



Additional Assessment Materials  
Summer 2021

Pearson Edexcel

GCSE (9-1) in Mathematics 1MA1  
Higher (Calculator) (Pearson release  
version)

Topic 4: Geometry (Test 2)

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## **General guidance to Additional Assessment Materials for use in 2021**

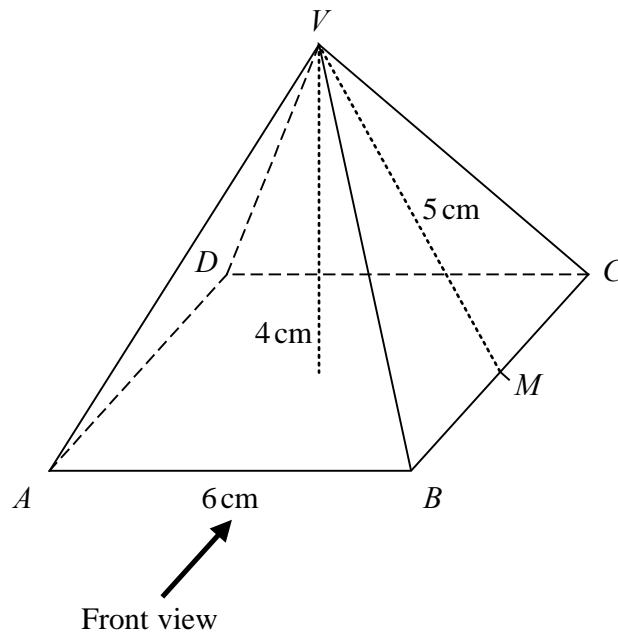
### **Context**

- Additional Assessment Materials are being produced for GCSE, AS and A levels (with the exception of Art and Design).
- The Additional Assessment Materials presented in this booklet are an optional part of the range of evidence teachers may use when deciding on a candidate's grade.
- 2021 Additional Assessment Materials have been drawn from previous examination materials, namely past papers.
- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.

### **Purpose**

- The purpose of this resource to provide qualification-specific sets/groups of questions covering the knowledge, skills and understanding relevant to this Pearson qualification.
- This document should be used in conjunction with the mapping guidance which will map content and/or skills covered within each set of questions.
- These materials are only intended to support the summer 2021 series.

