Four solid balls are packed in a cylindrical container.

6 cm

24 cm

The diameter of each ball is 6 cm.
The cylinder has diameter 6 cm and height 24 cm.

Calculate the volume of unused space in the cylinder.

[The volume V of a sphere is $V = \frac{4}{3}\pi r^3$ where r is the radius.]

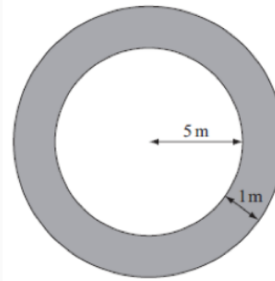The diagram shows a circular pond with a path around it.

Diagram **NOT**
accurately drawn

5 m

1 m

The pond has a radius of 5m.
The path has a width of 1m.

Work out the area of the path.
Give your answer correct to 3 significant figures.

Frances grows plants in a container.
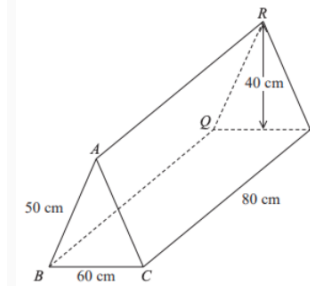Each of the 5 faces of the container is made of glass.

Diagram **NOT**
accurately drawn

R

40 cm

Q

P

A
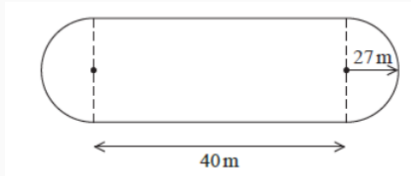
50 cm

80 cm

B   60 cm   C

The container is in the shape of a prism.
The cross section of the prism is an isosceles triangle with height 40 cm.

$BC = 60$ cm
$AB = AC = 50$ cm
$CP = 80$ cm

Work out the total area of glass needed to make the container.

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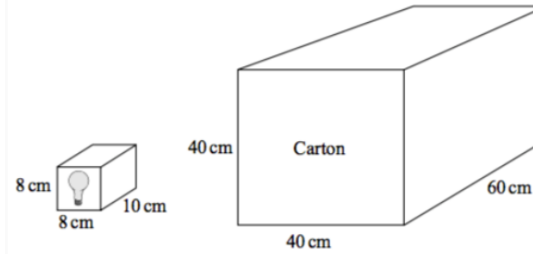
The diagram shows a cycle track.

27 m

40 m

The track has two straight sides each of length 40 m.
Each end of the track is a semicircle of radius 27 m.

The diameter of each wheel of Ian's bike is 590 mm.
Ian is going to ride his bike around the track once.

Calculate how many **complete** revolutions each wheel of his bike will make.

Diagrams **NOT**
accurately drawn

40 cm Carton

8 cm

8 cm 10 cm

60 cm

40 cm

A light bulb box measures 8 cm by 8 cm by 10 cm.
Light bulb boxes are packed into cartons.
A carton measures 40 cm by 40 cm by 60 cm.

Work out the number of light bulb boxes which can completely fill **one** carton.

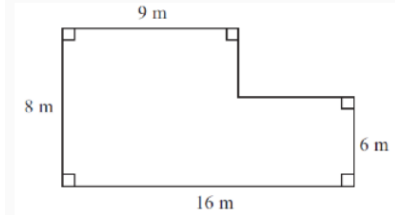
The diagram shows the floor of a village hall.

9 m

Diagram **NOT**
accurately drawn

8 m

6 m

16 m

The caretaker needs to polish the floor.

One tin of polish normally costs £19.
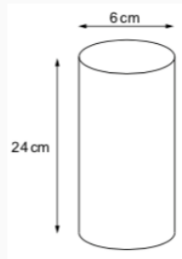One tin of polish covers 12 m^2 of floor.

There is a discount of 30% off the cost of the polish.

The caretaker has £130.

Has the caretaker got enough money to buy the polish for the floor?
You must show all your working.

DELTA Academies Trust

Panel 1

Four solid balls are packed in a cylindrical container.

The diameter of each ball is 6 cm.
The cylinder has diameter 6 cm and height 24 cm.

Calculate the volume of unused space in the cylinder.

[The volume V of a sphere is $V = \frac{4}{3}\pi r^3$ where r is the radius.]

