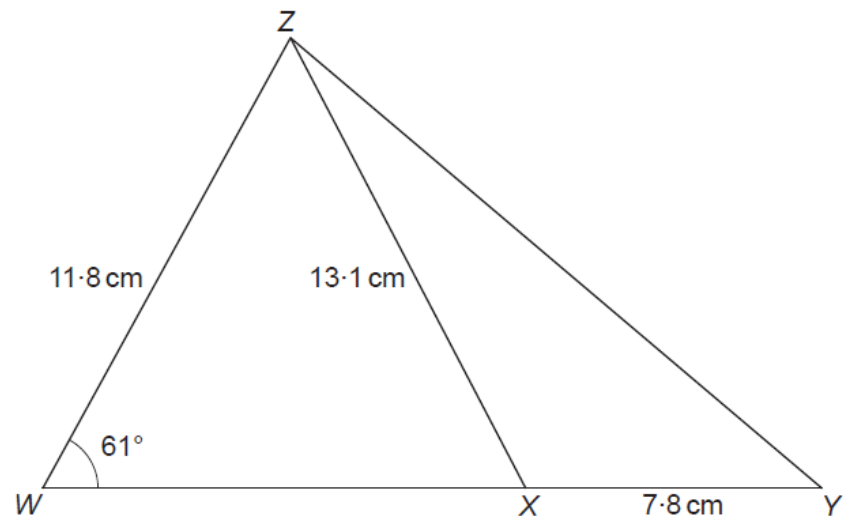


Diagram not drawn to scale

WXY is a straight line.

Calculate the length of YZ .

[6]

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Question taken from Eduqas examination paper 530004, June 2024

A quadrilateral $ABCD$ is shown with diagonal AC . The side lengths are $AB = 6.4$ cm, $BC = 11.1$ cm, and $CD = 8.3$ cm. The angle BAC is 71° and the angle BCD is 68° .

Calculate the size of $\hat{C}BD$.

150

#8

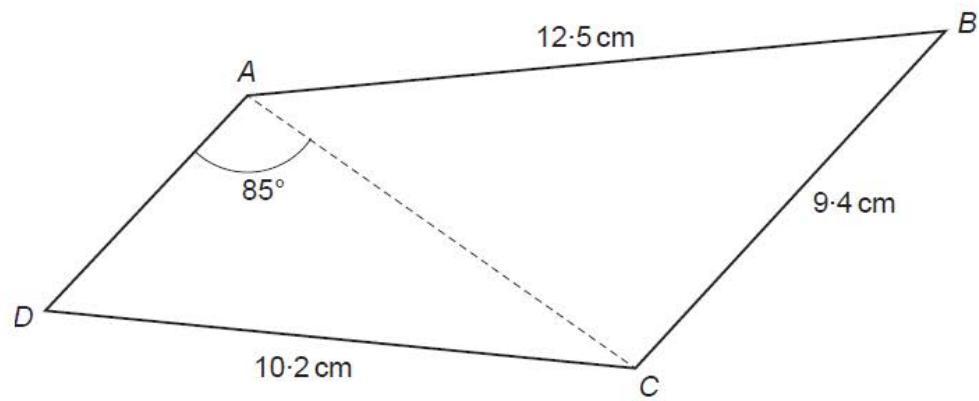


Diagram not drawn to scale

$\hat{A}BC$ is acute.

The area of triangle ABC is 45.0 cm^2 .

Show that $\hat{ABC} = 50^\circ$ correct to the nearest integer and hence calculate $\hat{ADC}$.

[9]

Question taken from Edugas examination paper 530004, June 2022

#9

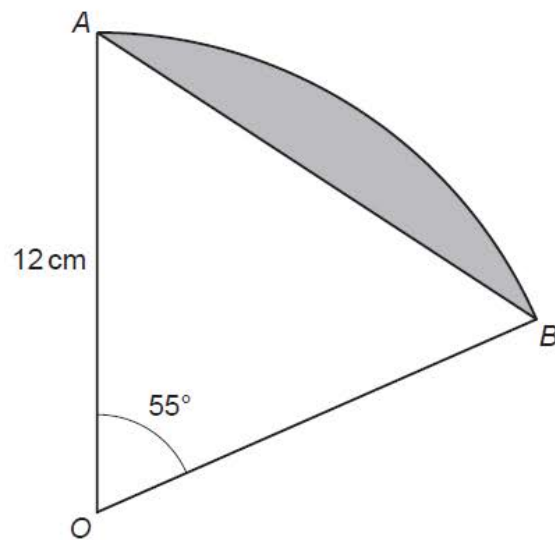


Diagram not drawn to scale

The diagram shows a sector of a circle, centre O, radius 12 cm.
 $\hat{AOB}$ is 55° .

- (a) Find the area of the shaded region.

[4]

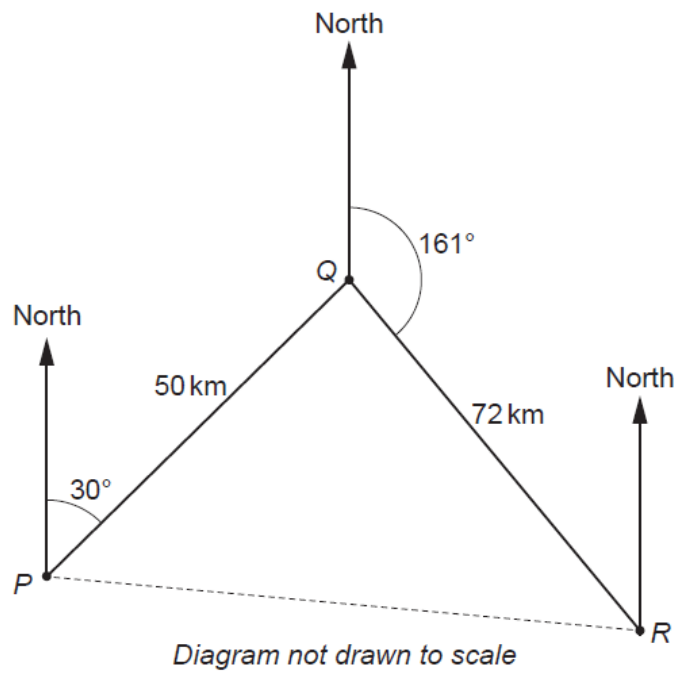
(b) Find the perimeter of the shaded region.

[6]

Question taken from Eduqas examination paper 530004, November 2022

#10

The diagram shows the journey of a small boat.



The boat sails from point P on a bearing of 030° for 50 km.
When it reaches point Q , it changes direction and travels to point R on a bearing of 161° for 72 km.

(a) Show that $\hat{PQR} = 49^\circ$.

[1]

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(b) The triangular area PQR is to be searched to locate a shipwreck.
Calculate this area.

[2]

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Area = km^2

- (c) Calculate the bearing of P from R .
Give your answer correct to the nearest degree.

[7]

Question taken from Eduqas examination paper 530004, November 2021

#11

Mark's little sister Lucy has lost a piece of her jigsaw puzzle.
Mark has recorded some of the measurements of the gap left in the jigsaw by this missing piece.

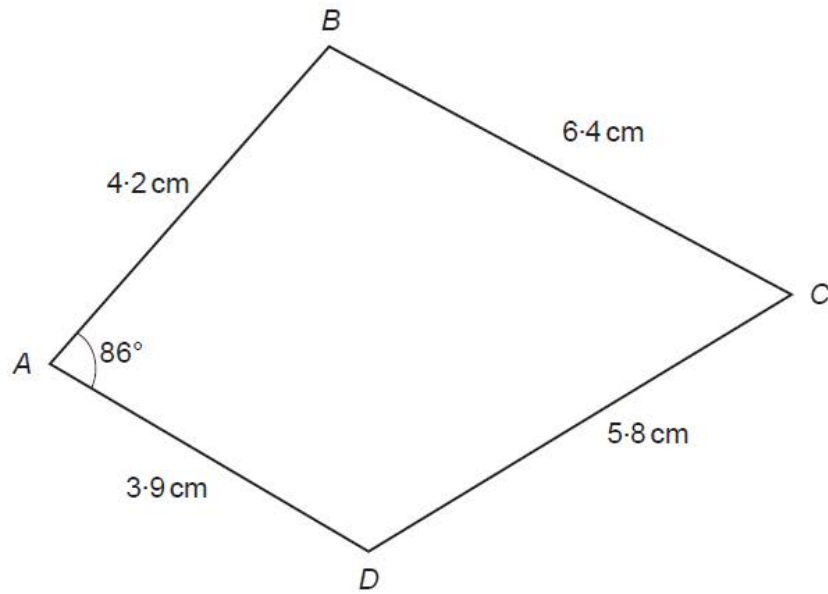


Diagram not drawn to scale

Mark agrees to make a replacement jigsaw piece for Lucy.

One face of the replacement jigsaw piece is to be painted gold.

It cost Mark £3.59 to buy a small pot of gold paint.

The label on the pot states there is enough paint in the pot to cover an area of 60 cm^2 .

He says Lucy has to pay for the share of the gold paint he uses to make the missing jigsaw piece.

- Calculate the size of $\hat{BCD}$.
- Hence calculate how much Mark should charge Lucy.

You must show all your working.

[10]

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Mark should charge Lucy £

Question taken from Eduqas examination paper 530004, June 2018

Area / Perimeter of a Sector / Segment: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
Total	6	

#1

Nia and David are trying to work out the area of this sector of a circle. They must give the answer as a multiple of π .

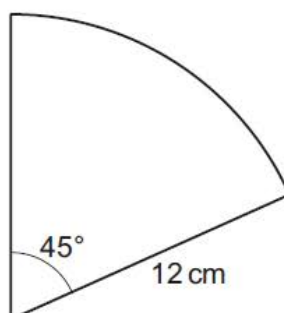


Diagram not drawn to scale

Here is Nia's answer.

Step 1 $360 \div 45 = 8$

Step 2 Area of whole circle = $\pi \times 24$

Step 3 Area of sector = $\frac{1}{8}$ of $24\pi = \frac{24\pi}{8}$

Step 4 Answer = $3\pi \text{ cm}^2$

David looks at Nia's answer and says,

'Your answer is wrong.'

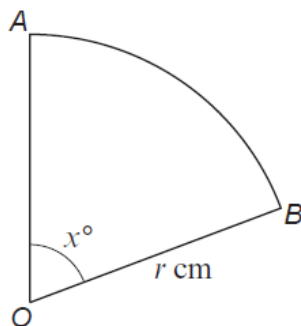
- Explain the error that Nia has made.
- Calculate the correct answer as a multiple of π .

[3]

Question taken from Eduqas examination paper 530003, June 2018

#2

(a)

*Diagram not drawn to scale*

The diagram shows a sector of the circle with centre O and radius r cm.

The length of the arc, AB , is $\frac{1}{6} \times \pi \times r$.

Work out the value of x .

[3]

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Question taken from Eduqas examination paper 530003, November 2021

Area / Perimeter of a Sector / Segment: Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
#2	6	
#3	11	
Total	22	

#1

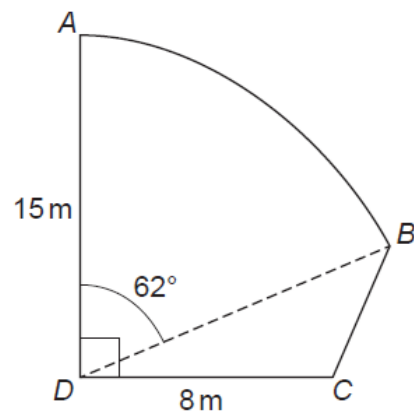


Diagram not drawn to scale

The diagram shows a sector, ABD , of a circle with centre D and a triangle, BCD . $\widehat{ADC}$ is a right angle.

Show that the area of $ABCD$ is 150 m^2 , correct to 3 significant figures.

[5]

Question taken from Eduqas examination paper 530004, June 2023

#2

The diagram shows a sector of a circle with radius r cm and angle x° .

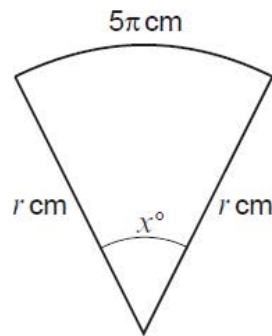


Diagram not drawn to scale

The arc length of the sector is 5π cm.

(a) Show that $x = \frac{900}{r}$.

[2]

(b) The area of the sector is $30\pi \text{ cm}^2$.

Calculate the value of x .

[4]

Question taken from Eduqas examination paper 530004, November 2020

#3

The diagram below shows a plan view of a stage, $ABCD$. ABC is a sector of a circle, with centre C .

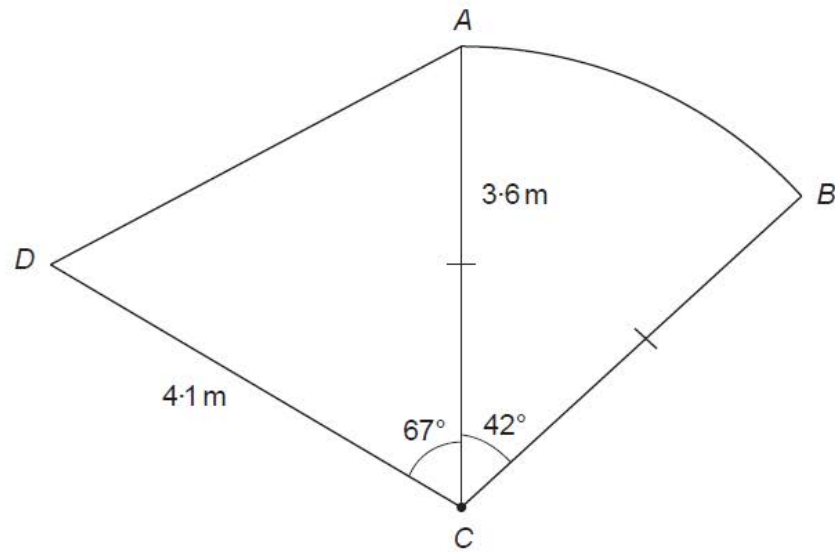


Diagram not drawn to scale

- (a) The band *Fredalive* need a stage area of at least 11.5 m^2 to set up equipment and perform.

Is this stage suitable for *Fredalive* to set up equipment and perform?
You must show all your working.

[5]

Conclusion

The stage is suitable:

Yes

102

No

5

- (b) Fredalive want to place a banner around the perimeter of the stage.

Will a banner of length 14 m fit around this stage without leaving a gap?
You must show all your working.

[6]

Conclusion

The banner will fit without leaving a gap:

Yes

10

No

75

Question taken from Edugas examination paper 530004, June 2019

Vectors: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	3	
#3	4	
#4	4	
#5	4	
#6	5	
#7	5	
#8	5	
#9	6	
#10	7	
Total	45	

#1

$$\mathbf{p} = \begin{pmatrix} 4 \\ 2 \end{pmatrix} \text{ and } \mathbf{q} = \begin{pmatrix} -3 \\ 2 \end{pmatrix}$$

Work out the column vector $\frac{1}{2}\mathbf{p} - \mathbf{q}$. [2]

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$$\frac{1}{2}\mathbf{p} - \mathbf{q} = \begin{pmatrix} \\ \end{pmatrix}$$

Question taken from Eduqas examination paper 530003, June 2019

#2

The diagram shows a trapezium, $ABCD$, with AD parallel to BC .

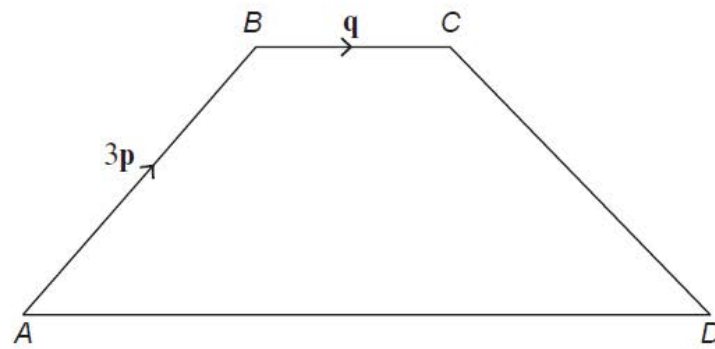


Diagram not drawn to scale

The vectors $\mathbf{AB}$ and $\mathbf{BC}$ are shown in the diagram.
The side AD is 3 times the length of the side BC .

Find $\mathbf{DC}$ in terms of $\mathbf{p}$ and $\mathbf{q}$.
Give your answer in its simplest form.

[3]

Question taken from Eduqas examination paper 530003, June 2018

#3

$$\mathbf{p} = \begin{pmatrix} -1 \\ 5 \end{pmatrix}, \quad \mathbf{q} = \begin{pmatrix} 7 \\ -2 \end{pmatrix} \quad \text{and} \quad \mathbf{r} = \begin{pmatrix} 19 \\ 4 \end{pmatrix}$$

- (a) Work out the column vector $4(\mathbf{p} + \mathbf{q})$. [2]

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$$4(\mathbf{p} + \mathbf{q}) = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$$

- (b) When $2\mathbf{p} + x\mathbf{q} = \mathbf{r}$, find the value of x . [2]

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$$x = \text{.....}$$

Question taken from Eduqas examination paper 530003, November 2018

A triangle with vertices labeled A , B , and O . Vertex A is at the top, O is at the bottom left, and B is at the bottom right. Point C is located on the side AB , and point D is located on the side OB .

[4]

170

#5

$$\mathbf{p} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}, \mathbf{q} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$$

- (a) Find the values of m and n such that $m(\mathbf{p} + \mathbf{q}) = \begin{pmatrix} 5 \\ n \end{pmatrix}$. [3]

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$$m = \text{.....} \quad n = \text{.....}$$

- (b) Write down the vector $\mathbf{r}$ which is parallel to the vector $\mathbf{q}$ and is 3 times as long. [1]

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$$\mathbf{r} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$$

Question taken from Eduqas examination paper 530003, November 2024

#6

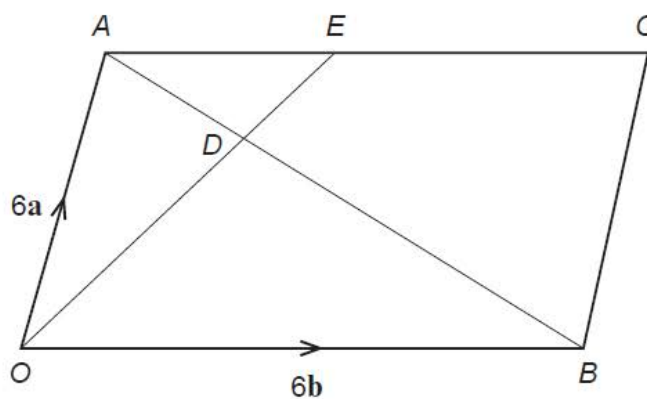


Diagram not drawn to scale

The diagram shows a parallelogram, $OACB$, and the vectors $\mathbf{OA}$ and $\mathbf{OB}$. E lies on AC .

D is the point of intersection of OE and AB so that $\mathbf{AD} = \frac{1}{3}\mathbf{AB}$.

- (a) Complete this proof to show that $\mathbf{OE} = 6\mathbf{a} + 3\mathbf{b}$. [4]

Proof:

$$\mathbf{OE} = \mathbf{OA} + \mathbf{AE} = 6\mathbf{a} + k\mathbf{b} \text{ for some positive scalar } k$$

$$\mathbf{OE} = n\mathbf{OD}, \text{ for some positive scalar } n$$

$$\mathbf{OD} = \dots\dots\dots$$

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- (b) What does the proof in part (a) also tell you about the point E ? [1]

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Question taken from Eduqas examination paper 530003, June 2019

#7

- (a) The vector $\mathbf{r} = \begin{pmatrix} 7 \\ -2 \end{pmatrix}$ and the vector $\mathbf{w} = \begin{pmatrix} -2 \\ 4 \end{pmatrix}$.

On the grid below, draw the vector $\mathbf{r} + \mathbf{w}$.

[2]



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(b)

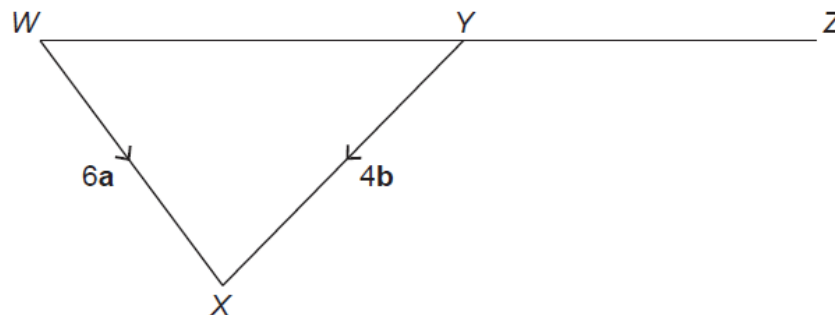


Diagram not drawn to scale

WYZ is a straight line.

The vectors $\mathbf{WX}$ and $\mathbf{YX}$ are shown in the diagram.

Given that $WY : YZ = 2 : 3$, write the vector $\mathbf{WZ}$ in the form $m\mathbf{a} + n\mathbf{b}$.

[3]

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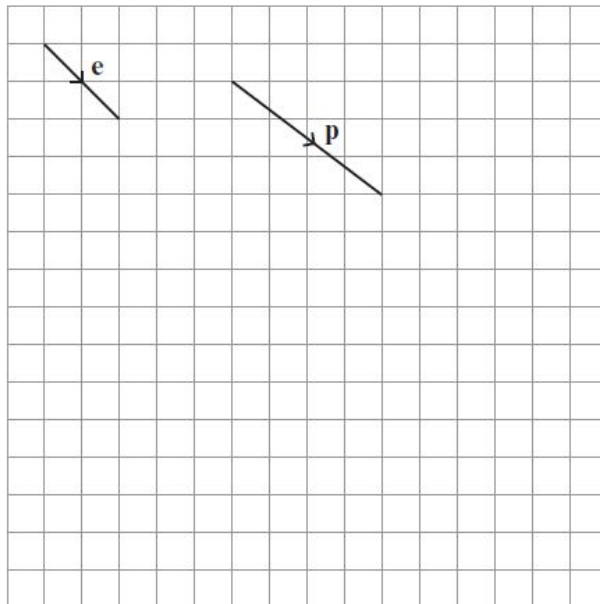
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Question taken from Eduqas examination paper 530003, November 2023

#8

(a)



The grid shows the vector $\mathbf{e} = \begin{pmatrix} 2 \\ -2 \end{pmatrix}$ and the vector $\mathbf{p}$.

The vector $\mathbf{q} = \begin{pmatrix} -0.5 \\ -2.5 \end{pmatrix}$.

Draw a diagram on the grid above to represent $\mathbf{p} + 2\mathbf{q}$.