1 Here is a solid square-based pyramid,  $VABCD$ .

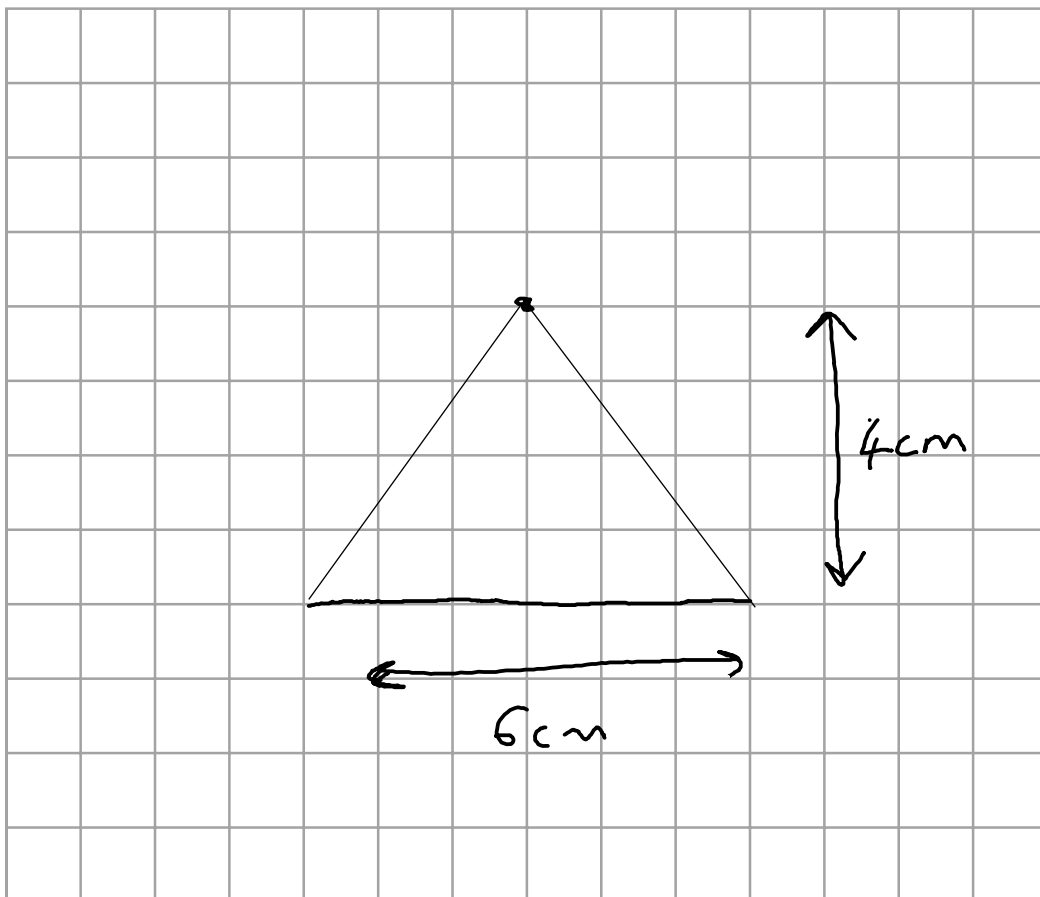


The base of the pyramid is a square of side 6 cm.

The height of the pyramid is 4 cm.

$M$  is the midpoint of  $BC$  and  $VM = 5$  cm.

(a) Draw an accurate front elevation of the pyramid from the direction of the arrow.



(2)

(b) Work out the total surface area of the pyramid.

$$SA = (\text{base}) + (4 \times \text{triangle})$$

$$\text{base} = 6 \times 6 = 36 \text{ cm}^2$$

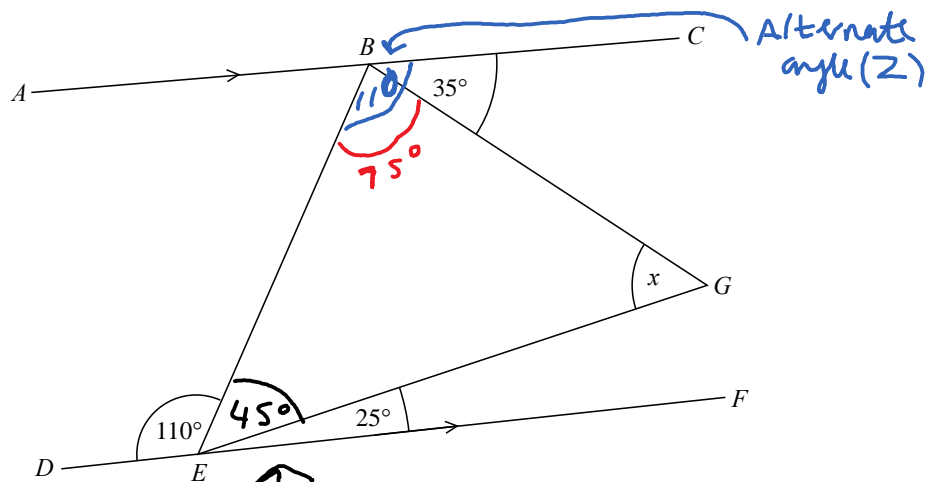
$$4 \text{ triangles} = 4 \times \frac{1}{2} \times 6 \times 5 = 60 \text{ cm}^2$$

$$60 + 36 = \underline{\underline{96 \text{ cm}^2}}$$

..... 96 cm<sup>2</sup> ..... (4)

(Total for Question 1 is 6 marks)

2 *BEG* is a triangle.



*ABC* and *DEF* are parallel lines.

Work out the size of angle *x*.

Give a reason for each stage of your working.

angles on straight line = 180°

$$180 - (110 + 25) = 45^\circ$$

angles in triangle add to 180 so  $180 - (45 + 75) = x$   
 $= 60^\circ$   
60°

(Total for Question 2 is 4 marks)

3  $\mathbf{a} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$        $\mathbf{b} = \begin{pmatrix} 5 \\ -2 \end{pmatrix}$

Find  $2\mathbf{a} - 3\mathbf{b}$  as a column vector.