$= 72\pi$
$= 226.19 \text{cm}^3$

Panel 2

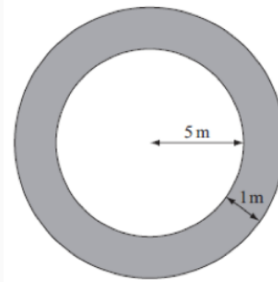The diagram shows a circular pond with a path around it.

Diagram **NOT** accurately drawn

The pond has a radius of 5m.
The path has a width of 1m.

Work out the area of the path.
Give your answer correct to 3 significant figures.

$= 11\pi$
$= 35.6 \text{m}^2$

Panel 3

Frances grows plants in a container.
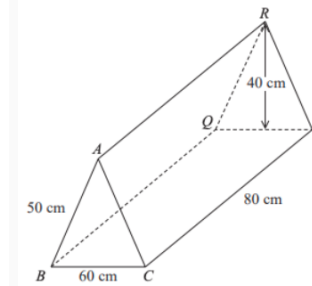Each of the 5 faces of the container is made of glass.

Diagram **NOT** accurately drawn

The container is in the shape of a prism.
The cross section of the prism is an isosceles triangle with height 40 cm.
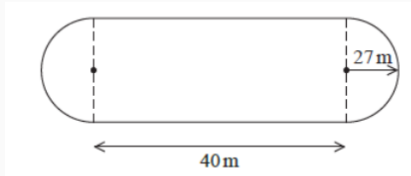
$BC = 60 \text{ cm}$
$AB = AC = 50 \text{ cm}$
$CP = 80 \text{ cm}$

Work out the total area of glass needed to make the container.

$= 15200 \text{cm}^2$
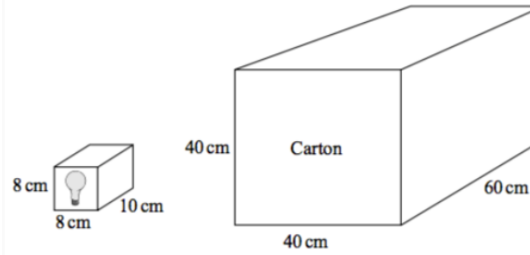
Panel 1

The diagram shows a cycle track.

The track has two straight sides each of length 40 m.
Each end of the track is a semicircle of radius 27 m.

The diameter of each wheel of Ian's bike is 590 mm.
Ian is going to ride his bike around the track once.

Calculate how many **complete** revolutions each wheel of his bike will make.

= 134 full revolutions

Panel 2

Diagrams NOT accurately drawn

A light bulb box measures 8 cm by 8 cm by 10 cm.
Light bulb boxes are packed into cartons.
A carton measures 40 cm by 40 cm by 60 cm.

Work out the number of light bulb boxes which can completely fill **one** carton.

= 150 light bulb boxes

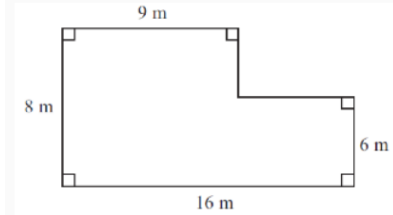## Panel 3

The diagram shows the floor of a village hall.

Diagram NOT accurately drawn

The caretaker needs to polish the floor.

One tin of polish normally costs £19.
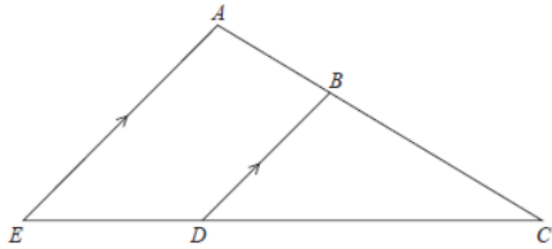One tin of polish covers 12 m² of floor.

There is a discount of 30% off the cost of the polish.

The caretaker has £130.

Has the caretaker got enough money to buy the polish for the floor?
You must show all your working.

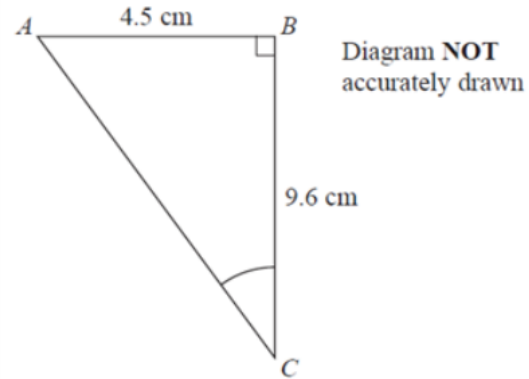= £133 so No he does not have enough money

ABC and EDC are straight lines.
EA is parallel to DB.