[2]

(b)

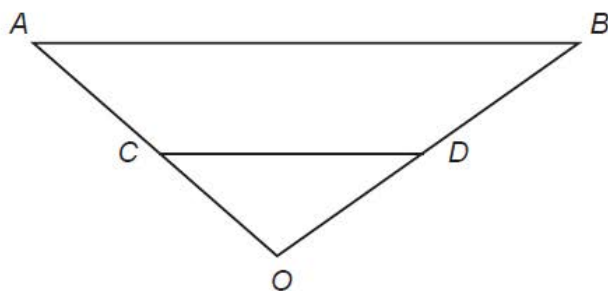


Diagram not drawn to scale

$\mathbf{OA} = 3\mathbf{a}$ and $\mathbf{OB} = 6\mathbf{b}$.

The sides of triangles OAB and OCD are in the ratio $3 : 1$.

By writing $\mathbf{AB}$ and $\mathbf{CD}$ in terms of $\mathbf{a}$ and $\mathbf{b}$, decide whether CD is parallel to AB .

Parallel

☐

Not Parallel

☐

Show how you decide.

[3]

Question taken from Eduqas examination paper 530003, November 2020

#9

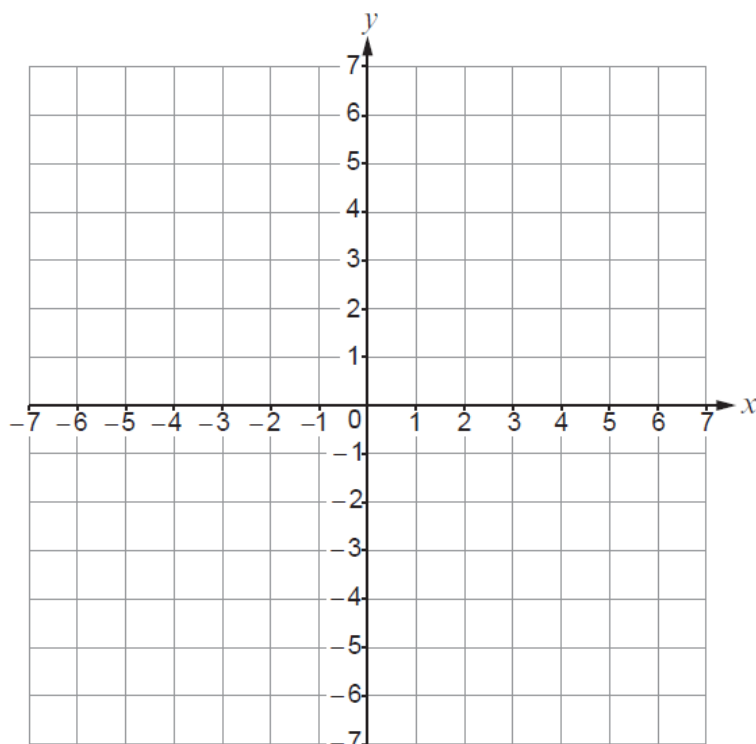
- (a) The point O is the origin.

The points O , P , and R are such that $\mathbf{OP} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$ and $\mathbf{OR} = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$.

- (i) Find $\mathbf{PR}$.

You may use this grid to help you.

[2]



$$\mathbf{PR} = \begin{pmatrix} \\ \end{pmatrix}$$

- (ii) The point Q is such that, when taken in a clockwise direction, the points O , P , Q and R form a parallelogram.

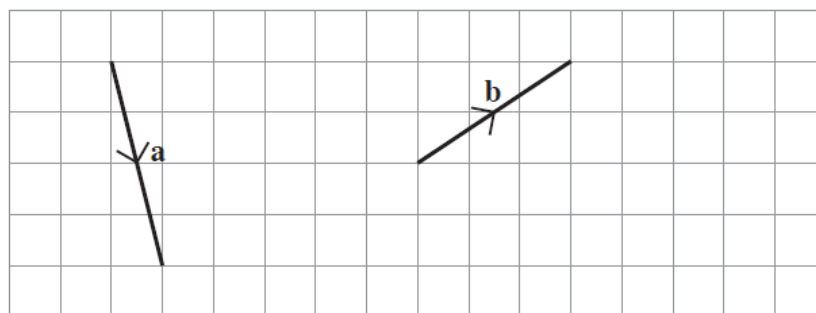
Find $\mathbf{OQ}$.

You may use the grid above to help you.

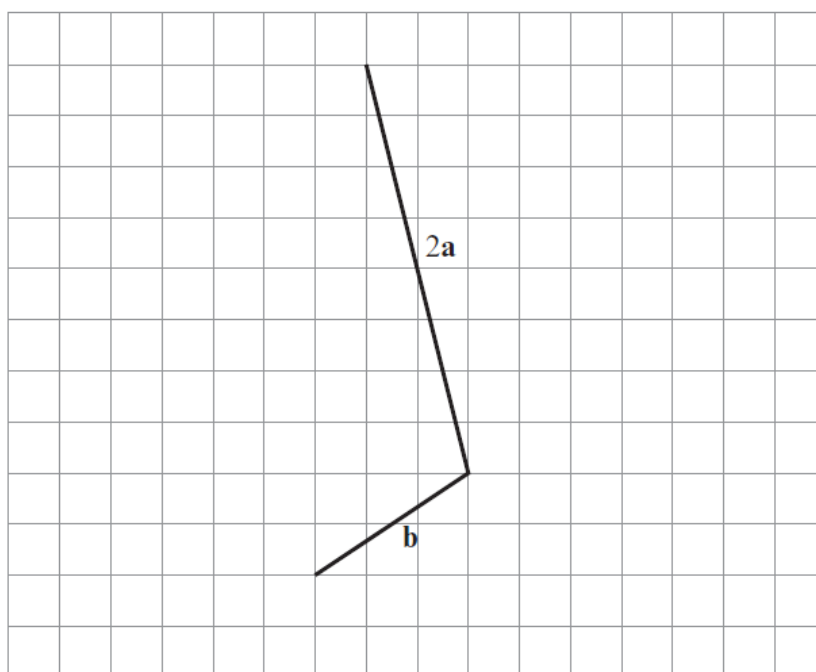
[2]

$$\mathbf{OQ} = \begin{pmatrix} \\ \end{pmatrix}$$

- (b) The grid shows the vectors **a** and **b**.



Mitch wants to draw the vector $2\mathbf{a} + \mathbf{b}$.
His diagram is shown below.



Make **two** criticisms of Mitch's diagram.

[2]

Criticism 1

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Criticism 2

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Question taken from Eduqas examination paper 530003, May 2022

#10

The vectors **OP**, **OQ** and **OR** are shown in the diagram.

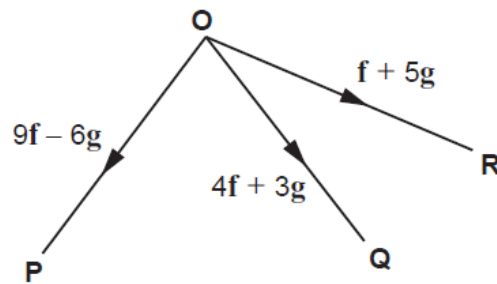


Diagram not drawn to scale

- (a) (i) **$RQ = kOP$.**
Find the value of k .
You must show all your working. [3]

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The value of $k =$

- (ii) Write down **two** facts about the lines OP and RQ . [2]

Fact 1:

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Fact 2:

.....

- (b) O is the midpoint of the line PX .
Find PX in the form $m\mathbf{f} + n\mathbf{g}$ where m and n are integers. [2]

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Question taken from Eduqas examination paper 530003, May 2024

Vectors: Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	4	
#3	4	
Total	10	

#1

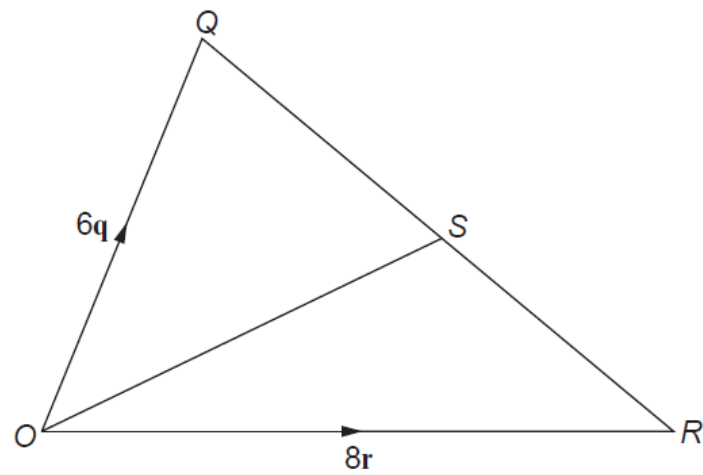


Diagram not drawn to scale

In the triangle OQR , $\mathbf{OQ} = 6\mathbf{q}$ and $\mathbf{OR} = 8\mathbf{r}$.
 S is the mid-point of QR .

Find $\mathbf{RS}$ in terms of $\mathbf{q}$ and $\mathbf{r}$.

Give your answer in the form $a\mathbf{q} + b\mathbf{r}$, where a and b are integers.

[2]

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Question taken from Eduqas examination paper 530004, November 2024

#2

The diagram shows quadrilateral $OABC$.
 $\mathbf{OA} = 5\mathbf{x}$, $\mathbf{OB} = 12\mathbf{x} + 6\mathbf{y}$ and $\mathbf{OC} = 8\mathbf{y}$.

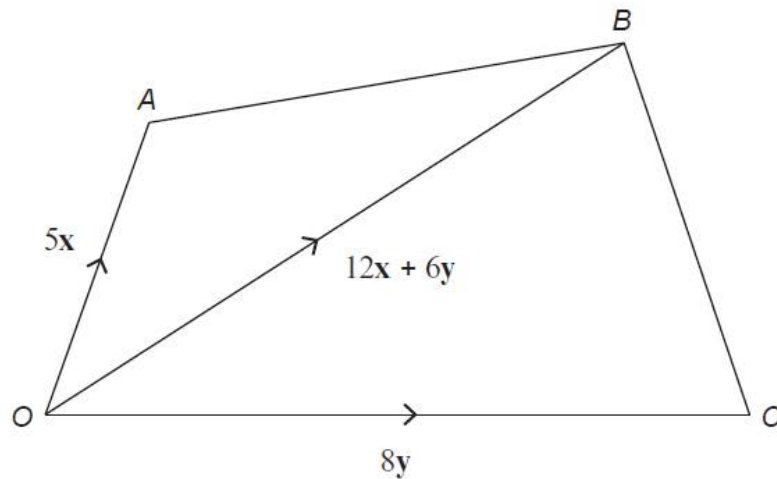


Diagram not drawn to scale

- (a) Express $\mathbf{CA}$ in terms of $\mathbf{x}$ and $\mathbf{y}$. [1]

- (b) P is the midpoint of OB .
 Express each of the following in terms of $\mathbf{x}$ and $\mathbf{y}$.
 Give each of your answers in the simplest form.

- (i) $\mathbf{OP}$ [1]

- (ii) $\mathbf{PA}$ [1]

- (c) Does P lie on CA ?

Yes ☐ No ☐

You must give a reason for your answer. [1]

Question taken from Eduqas examination paper 530004, November 2019

#3

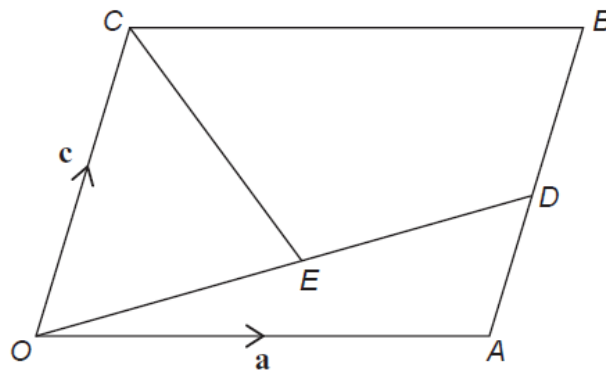


Diagram not
drawn to scale

OABC is a parallelogram.

$\vec{OA} = \mathbf{a}$ and $\vec{OC} = \mathbf{c}$.

D is the midpoint of AB and E is the midpoint of OD.

- (a) Find $\vec{OD}$ in terms of $\mathbf{a}$ and $\mathbf{c}$.

[1]

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- (b) Find $\vec{OE}$ in terms of $\mathbf{a}$ and $\mathbf{c}$.

[1]

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- (c) Find $\vec{CE}$ in terms of $\mathbf{a}$ and $\mathbf{c}$.
Give your answer in its simplest form.

[2]

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Question taken from Eduqas examination paper 530004, November 2022

Circle Theorem: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
#3	4	
#4	4	
#5	4	
#6	5	
#7	6	
#8	7	
Total	36	

#1

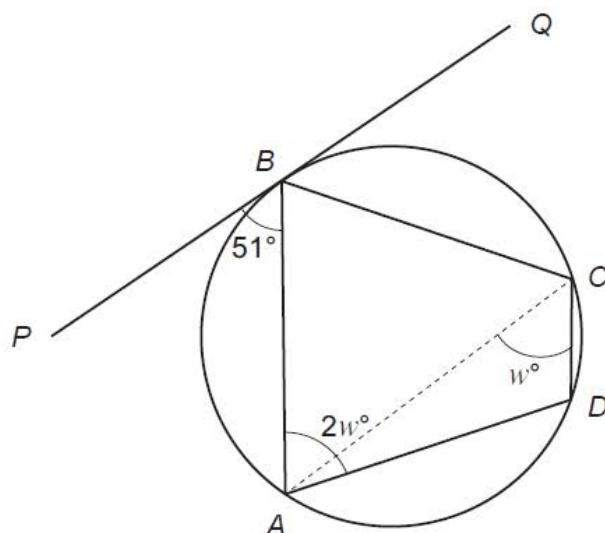


Diagram not drawn to scale

A, B, C and D are points on a circle.
The line PQ is a tangent to the circle at B .

$$\hat{PBA} = 51^\circ, \hat{ACD} = w^\circ \text{ and } \hat{BAD} = 2w^\circ.$$

Find the value of w .

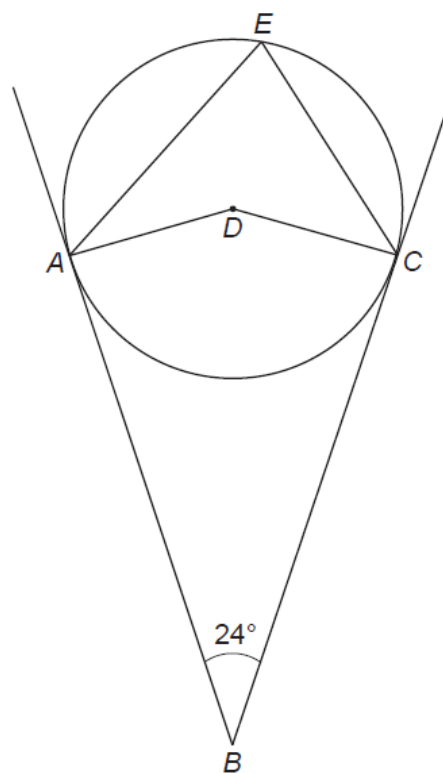
You must show all your working.

[3]

$w =$

Question taken from Edugas examination paper 530003, June 2019

#2

*Diagram not drawn to scale*

AB and CB are tangents to a circle with centre D .

E is a point on the circumference of the circle.

$$\angle ABC = 24^\circ$$

Find the size of $\angle AEC$.

You must give a reason for each step of your working.

[3]

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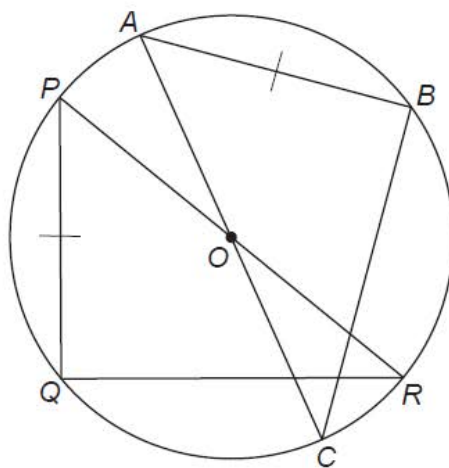
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Question taken from Eduqas examination paper 530003, November 2021

(a)



Points A, B, C, P, Q and R lie on the circumference of the circle, centre O .

Show that triangle ABC is congruent to triangle PQR .
Give a reason for each step of your answer.

[3]

- (b) William says,
"It is possible to draw one circle through the four vertices of any kite that has two opposite angles that are right angles."

Is William correct?

Yes

☐

No

☐

Show how you decide.

[1]

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Question taken from Eduqas examination paper 530003, November 2020

#4

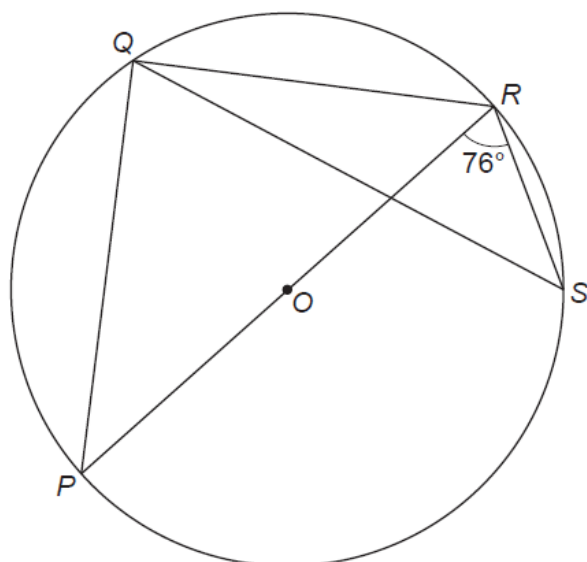


Diagram not
drawn to scale

P , Q , R and S are points on the circumference of a circle with centre O .

PR is a diameter of the circle.

$\angle PRS$ is 76° .

Find $\angle SQR$.

You must give a reason for each step of your working.

[4]

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$$\angle SQR = \text{.....}^\circ$$

Question taken from Eduqas examination paper 5300003, November 2022

#5

X , Y and Z are points on the circumference of a circle with centre O .

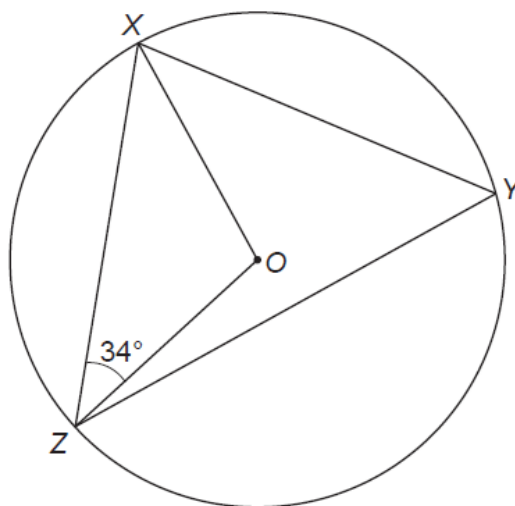


Diagram not drawn to scale

Maia thinks that $\widehat{XYZ}$ is 58° .
Prove that Maia is incorrect.

You must show all your working and give a reason for each step of your proof.

[4]

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Question taken from Eduqas examination paper 530003, November 2023

P, Q, R and S are points on a circle with centre O .
The line TU is a tangent to the circle at the point S .
 $\widehat{POS} = 130^\circ$ and $\widehat{PQR} = 120^\circ$.

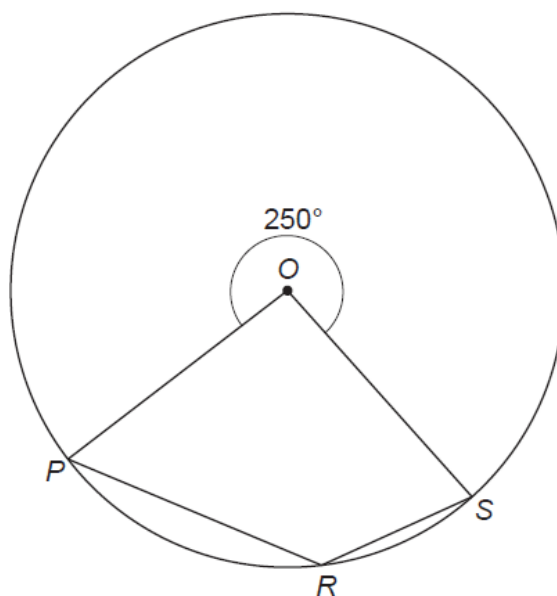
Give a reason for each step of your answer.

[5]

191

#7

(a)

*Diagram not drawn to scale*

The diagram shows a circle, centre O .
Points P , R and S are on the circumference of the circle.

Reflex angle $\widehat{POS} = 250^\circ$.

$\widehat{OPR} : \widehat{OSR} = 2 : 3$.

Calculate the size of $\widehat{OPR}$.
You must show all your working.

[3]

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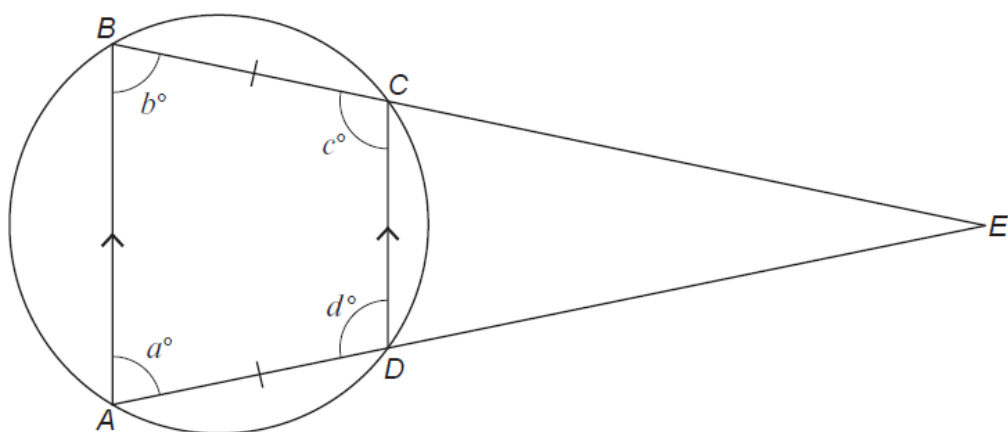
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(b)

*Diagram not drawn to scale*

ABE is an isosceles triangle.

AB is parallel to DC so that $ABCD$ is an isosceles trapezium.

Prove that $ABCD$ is always a cyclic quadrilateral.

State any reasons that you use in your proof.