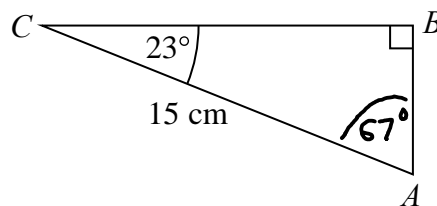
$$2\mathbf{a} = \begin{pmatrix} 6 \\ 8 \end{pmatrix} \quad 3\mathbf{b} = \begin{pmatrix} 15 \\ -6 \end{pmatrix}$$

$$2\mathbf{a} - 3\mathbf{b} = \begin{pmatrix} 6 \\ 8 \end{pmatrix} - \begin{pmatrix} 15 \\ -6 \end{pmatrix} = \underline{\underline{\begin{pmatrix} -9 \\ 14 \end{pmatrix}}}$$

$$\begin{pmatrix} -9 \\ 14 \end{pmatrix}$$

(Total for Question 3 is 2 marks)

4  $ABC$  is a right-angled triangle.



Calculate the length of  $AB$ .

Give your answer correct to 3 significant figures.

$$\text{angle } BAC \rightarrow 180 - (23 + 90) = 67^\circ$$

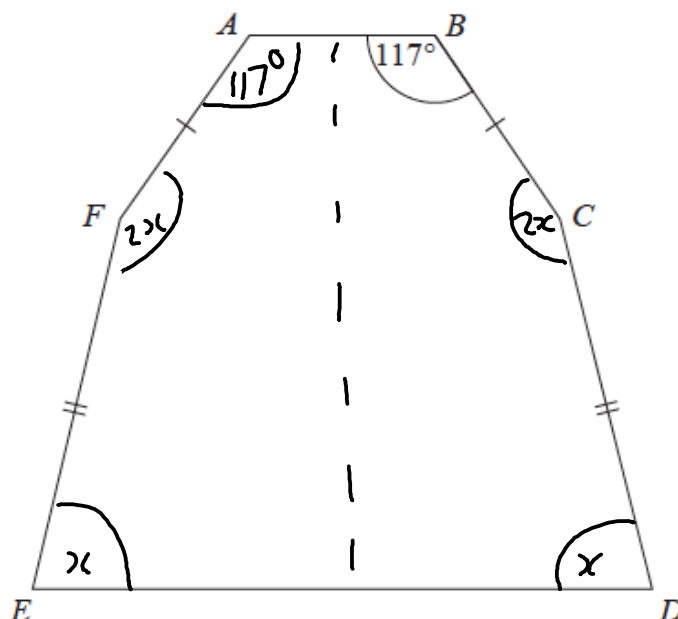
$$\cos 67 = \frac{AB}{15} \rightarrow (\cos 67) \times 15 = AB = \underline{\underline{5.86 \text{ cm}}}$$

5.86

.....cm

(Total for Question 4 is 2 marks)

- 5 The diagram shows a hexagon.  
The hexagon has one line of symmetry.



$$FA = BC$$

$$EF = CD$$

$$\text{Angle } ABC = 117^\circ$$

$$\text{Angle } BCD = 2 \times \text{angle } CDE$$

Work out the size of angle  $AFE$ .

You must show all your working.

$$\text{Angles total in hexagon} \rightarrow (n-2) \times 180 = 4 \times 180 = \underline{720^\circ}$$