$EC = 8.1$ cm.
$DC = 5.4$ cm.
$DB = 2.6$ cm.

Work out the length of AE.

Work out the size of angle ACB.
Give your answer correct to 1 decimal place.

4.5 cm

Diagram **NOT** accurately drawn

9.6 cm

Work out the length of AC.

Give your answer to 3 significant figures.

73°

11.3 cm

A frame is made from wire.

Diagram **NOT** accurately drawn

20 cm

30 cm

The frame is in the shape of a rectangle, 30 cm by 20 cm.
The two diagonals of the rectangle are also made from wire.

Calculate the total length of wire needed to make the frame and the diagonals.
Give your answer correct to 1 decimal place.

Work out the length of AC.
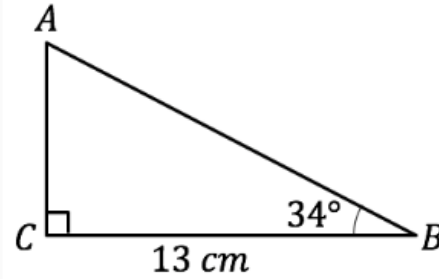
Give your answer to 3 significant figures.

A

C　$34°$　B

$13\ cm$

The diagram shows a shape with one line of symmetry.

10 cm

Diagram **NOT** accurately drawn

12 cm　4 cm

15 cm

Work out the area of the shape.

DELTA
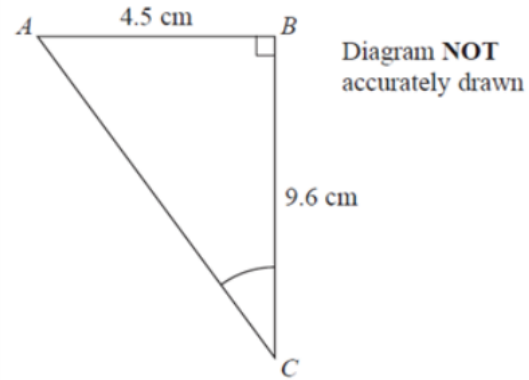Academies Trust
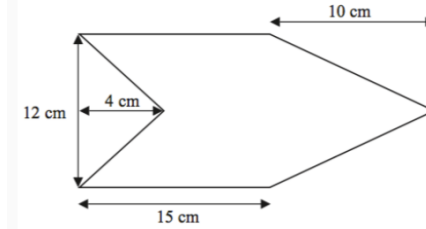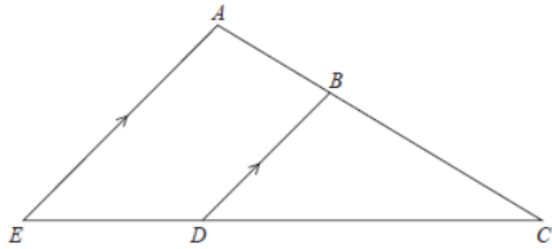
ABC and EDC are straight lines.
EA is parallel to DB.

$EC = 8.1$ cm.
$DC = 5.4$ cm.
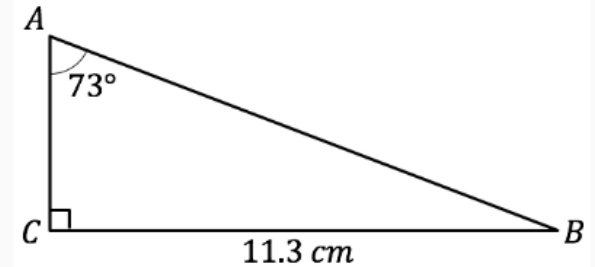$DB = 2.6$ cm.

Work out the length of AE.

= 3.9cm

Work out the size of angle ACB.
Give your answer correct to 1 decimal place.

4.5 cm

Diagram **NOT** accurately drawn

9.6 cm

= 25.1°

Work out the length of AC.

Give your answer to 3 significant figures.

73°

11.3 cm

= 3.45cm

DELTA
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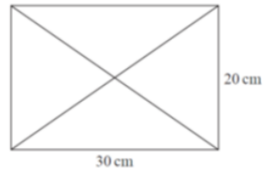A frame is made from wire.