[3]

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Question taken from Eduqas examination paper 5300003, May 2023

#8

(a)

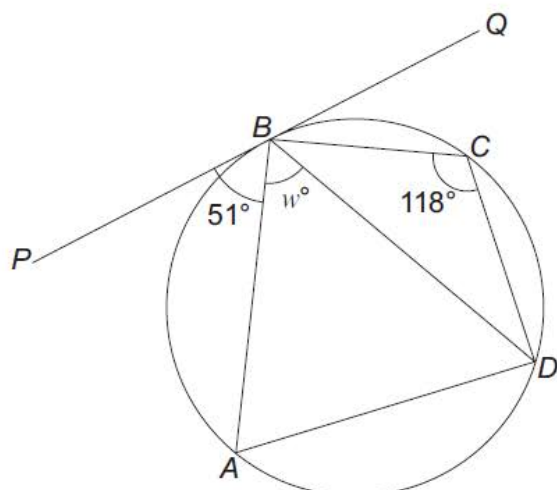


Diagram not drawn to scale

A, B, C and D are points on a circle.
The line PQ is a tangent to the circle at B .

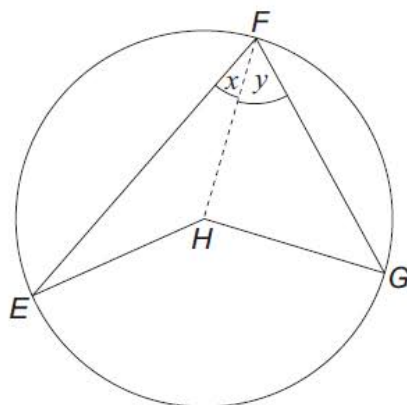
$$\hat{PBA} = 51^\circ, \hat{BCD} = 118^\circ \text{ and } \hat{ABD} = w^\circ.$$

Find the value of w .
You must show all your working.

[3]

$W =$

(b)

*Diagram not drawn to scale*

E , F and G are points on a circle with centre H .

$\widehat{EFH} = x$ and $\widehat{GFH} = y$.

Complete the proof of the following statement:

The angle at the centre is twice the angle at the circumference.

[4]

Proof:

$$\widehat{EFG} = x + y$$

$$\widehat{FEH} = x \text{ (triangle } FEH \text{ is isosceles)}$$

$$\widehat{FHE} = \dots\dots\dots$$

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Question taken from Eduqas examination paper 530003, November 2018

Circle Theorem: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	4	
#3	4	
Total	11	

#1

The points A , B , C and D lie on the circumference of the circle.
The line EF is a tangent to the circle at point D .

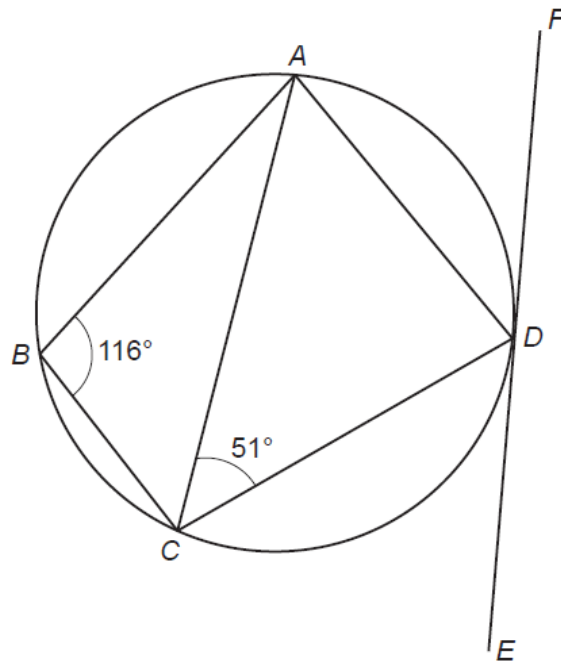


Diagram not drawn to scale

Prove that $\hat{CDE} = 65^\circ$.
Give reasons for your answer.

[3]

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Question taken from Eduqas examination paper 5300004, November 2024

#2

The diagram shows a circle with centre O .
Points A , B , C and D all lie on the circumference of the circle.

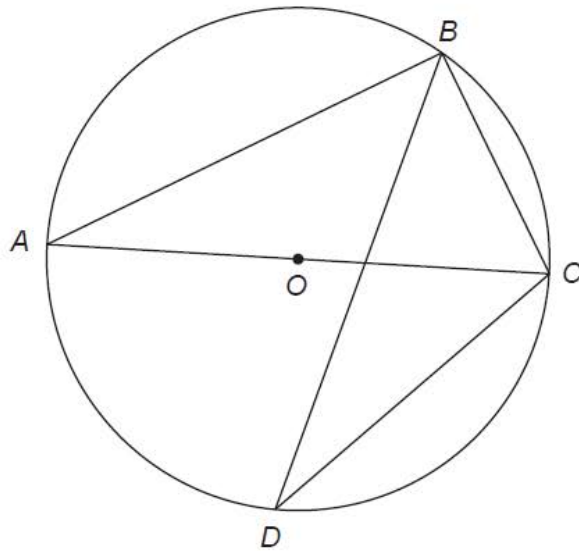


Diagram not drawn to scale

The radius of the circle is 3.6 cm, $BC = 4.1$ cm and $\hat{BCD} = 93^\circ$.

Prove that $\hat{DBC} = 52.3^\circ$, correct to 3 significant figures.

You must show all your working and give a reason for each stage of your proof.

[4]

Question taken from Edugas examination paper 530004, November 2019

#3

The diagram shows points R , S and T on the circumference of a circle with centre O .
The lines QR and QT are both tangents to the circle.

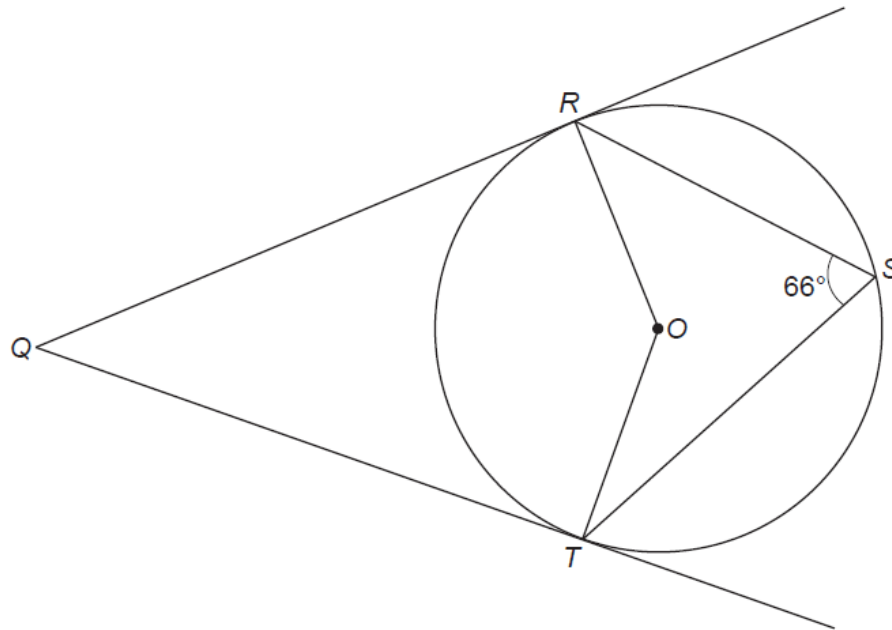


Diagram not drawn to scale

Show that $\widehat{RQT} = 48^\circ$.

Give a reason for each step of your answer.

[4]

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Question taken from Eduqas examination paper 5300004, June 2024

Properties of 2D / 3D Shapes: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
Total	2	

Marking Scheme

#1

Component 1: Higher Tier	Mark	
Second and fifth statements indicated and no others	B2	B1 for each if only two statements indicated OR for exactly three statements indicated of which two are correct
	(2)	

Angles Properties: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	5	
Total	8	

Marking Scheme

#1

Two correct angles or $x + y + DCE = 180$ (Angles in a triangle (sum to 180°)) $DCE = DBF$ (Corresponding angles (are equal)) $w + DBF = 180$ (Angles on a straight line (sum to 180°))	B1	May be shown on diagram; angles need to be indicated in some way Angle $DFB = y$ or Angle $DFA = y$ (Corresponding angles (are equal)) and Angle $DBF = 180 - x - y$ (Corresponding angles (are equal) or Angles in a triangle (sum to 180°)) or Angle $DCE = 180 - x - y$ (Angles in a triangle (sum to 180°)) or Angle $DCE = 180 - w$ (Corresponding angles (are equal)) and Angle $DBF = 180 - x - y$ (Corresponding angles (are equal) or Angles in a triangle (sum to 180°)) or Angle $DBF = 180 - w$ (Angles on a straight line (sum to 180°))
A correct reason linked to a correct statement	B1	
Fully correct and justified complete argument to prove $w = x + y$	B1	Must be fully justified with all valid reasons
		Alternative method: Angle $DFB = y$ or Angle $DFA = y$ Corresponding angles are equal or angle $BCE = w$ alternate angle are equal $w = x + y$ The exterior angle is equal to the sum of the two opposite interior angles
	(3)	B1 B2

#2

Component 1: Higher Tier	Mark	
$(x =) \frac{360 - 290}{2}$ oe	M2	Check diagram M1 for $x + 75 + x + 70 + 85 + 60 = 360$ oe
$x = 35$	A1	May be in stages e.g. $60 + 85 = 145$, $360 - 145 = 215$, $2x + 145 = 215$
$y = 180 - (35 + 70)$ or $x + 70 = 180 - y$	m1	Implied by 105 on the diagram.
$y = 75$	A1	FT 'their derived 35' provided it is less than 110 and <u>M2</u> previously awarded. FT
	(5)	

Angles Properties: Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
Total	5	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
$5x + 40 = 6x + 20$ $x = 20$ $5 \times 20 + 40 + y + 35 = 180$ OR $6 \times 20 + 20 + y + 35 = 180$ OR $5 \times 20 + 40 + 2(y + 35) + 6 \times 20 + 20 = 360$ $y = 5$	M1 A1 M2 A1	Allow for $5 \times 20 + 40 = 6 \times 20 + 20$ which may be seen in stages FT 'their 20' for possible M2 provided previous M1 awarded May be seen in stages. M1 for a correct equation $5x + 40 + y + 35 = 180$ or $6x + 20 + y + 35 = 180$ or $5x + 40 + y + 35 + 6x + 20 + y + 35 = 360$ CAO
<i>Alternative method (using simultaneous equations)</i> <i>Writes two correct equations in x and y</i> $5x + 40 + y + 35 = 180$ or $6x + 20 + y + 35 = 180$ or $5x + 40 + y + 35 + 6x + 20 + y + 35 = 360$	M2	M1 for each correct equation May be simplified
<i>Method to eliminate variable, e.g. equal coefficients and method to find second variable</i>	m1	Allow one error in one term but not with equal coefficients
<i>Finds the value of the first variable</i>	A1	CAO $x = 20$ OR $y = 5$
<i>Second variable</i>	A1	FT 'their first variable'
	(5)	

Interior / Exterior Angles of Polygons: Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	6	
Total	10	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(Interior angle of the heptagon =) $180 - 360 \div 7$ OR $(7 - 2) \times 180 \div 7$ OR $(7 \times 180 - 360) \div 7$ $= 128.6(^{\circ})$ or $128.57(\dots)^{\circ}$ (Unique angle in triangle =) $(360 - 90 - 90 - 128.6) = 51.4(28\dots^{\circ})$ Working to show that $x = 64.3$ to 1 d.p. $(180 - 51.4(28\dots)) \div 2 = 64.285$ to 64.3	M1 A1 B1 B1	May be seen on diagram. FT 'their derived 128.6' May be seen on diagram CAO
<i>Alternative method 1 working from 64.3</i> (Unique angle in triangle =) $(180 - 64.3 - 64.3) = 51.4$ (Interior angle of the heptagon =) $(360 - 90 - 90 - 51.4) = 128.6$ (Interior angle of the heptagon =) $180 - (360 \div 7)$ OR $(7 - 2) \times 180 \div 7$ OR $(7 \times 180 - 360) \div 7$ $= 128.6$ or $128.57(\dots)^{\circ}$	B1 B1 M1 A1	FT 'their $180 - 64.3 - 64.3$ ' Only awarded if this is clearly the interior angle of the heptagon CAO
<i>Alternative method 1a for final 2 marks</i> (Sum of the interior angles of a heptagon =) $(7 - 2) \times 180$ o.e AND 128.6×7 900	M1 A1	M0 for 'their $128.6 \times 7 = 900(.2)$ alone Allow for 900 and 900.2
<i>Alternative method 2 using exterior angles</i> Exterior angle (of the heptagon) = $360 \div 7$ $= 51.4(28\dots^{\circ})$ (Unique angle in triangle =) $(360 - 90 - 90 - (180 - 51.4(28\dots^{\circ})))$ $= 51.4(28\dots^{\circ})$ Working to show that $(x =) (180 - 51.4(28\dots)) \div 2 = 64.3$	M1 A1 B1 B1	Method must be seen May be seen on diagram. FT 'their derived 51.4(28...)' May be seen on diagram. CAO
	(4)	

#2

	Mark	Comment
$x + x + 40 + 2x - 30 + 3x - 120 + 3x$ (Interior angle sum) $3 \times 180(^{\circ})$ or alternative FULL method $540(^{\circ})$	B1 M1 A1	$3(x - 40) = 3x - 120$ may be seen in later working FT 'their $10x - 110 = n$ where $n \geq 360$ '
$10x - 110 = 540$ or $10x = 540 + 110$ or $10x = 650$ $x = 65(^{\circ})$	M1 A1	CAO
$(65(^{\circ}), 105(^{\circ}), 100(^{\circ}), 75(^{\circ}), \dots)$ 195(^{\circ}) (so this angle is greater than 180°)	E1 (6)	FT provided similar outcome

Perimeter / Area / Volume: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
#2	5	
#3	6	
Total	11	

#1

209

#2

Component 1: Higher Tier	Mark	
(Original depth of liquid =) 5400 $\div 0.9$ $\div (20 \times 20)$ $\times \frac{2}{3}$ 10 (cm)	M1 M1 M1 A2	Method marks may be awarded in any order Award A1 for sight of any ONE of the following: • $(5400 \div 0.9 =) 6000$ • $(5400 \times \frac{2}{3} =) 3600$ • $(5400 \div (20 \times 20) =) 13.5$ • Two correct evaluations, following an initial error e.g. $5400 \div 0.9 = 600, 600 \div 400 \times \frac{2}{3} = 1.$
<u>Alternative method</u> Let original depth = x $20 \times 20 \times 1.5x (= 600x)$ $0.9 = \frac{5400}{600x} (= \frac{9}{x})$ $x = 10 \text{ (cm)}$	M2 M1 A1 A1	M1 for $20 \times 20 \times h (= 400h)$ M1 for $0.9 = \frac{5400}{\text{'their volume'}}$
<u>Alternative method 2</u> Let final depth = h $20 \times 20 \times h (= 400h)$ $0.9 = \frac{5400}{400h}$ $(\text{original depth} =) h \times \frac{2}{3}$ 10 (cm)	M1 M1 A1 M1 A1	M1 for $0.9 = \frac{5400}{\text{'their volume'}}$
	(5)	

#3

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
(length of hedge = $11 \times 1.2 \div 2 =$) 6.6 (m) or (width of garden = $13 \times 1.2 \div 2 =$) 7.8 (m) (pond is) 8 (m) by 3.5 (m) (flowerbed is) 10 (m) by 1.5 (m) (area of grass =) $10 \times (6.6 + 1.2) - 10 \times 1.5 - 28$ or $3.5 \times 2 + 10 (6.6 + 1.2 - 1.5 - 3.5)$ or $(3.5 + 2.8) \times 2 + 8 \times 2.8$ oe 35 (m ²)	B1 B2 B1 M1 A1	Check diagram for either B1 for use of 28 and 8 in an attempt to calculate the width of the pond. FT 'their 8' + 2 by 'their 3.5' – 2 FT 'their derived 10, 6.6, 7.8, 1.5 and 3.5' CAO
	(6)	

Perimeter / Area / Volume: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	5	
#3	9	
Total	17	

Marking Scheme

#1

Component 2: Foundation Tier	Mark	
(b) $7 \times 9.8 \times 16$ 1097.6 or 1098 (cm ³)	M2 A1	M1 for $7 \times 9.8 (=68.6)$

#2

$3(7x+5)+2x-9+3(7x+5)+2x-9=232.8$ $21x+15+2x-9+21x+15+2x-9=232.8$ $46x + 12 = 232.8$ or $46x = 220.8$ or $x = 220.8 \div 46$ $x = 4.8$ (cm) Length 115.8 (cm) AND Width 0.6 (cm)	B1 B1 B1 B1 B1 (5)	Or equivalent FT from ' $21x+15 + 2x - 9 = 232.8$ ' (semi perimeter) FT from 1 error (or repeated error) in multiplying out brackets FT from ' $their\ ax + b = 232.8$ ' provided $a \neq 0$ and $b \neq 0$ (FT from semi perimeter is 9.86... cm) (FT from semi perimeter is 222.06 cm AND 10.72 cm) FT evaluations correct for 'their derived x'
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#3

Eduqas Autumn 2019 C2 Higher Tier	Mark	Comment
(a) Initial strategy, e.g. sketch of concentric squares	S1	For intention, but some sections may be missed
Correct method to find area, e.g. subtraction of areas or composite shapes	M1	
$(8+2y)(8+2y) - 8 \times 8$ or $8y+8y+8y+8y+y^2+y^2+y^2+y^2$	A1	Or equivalent
$4y^2+32y$ or $4(y^2+8y)$ or $4y(y+8)$ or equivalent	A1	Mark final answer <i>If the path has been built inside then MR-1 and FT</i>
(b) Strategy, drawing with $\frac{1}{4}$ circles in corners OR sight of $\pi \times 1.5^2$ of a fraction or multiple of $\pi \times 1.5^2$ (or equivalent)	S1	FT from (a) if possible
$4 \times 8 \times 1.5 + 4 \times \frac{1}{4} \times \pi \times 1.5^2$ $\times 0.08$	M1 m2	Accept if measurements changed to cm consistently throughout m1 for $\times$ 'digit 8' with incorrect place value
4.4(... m ³)	A1 (9)	CAO <i>If the path has been built inside then MR-1 and FT</i>

Constructions Using Ruler / Compass: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
#2	6	
Total	11	

Marking Scheme

#1

(a) Arc, centre P , radius 6 cm	B1	Allow $\pm 2\text{mm}$
Correct perpendicular bisector of AB with appropriate arcs	B2	B1 for correct arcs NB No arcs, no marks; if two full arcs used there must be daylight between the overlapping sections Tolerance $\pm 2^\circ$
Correct line segment indicated	B1	FT provided at least the first B1 awarded and a perpendicular bisector attempted (may not have arcs)
(b) Midpoint of AB clearly identified as S	B1	
	(5)	

#2

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	
(a) Correct perpendicular bisector construction with appropriate arcs	B2	($\pm 2^\circ, \pm 2\text{mm}$) B1 for perpendicular bisector within tolerance without arcs or with invalid arcs or for a correct set of arcs
Correct angle bisector construction with appropriate arcs	B2	($\pm 2^\circ$) B1 for angle bisector within tolerance without arcs or with invalid arcs or for a correct set of arcs
Correct point indicated	B1	FT provided at least B1, B1 awarded; may be implied by intersecting loci
(b) F marked correctly at the midpoint of AB	B1	STRICT FT 'their labelled $E'(\pm 2^\circ)$
	(6)	

Constructions Using Ruler / Compass: Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	4	
#3	5	
#4	5	
#5	6	
Total	24	

Marking Scheme

#1

Component 2: Higher Tier	Mark	Comments
Arc (of circle) centre A radius 5.5 cm	B1	$\pm 2\text{mm}$
Correct perpendicular bisector construction with appropriate arcs	B2	B1 for perpendicular bisector within tolerance ($\pm 2^\circ$) without arcs or with invalid arcs
Correct area shaded or indicated	B1	FT provided at least B1 previously awarded for a closed region bounded by an attempt at a perpendicular bisector, with or without arcs, and the arc of a circle centre A
	(4)	

#2

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
Correct position of D with both constructions completed correctly.	B4	Award B2 for each of the following: - Correct angle bisector drawn from construction with appropriate arcs. - Correct perpendicular bisector drawn from construction with appropriate arcs. Award B1 for each of the following: - Angle bisector drawn within tolerance ($\pm 2^\circ$) or a correct angle bisector construction with appropriate arcs but no line - Perpendicular bisector drawn within tolerance ($\pm 2\text{ mm}$) without arcs or with invalid arcs or for a correct pair of arcs that intersect twice. Penalise -1 if the lines do not intersect. If no marks award SC1 for the correct position of D given
	(4)	

#3

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
Correct perpendicular bisector construction with appropriate arcs	B2	B1 for perpendicular bisector within tolerance ($\pm 2^\circ$) without arcs or with invalid arcs or for correct pair of arcs that intersect twice
Correct angle bisector construction of XOY with appropriate arcs	B2	B1 for angle bisector within tolerance ($\pm 2^\circ$) without arcs or with invalid arcs or for a correct pair of arcs
Correct point indicated	B1	FT provided at least B1, B1 awarded; may be implied by intersecting loci
	(5)	

#4

Component 2: Higher Tier	Mark	Comment
Correct perpendicular bisector construction of SR with appropriate arcs	B2	B1 for perpendicular bisector within tolerance ($\pm 2^\circ$, $\pm 2\text{mm}$) without arcs or with invalid arcs
Correct perpendicular to the path through Y with appropriate arcs	B2	B1 for perpendicular through Y within tolerance ($\pm 2^\circ$) without arcs or with invalid arcs
Correct angle	B1	FT provided at least B1 B1 awarded tolerance ($\pm 2^\circ$); if correct 34° , allow e.g. 034°
	(5)	

#5

Component 2: Higher Tier	Mark	Comment
A circle with a radius of 4 cm centred at the water feature.	B1	
Correct perpendicular bisector construction with appropriate arcs.	B2	B1 for perpendicular bisector within tolerance ($\pm 2^\circ$) without arcs or with invalid arcs or for a correct pair of arcs that intersect twice.
Correct angle bisector construction with appropriate arcs.	B2	B1 for angle bisector within tolerance ($\pm 2^\circ$) without arcs or with invalid arcs or for a correct pair of arcs.
Correct area clearly indicated.	B1	FT provided at least B1, B1, B1 previously awarded.
	(6)	

Plans & Elevations: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	4	
Total	10	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
For the plan: draws a circle, radius 3 cm and for the side elevation: draws a 4 cm by 6 cm rectangle	B3	Circle must be drawn with compasses and rectangle must be ruled. B2 for either the plan or elevation correct or for good freehand sketches of both the correct circle and the correct rectangle or B1 for a circular plan with incorrect radius or for a rectangular side elevation with incorrect dimensions or for a good freehand circle for the plan or a good freehand rectangle for the elevation; may also have incorrect dimensions
	(3)	