$$(2 \times 117) + 6x = 720$$

$$234 + 6x = 720 \rightarrow 6x = 486$$

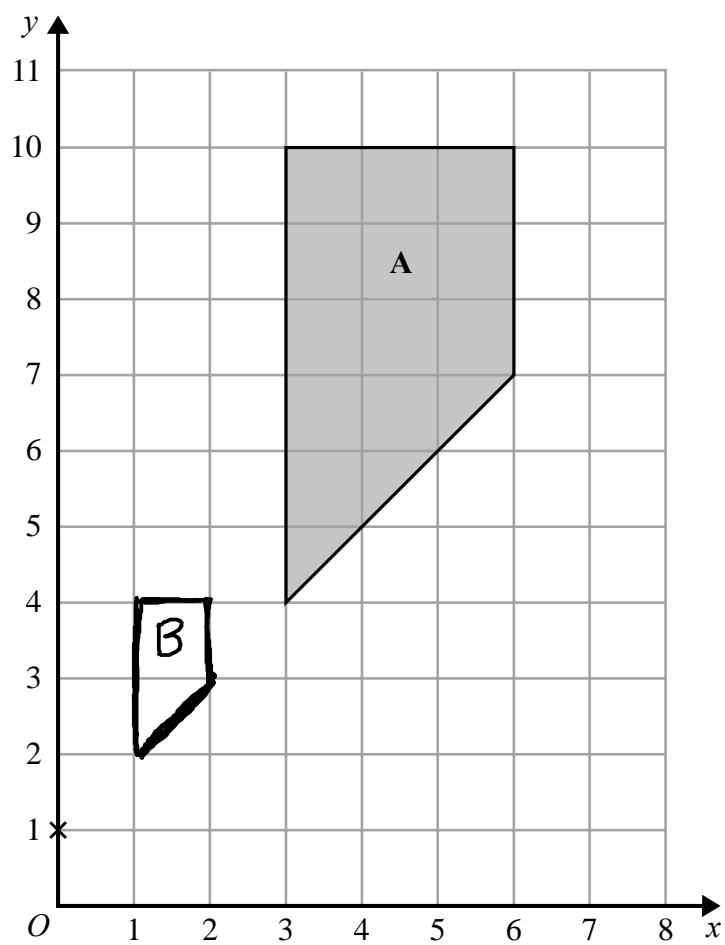
$$x = \underline{81^\circ}$$

$$\text{Angle } AFE = 2x = 2(81) = \underline{\underline{162^\circ}}$$

..... 162 .....

(Total for Question 5 is 4 marks)

6



Enlarge shape A by scale factor  $\frac{1}{3}$  centre (0, 1)

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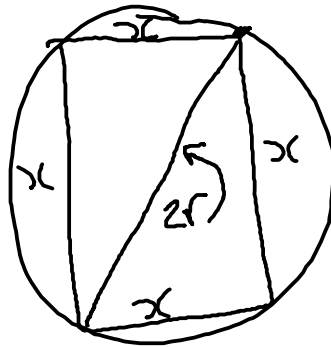
(Total for Question 6 is 2 marks)



- 7 A square, with sides of length  $x$  cm, is inside a circle.  
 Each vertex of the square is on the circumference of the circle.  
 The area of the circle is  $49 \text{ cm}^2$ .

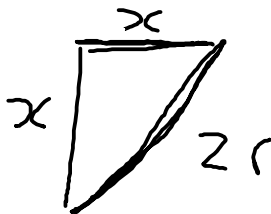
Work out the value of  $x$ .

Give your answer correct to 3 significant figures.



$$\begin{aligned} \pi r^2 &= 49 \\ r^2 &= \frac{49}{\pi} \\ r &= \frac{7}{\sqrt{\pi}} \end{aligned}$$