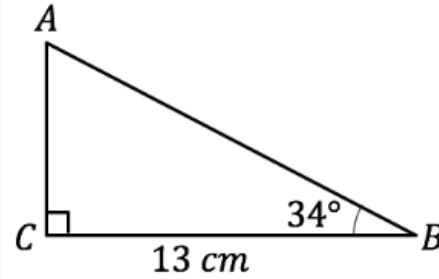Diagram **NOT** accurately drawn

20 cm

30 cm

The frame is in the shape of a rectangle, 30 cm by 20 cm.
The two diagonals of the rectangle are also made from wire.

Calculate the total length of wire needed to make the frame and the diagonals.
Give your answer correct to 1 decimal place.

= 172.1cm

Work out the length of AC.

Give your answer to 3 significant figures.

A

C $\quad$ 34°

13 *cm*

B

= 8.8cm

The diagram shows a shape with one line of symmetry.

10 cm

Diagram **NOT** accurately drawn

12 cm $\quad$ 4 cm

15 cm
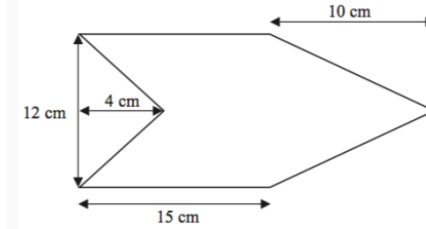
Work out the area of the shape.

= 216cm^2

In the diagram, AB, BC and CD are three sides of a regular polygon P.

regular 12-sided polygon
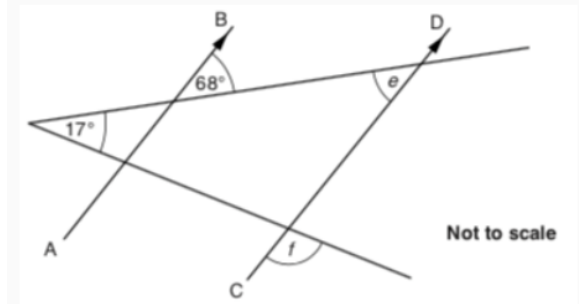
Show that polygon **P** is a hexagon.

$ABCDEFGH$ is a regular octagon.
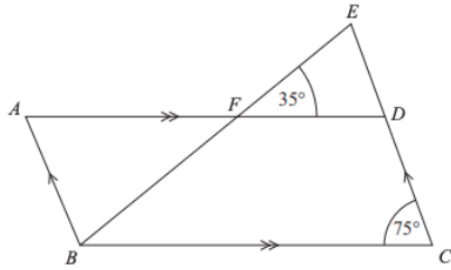
ADJ is a straight line.

angle BAD = angle CDA

Find the size of angle CDJ

In the diagram AB is parallel to CD.
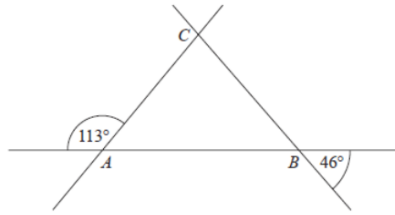

Not to scale

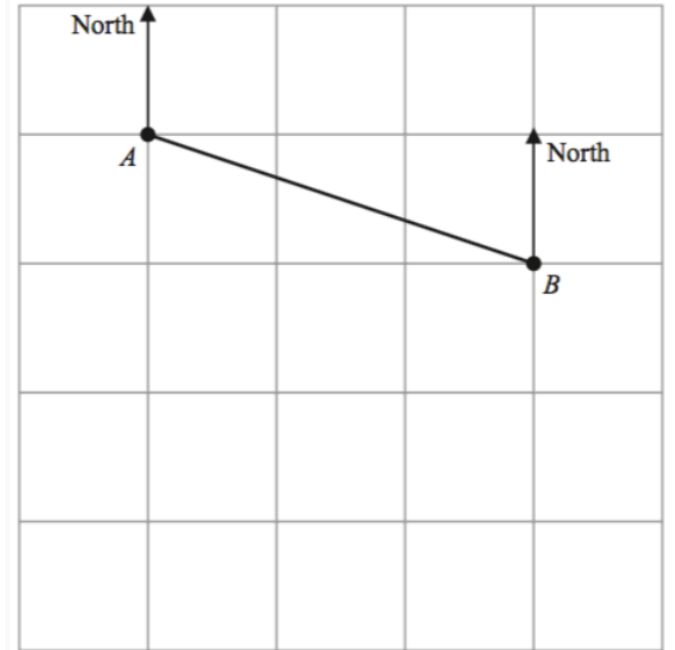Work out the following angle.