#2

Component 1: Higher Tier	Mark	
(b) radius 3 cm or diameter 6 cm and height 6 cm si For the plan: draws a circle, radius 3cm and for the side elevation: draws an isosceles triangle with base 6 cm and height 6 cm	B1 B3	Correct use of the scale; may be implied by correctly drawn plan and elevation; FT 'their stated radius and their stated height' OR if no statement or calculation for radius and height, FT 'their diameter = their height = their base' For B3, circle must be drawn with compasses and triangle must be ruled. B2 FT for either an accurately drawn, correct plan or an accurately drawn, correct elevation FT 'their stated radius and their stated height' OR if no statement or calculation for radius and height, FT 'their diameter = their base' or 'their base = their height' or 'their diameter = their height' OR B2 FT for good sketches of both the correct plan and elevation or one sketch and one drawn accurately FT 'their stated radius and their stated height' OR if no statement or calculation for radius and height, FT 'their diameter = their height = their base' B1 for a circular plan with any radius or for a side elevation that is an isosceles triangle with any dimensions ; allow good freehand for B1 but base of triangle must not be clearly curved If B1 B0 or B0 B0, award SC1 for an accurate plan and elevation drawn in incorrect positions

Similarity & Congruency: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	6	
Total	6	

Marking Scheme

#1

Component 1: Higher Tier	Mark	Comment												
(a) <table border="1"> <tr> <td>True</td><td>False</td><td>Need more information</td></tr> <tr> <td></td><td></td><td>✓</td></tr> <tr> <td>✓</td><td></td><td></td></tr> <tr> <td></td><td>✓</td><td></td></tr> </table>	True	False	Need more information			✓	✓				✓		B2	For all three correct B1 for any two correct
True	False	Need more information												
		✓												
✓														
	✓													
(b) Yes indicated or clearly implied (with indication of one 120° angle) with two 30° angles.	B2	B1 for a clear indication of interior angle of 120°												
(c) $(\frac{10}{7.5} = \frac{12}{9} = \frac{8}{6})$ same scale factor = $\frac{4}{3}$ oe OR $(\frac{7.5}{10} = \frac{9}{12} = \frac{6}{8})$ same scale factor = $\frac{3}{4}$ oe	B2	B1 just for $\frac{10}{7.5} = \frac{12}{9} = \frac{8}{6}$ OR $\frac{7.5}{10} = \frac{9}{12} = \frac{6}{8}$ Award no marks if the ratios of less than three pairs of sides compared.												
<u>Alternative method 1</u> 12:10:8 and 9:7.5:6 both simplify to 6:5:4 oe OR both equivalent to 108:90:72 oe	B2	B1 for stating 12:10:8 = 9:7.5:6 without simplifying to 6:5:4												
<u>Alternative method 2</u> B2 for any one of the following: $7.5 \times \frac{12}{9} = 10$ AND $6 \times \frac{12}{9} = 8$ $10 \div \frac{12}{9} = 7.5$ AND $8 \div \frac{12}{9} = 6$ $9 \times \frac{10}{7.5} = 12$ AND $6 \times \frac{10}{7.5} = 8$ $12 \div \frac{10}{7.5} = 9$ AND $8 \div \frac{10}{7.5} = 6$ $9 \times \frac{8}{6} = 12$ AND $7.5 \times \frac{8}{6} = 10$ $12 \div \frac{8}{6} = 9$ AND $10 \div \frac{8}{6} = 7.5$	B2	B1 for any one of the following: $7.5 \times \frac{12}{9} = 10$ OR $6 \times \frac{12}{9} = 8$ $10 \div \frac{12}{9} = 7.5$ OR $8 \div \frac{12}{9} = 6$ $9 \times \frac{10}{7.5} = 12$ OR $6 \times \frac{10}{7.5} = 8$ $12 \div \frac{10}{7.5} = 9$ OR $8 \div \frac{10}{7.5} = 6$ $9 \times \frac{8}{6} = 12$ OR $7.5 \times \frac{8}{6} = 10$ $12 \div \frac{8}{6} = 9$ OR $10 \div \frac{8}{6} = 7.5$												
	(6)													

Similar Shapes: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	5	
Total	9	

Marking Scheme

#1

	Mark	Comment
(a)(i) Valid reason e.g. 'The parts of the ratio should be cubed' or '4 : 9 is the area factor not the volume factor' or 'Because the correct ratio is $2^3 : 3^3$.'	E1	Allow e.g. 'Squaring does not find the volume.'
8 : 27 oe	B1	ISW
(a)(ii) 36	B2	B1 for $3 \times 3 (\times 4)$ oe seen

#2

Component 1: Higher Tier	Mark	Comment
(a) Sight of $\frac{10}{8}$ or $\frac{8}{10}$ oe si $128 \times \left(\frac{10}{8}\right)^2$ or $128 \div \left(\frac{8}{10}\right)^2$ oe 200 (cm ²)	B1 M1 A1	Can be implied from $128 \times 10 \div 8$ oe
(b) 64 : 125	B2	If not B2, award B1 for any one of the following: $4^3 : 5^3$ $8^3 : 10^3$ oe - sight of 125 AND 64 $\left(\frac{10}{8}\right)^3$ oe FT $128 \times 8 : \text{'their 200'} \times 10$ from (a) oe
	(5)	

Similar Shapes: Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	2	
#3	3	
#4	3	
Total	10	

Marking Scheme

#1

$(1 + 0.8)^3 \times 66$ or equivalent	M1	
128.9(0625 litres) or 129 (litres)	A1	
	(2)	

#2

$(b) (6/4)^3 \times 40$ 135 (cm ³)	M1 A1	
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#3

Eduqas Autumn 2019 C2 Higher Tier	Mark	Comment
(b) Sight of 8 : 343 or $(7/2)^3$ or equivalent	B1	
445.9 (cm ³)	B2	B1 for $3.5^3 \times 10.4$ or equivalent

#4

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(b) Use of $18 \div 12$ or $12 \div 18$ oe	B1	May be embedded in further working
$(18 \div 12)^2 \times 300$ or $300 \div (12 \div 18)^2$ oe	M1	Award M1 for any other complete and correct method
675 (cm ²)	A1	Award B1 M0 A0 SC1 if 675 obtained from use of curved surface area = 300 cm ² .

Converting Units: Calculator

Question	Maximum Mark	Mark Awarded
#1	1	
#2	8	
Total	9	

Marking Scheme

#1

Component 2: Higher Tier	Mark	Comment
(a) 7 000 000 indicated	B1	

#2

(a) Explanation, e.g. '1m ² = 10 000cm ² ', 'as this is area not length', '1m ² is 100cm by 100cm'	E1	Accept a diagram showing 1m by 1m is 100cm by 100cm
(b)(i) 6.5 × 'a value between 1.2m and 1.4m inclusive'	M1	Place value may not be correct
65000 × 120 or 6.5 × 1.2 to 65000 × 140 or 6.5 × 1.4	M1	Place value must be consistent, although may include conversion to litres, ÷ 1000 or × 1000 respectively (65000 × 130 = 8 450 000 or 6.5 × 1.3 = 8.45) FT 'their (120+120+130+140+140) ÷ 5'
Answer in the range 7 800 000cm ³ to 9 100 000cm ³ , or 7.8m ³ to 9.1m ³ , or 7800 litres to 9100 litres	A1	Accept embedded within further calculation Any units given must be correct FT correct evaluation using 'their (120+120+130+140+140) ÷ 5'
(7800 litres to 9100 litres) ÷ 1800 × 0.5, or (7800 litres to 9100 litres) ÷ 3600, or equivalent	m1	Place value may not be correct FT 'their volume' provided at least M1 previously awarded Accept rounded or truncated from correct working
Answer in the range 2.16 (litres) to 2.53 (litres)	A1	CAO
(b)(ii) Explanation of decision, e.g. 'I only used one of the depths', 'I used an average depth but this may not be accurate', 'I used an average depth but there were only 5 readings', 'I used the median depth of just a few readings' AND Improvement of method, e.g. 'take more depth readings', 'I could have used the average depth', 'I could have looked at the shallowest and deepest readings', 'get more information', 'consider the shape of the pond'	E2 (8)	This explanation must follow from the method they used. E1 for either the decision or the improvement of the method Allow 'I used one of the depths', 'I used the median', 'I used an average depth', 'I used the mean depth'

Transformations: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	5	
#3	5	
Total	13	

Marking Scheme

#1

Rotation 90° clockwise or equivalent (about) (2, -2)	B3	Marks can only be awarded for description of a single transformation. B2 for rotation about (2, -2) or for rotation, 90° clockwise or equivalent about 'their (2, -2)' provided 'their (2, -2)' is not (0, 0) B1 for rotation about 'their (2, -2)' provided 'their (2, -2)' is not (0, 0) If no marks award SC1 for any clear diagram showing a complete correct transformation of a triangle (which may not be scalene).
	(3)	

#2

Component 1: Higher Tier	Mark	
(a) Correct rectangle with vertices (1, 3), (1, 2), (3, 2), (3, 3)	B2	B1 for one of the following: - at least 3 vertices correct, - a correct enlargement of scale factor $-\frac{1}{3}$.
(b) Rotation 180° about (0, 0) OR enlargement scale factor -1 centre (0, 0)	B3	If correct triangle seen, then award B1 for each component. Rotation may be clockwise or anticlockwise. If no marks, award SC1 for triangle drawn at (-2, -4), (-4, -4), (-2, -8) or these coordinates seen.
	(5)	

#3

Component 1: Higher Tier	Mark	Comment
(a) Rotation 90° clockwise or 270° anti-clockwise about $(-1, 0)$	B3	Must be a single transformation for B3 If B3 not awarded, allow B1 for each correct 'condition', up to B2, from a single transformation or a multi-step transformation e.g. Award B1B1 for 'Centre of rotation $(-1, 0)$ ' Award B1B1 for 'Rotation clockwise 90°', and then a translation 1 to the left and 1 down'.
(b) Correct triangle with vertices at $(-4, 10)$, $(-7, 4)$, $(8, 4)$	B2	B1 for any one of the following: • A triangle with 2 correct vertices • 3 vertices correctly plotted, but not joined • for a correct enlargement from an incorrect centre • an enlargement using an different scale factor ($\neq 1$) from the centre $(5, 1)$
	(5)	

Transformations: Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	4	
#3	6	
Total	12	

Marking Scheme

#1

	Mark	Comment
(c) Correct negative enlargement	B2	B1 an enlargement with scale factor $-\frac{1}{2}$, with correct orientation with incorrect placement.

#2

Component 2: Higher Tier	Mark	Comment
(a) Enlargement, centre (4, 5), sf $\frac{1}{2}$	B2	B1 for any 2 correct elements Allow from point (4, 5)
(b) Triangle with vertices (-4, -3), (-8, 5), (-2, 3)	B2	Allow a good freehand; ignore labels B1 for a triangle with 2 correct vertices or for all 3 correct vertices plotted but not joined OR for an enlargement with scale factor -1 , with correct orientation with incorrect placement e.g. use of centre (3, 0) leading to triangle with vertices (4, -3), (-2, -1), (2, -9) If no marks, award SC1 for a correct enlargement of PQR with scale factor -1 and centre (0, 3): (-3, 2), (-6, 3), (-4, -1)
	(4)	

#3

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(a)(i) $\begin{pmatrix} 6 \\ -1 \end{pmatrix}$	B2	B1 for sight of $\begin{pmatrix} 3 \\ -5 \end{pmatrix} + \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ Allow B1 for $\begin{pmatrix} 6 \\ -1 \end{pmatrix}$ written incorrectly e.g. $\begin{pmatrix} 6 \\ -1 \end{pmatrix}$
(a)(ii) Correct shape <i>B</i> drawn at (2, 1), (2, 4), (3, 4), (3, 2), (4, 2), (4, 1),	B2	or correct FT; FT 'their' $\begin{pmatrix} 6 \\ -1 \end{pmatrix}$, B1 for a translation attempted with at least 4 vertices correct or shape <i>A</i> correctly translated by $\begin{pmatrix} 6 \\ y \end{pmatrix}$ where $y \neq -1$ or $\begin{pmatrix} x \\ -1 \end{pmatrix}$ where $x \neq 6$ If no marks in (a) then award SC1 for a clear attempt to translate by $\begin{pmatrix} 3 \\ -5 \end{pmatrix}$ and $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$.
(b) Reflection (in the line) $y = x$	B2	B1 for either stating a reflection or giving the equation $y = x$ Award no marks if more than one transformation indicated If no marks then award SC1 for a correct diagram with the line $y = x$ drawn.
	(6)	

Pythagoras: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	5	
Total	9	

Marking Scheme

#1

Component 1: Higher Tier	Mark	
$(h =) \sqrt{3} x$	B4	B3 for $h^2 = 3x^2$ or $(h =) \sqrt{3x^2}$ OR $(h =) \frac{2x\sqrt{3}}{2}$ B2 for $(2x)^2 - x^2 = h^2$; accept e.g. $(h =) \sqrt{(2x)^2 - x^2}$ OR $\frac{h}{2x} = \frac{\sqrt{3}}{2}$ OR $h^2 = (2x)^2 + x^2 - \frac{2(2x)(x)}{2}$ or $(h =) \sqrt{(2x)^2 + x^2 - \frac{2(2x)(x)}{2}}$ allow e.g. $(h =) \sqrt{2x^2 - x^2}$ or $h^2 = 2x^2 - x^2$ or $(2x)^2 - y^2 = h^2$ OR $h^2 = 2x^2 + x^2 - \frac{2(2x)(x)}{2}$ or $(h =) \sqrt{2x^2 + x^2 - \frac{2(2x)(x)}{2}}$ B1 for $x^2 + h^2 = (2x)^2$; allow e.g. $x^2 + h^2 = 2x^2$ or $y^2 + h^2 = (2x)^2$ or $2x^2 - y^2 = h^2$ or $(h =) \sqrt{2x^2 - y^2}$ OR $\sin 60^\circ = \frac{\sqrt{3}}{2}$ or $\sin 60^\circ = \frac{h}{2x}$ OR $\cos 30^\circ = \frac{\sqrt{3}}{2}$ or $\cos 30^\circ = \frac{h}{2x}$ OR $h^2 = (2x)^2 + x^2 - 2(2x)(x) \cos 60$ or $(h =) \sqrt{(2x)^2 + x^2 - 2(2x)(x) \cos 60}$ or $h^2 = 2x^2 + x^2 - 2(2x)(x) \cos 60$ or $(h =) \sqrt{2x^2 + x^2 - 2(2x)(x) \cos 60}$
	(4)	

#2

Component 1: Higher Tier	Mark	
(a) $16^2 + \text{east}^2 = 20^2$	S1	Strategy of using Pythagoras; si by sight of e.g. 3, 4, 5
$\text{east}^2 = 20^2 - 16^2$ or $(\text{east} =) \sqrt{20^2 - 16^2}$	M1	si by sight of 12, 16, 20 or 3×4
(east =) 12 (km)	A1	
(b)		
$\frac{20}{25} (\times 60)$	M1	May be seen in stages. e.g. (5 km in 12 minutes) $\times 4$
48 (minutes)	A1	
	(5)	

Pythagoras: Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
#2	5	
#3	6	
Total	16	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(b) $\sqrt{1.8^2 - 0.6^2} (= 1.69705....)$	M2	M1 for $1.8^2 - 0.6^2$ or $x^2 + 0.6^2 = 1.8^2$
$\frac{\sqrt{1.8^2 - 0.6^2} \times 0.6}{2}$ $\times 2.5$	M1	Allow FT from use of $\sqrt{1.8^2 + 0.6^2} (= 1.897....)$
1.27(...) or 1.28 or 1.3 (m ³)	m1	
	A1	CAO

#2

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(BC ² =) $7.2^2 + 5.4^2$ or (BC ² =) 81	M1	Allow equivalent methods May be shown in further working.
(BC =) $\sqrt{7.2^2 + 5.4^2}$ or $\sqrt{81}$	A1	
(BC =) 9 (cm)	A1	FT from M1 for the correctly evaluated square root of 'their 81' provided their answer > 7.2.
(Area =) $\frac{4.9 \times 9}{2}$	m1	FT 'their 9'
= 22.05 (cm ²)	A1	FT. Accept 22 or 22.1 from correct working.
	(5)	

#3

Component 2: Higher Tier	Mark	Comment
$(h^2 =) 7.2^2 + 13.5^2$	M1	No marks are awarded for an answer of 15.3 obtained from use of a scale drawing. May be implied in later working. Provided not spoiled by answers of 20.7, 20.7^2 or 428.49.
$h^2 = 234.09$ or $(h =) \sqrt{234.09}$	A1	
$(h =) 15.3$	A1	FT from M1 for the correctly evaluated square root of 'their 234.09' provided 'their answer' > 13.5 (cm) Must be from correct working
(Area of square =) $((7.2 + 13.5 + 15.3) \div 4)^2$	M2	FT 'their 15.3' provided M1 previously awarded. M1 for $(7.2 + 13.5 + 15.3) \div 4 (= 9)$
81 (cm ²)	A1	FT If no marks award SC1 for the correct evaluation of $(13.5 + 7.2 + \text{'their 15.3'}) \div 4)^2$
	(6)	

Trigonometry: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
#3	4	
#4	4	
#5	4	
#6	5	
#7	6	
#8	6	
#9	7	
#10	7	
Total	49	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(a) $\sin^{-1}\left(\frac{0.5}{6}\right)$	M2	M1 for $\sin(\) = \frac{0.5}{6}$
4.7(8...)	A1	Unsupported 4.7(8...) is awarded no marks

#2

	Mark	Comment
$\sin f = 8.4/12.3$ (f =) 43(.07...°)	M1 A2 (3)	A1 for (f =) $\sin^{-1}0.68(29...)$

#3

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
$\frac{35}{\tan(72)}$ or $35\tan(90 - 72)$ or $\frac{35\sin(90 - 72)}{\sin(72)}$ or $\sqrt{\left(\frac{35}{\sin(72)}\right)^2 - 35^2}$ or $\sqrt{(36.8..)^2 - 35^2}$ 11.3(7...) or 11.4 (m) AND Yes, indicated or implied.	M2 A2	Allow an alternative full method M1 for $\tan(72) = \frac{35}{dist}$ or $\tan(90 - 72) = \frac{dist}{35}$ or $\frac{dist}{\sin(90 - 72)} = \frac{35}{\sin(72)}$ oe or $(36.8..)^2 - 35^2$ A1 for one of the following 11.3(7...) or 11.4 (m) and no decision or incorrect decision - a correct decision FT their incorrect answer from M2
	(4)	

#4

Component 2: Higher Tier	Mark	Comment
(Finding the angle at Port A) (x =) $\tan^{-1}\left(\frac{17}{11}\right)$	M2	M1 for $\tan(x) = \frac{17}{11}$
(x =) 57.09...(°) or 57.1(°) or 57(°)	A1	
(Bearing) ((180–57.09) or (90+32.9)) 122.905...(°) or 122.9(°) or 123(°)	B1	FT 'their 57.09...' provided M1 awarded
<u>Alternative method</u> (Finding the angle at Port B) (x =) $\tan^{-1}\left(\frac{11}{17}\right)$	M2	M1 for $\tan(x) = \frac{11}{17}$
(x =) 32.90...(°) or 32.9 (°) or 33 (°)	A1	
(Bearing) ((180 – 57.09) or (90 + 32.9)) 122.905...(°) or 122.9(°) or 123(°)	B1	FT 'their 32.90...' provided M1 awarded
	(4)	

#5

Component 2: Higher Tier	Mark	Comments
Use of right-angled triangle with trigonometry with 3° or 87° correctly indicated with 2.5 used as a side.	S1	Degree symbol may be omitted throughout; lengths may be in metres throughout Angle may be marked on diagram; trig ratio used may not be correct at this stage
(vertical height =) $2.5 \tan 3^\circ$ or $\frac{2.5}{\tan 87^\circ}$	M2	M1 for $\tan 3^\circ = \frac{?}{2.5}$ or $\tan 87^\circ = \frac{2.5}{?}$
0.1(3...) (km)	A1	Not from wrong working e.g. $2.5\sin(3)$ If units are stated, they must be correct but ISW any attempt at a unit change after a correct answer has been seen Unsupported 0.1(3...) is awarded S1 only
<u>Alternative method</u> Use of right-angled triangle with trigonometry with 3° or 87° correctly indicated with 2.5 used as a side.	S1	Angle may be marked on diagram; trig ratio used may not be correct at this stage
(vertical height =) $\frac{2.5 \times \sin 3}{\sin 87}$	M2	M1 for $\frac{2.5}{\sin 87} = \frac{x}{\sin 3}$ oe
0.1(3...) (km)	A1	Unsupported 0.1(3...) is awarded S1 only
	(4)	

#6

Component 2: Higher Tier	Mark	Comment
$(BC =) 4.8 \tan 57^\circ \text{ or } \frac{4.8}{\tan(180-90-57)}$ 7.39 to 7.4 si $(\text{Area} =) \frac{1}{2} \times 7.39135... \times 4.8$ 17.7(392...) (cm ²)	M2 A1 M1 A1	M1 for $\tan 57^\circ = \frac{BC}{4.8}$ si or $\tan(180-90-57) = \frac{4.8}{BC}$ si CAO FT ' $\frac{1}{2} \times$ their derived $BC \times 4.8$ ' provided 'their derived BC' is from use of trigonometry FT 'their derived BC' If correct, accept answer in range 17.7 to 17.8; accept 18 following correct working
<u>Alternative (Higher tier) method 1</u> $(BC =) \frac{4.8 \times \sin 57}{\sin(90-57)}$ 7.39 to 7.4 si $(\text{Area} =) \frac{1}{2} \times 7.39135... \times 4.8$ 17.7(392...) (cm ²)	M2 A1 M1 A1	M1 for $\frac{BC}{\sin 57} = \frac{4.8}{\sin(90-57)}$ CAO FT ' $\frac{1}{2} \times$ their derived $BC \times 4.8$ ' provided 'their derived BC' is from use of trigonometry FT 'their derived BC' If correct, accept answer in range 17.7 to 17.8; accept 18 following correct working
<u>Alternative (Higher tier) method 2</u> $\text{Area of } ABC = \frac{1}{2} \times 4.8 \times AC \times \sin 57$ $(AC =) \frac{4.8}{\cos 57}$ 8.8 to 8.81(3...) si $\text{Area of } ABC = \frac{1}{2} \times 4.8 \times 8.81... \times \sin 57$ $= 17.7(392...) \text{ (cm}^2\text{)}$	M1 m2 A1 A1	Not awarded until $AC = \frac{4.8}{\cos 57}$ oe substituted. m1 for $\cos 57 = \frac{4.8}{AC}$ CAO FT 'their derived AC' If correct, accept answer in range 17.7 to 17.8; accept 18 following correct working
	(5)	

#7

Component 2: Higher Tier	Mark	Comment
Uses $EC = 6$ oe correctly in a trigonometric statement	S1	
$(BC =) \frac{6}{\cos 35}$ or $\frac{6}{\sin (90-35)}$	M2	Allow equivalent complete methods for M2 or M1 M1 for $\cos 35 = \frac{6}{BC}$ or $\sin(90 - 35) = \frac{6}{BC}$ oe May be implied by a correct expression for the perimeter e.g. $\frac{24}{\cos 35}$ or $\frac{24}{\sin 55}$ oe
$(BC =) 7.3(246\dots)$ si	A1	
$(\text{perimeter} =) 4 \times 7.3(246\dots)$ si	M1	FT 'their derived BC ' providing S1 previously awarded and their $BC > 6$
$(\text{perimeter} =) 29.2(\dots)$ or 29.3 or 29 (cm)	A1	FT
	(6)	