$2r$  means  $2 \times \text{radius} = \text{Diameter of circle}$

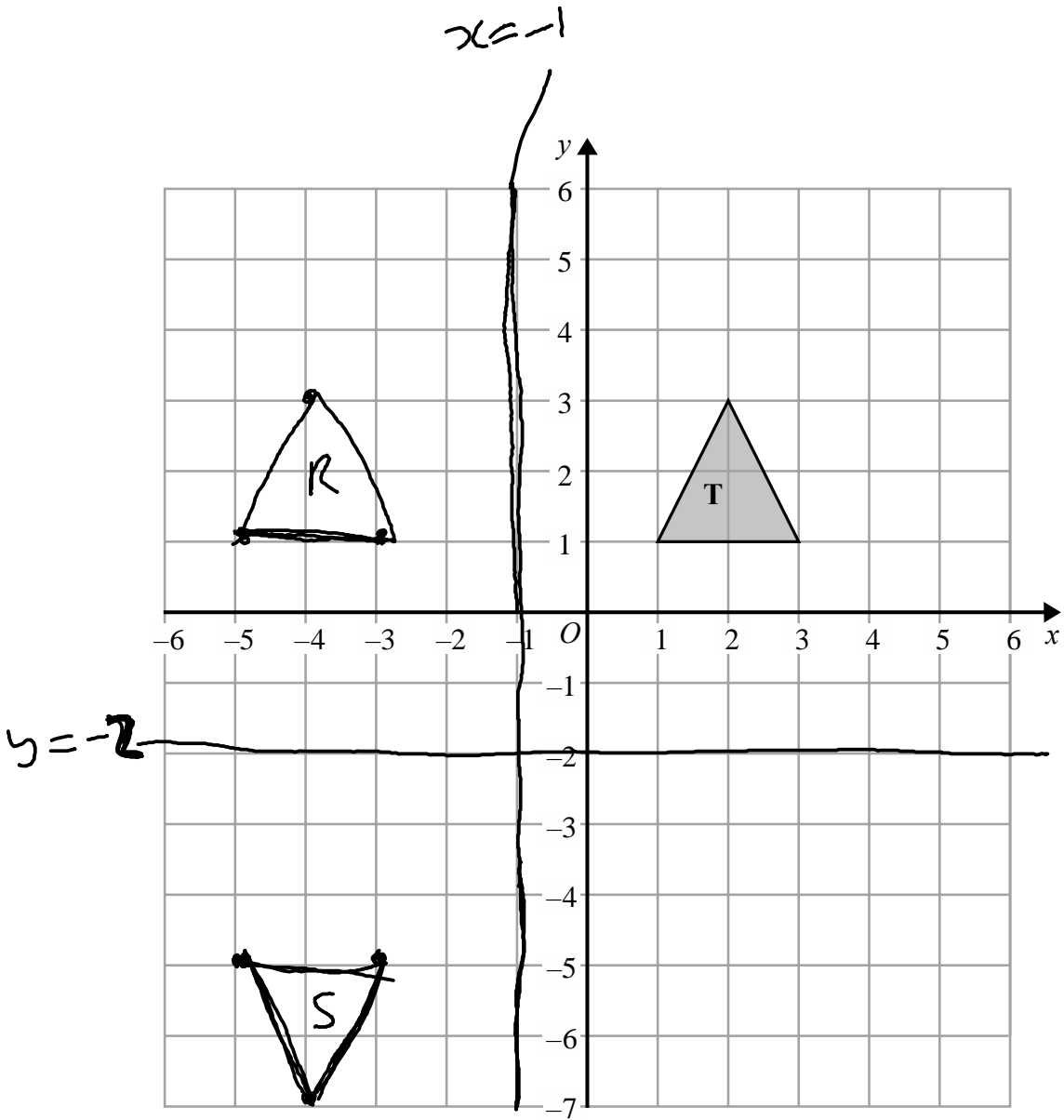


$$\begin{aligned} x^2 + x^2 &= (2r)^2 \\ 2x^2 &= \left(\frac{14}{\sqrt{\pi}}\right)^2 \rightarrow x^2 = \frac{98}{\pi} \\ x &= \underline{\underline{5.59 \text{ cm}}} \end{aligned}$$

5.59 cm

(Total for Question 7 is 4 marks)

8



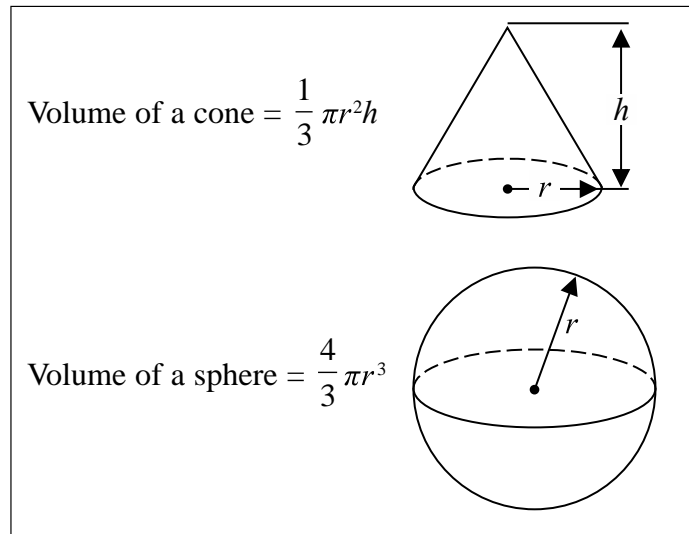
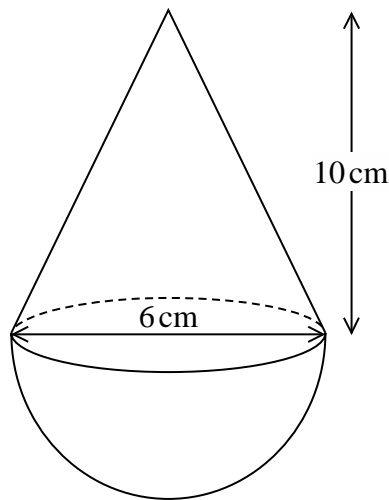
Shape **T** is reflected in the line  $x = -1$  to give shape **R**.  
Shape **R** is reflected in the line  $y = -2$  to give shape **S**.