Securing grade 5 – Shape – Angles

$ABCD$ is a parallelogram.
EDC is a straight line.
F is the point on AD so that BFE is a straight line.

Angle $EFD = 35°$
Angle $DCB = 75°$

Find angle ABF.

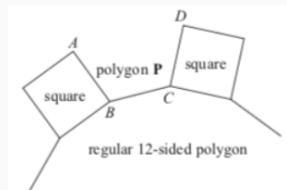Here is triangle ABC with each of its sides extended.

Is the triangle ABC isosceles? Give a reason for each stage of your working.

The diagram shows point A and point B on a map.
The point C is due south of A.
The bearing of C from B is 235°.

The bearing of a point D from B is 168°.

Find the bearing of B from D

DELTA
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In the diagram, AB, BC and CD are three sides of a regular polygon **P**.

regular 12-sided polygon

Show that polygon **P** is a hexagon.

Exterior angle of 12 sided polygon
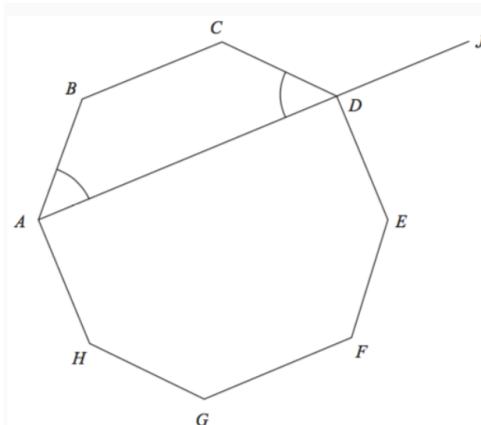$\frac{360}{12} = 30°$

Interior angle of polygon P
30 + 90 = 120°

Interior angle of a hexagon
$\frac{(6-2) \times 180}{6} = \frac{720}{6}$
= 120°

$ABCDEFGH$ is a regular octagon.

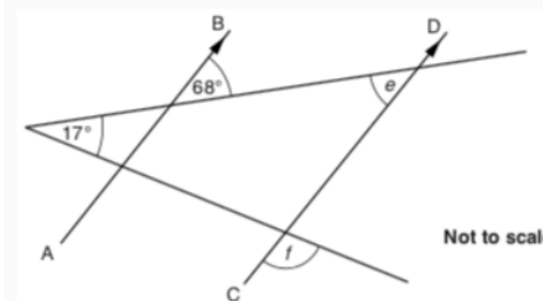ADJ is a straight line.

angle BAD = angle CDA

Find the size of angle CDJ

= 135°

In the diagram AB is parallel to CD.
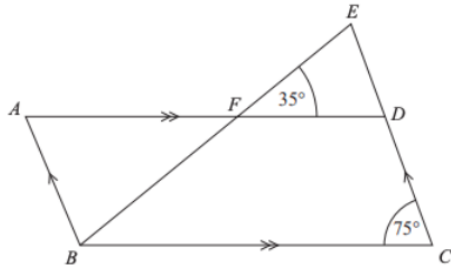

Not to scale

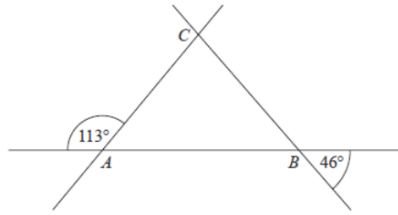Work out the following angle.

e = 68°

f = 95°

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$ABCD$ is a parallelogram.
EDC is a straight line.
F is the point on AD so that BFE is a straight line.