#8

Component 2: Higher Tier	Mark	Comment
(a) Use of trigonometry in a right-angled triangle with an angle of 48° or 42° and a side of 800 (m)	S1	Trig ratio used may not be correct at this stage.
$(h =) \frac{800}{\cos (42)}$ or $(h =) \frac{800}{\sin (48)}$	M2	Or alternative full method M1 for $\cos(42) = \frac{800}{h}$ or $\sin(48) = \frac{800}{h}$
$(h =) 1076(.5\dots)$ or 1077 (feet)	A1	Allow 1076 (feet) from correct working
(b)(i) A correct assumption e.g. 'The (surface of) the slope is smooth (and he cycles the shortest distance).'	E1	Allow e.g. 'He rode in a straight line.' 'It was a straight line.' 'The track wasn't bumpy.' 'He cycled straight from the top to the bottom.' 'He didn't do any jumps.' 'There are no obstructions.' 'The surface is flat.' 'He cycled the shortest distance.' 'That it was 48° the whole way down'. 'That it is a right-angled triangle' 'The track is level' (assume they mean not bumpy) Do not allow: 'That it was 48° '
(b)(ii) A correct effect of assumption e.g. 'If the surface of the slope is not smooth then Vaughan will have cycled further than the calculated value in (a).'	E1	If no valid assumption is made, then this mark cannot be awarded. Cannot award E0 E1. Allow e.g. 'He cycled further.' 'The answer would be bigger.' Do not allow: 'The answer would be different'
	(6)	

#9

Eduqas Autumn 2019 C2 Higher Tier	Mark	Comment
(a)* Sight of appropriate measurements 0.8 (m) and 1.2 (m)	B1	FT 'their 2.5 – 1.7' and 'their 2.4 ÷ 2' If M0, A0 then award SC1 for an answer of 56(.3°) (or equivalent unrounded irrespective of any labelling on the diagram)
Full method to find the correct angle, e.g. $\tan x = 0.8 / 1.2$	M1	
(x=) $\tan^{-1} 0.8/1.2$	M1	
33.69...(°) or 33.7(°) or 34(°)	A1	
(b)* $2.4 \times 2.04 \div 1.7$ or $2.5 \times 2.04 \div 1.7$ 2.88 (m) or 2.9 (m) 3 (m)	M1 A1 A1 (7)	

#10

(a)(i) $\tan \text{rise} = 24/26.4$ or angle of rise = $\tan^{-1} 24/26.4$ 42(.27...°)	M1 A1	<u>Trigonometry must be used in (a)</u>
(a)(ii) $\tan 42(.27...^\circ) = 2^{\text{nd}} \text{rise}/39.5$ or $2^{\text{nd}} \text{rise} = 39.5 \times \tan 42(.27...^\circ)$ (2 nd rise =) 36 (cm)	M1 A1	FT 'their angle of rise' provided M1 previously awarded Must be 2 sig. figs. Do not accept an unsupported answer of 36 (cm), trigonometry must be seen
(b) $2^{\text{nd}} \text{rise}/39.5 = 24/26.4$ or $2^{\text{nd}} \text{rise} = 39.5 \times 24/26.4$ or $2^{\text{nd}} \text{rise} = 39.5 \times 0.9(090...)$ or $2^{\text{nd}} \text{rise} = 39.5 \div 1.1$ or equivalent 35.9(... cm) or 36 (cm) AND an evaluation, e.g. 'similar triangles as fewer stages', 'non trigonometry method as few stages, so less chance of making a mistake'	M1 A2 (7)	Must show ratio or similar triangle working, not the use of 'tan' Accept use of scale factor method MUST FT from working A1 for 36 (cm) or 35.9(...cm) OR for an evaluation

Pythagoras / Trigonometry Combined: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
Total	3	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
$(BD =) \sqrt{6^2 + 8^2}$	M1	Allow for comment e.g. 'Pythagorean triple is 6, 8, 10.' or '6, 8, 10 is a right-angled triangle.' (must be clear it is a triple and not just listing the 3 values from the diagram) Allow poor use of notation if intent is clear.
10	A1	does not imply M1 unless it is clear that $BD = 10$ (either in a statement, on the diagram or from $\tan x = \frac{10}{10}$).
45	A1	dep on all previous marks being awarded
	(3)	

Pythagoras / Trigonometry Combined: Calculator

Question	Maximum Mark	Mark Awarded
#1	6	
#2	6	
Total	12	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(a) $(x^2 =) 11.3^2 - 8.6^2$ $x^2 = 53.73$ or $(x =) \sqrt{53.73}$ $(x =) 7.3(3... \text{ cm})$	M1 A1 A1	FT from M1 for the correctly evaluated square root of 'their 53.73' provided 'their $x < 11.3$ ' If no marks award SC2 for an answer of 7.3(3...) seen from use of $8.6^2 - 11.3^2$
(b) $\cos(y) = 8.6 \div 13.5$ $(y =) \cos^{-1}(8.6 \div 13.5)$ $(y =) 50(.4....^\circ)$	M1 m1 A1	Accept any equivalent full method
	(6)	

#2

.. (a) $x^2 = 96.05$ or $(x =) \sqrt{96.05}$ 9.8(cm)	M2 A1	M1 for $(x^2 =) 4.7^2 + 8.6^2$ FT from M1 for the correctly evaluated square root of 'their 96.05' provided 'their answer' > 8.6 (cm)
(b) $(y =) \sin^{-1} 8.6/12.1$ or $\sin^{-1} 0.7107..$ 45(.295...°) or 45.3(°)	M2 A1 (6)	M1 for $\sin y = 8.6/12.1$ ISW, i.e. do not accept 45.2(°) unless at least 45.29(5...°) seen previously Do not accept 45° without further explanation

Exact Trigonometric Values: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
Total	2	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
(a)		
$(\cos 30 =) \frac{\sqrt{3}}{2}$	B1	
$(\tan 30 =) \frac{1}{\sqrt{3}} \text{ OR } \frac{\sqrt{3}}{3}$	B1	Allow $\frac{\sqrt{1}}{\sqrt{3}}$

Pythagoras / Trigonometry in 3D: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	6	
Total	6	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
(b)		
(CD =) $10 \times \sin 30$	M2	Allow $10 \times \frac{1}{2}$ OR $10 \div 2$
		M1 for $\sin 30 = \frac{CD}{10}$
5(cm)	A1	An unsupported 5 (cm) is awarded M0 A0
(AD ² =) $12^2 + 5^2$	M1	FT 'their derived 5', from use of trigonometry or unsupported 5. Allow M1 only for $AD^2 = 12^2 + CD^2$
(AD =) $\sqrt{169}$ or $AD^2 = 169$	A1	FT 'their derived 5'.
(AD =) 13 (cm)	A1	CAO

Pythagoras / Trigonometry in 3D: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	5	
Total	8	

Marking Scheme

#1

Component 2: Higher Tier	Mark	Comment
$\sqrt{56^2 + 33^2 + 72^2}$ or $\sqrt{56^2 + 33^2} (= 65)$ and $\sqrt{65^2 + 72^2}$ or $\sqrt{72^2 + 56^2} (= \sqrt{8320} = 8\sqrt{130})$ and $\sqrt{8320 + 33^2}$ or $\sqrt{72^2 + 33^2} (= \sqrt{6273} = 3\sqrt{697})$ and $\sqrt{6273 + 56^2}$ 97 (cm)	M2	M1 for $DF^2 = 56^2 + 33^2 + 72^2$ OR for one correct application of Pythagoras in 2D e.g. $\sqrt{56^2 + 33^2}$ or $\sqrt{72^2 + 56^2}$ or $\sqrt{72^2 + 33^2}$; implied by finding e.g. $DB = 65$
	A1	Allow 96.98 to 97 from earlier rounding
	(3)	

#2

Component 2: Higher Tier	Mark	Comment
$(x^2 =) 12^2 - (9 \div 2)^2$ $x^2 = 123.75$ or $(x =) \sqrt{123.75}$	M1	Where x represents the perpendicular height. Accept other notation.
	A1	
$(x =) 11(.12\dots)$ or $\frac{3\sqrt{55}}{2}$ (cm)	A1	
$(\text{Volume} =) \frac{1}{3} \times 9 \times 9 \times 11(.12\dots)$	M1	FT their height provided M1 awarded.
Answers in the range 299.7 to 300.4 inclusive.	A1	FT
	(5)	

Properties of a Circle: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	4	
Total	8	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
(a) 2	B1	
(b) $\pi \times 6^2 - \pi \times 5^2$ or $36\pi - 25\pi$ si	M2	For M2 or M1, π could be 3.14 or better or $\frac{22}{7}$ etc M1 for $\pi \times 6^2$ or $\pi \times 5^2$
11 π	A1	Mark final answer; not from wrong working; allow $\pi \times 11$ or $11 \times \pi$ but do not allow $\pi 11$ If no marks, award SC1 for an answer of 44π or $\pi \times 44$ or $44 \times \pi$ (from $\pi \times 12^2 - \pi \times 10^2$)
	(4)	

#2

Component 1: Higher Tier	Mark	Comment
(Area of shape =) $2 \times \pi \times 6^2$ OR $4 \times \frac{\pi \times 6^2}{2}$	M2	M1 for $\pi \times 6^2$ or $\frac{\pi \times 6^2}{2}$
+ 12^2	m1	FT from M2 or M1
= $144 + 72\pi$ (cm ²)	A1	CAO
	(4)	

Properties of a Circle: Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	4	
#3	4	
#4	5	
#5	5	
#6	5	
#7	6	
#8	8	
#9	8	
Total	49	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(radius =) $\frac{40.841}{2\pi}$ (= 6.50...)	B2	B1 for $2\pi r = 40.841$ or $\pi d = 40.841$ or $\frac{40.841}{\pi}$ or 13.0
(Area =) $\pi \times \left(\frac{40.841}{2\pi}\right)^2$ (= $\pi \times 6.5^2$)	M1	FT 'their derived radius'
132.7(...) or 133 (cm ²)	A1 (4)	CAO correct answer implies all previous marks

#2

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(Force =) $0.97 \times \pi \times 24^2 = 0.97 \ 1809.557$	M3	May be seen in stages M2 for $0.97 = \frac{\text{Force}}{\pi \times 24^2}$ If not M2, award M1 for one of the following: • $0.97 = \text{Force}/(k \times \pi \times 24^2)$ where k is an integer > 1 • $(\text{Force} =) 0.97 \times k \times \pi \times 24^2$ where k is an integer > 1 • sight of $(\text{Area of base} =) \pi \times 24^2$
0.97 = Force/(3619.11..) gains the M1 (Force =) $0.97 \times 3619.11..$		
Answers in the range 1754 to 1756	A1	CAO Award A0 if the answer is given as a multiple of π
	(4)	

#3

Component 2: Higher Tier	Mark	Comments
(a) $8.2^2 - \pi \times \left(\frac{8.2}{2}\right)^2$ oe	M3	M2 for sight of (area of circle =) $\pi \times \left(\frac{8.2}{2}\right)^2$ (= 52.81...) oe or M1 for sight of (area of square =) 8.2^2 (= 67.24) AND for (radius of circle =) 4.1 (look on diagram) May be embedded in an incorrect calculation
14.4 or 14.42 to 14.46 (cm ²)	A1	Allow 14 only if from correct working

#4

Component 2: Higher Tier	Mark	Comment
(a)		
$\frac{42}{60} \times 360$ or 42×6 or 360×0.7 oe	M2	M1 for appropriate sight of $\frac{42}{60}$ or 0.7 oe or $42 \times 360 (= 15\,120)$
252(°)	A1	CAO
(b)(i) A valid assumption e.g. 'The wheel spins at a constant speed.' or 'The wheel is spinning at the same rate all the time'	E1	Allow e.g. 'Each turn takes the same amount of time' 'The wheel is spinning at the same speed' 'We do not know precisely how many degrees it turns in a second' 'The wheel turns every second' 'The wheel never stops and starts' 'The wheel is always spinning'. Allow answers that state that the timing must not vary e.g. 'Each second must be accurate' Do not allow, 'The wheel turns 252° each second'.
(b)(ii) A valid impact based on their valid assumption e.g. 'If it was spinning faster, it may have turned through more degrees' or 'If it was spinning more slowly, it may have turned through fewer degrees.'	E1	If no valid assumption is made, then this mark cannot be awarded. Cannot award E0 E1. Allow e.g. 'My answer would be different.'
	(5)	

#5

	Mark	Comment
(b) $86 = \pi \times \text{Diameter}$, or $86 = 2 \times \pi \times \text{Radius}$	M1	
Diameter = $86 \div \pi$ or Radius = $86 \div 2\pi$	m1	(Diameter = 27.37 to 27.4 cm) (Radius = 13.68 to 13.7 cm)
Perimeter semi-circle $86 \div 2 + \text{Diameter}$, or $86 \div 2 + 2 \times \text{Radius}$	M1	FT 'their derived diameter' or 'their derived $2 \times \text{radius}$ ', independent of previous marks
70.4 (cm) or 704 mm	A2	CAO. For A2 if units are given they must be correct A1 for a correct answer given to the wrong level of accuracy (70.37 to 70.39 or 70(cm)).

#6

Component 2: Higher Tier	Mark	Comment
(a) 40 (circles)	B1	
(b) $60 \times 96 - 40 \times \pi \times 6^2$ Answer in the range 1235.5 to 1238.4(cm ²)	M3 A1	May be seen in stages. FT their 40 provided between 6 and 50 inclusive M2 for $40 \times \pi \times 6^2$ M1 for $60 \times 96 - k\pi$ sight of $\pi \times 6^2$ or 113(.09..) CAO. <i>If no marks, allow M1 for sight of $\pi \times 6^2$ or 113(.09..) seen in (a) or by the diagram</i>
	(5)	

#7

Component 2: Higher Tier	Mark	Comment
(b) $\frac{1}{2} \times (79 + 62) \times 30$ oe $\pi(30 \div 2)^2$ $(\frac{1}{2} \times (79 + 62) \times 30 - \pi \times 15^2) \div (\pi \times 15^2)$ OR $\frac{1}{2} \times (79 + 62) \times 30 \div (\pi \times 15^2) - 1$ $(k =) 1.9(921...) \text{ si}$ $(k =) 2$	B1 B1 M2 A1 B1	(= 2115) (= 706.858...) dep on at least B1 awarded; FT 'their area of circle' or 'their area of trapezium' for M2 or M1 (= $(2115 - 225\pi) \div 225\pi$) Award M1 for one of the following: $\frac{1}{2} \times (79 + 62) \times 30 - \pi \times 15^2$ (= 1408.1..) $\frac{1}{2} \times (79 + 62) \times 30 \div (\pi \times 15^2)$. (= 2.99..) $(706.9 : 2115) = 1 : 2.9(9..)$ or $1 : 3$ CAO FT 'their 1.99...' rounded to 1 sig fig, providing at least M1 previously awarded and a ratio obtained (not for rounding an area). An answer of $(k =) 2$ implies the previous A1 if no incorrect working seen e.g. $706.9 : 1408 = 1 : 2$ <i>Note: unsupported answers of 1:2 or $k = 2$ or are awarded zero marks</i>

#8

Eduqas Autumn 2019 C2 Higher Tier	Mark	Comment
(c)(i) Use of radius 2.5	B1	
(Area) $\pi \times 2.5^2$ 19.6(....cm ²) or $25\pi/4$	M1 A1	FT 'their radius' including use of 5 (cm) for M1 only Mark final answer Accept 20 (cm ²) from correct working
(c)(ii) Assumption: Cylinder	E1	Accept, e.g. 'uniform depth', 'uncooked', 'currants not sticking out' Allow, e.g. 'all scones have diameter 5cm and depth 0.8cm'
(Curved surface) $\pi \times 5$ or equivalent $\times 0.8$	M1 M1	FT 'their assumption regarding depth' FT from use of πd with $d=5$
$+ 2 \times 19.6(\dots)$	m1	FT $2 \times$ 'their (c)(i)' provided at least M1 previously awarded
51.7(6) (cm ²) to 52 (cm ²) or $33\pi/2$ (cm ²)	A1	FT from (c)(i) and 'their depth assumption', otherwise CAO

#9

Eduqas Autumn 2018 Component 2 Higher Tier	Marks	Comments
(a)(i) (C =) $2 \times \pi \times 14$ or $\pi \times 28$ Answer in the range 87.9 to 88 (cm) or 28π (cm)	M1 A1	
(a)(ii) (Area circle =) $\pi \times 14^2$ (Area square =) $1.25 \times \pi \times 14^2$	M1 M1	(= 615(.44...) to 616 cm ² or 196π) (= 768.75 to 770 cm ² or 245π) FT 'their $\pi \times 14^2$ ' provided it is dimensional correct, i.e. not for circumference
(Side of square) $\sqrt{(1.25 \times \pi \times 14^2)}$	m1	(= 27.7... cm)
(Perimeter) $4 \times \sqrt{(1.25 \times \pi \times 14^2)}$	m1	FT 'their area of a square' FT $4 \times$ 'their side length' provided at least M1 previously awarded
(Perimeter) Answer in the range 110.9 (cm) to 111 (cm)	A1	CAO
Evaluation to suit the method used, e.g. 'rounding errors introduced by working out stage answers', 'it could have been worked out in one calculation without rounding errors', 'could be only suitable to give as a whole number', '(perhaps) radius given was only accurate to nearest cm, so answer cannot be accurate to 8 decimal places'	E1	

Volume / Surface Area of a Cylinder: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
#2	9	
Total	14	

Marking Scheme

#1

Component 1: Higher Tier	Mark	Comment
(Area of both circles $\Rightarrow 2 \times \pi \times 4^2$	M1	May be seen or implied in later work or by sight of 32π
(Curved surface area $\Rightarrow 2 \times \pi \times 4 \times h$ oe	M1	May be seen or implied in later work or by sight of $8\pi h$
$(h =) \frac{104\pi - \pi \times 4^2 \times 2}{2 \times \pi \times 4} \left(= \frac{72\pi}{8\pi} \right)$	M2	FT 'their 32π ' (or 16π) AND 'their 8π ' provided both are multiples of π for M2 or M1 M1 for $2 \times \pi \times 4^2 + 2 \times \pi \times 4 \times h = 104\pi$ OR M1 for $32\pi + 8\pi h = 104\pi$
(h=) 9	A1	CAO
	(5)	

#2

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
(a) $2 \times \pi \times 12 \times 7 + 2 \times \pi \times 12 \times 12$ $(168\pi + 288\pi)$ $456\pi \text{ (cm}^2\text{)}$	M3 A1	M2 for $2 \times \pi \times 12 \times 7 + \pi \times 12 \times 12$ $(168\pi + 144\pi = 312\pi)$ OR $2 \times \pi \times 12 \times 7$ AND $2 \times \pi \times 12 \times 12$ (168π) AND (288π) M1 for $2 \times \pi \times 12 \times 7$ OR $2 \times \pi \times 12 \times 12$ (168π) OR (288π) CAO
(b) (Volume of wedge =) $\frac{30}{360} \times \pi \times r^2 \times 8$ (Fraction =) $\frac{\frac{30}{360} \times \pi \times r^2 \times 8}{\pi \times r^2 \times 25}$ $\frac{2}{75}$	M2 M2 A1	Allow a number for 'r' provided used correctly M1 for $\frac{30}{360} \times \pi \times r^2$ FT from M1 M1 for sight of $\pi \times r^2 \times 25$ CAO
<u>Alternative method</u> <i>Candidates that do not calculate volumes</i> $\frac{30}{360} \times \frac{8}{25}$ $\frac{2}{75}$	M4 A1	If no marks SC1 for sight of $\frac{30}{360}$ AND $\frac{8}{25}$
	(9)	

Volume / Surface Area of a Cylinder: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
#3	4	
#4	7	
#5	7	
Total	24	

Marking Scheme

#1

Component 2: Higher Tier	Mark	Comment
$\pi \times 7^2 \times 21 \div 102$	M2	M1 for $\pi \times 7^2 \times 21$ (= 3231 to 3233.118 or 1029π) Allow the M1 for sight of $\pi \times 7^2 \times 21$ if embedded in incorrect work e.g. $2 \times \pi \times 7^2 \times 21$
= 31 (complete cylinders)	A1	Unsupported 31.69 or 32 is awarded M2 A0
	(3)	

#2

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
$(h =) \frac{500}{\pi \times 3.5^2} = 500/38.4(8.)$	M2	M1 for $500 = \pi \times 3.5^2 \times h$
(h =) 12.98(...) to 13 (cm)	A1	CAO Not from wrong working If no marks award SC1 for an answer of: 25.97 to 26(.0) from $500 = \frac{1}{2}\pi \times 3.5^2 \times h$ OR 38.96 to 39(.0) from $500 = \frac{1}{3}\pi \times 3.5^2 \times h$
	(3)	

#3

Component 2: Higher Tier	Mark	Comment
(Vol of whole cheese =) $\pi \times 7^2 \times 5$ 769.69 to 769.79	M1 A1	Accept 245π Allow 770 from correct working
$\frac{154}{769.69} (\times 100)$	m1	FT 'their derived 769.69' Award for $(1 - \frac{245\pi - 154}{245\pi}) (\times 100)$ or equivalent complete method
20(....%)	A1	
<u>Alternative method:</u> Angle of sector = $\frac{154}{\pi \times 7^2 \times 5} \times 360$	M1	
72.(0...)	A1	May be embedded in further work
$\frac{72}{360} (\times 100)$	m1	FT 'their derived 72°'
20(....%)	A1	
	(4)	

#4

(a) (Volume of the carton) $6 \times 6 \times 20$ 720 (cm³) (Volume in the bottle) $\pi \times 3.5^2 \times 18.5$ 711.6 to 712.1 (cm³) Conclusion stating or implying 'No', with a reason, e.g. 'No as 720 > 712' OR 'Yes', with a reason, e.g. 'Yes, as the milk will fill up past the height of 18.5cm (beyond the cylindrical part of the bottle)'	M1 A1 M1 A1 E1	Allow if a drop extra is included, up to a maximum of 10cm³ FT for 'their volume of the carton' and 'their height in the milk bottle' provided at least M1, M1 previously awarded Accept reasoning based on uncertainty
(b)(i) Assumption stated, e.g. 'the bottle is in the shape of a cylinder (with height 18.5cm)', 'the measurements given are the internal measurements', 'no milk in the top of the carton', 'no milk in the neck of the bottle', 'assumed filled to the top'	E1	Do not accept 'measurements given were not accurate' Accept 'measurements were internal measurements'
(b)(ii) Impact, e.g. 'all the milk may not fit into the bottle', 'the milk might overflow in the bottle', 'the milk might fill the neck of the bottle'	E1 (7)	Allow 'milk may or may not fit' provided this could reasonably be an impact following 'their assumption'