Describe the **single** transformation that will map shape **T** to shape **S**.

.....  
Enlargement by scale factor  $-1$  with  
.....  
centre at  $(-1, -2)$   
.....

(Total for Question 8 is 2 marks)

- 9 The diagram shows a solid shape.  
The shape is a cone on top of a hemisphere.



The height of the cone is 10 cm.

The base of the cone has a diameter of 6 cm.

The hemisphere has a diameter of 6 cm.

The total volume of the shape is  $k\pi \text{ cm}^3$ , where  $k$  is an integer.

Work out the value of  $k$ .

$$\text{cone vol} = \frac{1}{3} \pi \times 9 \times 10 = 30\pi$$

$$\text{sphere vol} = \frac{2}{3} \pi r^3 = \frac{2}{3} \pi \times 27 = 18\pi$$

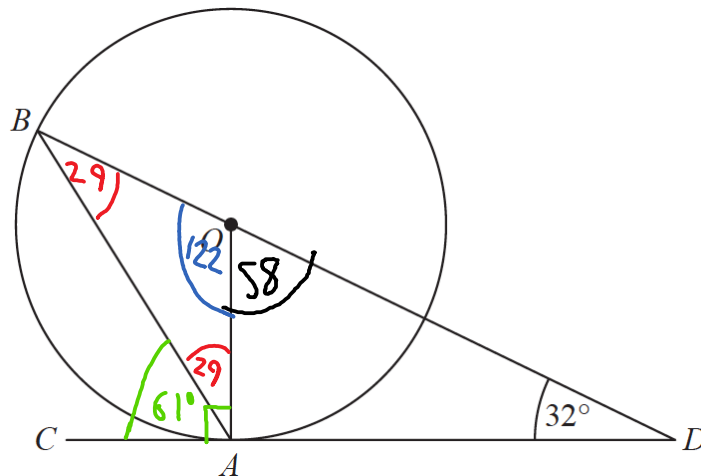
$$\text{total vol} = 18\pi + 30\pi = 48\pi$$

$$48\pi = k\pi$$

$$\underline{\underline{k = 48}}$$

$$k = \underline{\underline{48}}$$

(Total for Question 9 is 4 marks)



A and B are points on a circle with centre O.

CAD is the tangent to the circle at A.

BOD is a straight line.

Angle  $ODA = 32^\circ$

Work out the size of angle CAB.

You must show all your working.

$$\text{Angle } AOD = 180 - (32 + 90) = 58^\circ$$

because angles in triangle =  $180^\circ$  total

$$\text{Angle } BOA = 180 - 58 = 122^\circ$$

as angles on straight line =  $180^\circ$

Angle  $OBA = OAB$  as both sides = radius

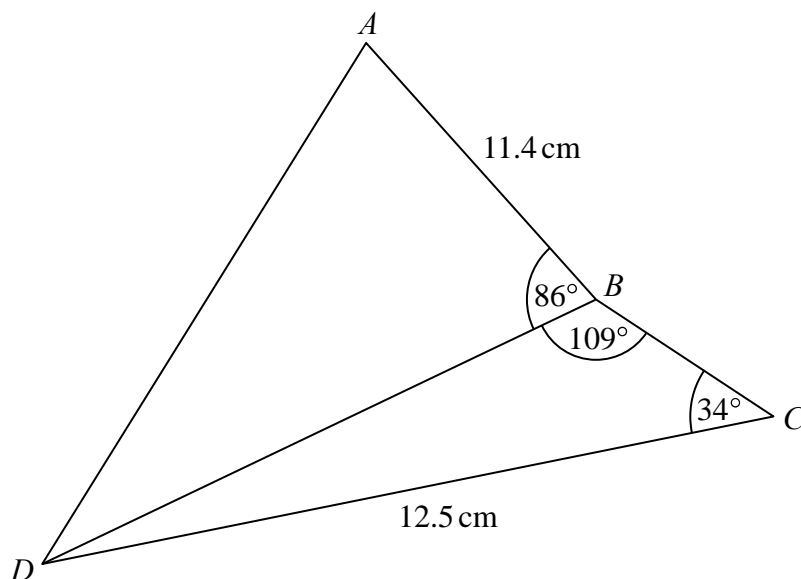
$$\frac{180 - 122}{2} = 29^\circ$$

$$\text{CAB} = 90 - 29 = \underline{\underline{61^\circ}}$$

.....61.....°

(Total for Question 10 is 3 marks)

11



Work out the length of  $AD$ .

Give your answer correct to 3 significant figures.

Length of  $DB$  using sine rule.

$$\frac{DB}{\sin 34} = \frac{12.5}{\sin 109}$$

$$\rightarrow DB = \sin 34 \times \frac{12.5}{\sin 109} = 7.39267$$

4744

Use cosine to find  $AD$

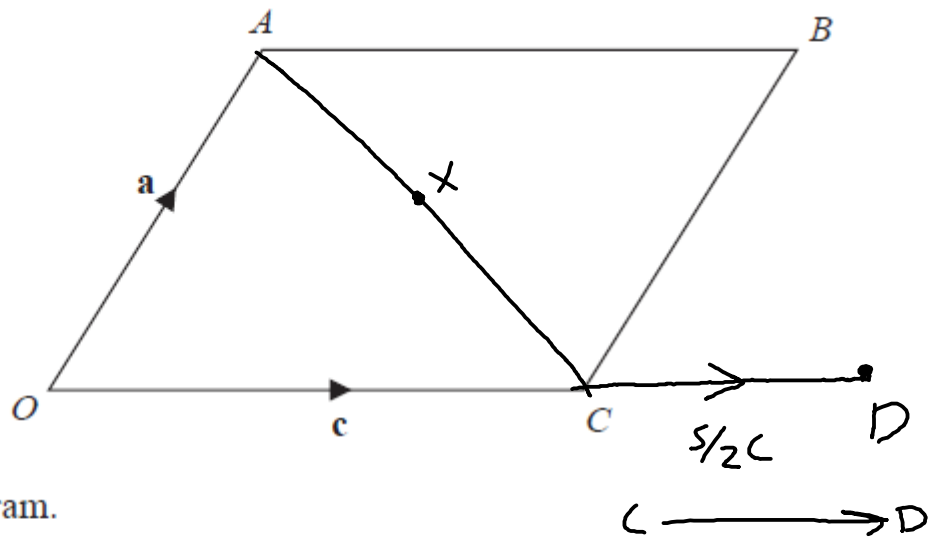
$$(AD)^2 = (11.4)^2 + (7.39)^2 - 2 \times 11.4 \times 7.39 \times \cos 86$$

$$(AD)^2 = 173.2665276 \rightarrow \underline{\underline{AD = 13.2 \text{ cm}}}$$

13.2

..... cm

(Total for Question 11 is 5 marks)



$OABC$  is a parallelogram.

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

$X$  is the midpoint of the line  $AC$ .

$OCD$  is a straight line so that  $OC : CD = k : 1$

$$\text{Given that } \vec{XD} = 3\mathbf{c} - \frac{1}{2}\mathbf{a}$$

find the value of  $k$ .

$$\begin{aligned} AC &= -\mathbf{a} + \mathbf{c} \\ \vec{XC} &= \frac{1}{2}(-\mathbf{a} + \mathbf{c}) \end{aligned}$$

$$\begin{aligned} \vec{XD} &= \vec{XC} + \vec{CD} \\ &= \frac{1}{2}AC + \vec{CD} \end{aligned}$$

$$-\frac{1}{2}(-\mathbf{a} + \mathbf{c}) + \vec{CD} = 3\mathbf{c} - \frac{1}{2}\mathbf{a}$$

$$-\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{c} + \vec{CD} = 3\mathbf{c} - \frac{1}{2}\mathbf{a}$$

$$\frac{1}{2}\mathbf{c} + \vec{CD} = 3\mathbf{c}$$

$$\vec{CD} = 2\frac{1}{2}\mathbf{c}$$

$$OC : CD$$

$$k : 1$$

$$1 : 2\frac{1}{2}$$

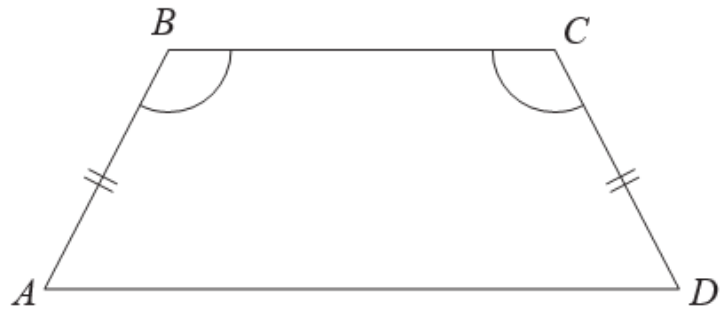
$$\rightarrow \text{so } k = \frac{2}{5}$$

$$K = \frac{2}{5}$$

(Total for Question 12 is 4 marks)