#5

Component 2: Higher Tier	Mark	Comment
(Radius of cylinder =) 3 (cm) si	B1	Multiplications can take place in any order May be implied by e.g. $d = 6$
(Number of cylinders in crate =) 80	B1	May be implied in later working
$\pi \times 3^2 \times 32$	M1	(288π or 904.7(7..) to 904.9 cm^3)
$\times 0.961$	M1	(869.4 to 869.6(0...) g) FT 'their derived volume' providing it is a multiple of π . May use 0.000 961 (kg/cm^3); allow multiplication by figs 961 if a unit conversion error
$\times 80$	M1	FT 'their 80' $\times$ 'their derived volume or mass'
$= 69\,552$ to $69\,569$ (g)	A1	CAO
No indicated (with sight of 69() kg or 70 000 g)	A1	FT 'their 69 552 to 69 569 (g)' providing at least M2 previously awarded and no incorrect conversion to kg seen
<i>Alternative method</i>		
(Radius of cylinder =) 3 (cm) si	B1	May be implied by e.g. $d = 6$
(Number of cylinders in crate =) 80	B1	May be implied in later working
$\pi \times 3^2 \times 32$	M1	(288π or 904.7(7..) to 904.9 cm^3)
$\times 0.961$	M1	(869.4 to 869.6(0...) g) FT 'their derived volume' providing it is a multiple of π . May use 0.000 961 (kg/cm^3); allow multiplication by figs 961 if a unit conversion error
$= 869.5$ to 869.7 (g)	A1	FT 'their $6 \div 2$ ' and possibly figs 961 Allow e.g. 870 if correct working seen
$70\,000 \div 80 (= 875 \text{ (g)})$	M1	
No indicated (with sight of 869() g and 875 g)	A1	FT 'their 869.5 to 869.7(g)' or 'their 870' providing at least M2 previously awarded
	(7)	

Volume / Surface Area of a Cone / Sphere: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	4	
#3	6	
#4	7	
Total	19	

Marking Scheme

#1

4.	$4\pi\left(\frac{3}{4}\right)^2$	M1	Allow the omission of the brackets
	$\frac{9}{4}\pi$ or 2.25π or $2\frac{1}{4}\pi$	A1	Or an equivalent multiple of π ; mark final answer
		(2)	

#2

Component 1: Higher Tier	Mark	Comment
$\frac{2}{3}\pi r^3 = 18000\pi$ oe	M1	
$r^3 = \frac{18000\pi \times 3}{2\pi}$ oe	M1	Allow for $r^3 = \frac{18000\pi}{\frac{2}{3}\pi}$ oe
$(r =) \sqrt[3]{\frac{18000\pi \times 3}{2\pi}}$ oe	M1	$(r =) \sqrt[3]{27000}$
$(r =) 30$ (cm)	A1	If no marks, award SC2 for $(r =) \sqrt[3]{\frac{18000\pi \times 3}{4\pi}} (= \sqrt[3]{13500})$ oe or SC1 for $r^3 = \frac{18000\pi \times 3}{4\pi}$ oe
	(4)	

#3

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	
(b) $24 \times 13\pi$ or $\pi \times 6 \times 4 \times 13$ oe	B2	Must involve π for B2 or B1; allow B2 for e.g. $13(24\pi)$ or for $312\pi \div 13\pi = 24$ B1 for (surface area cone =) $\pi \times 6 \times 52$ or 312π
(c) $4\pi(7 \times 10^4)^2$ si	B1	Missing brackets may be recovered in further correct work
$4\pi(49 \times 10^8)$ or $4\pi(4\,900\,000\,000)$ oe	M2	M1 for $4\pi(49 \times 10^n)$, $n \neq 8$ or for $4\pi(m \times 10^8)$, $m \neq 49$
$(1.96 \times 10^{10})\pi$	A1	Allow $1.96\pi \times 10^{10}$ If no marks, award SC1 for $k\pi(49 \times 10^8)$, $k \neq 4$

#4

Component 1: Higher Tier	Mark	
(a) $\frac{1}{3} \times \pi \times 15^2 \times 30 \text{ oe, si}$ $\frac{1}{3} \times \pi \times 225 \times 30 \text{ oe, si}$ $2250\pi \text{ (cm}^3\text{)}$	M1 A1 A1	Allow e.g. 3.14 substituted for π; may be in stages Allow e.g. 3.14 substituted for π; may be in stages FT 'their 225', M1 A0 A1 is possible; Must be a multiple of π; do not ignore subsequent evaluation of e.g. 2250×3.14
(b) radius 3 cm or diameter 6 cm and height 6 cm si For the plan: draws a circle, radius 3cm and for the side elevation: draws an isosceles triangle with base 6 cm and height 6 cm	B1 B3	Correct use of the scale; may be implied by correctly drawn plan and elevation; FT 'their stated radius and their stated height' OR if no statement or calculation for radius and height, FT 'their diameter = their height = their base' For B3, circle must be drawn with compasses and triangle must be ruled. B2 FT for either an accurately drawn, correct plan or an accurately drawn, correct elevation FT 'their stated radius and their stated height' OR if no statement or calculation for radius and height, FT 'their diameter = their base' or 'their base = their height' or 'their diameter = their height' OR B2 FT for good sketches of both the correct plan and elevation or one sketch and one drawn accurately FT 'their stated radius and their stated height' OR if no statement or calculation for radius and height, FT 'their diameter = their height = their base' B1 for a circular plan with any radius or for a side elevation that is an isosceles triangle with any dimensions ; allow good freehand for B1 but base of triangle must not be clearly curved If B1 B0 or B0 B0, award SC1 for an accurate plan and elevation drawn in incorrect positions
	(7)	

Volume / Surface Area of a Cone / Sphere: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	4	
#3	4	
#4	4	
#5	4	
#6	7	
#7	8	
#8	9	
Total	43	

Marking Scheme

#1

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(Mass =) $14\pi y^3$ (g) ISW	B3	Allow use of other letters for y. If not B3 then award, B2 for either of the following: - an answer of $43.9(8\dots)y^3$ or $44y^3$ - sight of $7 \times \frac{1}{3} \times \pi \times y^2 \times 6y$ OR B1 for sight of $\frac{1}{3} \times \pi \times y^2 \times 6y$ or $2\pi y^3$
	(3)	

#2

Component 2: Higher Tier	Mark	Comment
(Density of copper =) $\frac{2150.4}{240}$ 8.96 or 9 (g/cm ³)	M1 A1	If a mixture of methods is employed, use the one that awards marks to the candidates advantage.
(mass of sphere =) $\frac{4}{3}\pi x^3 \times 8.96$ $37(.5\dots)x^3$ (< $38x^3$)	m1 A1	FT 'their 8.96' Allow answers in the range $37(x^3)$ to $37.7(x^3)$ from correct working.
<u>Alternative method 1:</u> (For equal volumes) $x^3 = 240 \times \frac{3}{4} \div \pi$ $= 57.29\dots$ EITHER (For equal mass multiplier of x^3 =) $2150 \div 57.29$ <u>= 37.53...(and less than 38)</u>	M1 A1 m1 A1	Allow for $240 = \frac{4}{3} \times \pi \times x^3$ Allow answers in the range 57.28 to 57.9 May be seen in later working
<u>Alternative method for the last two marks</u> OR (If multiplier of $x^3 = 38$, mass =) $38 \times 57.29\dots$ $= 2177(.2\dots\text{g.})$ AND this is greater than 2150.4g	m1 A1	
<u>Alternative method 2:</u> (Density of copper =) $\frac{2150.4}{240}$ 8.96 or 9 (g/cm ³) $\frac{4}{3}\pi \times k = 38$ si $k = 9.07\dots$ (and it is less than this so mass is less than $38x^3$)	M1 A1 M1 A1	
	(4)	

#3

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(a) $\frac{1}{3}\pi r^2 \times 20 = 2400$ ($r^2 =$) $3 \times 2400 \div 20\pi$ (=114.5(9) or 114.6) ($L^2 =$) $114.5(9...) + 20^2$ or $10.7^2 + 20^2$ ($L =$) answer in the range 22.68 to 22.7 (cm)	M1 A1 M1 A1	 ($r = 10.7(0...)$) FT 'their derived r' FT 'their derived r' providing 'their L' > 20 Allow 23 from correct working.

#4

	Mark	Comment
(a) (Volume sphere) $\frac{4}{3} \times \pi \times 2.7^3$ (Volume of cuboid) $14.2 \times \text{height} = \frac{4}{3} \times \pi \times 2.7^3$	M1 M1	($\approx 82.4... \text{ cm}^3$) FT for 'their volume of sphere'
Height = $\frac{4}{3} \times \pi \times 2.7^3 \div 14.2$	m1	FT for 'their volume of sphere'
Answer in the range 5.8 to 5.81 (cm^3)	A1	CAO

#5

Eduqas Autumn 2019 C2 Higher Tier	Mark	Comment
(a) $\frac{1}{3} \times \pi \times 16r^2 \times h = \frac{4}{3} \times \pi \times r^3$ ($h =$) $\frac{r}{4}$	M2 A2	M1 for $\frac{1}{3} \times \pi \times (4r)^2 \times h = \frac{4}{3} \times \pi \times r^3$, allow for $\frac{1}{3} \times \pi \times 4r^2 \times h = \frac{4}{3} \times \pi \times r^3$ A1 for correct rearrangement but unsimplified form or $r = 4h$, or FT from M1 to A1 for ($h =$) r <i>Alternative:</i> $\frac{1}{3} \times \pi \times 16r^2 \times r/4$ M2 (or $\frac{1}{3} \times \pi \times (4r)^2 \times r/4$ M1) $\frac{4}{3} \times \pi \times r^3$ A2 (or A1 for 1 stage of simplification)

#6

	Mark	Comment
Showing $x^2 + 2x - 132.48 = 0$ or $2x^2 + 4x - 264.96 = 0$	B2	B1 for $x^2 + (x + 2)^2 = 16.4^2$
$x = \frac{-4 \pm \sqrt{(4^2 - 4 \times 2 \times -264.96)}}{2 \times 2}$ or $x = \frac{-2 \pm \sqrt{(2^2 - 4 \times 1 \times -132.48)}}{2 \times 1}$ or $(x + 1)^2 - 133.48 = 0$	M1	FT for equivalent level of difficulty Allow 1 slip in substitution, not use of incorrect formula
$x = \frac{-4 \pm \sqrt{2135.68}}{4}$ or $x = \frac{-2 \pm \sqrt{533.92}}{2}$ or $x + 1 = \sqrt{133.48}$	A1	Either negative x-value not given or ignored in further working
$x = 10.55...(cm)$ or $10.6(cm)$	A1	Candidate must not show working with negative x-value
(Volume =) $\frac{1}{3} \times \pi \times 10.55...^2 \times 12.55...$	M1	FT provided at least 2 marks previously awarded
Answer in the range 1462 (cm^3) to 1483 (cm^3)	A1	Must be from correct working FT for an answer in a similar range, not allowing truncation of 'their x' to a whole number or 1 d.p.
	(7)	

#7

(a)(i) $h^2 = 15^2 - 3.5^2$ $h^2 = 212.75$ or $h = \sqrt{212.75}$ $14.58595...(\text{cm})$ or $14.6 (\text{cm})$ (Volume) $\frac{1}{3} \times \pi \times 3.5^2 \times 14.58595...$ Answer in the range $187.(... \text{cm}^3)$ $2000 \div 187.(....)$ 10 (ice creams)	M1 A1 A1 m1 A1 M1 A1	Accept $15^2 = h^2 + 3.5^2$ Accept rounded answers, but NOT truncated answers FT from M1 for the correctly evaluated square root of 'their 212.75' provided 'their answer' < 15 (cm) FT 'their 14.58595...' provided M1 previously awarded FT 'their 187.(...)' provided at least 3 marks previously awarded Must be a whole number
(a)(ii) Evaluation of results, e.g. 'cone was full, if it wasn't Megan could have made more ice creams',	E1	Accept FT from reasoning behind rounding 'their number of ice creams' up or down Allow, e.g. 'inside measurements could be less, so could be 11 rather than 10 ice creams', 'could have extra ice cream on the top, so makes fewer', 'not practical, as impossible to fill to the bottom of the cone'

#8

Component 2: Higher Tier	Mark	Comment																																																
(a) (Expression for total volume) $\frac{1}{2} \times \frac{4}{3} \times \pi \times (x + 1)^3 + \frac{1}{3} \times \pi \times (x + 1)^2 \times 5$ (Equate to 24π and expands brackets correctly) $2x^3 + 11x^2 + 16x + 7 = 72$ or $\frac{2\pi}{3}x^3 + \frac{11}{3}\pi x^2 + \frac{16}{3}\pi x + \frac{7}{3}\pi = \frac{72}{3}\pi (=24\pi)$ or $(2x^3+4x^2+2x+2x^2+4x+2)+(5x^2+10x+5)=72$ Convincingly leading to $2x^3 + 11x^2 + 16x = 65$	B1 B3 B1	Need not be equated to 24π for this mark FT provided of the form: $k\pi(x + 1)^3 + 5m\pi(x + 1)^2 (= 24\pi)$ B2 for volume equated to 24π and both $(x + 1)^3$ and $(x + 1)^2$ expanded correctly e.g. $\frac{2}{3}\pi (x^3 + 2x^2 + x + x^2 + 2x + 1) +$ $\frac{5}{3}\pi (x^2 + 2x + 1) = 24\pi$ or $2(x^3 + 2x^2 + x + x^2 + 2x + 1) +$ $5(x^2 + 2x + 1) = 72$ OR for $(x^2 + 2x + 1)(2x + 7) = 72$ B1 for one of the following: $2(x + 1)^3 + 5(x + 1)^2 = 72$ $(x + 1)^2 (2(x + 1) + 5) = 72$ $(x + 1)^2(2x + 7) = 72$ CAO If no marks award SC1 for sight of: $\frac{1}{2} \times \frac{4}{3} \times \pi \times (x + 1)^3$ AND $\frac{1}{3} \times \pi \times (x + 1)^2 \times 5$ If no marks or B1 B0 B0 awarded, award SC1 for the correct expansion of $(x + 1)^3$ $x^3 + x^2 + x^2 + x^2 + x + x + x + 1$ or better																																																
(b) One correct evaluation $1.6 \leq x \leq 1.7$ 2 correct evaluations $1.635 \leq x \leq 1.655$, one < 0, one > 0. 2 correct evaluations $1.645 \leq x \leq 1.655$, one < 0, one > 0. $x = 1.65$	B1 B1 M1 A1	Correct evaluation regarded as enough to identify if < 0 or > 0. If evaluations not seen accept 'too high' or 'too low'. Some candidates may test $2x^3 + 11x^2 + 16x - 65 = 0$ <table><thead><tr><th>x</th><th>$2x^3 + 11x^2 + 16x$</th><th></th><th></th></tr></thead><tbody><tr><td>1.6</td><td>61.952</td><td></td><td></td></tr><tr><td>1.61</td><td>62.619...</td><td></td><td></td></tr><tr><td>1.62</td><td>63.291...</td><td></td><td></td></tr><tr><td>1.63</td><td>63.967...</td><td></td><td></td></tr><tr><td>1.64</td><td>64.647...</td><td>1.635</td><td>64.306...</td></tr><tr><td>1.65</td><td>65.331...</td><td>1.645</td><td>64.989...</td></tr><tr><td>1.66</td><td>66.020...</td><td>1.646</td><td>65.0575..</td></tr><tr><td>1.67</td><td>66.712...</td><td>1.655</td><td>65.675...</td></tr><tr><td>1.68</td><td>67.409...</td><td></td><td></td></tr><tr><td>1.69</td><td>68.110...</td><td></td><td></td></tr><tr><td>1.7</td><td>68.816...</td><td></td><td></td></tr></tbody></table> <u>Note:</u> Evidence for M1 must be <u>seen</u> before A1 can be awarded. No marks awarded for an unsupported answer of 1.65.	x	$2x^3 + 11x^2 + 16x$			1.6	61.952			1.61	62.619...			1.62	63.291...			1.63	63.967...			1.64	64.647...	1.635	64.306...	1.65	65.331...	1.645	64.989...	1.66	66.020...	1.646	65.0575..	1.67	66.712...	1.655	65.675...	1.68	67.409...			1.69	68.110...			1.7	68.816...		
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1.7	68.816...																																																	
	(9)																																																	

Frustums: Calculator

Question	Maximum Mark	Mark Awarded
#1	7	
#2	8	
Total	15	

Marking Scheme

#1

Component 2: Higher Tier	Mark	Comments
(Depth of water =) 15 (cm)	B2	May be embedded in later working B1 for $\frac{6}{20} \times 50$ oe
$\frac{1}{3}\pi \times 20^2 \times 50 - \frac{1}{3}\pi \times 6^2 \times 15$ (20000π) - (540π) oe	M2	FT provided B1 previously awarded for M2 M1 for $\frac{1}{3}\pi \times 20^2 \times 50$ or $\frac{1}{3}\pi \times 6^2 \times 15$
20943.95102 – 565.4866776 $\frac{19460}{3}\pi$ or 20378(.464...) si	A1	FT from M2 only
20378(.464...) ÷ 1000 × 10 oe	M1	FT 'their derived volume' providing at least 3 marks previously awarded
204 or 203.7 to 203.8 (seconds)	A1	CAO
<u>Alternative method</u> (Depth of water =) 15 (cm)	B2	May be embedded in later working B1 for $\frac{6}{20} \times 50$ oe
(Time to fill initial volume =) $(\frac{1}{3} \times \pi \times 6^2 \times 15) \div 1000 \times 10$	M2	FT provided B1 previously awarded for M2 M1 for $\frac{1}{3} \times \pi \times 6^2 \times 15$
5.6548 (s) si	A1	FT from M2 only
$5.6548... \times \frac{20^3}{6^3} - 5.6548... \text{ oe}$	M1	FT 'their derived volume' providing at least 3 marks previously awarded Must be a complete method to find the time needed
204 or 203.7 to 203.8 (seconds)	A1	CAO
	(7)	

#2

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(a)		Mark using one method only, to the candidate's advantage
(Height of pyramid removed =) 4 (cm)	B1	
$\frac{1}{3} \times 24 \times 12^2 - \frac{1}{3} \times 4 \times 2^2 (= 1152 - 5.33...)$	M2	FT 'their 4' provided < 24
		M1 for $\frac{1}{3} \times 24 \times 12^2$ or $\frac{1}{3} \times 4 \times 2^2$
$\frac{3440}{3}$ or 1146.6(66...) or 1146.7	A1	FT 'their 4' Allow 1147 from correct working
(Mass =) $0.9 \times \frac{3440}{3}$	M1	FT 'their $\frac{3440}{3}$ '
1032 (grams)	A1	CAO
	E1	Award for 1031.9(4) to 1032.3
Valid assumption e.g. 'No wax is lost when the wax is cut.' or 'The mass of the wick is negligible.' or 'The wick can be ignored.' or 'The volume of the wick is negligible.' or 'The wick has the same density as the wax.'		
Alternative Method 1 for first 6 marks (difference of masses): (Height of pyramid removed =) 4 cm		
$\frac{1}{3} \times 24 \times 12^2$ or $\frac{1}{3} \times 4 \times 2^2$	M1	(1152 or 5.33...) 'FT their 4'
$0.9 \times \frac{1}{3} \times 24 \times 12^2$ and $0.9 \times \frac{1}{3} \times 4 \times 2^2$	M2	FT 'their 4' for M2 or M1
		M1 for $0.9 \times \frac{1}{3} \times 24 \times 12^2$ or $0.9 \times \frac{1}{3} \times 4 \times 2^2$; (1036.8 or 1037) (4.77 or 4.8)
$\left(0.9 \times \frac{1}{3} \times 24 \times 12^2\right) - \left(0.9 \times \frac{1}{3} \times 4 \times 2^2\right)$	M1	
1032 (grams)	A1	CAO Award for 1031.9(4) to 1032.3
Alternative Method 2 for first 6 marks (scaling the volume): $\frac{1}{3} \times 24 \times 12^2$	M1	(=1152)
$0.9 \times \frac{1}{3} \times 24 \times 12^2$ or $\frac{1}{6^3} \left(\frac{1}{3} \times 24 \times 12^2\right)$	M1	(1036.8 or 1037) or (4.77 or 4.8)
$0.9 \left(\frac{1}{3} \times 24 \times 12^2 - \frac{1}{6^3} \left(\frac{1}{3} \times 24 \times 12^2\right)\right)$ oe	M3	or M2 for sight of $\frac{1}{3} \times 24 \times 12^2 - \frac{1}{6^3} \left(\frac{1}{3} \times 24 \times 12^2\right)$ oe or M1 for sight of $\frac{1}{6^3} \left(0.9 \times \frac{1}{3} \times 24 \times 12^2\right)$ oe
1032 (grams)	A1	CAO Award for 1031.9(4) to 1032.3
(b)		
Valid impact following their assumption e.g. 'The volume of the wax may be a little less so the mass will be less.' or 'The density of the wick is likely to be less than the density of the wax, so in fact the mass of the candle is likely to be a bit less.'	E1	Must have stated an assumption in part (a).
	(8)	

Area of a Triangle: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
Total	4	

Marking Scheme

#1

$10 - 3\sqrt{5} = \frac{1}{2} \times base \times \sqrt{5}$ $(base =) \frac{10 - 3\sqrt{5}}{\frac{1}{2} \times \sqrt{5}} \text{ or equivalent}$ $(base =) \frac{20}{\sqrt{5}} - 6 \text{ or better}$ or $(base =) \frac{2 \times 10\sqrt{5} - 2\sqrt{5} \times 3\sqrt{5}}{(\sqrt{5})^2} \text{ or better}$ $(base =) 4\sqrt{5} - 6$	B1 B1 M1 A1 (4)	Any clear notation is acceptable. Allow $\frac{10 - 3\sqrt{5}}{\sqrt{5}} = \frac{1}{2} \times base$ or $10\sqrt{5} - 3 \times 5 = \frac{1}{2} \times base \times 5$ or $20 = \sqrt{5}(base + 6)$ Allow $\frac{10}{\sqrt{5}} - 3 = \frac{1}{2} \times base$ or better or $\frac{10\sqrt{5} - 3\sqrt{5} \times \sqrt{5}}{(\sqrt{5})^2} = \frac{1}{2} \times base$ or better Allow $-6 + 4\sqrt{5}$
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Area of a Triangle: Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
Total	5	

#1

284

Sine Rule / Cosine Rule / Area of a Triangle: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
#2	5	
Total	10	

Marking Scheme

#1

Component 1: Higher Tier	Mark	Comment
$0.5 \times 14 \times 15 \times 0.6$	M1	FT 'their 63'
$63 \text{ (cm}^2\text{)}$	A1	
$63 \div 7 \times 16 \text{ (}\pi\text{)}$ $144 \text{ (}\pi\text{)}$	m1 A1	
12 (cm)	A1	
	(5)	

#2

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
$\cos 60^\circ = \frac{1}{2}$ si	B1	Allow even if $AC =$
$(AC^2 =) 4^2 + 12^2 - 2 (4)(12)\cos 60$	M1	
$(AC^2 =) 112$	M1	FT 'their cos 60' provided $-1 < \text{'their cos 60'} < 1$
$AC = \sqrt{112}$	A1	FT 'their cos 60' provided 'their 112' > 0
$AC = 4\sqrt{7}$	A1	CAO
	(5)	

Sine Rule / Cosine Rule / Area of a Triangle: Calculator

Question	Maximum Mark	Mark Awarded
#1	4	
#2	6	
#3	6	
#4	6	
#5	6	
#6	6	
#7	7	
#8	9	
#9	10	
#10	10	
#11	10	
Total	80	

Marking Scheme

#1

Component 2: Higher Tier	Mark	Comment
An explicit calculation for $\sin BCA$ e.g. $\sin BCA = 7 \times \frac{\sin 61}{9}$ $BCA = 42.86...^\circ$ $(\widehat{BCD} = 180 - 42.86... =)$ Answer in range 137.1° to 137.2° inclusive	M2 A1 B1	M1 for any correct implicit form e.g. $\frac{\sin BCA}{7} = \frac{\sin 61}{9}$ Accept 43 FT 'their 42.8 to 43' providing at least M1 previously awarded. Accept 137 following complete working; degree symbol may be omitted
	(4)	

#2

Eduqas Autumn 2019 C2 Higher Tier	Mark	Comment
$BD^2 = 10.8^2 + 12.3^2 - 2 \times 10.8 \times 12.3 \times \cos 112^\circ$	M1	
$BD^2 = 367.455...$	A1	
$BD = 19.169(...\text{cm})$ or $BD = 19.2 (\text{cm})$ or $BD = 19.17 (\text{cm})$	A1	
(Area DAB =) $\frac{1}{2} \times 10.8 \times 12.3 \times \sin 112^\circ$	M1	
(Area DBC =) $\frac{1}{2} \times 21.5 \times 19.169... \times \sin 75^\circ$	M1	FT 'their derived BD'
(Area DAB + DBC = $61.58... + 199.04... =$ $260.6 (\text{cm}^2)$ to $261 (\text{cm}^2)$	A1	FT provided at least one of the previous two M marks have been awarded
	(6)	

#3

$EG^2 = 24.4^2 + 20.3^2 - 2 \times 24.4 \times 20.3 \times \cos 36^\circ$ $(= 206.0054\dots)$	M1	
EG = 14.35(2...cm) or 14.4 (cm)	A1	
Area EFG = $\frac{1}{2} \times 24.4 \times 20.3 \times \sin 36^\circ$	M1	
Area EGH = $\frac{1}{2} \times 19.6 \times 14.35 \times \sin 49^\circ$	M1	FT 'their 14.35...' provided M1 awarded for the cosine rule
Area EFG = 145.5 (cm ²) to 145.6 (cm ²)	A1	
AND Area EGH = 106.1 (cm ²) to 106.6 (cm ²)		Use of 14.4 gives 106.5(046...cm ²)
Following correct working, answer in the range 251.6 (cm ²) to 252.2 (cm ²)	A1	Depends on the award of all previous M1 marks
	(6)	

#4

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(a) $DC = \frac{9.6}{\sin(180 - (79 + 39))} \times \sin 39$	M2	M1 for $\frac{DC}{\sin 39} = \frac{9.6}{\sin(180 - (79 + 39))}$
6.8(...) (cm)	A1	
(b) $\widehat{ADB} > 101$ $\sin \widehat{ADB} < \sin 101$ Mona's area is $\frac{1}{2} \times 9.6 \times 5.7 \sin \widehat{ADB}$ and is too large or $\frac{1}{2} \times AD \times BD \times \sin \widehat{ADB}$ is too large	B1 B1 B1	Accept example of $101 < \widehat{ADB} < 101.5$ Accept FT example of $0.9799 < \sin \widehat{ADB} < 0.9816$ Need both 'too big' and sight of $\frac{1}{2}ab\sin C$. Accept calculation using $\frac{1}{2} \times AD \times BD \times \sin \widehat{ADB}$ e.g. $26.810 < \text{area} < 26.857$ If no marks award SC1 for a convincing explanation without calculations, e.g. by drawing B3 for Area = $\frac{1}{2} \times 9.6 \times 5.7 \sin \widehat{ADB}$ and $\sin 101 > \sin \widehat{ADB}$
	(6)	

#5

Component 2: Higher Tier	Mark	Comments
(a) $(BC =) \frac{13}{\sin 67^\circ} \times \sin 38^\circ$	M2	Degree symbol may be missing throughout M1 for $\frac{BC}{\sin 38^\circ} = \frac{13}{\sin 67^\circ}$
8.7 or 8.69(4...) (cm)	A1	Allow 9 from correct working
(b) $(EF =) \sqrt{6^2 + 11^2 - 2(6)(11)\cos 43}$	M2	M1 for $EF^2 = 6^2 + 11^2 - 2(6)(11)\cos 43$ (=60(.46...))
7.77 to 7.8 (cm)	A1	Allow 8 from correct working
	(6)	

#6

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
$(W\hat{X}Z =) \sin^{-1}\left(\frac{\sin(61) \times 11.8}{13.1}\right)$ $= 51.9(82\dots)(^\circ) \text{ or } 52(^\circ)$ $(YZ =)$ $\sqrt{13.1^2 + 7.8^2 - 2 \times 13.1 \times 7.8 \times \cos(180 - 51.9(82\dots))}$ $= 18.9(2\dots) \text{ (cm) or } 19 \text{ (cm)}$	M2 A1 M2 A1	Award marks for similar complete methods M1 for $\frac{\sin(W\hat{X}Z)}{11.8} = \frac{\sin(61)}{13.1}$ oe Accept answers in the range 51.9 to 52 FT 'their derived 51.9(82...)' provided at least M1 previously awarded. M1 for (YZ² =) $13.1^2 + 7.8^2 - 2 \times 13.1 \times 7.8 \times \cos(180 - 51.9(82\dots))$ FT Accept answers in the range 18.9 to 19 inclusive.
<u>Alternative method</u> (Height of triangle = h =) $11.8 \sin(61)$ AND $(d =) \sqrt{13.1^2 - h^2}$ $(d =) 8.068(2\dots) \text{ or } 8.07$ $(YZ =) \sqrt{10.32^2 + (8.07 + 7.8^2)}$ $= 18.9(2\dots) \text{ (cm) or } 19 \text{ (cm)}$	M2 A1 M2 A1	$h = 10.32\dots$ FT 'their 8.07' provided M2 previously awarded M1 for $(YZ^2 =) 10.32^2 + (8.07 + 7.8^2)$ FT Accept answers in the range 18.9 to 19 inclusive
	(6)	

#7

Component 2: Higher Tier	Mark	Comment
$(BC =) \sqrt{6.4^2 + 8.3^2 - 2 \times 6.4 \times 8.3 \times \cos(71)}$ $(BC =) 8.67(5\dots) \text{ or } 8.7 \text{ (cm)}$ $\sin(BDC) = \frac{\sin(68)}{11.1} \times 8.6(75\dots)$ $(BDC =) 46.4 \text{ to } 46.6 (^\circ)$ $(CBD =) 65.4 \text{ to } 65.6 (^\circ)$	M2 A1 M2 A1 A1	Allow alternative full methods throughout M1 for $(a^2) = 6.4^2 + 8.3^2 - 2 \times 6.4 \times 8.3 \times \cos(71)$ (=75.26...) Allow A1 for an answer of 8.6 from correct working not from premature rounding FT 'their derived BC' provided it is a length. M1 for $\frac{\sin(BDC)}{8.6(75\dots)} = \frac{\sin(68)}{11.1}$ Allow 47(°) from correct working. Allow answers of 65(°) or 66(°) from correct working. FT provided both cosine and sine rule attempted and at least M1 awarded for each.
	(7)	

#8

Component 2: Higher Tier	Mark	Comment
$\sin(\dots) = 0.7 \frac{45.0 \times 2}{12.5 \times 9.4} \quad \text{oe}$ $\widehat{ABC} = 49.9(922\dots)^\circ (= 50^\circ)$ <u>Alternative method for the first 3 marks</u> (Perp height from C to AB =) $45 \times 2 \div 12.5 \text{ oe}$ $\sin \widehat{ABC} = \frac{7.2}{9.4}$ $\widehat{ABC} = 49.9(922\dots)^\circ (= 50^\circ)$ $AC = \sqrt{12.5^2 + 9.4^2 - 2(12.5)(9.4)\cos 50}$ $AC = 9.67 \text{ to } 9.7 \text{ (cm) si}$ $\sin \widehat{ADC} = \frac{9.67\dots \times \sin 85}{10.2} (=0.9446\dots) \text{ oe}$ Accept answers in range 70.8° to 71.33°	M2 A1 M1 M1 A1 M2 A1 M2 A1	Degree symbol may be omitted throughout M1 for $\frac{1}{2} \times 12.5 \times 9.4 \times \sin \widehat{ABC} = 45.0 \text{ oe}$ If M0 awarded, then: SC2 for $\frac{1}{2} \times 12.5 \times 9.4 \times \sin 50 = 45(.005\dots)$ or SC1 for $\frac{1}{2} \times 12.5 \times 9.4 \times \sin 50$ Allow for appropriate sight of 7.2 (cm) Allow 10 cm from correct working Allow A1 for $\sqrt{93.2}$ to $\sqrt{93.6}$ FT 'their 9.67...' M1 for $\frac{9.67\dots}{\sin \widehat{ADC}} = \frac{10.2}{\sin 85} \text{ oe}$ CAO
	(9)	

#9

Component 2: Higher Tier	Mark	Comment
(a)		
$\frac{55}{360} \times \pi \times 12^2$ oe	B1	
$\frac{1}{2} \times 12^2 \times \sin 55$ oe	B1	
$\frac{55}{360} \times \pi \times 12^2 - \frac{1}{2} \times 12^2 \times \sin 55$ or better	M1	(= $22\pi - 72\sin 55$); FT their difference of areas providing at least B1 previously awarded
10.1(36....)	A1	CAO Accept answers in the range 10.1 to 10.15; accept 10 following correct working
(b)		
$\sqrt{12^2 + 12^2 - 2(12)(12)\cos 55}$ oe OR $\frac{12\sin(55)}{\sin(62.5)}$ OR $2(12\sin(27.5))$	M2	M1 for sight of $12^2 + 12^2 - 2(12)(12)\cos 55$ oe OR $\frac{[...] }{\sin(55)} = \frac{12}{\sin(62.5)}$ oe OR $\sin(27.5) = \frac{\frac{1}{2} [...]}{12}$ oe
11(.0819...)	A1	
$\frac{11}{3}\pi$ oe	B2	B1 for $\frac{55}{360} \times 2 \times \pi \times 12$ oe
22.6(01...)	B1	FT providing at least M1 B1 previously awarded
	(10)	

#10

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(a) Correct justification e.g. $360 - 150 - 161 (= 49^\circ)$ or $180 - 161 + 30 (= 49^\circ)$	B1	or equivalent; check diagram; NB method must be seen as answer is given Allow $30 + 19 (= 49)$
(b) $\frac{1}{2} \times 50 \times 72 \times \sin 49$ 1358(.4772...km ²)	M1 A1	
(c) $PR^2 = 2960(.37.....)$ $PR = 54.4(... \text{ km})$ $\cos PRQ = \frac{54.4^2 + 72^2 - 50^2}{2 \times 54.4... \times 72}$ or $\sin PRQ = 50 \times \frac{\sin 49}{54.4...}$ or $\cos QPR = \frac{54.4^2 + 50^2 - 72^2}{2 \times 54.4... \times 72}$ or $\sin QPR = 72 \times \frac{\sin 49}{54.4...}$ $PRQ = 44^\circ$ or $QPR = 87^\circ$ Bearing is $(360 - 44 - 19 =) 297^\circ$ or $(180 + 30 + 87 =) 297^\circ$	M2 A1 M2 A1 A1 A1	M1 for $PR^2 = 50^2 + 72^2 - 2(50)(72)\cos 49$ soi; accept 54 km FT 'their 54.4....' for M2 or M1 M1 for $50^2 = 54.4...^2 + 72^2 - 2(54.4...)(72)\cos PRQ$ or for $\frac{\sin PRQ}{50} = \frac{\sin 49}{54.4...}$ soi; may be inverted or for $72^2 = 54.4...^2 + 50^2 - 2(54.4...)(72)\cos QPR$ or for $\frac{\sin QPR}{72} = \frac{\sin 49}{54.4...}$ soi; may be inverted CAO; Accept 43.9(...) or 87.0(...) FT 'their derived 44' or 'their derived 87'
Alternative method using area $PR^2 = 2960(.37.....)$ $PR = 54.4(... \text{ km})$ $\sin QRP = \frac{1358 \times 2}{54.4... \times 72}$ or $\sin QPR = \frac{1358 \times 2}{54.4... \times 50}$ $PRQ = 44^\circ$ or $QPR = 87^\circ$ Bearing is $(360 - 44 - 19 =) 297^\circ$ or $(180 + 30 + 87 =) 297^\circ$	M2 A1 M2 A1 A1	M1 for $PR^2 = 50^2 + 72^2 - 2(50)(72)\cos 49$ soi; accept 54 km FT 'their 1358' and 'their 54.4....' for M2 or M1 M1 for $\frac{1}{2} \times 54.4... \times 72 \times \sin QRP = 1358$ or for $\frac{1}{2} \times 54.4... \times 50 \times \sin QPR = 1358$ CAO; Accept 43.9(...) or 87.0(...) FT 'their derived 44' or 'their derived 87'
	(10)	

#11

$BD^2 = 4.2^2 + 3.9^2 - 2 \times 4.2 \times 3.9 \times \cos 86^\circ$ $BD^2 = 30.564 \dots$ or $BD = 5.528 \dots (\text{cm})$	M1	
	A1	Accept rounded or truncated, or implied in the next stage of working
$\cos C = \frac{6.4^2 + 5.8^2 - BD^2}{2 \times 6.4 \times 5.8} (=0.59 \dots)$	M2	With either the value for BD used or the values substituted into the cosine rule from the left hand side triangle M1 for $BD^2 = 6.4^2 + 5.8^2 - 2 \times 6.4 \times 5.8 \times \cos C$
An answer in the range 53° to 54°	A1	Must be from correct working shown
Area ABD = $\frac{1}{2} \times 4.2 \times 3.9 \times \sin 86^\circ$	M1	
Area BCD = $\frac{1}{2} \times 6.4 \times 5.8 \times \sin C$	M1	A value for C must be shown, FT 'their derived BCD'
Area ABD = $8.17 (\text{cm}^2)$ or $8.2 (\text{cm}^2)$	A1	Only accept $8 (\text{cm}^2)$ from sight of correct working
OR		
Area BCD = 14.8 to $15.02 (\text{cm}^2)$		FT 'their derived BCD'
$(\frac{\text{Total area}}{60} \times 3.59 =)$ $\frac{22.97}{60} \times 3.59$ to $\frac{23.2(0 \dots)}{60} \times 3.59$	M1	FT 'their total area' provided at least 2 marks previously awarded in working to find the area
Answer in the range (£)1.37 to (£)1.39	A1	CAO. Must follow correct working shown
		Maximum of SC7 for incorrectly considering AC as bisecting BAC: Correctly finding BCA (sine rule) B1 Finding CBA (angle sum triangle) B1 FT Correctly finding AC (cosine rule) B1 FT Correctly finding CDA (cosine rule) B1 FT Correctly finding the area of each of the triangles B1 B1 FT Correctly costs AND finds the change B1
	(10)	

Area / Perimeter of a Sector / Segment: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
Total	6	

Marking Scheme

#1

Any valid reason e.g. 'Nia has found the circumference.' or 'Circumference circle = $\pi \times 24$.' or 'She has used the diameter, not the radius squared'. or 'Area circle = $\pi \times 144$' $\left(\frac{\pi \times 144}{8}\right) = 18\pi \text{ (cm}^2\text{)}$	E1 B2	Allow e.g. 'Area of circle should be $\pi \times r^2$' or 'Area circle = $\pi \times 12^2$'. Do not allow e.g. 'Area circle = $\pi \times r^2$ and Circumference = $\pi \times d$' or Area = $\pi \times r^2$ without further evidence e.g. correct method shown B1 for (area sector =) $\frac{\pi \times 12^2}{8}$ or equivalent; Allow use of $\pi = 3.14$ for E1 and B1
	(3)	

#2

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	
(a) $\frac{x}{360} \times 2(\pi \times r) = \frac{1}{6}(\pi \times r) \text{ or } \frac{\frac{1}{6} \times \pi \times r}{2 \times \pi \times r} \text{ oe}$ $x = \frac{1}{6} \times 360 \div 2 \text{ or } \frac{1}{12} \times 360 \text{ oe}$ $x = 30$	M1 M1 A1	If no marks award SC1 for a final answer of 60 obtained from use of $\frac{x}{360}(\pi \times r) = \frac{1}{6}(\pi \times r)$

Area / Perimeter of a Sector / Segment: Calculator

Question	Maximum Mark	Mark Awarded
#1	5	
#2	6	
#3	11	
Total	22	

Marking Scheme

#1

Component 2: Higher Tier	Mark	Comments
(area sector =) $\frac{62}{360} \times \pi \times 15^2$	M1	
121.7(3...)	A1	CAO; accept $\frac{155}{4}\pi$; allow 122
(area triangle =) $\frac{1}{2} \times 15 \times 8 \times \sin(90 - 62)$	M1	
28.17 or 28.168(2....)	A1	FT 'their derived 28°' but must use 15 and 8 m; allow 28 or 28.2
A sum of correct areas that rounds to 150 e.g. $121.7(3...) + 28.16(8...) = 149.9... (=150)$	B1	CAO; sight of 149.9(0...) implies 5 marks providing M1 M1 awarded Allow e.g. $122 + 28.2 = 150.2$ but not $122 + 28 = 150$
	(5)	

#2

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
(a) $\frac{x}{360} \times 2\pi r = 5\pi$ $x = \frac{900}{r}$ from clear correct working	M1 A1	
Alternative method $\frac{x}{360} = \frac{5}{2r}$ $x = \frac{900}{r}$ from clear correct working	M1 A1	
(b) $\frac{x}{360} \times \pi r^2 = 30\pi$	M1	
$\left(\frac{900}{r}\right) \times \pi \times r^2 = 30\pi$ (r =) 12 (x =) 75	m1 A1 A1	FT 'their derived 12' provided M1 previously awarded
Alternative method $\frac{x}{360} \times \pi r^2 = 30\pi$ $xr = 900$ and $xr^2 = 10800$ oe (r =) 12 (x =) 75	M1 m1 A1 A1	FT 'their derived 12' provided M1 previously awarded
Alternative method $\frac{x}{360} = \frac{30}{r^2}$ oe $\frac{5}{2r} = \frac{30}{r^2}$ (r =) 12 (x =) 75	M1 m1 A1 A1	FT 'their derived 12' provided M1 previously awarded
Alternative method $\frac{x}{360} = \frac{30}{r^2}$ oe $\frac{x}{360} = \frac{30}{\left(\frac{900}{x}\right)^2}$ (x =) 75	M1 m1 A2	
	(6)	

	Mark	Comment
(a) Area of sector $\frac{42}{360} \times \pi \times 3.6^2$ Answer in range 4.748 (m ²) to 4.75... (m ²)	M1 A1	May be implied later
(Area ACD) $\frac{1}{2} \times 3.6 \times 4.1 \times \sin 67^\circ$ 6.79(...m ²)	M1 A1	May be implied later
Total area 11.53(8..m ²) to 11.54(...m ²) AND Yes	B1	FT provided at least M2 A1 previously awarded (with appropriate conclusion)
(b) (Arc length) $2 \times \frac{42}{360} \times \pi \times 3.6$ 2.64 (m)	M1 A1	Accept 2.63(...m)
(Triangle ACD) AD ² = 18.2(356...) AD = 4.27(...m)	M2 A1	M1 for AD ² = 4.1 ² + 3.6 ² - 2 × 4.1 × 3.6 × cos 67° Accept 4.3(m)
(Perimeter) (4.1 + 3.6 + 2.64 + 4.27) 14.6(1 m) AND No	B1 (11)	FT correct evaluation of 'their arc' + 'their AD' + 4.1 + 3.6 provided at least M2 and A1 previously awarded

Vectors: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	3	
#3	4	
#4	4	
#5	4	
#6	5	
#7	5	
#8	5	
#9	6	
#10	7	
Total	45	

Marking Scheme

#1

	Mark	Comment
$\begin{pmatrix} 5 \\ -1 \end{pmatrix}$	B2	Mark final answer for B2 B1 for each element or for $(\frac{1}{2}\mathbf{p}) = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ or seen or for $\begin{pmatrix} 5 \\ -1 \end{pmatrix}$ or for $\frac{5}{-1}$ in working space without brackets; allow $\frac{2}{1}$ seen for B1.
	(2)	

#2

(AD =) $3\mathbf{q}$	B1	may be on diagram
(DC =) $-3\mathbf{q} + 3\mathbf{p} + \mathbf{q}$	M1	– ‘their $3\mathbf{q}$ ’ + $3\mathbf{p} + \mathbf{q}$
$3\mathbf{p} - 2\mathbf{q}$	A1	CAO
	(3)	

#3

(a) $\begin{pmatrix} 24 \\ 12 \end{pmatrix}$	B2	Mark final answer B1 for each element or for $\mathbf{p} + \mathbf{q} = \begin{pmatrix} 6 \\ 3 \end{pmatrix}$ or $4\mathbf{p} = \begin{pmatrix} -4 \\ 20 \end{pmatrix}$ or $4\mathbf{q} = \begin{pmatrix} 28 \\ -8 \end{pmatrix}$ seen or for $\begin{pmatrix} 24 \\ 12 \end{pmatrix}$ as final answer or for a correct answer seen then spoiled
(b) 3	B2	Mark final answer; allow embedded answers e.g. $\begin{pmatrix} -2 \\ 10 \end{pmatrix} + 3\begin{pmatrix} 7 \\ -2 \end{pmatrix} = \begin{pmatrix} 19 \\ 4 \end{pmatrix}$ B1 for $-2 + 7x = 19$ or $10 - 2x = 4$ or for $x\begin{pmatrix} 7 \\ -2 \end{pmatrix} = \begin{pmatrix} 21 \\ -6 \end{pmatrix}$ or for $\begin{pmatrix} -2 \\ 10 \end{pmatrix} + 3\begin{pmatrix} 7 \\ -2 \end{pmatrix} = \begin{pmatrix} 19 \\ 4 \end{pmatrix}$ seen with an incorrect final answer
	(4)	