13

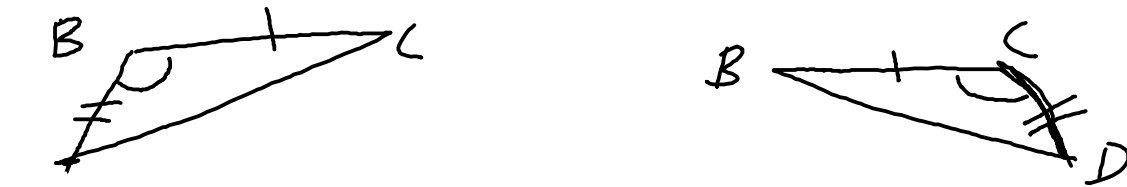
$ABCD$  is a quadrilateral.



$AB = CD$ .

Angle  $ABC =$  angle  $BCD$ .

Prove that  $AC = BD$ .



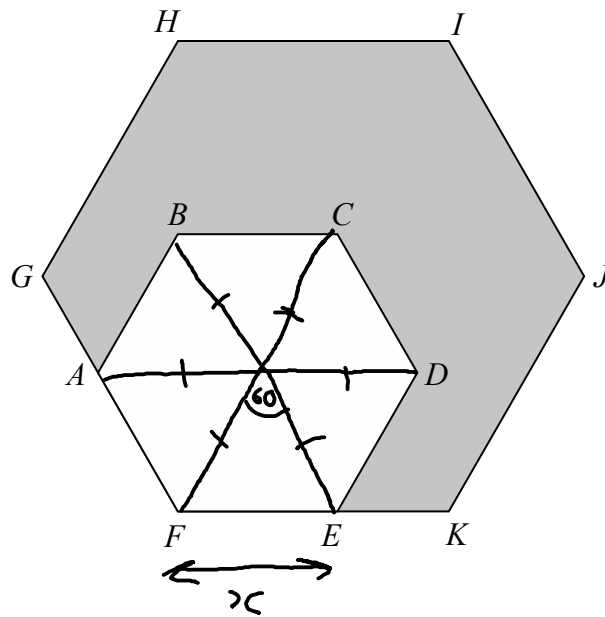
A

$\triangle ABC$  is congruent to  $\triangle BCD$   
Due to (SAS) rule.

$\therefore AC = BD$

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(Total for Question 13 is 4 marks)



$ABCDEF$  is a regular hexagon with sides of length  $x$ .

This hexagon is enlarged, centre  $F$ , by scale factor  $p$  to give hexagon  $FGHIJK$ .

Show that the area of the shaded region in the diagram is given by  $\frac{3\sqrt{3}}{2}(p^2 - 1)x^2$

make  $FE = x$

area  $ABCDEF$

$$\text{area} = \frac{1}{2} ab \sin C$$

$$= \frac{1}{2} x^2 \sin 60 = \frac{\sqrt{3}}{4} x^2$$

6 of these in hexagon so  $6 \times \frac{\sqrt{3}}{4} x^2 = \frac{3\sqrt{3}}{2} x^2$

area  $FGHIJK$

enlarged hexagon by factor  $p$  so length  $Fk = px$   
 so each side =  $px$  in  $FGHIJK$

$$\text{area} = \frac{3\sqrt{3}}{2} (px)^2 \rightarrow \frac{3\sqrt{3}}{2} p^2 x^2$$

$$\frac{3\sqrt{3}}{2} p^2 x^2 - \frac{3\sqrt{3}}{2} x^2 = \text{shaded area} = \frac{3\sqrt{3}}{2} x^2 (p^2 - 1)$$

$$= \frac{3\sqrt{3}}{2} (p^2 - 1) x^2$$

(Total for Question 14 is 4 marks)