#4

Component 1: Higher Tier	Mark	
DO + OA + AC si OR DB + BC si $-\frac{1}{2}\mathbf{b} + \mathbf{a} + \frac{1}{4}(\mathbf{b} - \mathbf{a})$ OR $\frac{1}{2}\mathbf{b} - \frac{3}{4}(\mathbf{b} - \mathbf{a})$ $\frac{3}{4}\mathbf{a} - \frac{1}{4}\mathbf{b}$ or $\frac{3\mathbf{a} - \mathbf{b}}{4}$	S1 M2 A1	M1 for sight of one of the following: • (DO =) $-\frac{1}{2}\mathbf{b}$ • (AC =) $\frac{1}{4}(\mathbf{b} - \mathbf{a})$ • (DB =) $\frac{1}{2}\mathbf{b}$ • (BC =) $-\frac{3}{4}(\mathbf{b} - \mathbf{a})$ May be seen on diagram. If S1 M1 then award SC1 for a final answer of $\frac{4}{5}\mathbf{a} - \frac{3}{10}\mathbf{b}$.
	(4)	

#5

Component 1: Higher Tier	Mark	Comment
(a) (m =) 2.5 (n = 6 × 2.5 =) 15	B2 B1	Answer space takes precedence. B1 for one of the following: • (p + q) = $\begin{pmatrix} 2 \\ 6 \end{pmatrix}$ not simplified e.g. $\begin{pmatrix} 1 \\ 3 \end{pmatrix}$ • 2m = 5 Strict FT 6 x 'their m' derived or stated – not from incorrect working.
(b) $\begin{pmatrix} -3 \\ 6 \end{pmatrix}$	B1	Accept $\begin{pmatrix} 3 \\ -6 \end{pmatrix}$
	(4)	

#6

	Mark	Comment
Correct vector route for OD e.g. $\mathbf{OA} + \frac{1}{3}\mathbf{AB}$	B1	
$\mathbf{OD} = 4\mathbf{a} + 2\mathbf{b}$	B1	Accept unsimplified e.g. $6\mathbf{a} + \frac{1}{3}(6\mathbf{b} - 6\mathbf{a})$; implies first B1
Compares $\mathbf{OE} = 4n\mathbf{a} + 2n\mathbf{b}$ and $\mathbf{OE} = 6\mathbf{a} + k\mathbf{b}$ to find $n = 1.5$	B1	
Finds ($2n =$) $k = 3$ or shows that $1.5(4\mathbf{a} + 2\mathbf{b}) = 6\mathbf{a} + 3\mathbf{b}$	B1	NB Answer is given so only award this mark following a complete argument
(b) Valid deduction e.g. 'E is the mid-point of AC'	E1	
	(5)	

#7

Component 1: Higher Tier	Mark	Comment
(a) $\binom{5}{2}$ drawn correctly	B2	B1 for one of the following: - sight of $\binom{5}{2}$, - a line representing $\binom{5}{2}$ without an arrow, - correct t joined to correct w drawn without the resultant shown, - t + w drawn, with either t or w drawn incorrectly, with resultant shown. - Correct drawing of their t + w with one error in addition.
(b) (WY =) $6\mathbf{a} - 4\mathbf{b}$	B1	Check diagram
(WZ =) $\frac{5}{2}(6\mathbf{a} - 4\mathbf{b})$ oe	B1	FT WY = $6\mathbf{a} + 4\mathbf{b}$
(WZ =) $15\mathbf{a} - 10\mathbf{b}$	B1	FT WY = $6\mathbf{a} + 4\mathbf{b}$ If B1 B0 B0 awarded then award SC1 for a final answer of (YZ=) $9\mathbf{a} - 6\mathbf{b}$ If no marks and WY = $6\mathbf{a} + 4\mathbf{b}$ then award SC1 for a final answer of (YZ=) $9\mathbf{a} + 6\mathbf{b}$
	(5)	

#8

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
(a) Correct completion of diagram e.g.	B2	B1 for the vector $\begin{pmatrix} 3 \\ -8 \end{pmatrix}$ seen or $\frac{3}{-8}$ seen or for a line representing $\begin{pmatrix} 3 \\ -8 \end{pmatrix}$ without an arrow or for an arrow with only one component correct; applies to $2q$ in the left-hand diagram or the single vector in the right-hand diagram allow complete diagram redrawn; may be unlabelled for B2 or B1, provided unambiguous; allow arrow at end of vector; allow good freehand
(b) $(AB =) 6b - 3a$ $(CD =) 2b - a$ Parallel indicated and e.g. $6b - 3a = 3(2b - a)$, (one is a scalar multiple of the other)	B1 B1 B1	may be on diagram; must be seen may be on diagram; must be seen dependent on all previous marks awarded Allow e.g. Parallel indicated and 'They are multiples.'
	(5)	

#9

Component 1: Higher Tier	Mark	
(a)(i) Attempts $OR - OP$ $\begin{pmatrix} 4 \\ -4 \end{pmatrix}$ as final answer	S1 B1	Evidence may be seen on grid Not from wrong working
(a)(ii) Attempts $OP + OR$ $\begin{pmatrix} 6 \\ 2 \end{pmatrix}$ as final answer	S1 B1	Evidence may be seen on grid If grid used, FT 'their points P and R' used consistently
(b) Two valid criticisms e.g. 'The directions of the vectors are missing.' and 'b has been drawn in the wrong direction.' or 'The $2a$ has been drawn in the wrong direction.' or 'He has drawn $2a - b$.'	E2	E1 for one valid criticism
	(6)	

#10

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
(a)(i) $(\mathbf{RQ} =) -(\mathbf{f} + 5\mathbf{g}) + (4\mathbf{f} + 3\mathbf{g})$ $3\mathbf{f} - 2\mathbf{g}$ $k = 1/3$	M1 A1 A1	Unsupported ($k =$) $1/3$ is awarded no marks
(a)(ii) RQ and OP are parallel or OP is 3 times <u>the length</u> of RQ RQ is $1/3$ of <u>the length</u> of OP	E1 E1	Allow the use of vector notation Do not allow 'they both go in same direction' STRICT FT for 'their k' from (i) Do not accept $OP = 3 \times RQ$ OR $RQ = \frac{1}{3} \times OP$
(b) $(\mathbf{PX} =) -18\mathbf{f} + 12\mathbf{g}$	B2	Allow B2 for $m = -18$ and $n = 12$ B1 for $(\mathbf{PX} =) 2(-9\mathbf{f} + 6\mathbf{g})$ or $-2(9\mathbf{f} - 6\mathbf{g})$ If no marks award SC1 for $(\mathbf{PX} =) 18\mathbf{f} - 12\mathbf{g}$ or $m = 18$ and $n = -12$
	(7)	

Vectors: Calculator

Question	Maximum Mark	Mark Awarded
#1	2	
#2	4	
#3	4	
Total	10	

Marking Scheme

#1

Component 2: Higher Tier	Mark	Comment
$\frac{1}{2}(-8r + 6q)$ oe $= 3q - 4r$	M1 A1	If no marks award SC1 for an answer of $-3q + 4r$
	(2)	

#2

Eduqas Autumn 2019 C2 Higher Tier	Mark	Comment
(a) $5x - 8y$	B1	
(b)(i) $6x + 3y$	B1	
(b)(ii) $-x - 3y$	B1	FT '- (b)(i) + 5x' simplified correctly
(c) States or implies 'No' with a reason, e.g. ' $5x - 8y$ is not a multiple of $-x - 3y$ '	E1	
	(4)	

#3

Component 2: Higher Tier	Mark	Comment
(a) $a + \frac{1}{2}c$	B1	
(b) $\frac{1}{2}a + \frac{1}{4}c$ or $\frac{1}{2}(a + \frac{1}{2}c)$	B1	FT 'their $a + \frac{1}{2}c$ ' from (a)
(c) $\frac{1}{2}a - \frac{3}{4}c$	B2	FT 'their OE' B1 for $-c + \frac{1}{2}a + \frac{1}{4}c$ oe
	(4)	

Circle Theorem: Non-Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	3	
#3	4	
#4	4	
#5	4	
#6	5	
#7	6	
#8	7	
Total	36	

Marking Scheme

#1

	Mark	Comment
$(BCA =) 51^\circ$	B1	May be seen in diagram.
$2w + w + 51 = 180$ oe	B1	If correct, implies first B1; FT 'their 51'
$(w =) 43$	B1	CAO
	(3)	

#2

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	
$\widehat{ADC} = 156^\circ$	B1	Allow on diagram or e.g. angle $D = 156$ but must be clear
$\widehat{AEC} = (156 \div 2 =) 78^\circ$ (Angle at the centre)	B1	FT 'their derived 156'; allow on diagram or e.g. angle $E = 78$ but must be clear
At least 'Tangent perpendicular to radius' and 'Angle at centre is twice that at the circumference' oe stated	E1	Accept equivalent wording; must be linked to relevant calculations or angles
	(3)	

#3

GCSE (9-1) Mathematics Component 1: Higher Tier	Mark	Comment
(a) $\widehat{PQR} = \widehat{ABC} (= 90^\circ)$ (angle in a semi-circle) $PQ = AB$ (given) $PR = AC$ (both are diameters) Therefore $ABC \cong PQR$, RHS, with at least two reasons stated	B1 B1 B1	Allow e.g. angle $B =$ angle Q dependent on all previous marks; allow the omission of 'given'; allow 'angle on a diameter' oe.
Alternative method 1: $\widehat{PQR} = \widehat{ABC} (= 90^\circ)$ (angle in a semi-circle) $PQ = AB$ (given) $PR = AC$ (both are diameters) $QR = BC$ (Pythagoras' theorem) Therefore $ABC \cong PQR$, SAS, or $ABC \cong PQR$, SSS, with at least two reasons stated	B1 B1 B1	dependent on all previous marks; allow the omission of 'given'
Alternative method 2: $\widehat{PQR} = \widehat{ABC}$ (angle in a semi-circle) $PQ = AB$ (given) $PR = AC$ (both are diameters) $\widehat{RPQ} = \widehat{CAB}$ (equal cosines) OR $\widehat{PRQ} = \widehat{ACB}$ (equal sines) Therefore $ABC \cong PQR$, ASA, with at least two reasons stated	B1 B1 B1	dependent on all previous marks; allow the omission of 'given'
18.(b) Yes indicated and valid explanation e.g. 'Angles in a quadrilateral sum to 360 therefore the both opposite pairs of angles sum to 180 and this type of kite is a cyclic quadrilateral.' or 'The long diagonal would be the diameter of the circle and angles in a semicircle are always 90°'	E1	Allow for Yes indicated and e.g. 'This is a cyclic quadrilateral as both pairs of opposite angles sum to 180' or 'Angle in a semicircle is 90°' Must not contain any incorrect or contradictory statements.
	(4)	

#4

Component 1: Higher Tier	Mark	Comment
$\widehat{PQR} = 90^\circ$ (angle in a semi-circle oe)	B1	Angles may be shown on diagram, otherwise any given angles must be identified e.g. $\widehat{PRS} = 76^\circ$
$\widehat{PQS} = 76^\circ$ (angle in the same segment oe)	B1	
$\widehat{SQR} = (90 - 76 =) 14^\circ$	B1	Implies 3 marks
Both reasons stated	E1	
<i>Alternative method 1</i> <i>By drawing, or imagining, an extra line segment, PS:</i> $\widehat{PSR} = 90^\circ$ (angle in a semi-circle oe) $\widehat{RPS} = (90 - 76 =) 14^\circ$ $\widehat{SQR} = 14^\circ$ (angle in the same segment oe) Both reasons stated	B1 B1 B1 E1	Angles may be shown on diagram, otherwise any given angles must be labelled e.g. $\widehat{PRS} = 76^\circ$ Implies 3 marks
<i>Alternative method 2</i> <i>By introducing a specific value for one of the unknown angles, not used in the solution e.g. for an angle at the intersection of PR and QS, or for the angle $\widehat{QSR}$.</i> $\widehat{PQR} = 90^\circ$ (angle in a semi-circle oe) <i>Full method using angle facts to gain</i> $\widehat{SQR} = 14^\circ$ (must include, at some stage, angles in the same segment oe) Both reasons stated	B1 B2 E1	Angles may be shown on diagram, otherwise any given angles must be labelled e.g. $\widehat{PRS} = 76^\circ$ Implies 3 marks
	(4)	

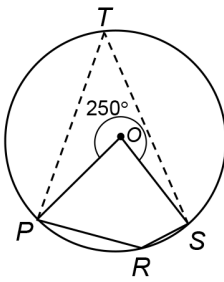
#5

Component 1: Higher Tier	Mark	Comment
$XOZ = 180 - (2 \times 34)$ $112 (^{\circ})$ $XYZ = 56(^{\circ})$ A complete proof with at least two valid angle properties appropriately stated e.g. - two radii make an isosceles triangle - an angle at the centre is twice the angle at the circumference	M1 A1 B1 E1	May be seen in stages or on the diagram. FT 'their 112' provided M1 awarded At least one of the angle properties must be a Circle Theorem.
<u>Alternative method</u> $XCZ = 180(^{\circ}) - 90(^{\circ}) - 34(^{\circ})$ $56(^{\circ})$ $XCZ = XYZ = 56(^{\circ})$ A complete proof with at least two valid angle properties appropriately stated e.g. - an angle in a semi-circle is 90° - angles in the same segment are equal	M1 A1 B1 E1	Extending XO or ZO to a point C on the circumference to create a right-angle triangle May be seen in stages or on the diagram. At least one of the angle properties must be a Circle Theorem.
	(4)	

#6

Component 1: Higher Tier	Mark	
$\widehat{PSO} = (180 - 130) \div 2$ or 25° (base angle isosceles triangle)	B1	Angles may be marked on diagram. Degrees symbol may be omitted throughout.
$\widehat{PSR} = 180 - 120$ or 60° (opposite angles in a cyclic quadrilateral)	B1	
$\widehat{OSR} = 60 - 25$ oe or 35° $(\widehat{PSR} = \widehat{PSO} + \widehat{OSR})$ OR $\widehat{OSP} = 90 - 25$ or 65° (tangent perpendicular to radius)	B1	FT 'their derived 25' and 'their derived 60' providing B1 already awarded; sight of 35 does not imply the previous mark
$x = 90 - 35$ oe ($= 55^\circ$) (tangent perpendicular to radius) OR $x = 180 - 125$ ($= 55^\circ$)	B1	CAO; must have earned all previous marks
At least 'opposite angles in a cyclic quadrilateral' oe and 'tangent perpendicular to radius' oe appropriately stated.	E1	
		If working back using the 55 award SC3 for $90 - 55 = 35$ oe (tangent perpendicular to radius) $\widehat{PSO} = (180 - 130) \div 2$ or 25° (base angle isosceles triangle) $\widehat{PSR} = 25 + 35$ or 60 $\widehat{PSR} = 180 - 120 = 60^\circ$ or $\widehat{PQR} = 180 - 60 = 120$ (opposite angles in a cyclic quadrilateral) or SC2 for any two or three of the 4 correct statements or SC1 for any one correct statement and E1 for reasons as above
	(5)	

#7

Component 1: Higher Tier	Mark	
(a) $\widehat{PRS} = 125(^{\circ})$ $\widehat{OPR} = \frac{2}{5} \times (360 - (125 + 110))$ or $125 - \frac{3}{5} \times 125$ oe $50(^{\circ})$	B1 B1 B1	Allow if marked on diagram Accept 50 : 75. <i>If no marks, award SC1 for correct evaluation of $\frac{2}{5} \times (250 - \text{'their PRS'})$ provided $90 < PRS < 180$.</i>
<u>Alternative method</u> $\widehat{PTS} = 55(^{\circ})$ AND $\widehat{PRS} = 125(^{\circ})$ $\widehat{OPR} = \frac{2}{5} \times (360 - (125 + 110))$ or $125 - \frac{3}{5} \times 125$ oe $50(^{\circ})$	B1 B1 B1	Adding a 4 th point to the circumference  Allow if angles marked on diagram Accept 50 : 75.
(b) $a = b$ AND $c = d$ (isosceles trapezium) $a + d = 180^{\circ}$ OR $b + c = 180^{\circ}$ (co-interior angles between parallel lines) $a + c = 180^{\circ}$ OR $b + d = 180^{\circ}$ Opposite angles in a cyclic quadrilateral (add up to 180°)	B3	Complete proof. At least two reasons must be provided. One of these reasons must be the cyclic quadrilateral. B2 for a complete proof with no reasons. B1 for $a + c = 180^{\circ}$ OR $b + d = 180^{\circ}$ AND $a = b$ AND $c = d$ OR $a + d = 180^{\circ}$ OR $b + c = 180^{\circ}$
	(6)	

#8

(a) (Angle $BAD =$) 62° (Angle $BDA =$) 51° or (Angle $QBD =$) 62° ($w =$) 67	B1 B1 B1	May be seen in diagram.
(b) Angle $FHE = 180 - 2x$ (Angles in a triangle) Angle $FGH = y$ (Triangle FGH is isosceles) AND Angle $GHF = 180 - 2y$ (Angles in a triangle) Angle EHG $= 360 - (180 - 2x + 180 - 2y)$ $= 2x + 2y$ or $2(x + y)$ (Angles at a point) (Therefore the angle at the centre is twice the angle at the circumference.) At least two correct reasons stated appropriately and all steps included in the proof.	B1 B1 B1 E1	Allow angle G for angle FGH or angle E for angle HEF. Do not allow angle H for e.g. angle GHF. <u>Alternative method for B marks:</u> <i>(ignoring angle $FHE = \dots$ and extending the line FH and using a naming convention to identify the exterior angle in the proof e.g. l for the end of the extension or marking the exterior angle as e.g. a)</i> Angle $EHI = 2x$ (exterior angle) B1 Angle $FGH = y$ (Triangle FGH is isosceles) Angle $IHG = 2y$ (exterior angle) B1 Angle $EHG = \text{Angle } EHI + \text{Angle } IHG = 2x + 2y$ B1
	(7)	

Circle Theorem: Calculator

Question	Maximum Mark	Mark Awarded
#1	3	
#2	4	
#3	4	
Total	11	

Marking Scheme

#1

Component 2: Higher Tier	Mark	Comment
$\widehat{ADC} = 64^\circ$ (opposite angles in a cyclic quadrilateral sum to 180°) $\widehat{CAD} = 65^\circ$ (angles in a triangle sum to 180) $\widehat{CDE} = 65^\circ$ with <u>alternate segment theorem</u>	B1 B1 B1	Angles may be seen on the diagram. No marks for sight of 64° or 65° unless appropriately labelled or correctly placed on the diagram. $\widehat{CAD} = 65^\circ$ must be from correct working.
<u>Alternative method 1</u> $\widehat{ADC} = 64^\circ$ (opposite angles in a cyclic quadrilateral sum to 180°) $\widehat{ADF} = 51^\circ$ with <u>alternate segment theorem</u> $\widehat{CDE} = 65^\circ$ (angles in a straight line sum to 180°)	B1 B1 B1	
<u>Alternative method 2</u> $\widehat{ABD} = 51^\circ$ (angles in the same segment) $\widehat{DBC} = 116 - 51 = 65^\circ$ $\widehat{CAD} = 65^\circ$. (angles in the same segment) $\widehat{CDE} = 65^\circ$ with <u>alternate segment theorem</u>	B1 B1 B1	The two steps are required for this mark
<u>Alternative method 3</u> $\widehat{COD} = 116 \times 2 - 51 \times 2 = 130^\circ$ (Angle at the centre is twice that at the circumference) $\widehat{CAD} = 65^\circ$ (Angle at the centre is twice that at the circumference) $\widehat{CDE} = 65^\circ$ with <u>alternate segment theorem</u>	B1 B1 B1	$\widehat{CAD} = 65^\circ$ must be from correct working.
	(3)	

Eduqas Autumn 2019 C2 Higher Tier	Mark	Comment
$\sin \hat{BAC} = \frac{4.1}{2 \times 3.6}$	M1	
$180 - 93 - \sin^{-1} 4.1/7.2$ or $180 - 93 - 34.7(\dots)$ or equivalent	m1	
Convincing $52.3(^{\circ})$	A1	
States: Angle in a semi-circle AND angles in the same segment	E1	
	(4)	If no marks award SC1 for sight of $(\sin^{-1} 4.1/7.2 = 34.7(\dots))$ <i>Alternatives:</i> • <i>using angles from the same chord and cos</i> • <i>finding BAC, then CAD = $87 - BAC$ (cyclic quadrilateral), DBC = CAD (angles on the same arc)</i>

#3

GCSE (9-1) Mathematics Component 2: Higher Tier	Mark	Comment
$\widehat{ROT} = 132^\circ$ (The angle at the centre is twice the angle at the circumference)	B1	Angles may be seen on the diagram. Not for $\widehat{ROT}$ reflex = 132°
$\widehat{ORQ} = 90^\circ$ or $\widehat{OTQ} = 90^\circ$ (A tangent and a radius meet at a right angle)	B1	Right-angle symbol on the diagram is sufficient.
$\widehat{RQT} = 360 - 132 - 90 - 90 (= 48^\circ)$ (The sum of the angles in a quadrilateral is 360°) OR $\widehat{RQT} = 2 \times (180 - 90 - \frac{132}{2}) (= 48^\circ)$ (The sum of the angles in a triangle is 180°)	B1	Note: B0 for $180 - 132 = 48$ (even if cyclic quadrilateral mentioned!)
Reasons must include (at least): - The angle at the <u>centre</u> is <u>twice</u> the angle at the <u>circumference</u>. - A <u>tangent</u> and a <u>radius</u> meet at a <u>right angle</u>.	E1	Dependent on B3 previously awarded
<u>Alternative method 1 (starting with 48°)</u>		Angles may be seen on the diagram.
$\widehat{ORQ} = 90^\circ$ or $\widehat{OTQ} = 90^\circ$ (A tangent and a radius meet at a right angle)	B1	Right-angle symbol on the diagram is sufficient
$\widehat{ROT} = 360 - 48 - 90 - 90 = 132^\circ$ (The sum of the angles in a quadrilateral is 360°) OR $\widehat{ROT} = 2 \times (180 - 90 - \frac{48}{2}) = 132$ (The sum of the angles in a triangle is 180°)	B1	
$\widehat{RST} = 66^\circ$ (The angle at the centre is twice the angle at the circumference)	B1	
Reasons must include (at least): - The angle at the <u>centre</u> is <u>twice</u> the angle at the <u>circumference</u>. - A <u>tangent</u> and a <u>radius</u> meet at a <u>right angle</u>.	E1	Dependent on B3 previously awarded
<u>Alternative method 2 (chord RT)</u>		Angles may be seen on the diagram.
$\widehat{TRQ} = \widehat{RTQ} = 66^\circ$ (Alternate segment theorem)	B2	B1 for either angle
$\widehat{RQT} = 180 - 2 \times 66 = 48^\circ$ (The sum of the angles in a triangle is 180°)	B1	
Reasons must include (at least): Alternate segment theorem.	E1	Dependent on B3 previously awarded
	(4)	