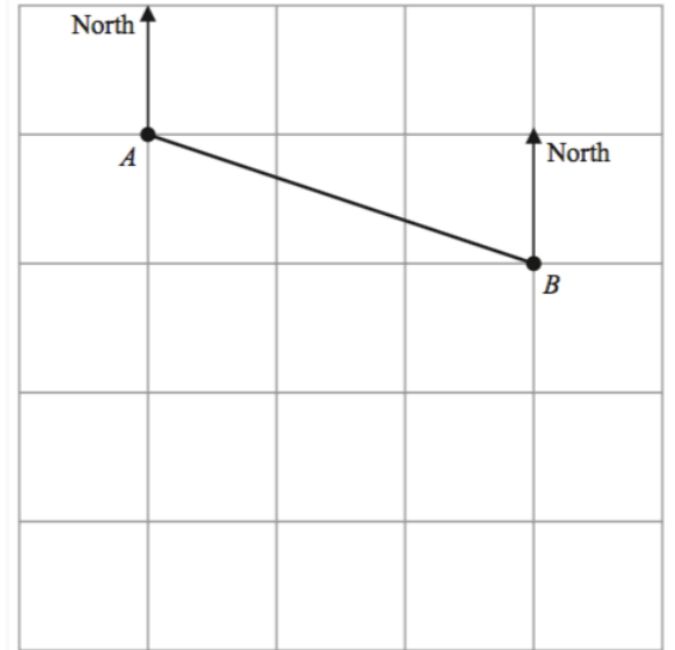Angle $EFD = 35°$
Angle $DCB = 75°$

Find angle ABF.

ABF = 70°

Here is triangle ABC with each of its sides extended.

Is the triangle ABC isosceles? Give a reason for each stage of your working.

ABC = 46º Vertically opposite angles are equal
CAB = 67º Angles on a straight line equal 180 degrees
ACB = 67º Angles in a triangle equal 180 degrees
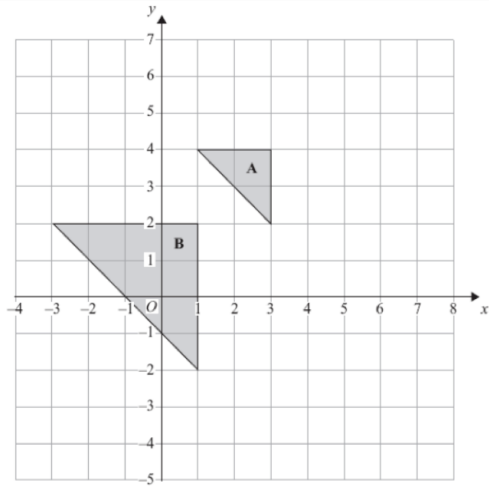
Yes it is isosceles as the base angles are equal.

The diagram shows point A and point B on a map.
The point C is due south of A.
The bearing of C from B is 235°.

The bearing of a point D from B is 168°.
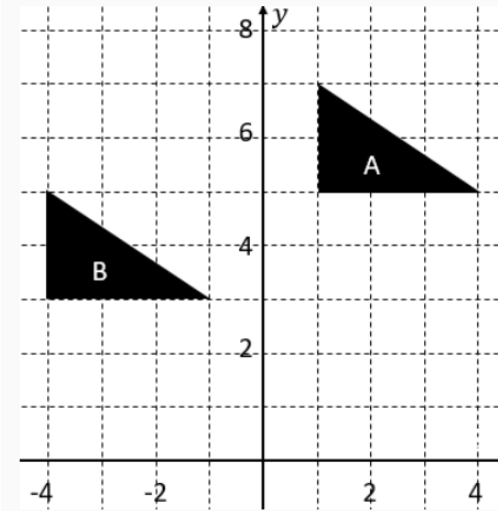
Find the bearing of B from D

e = 348º

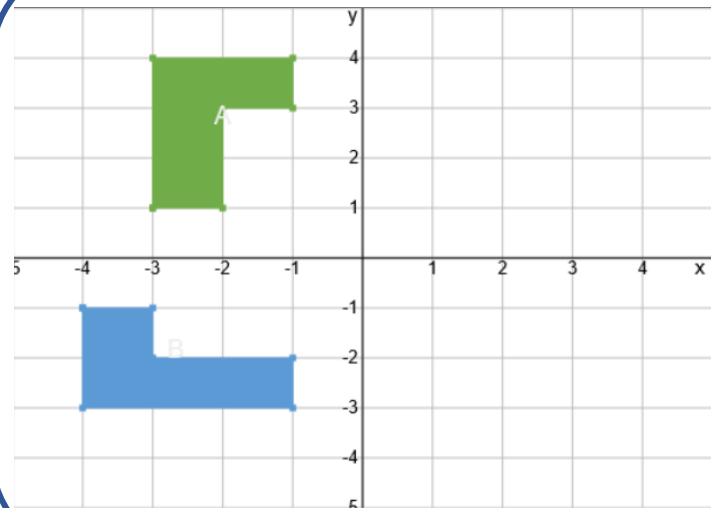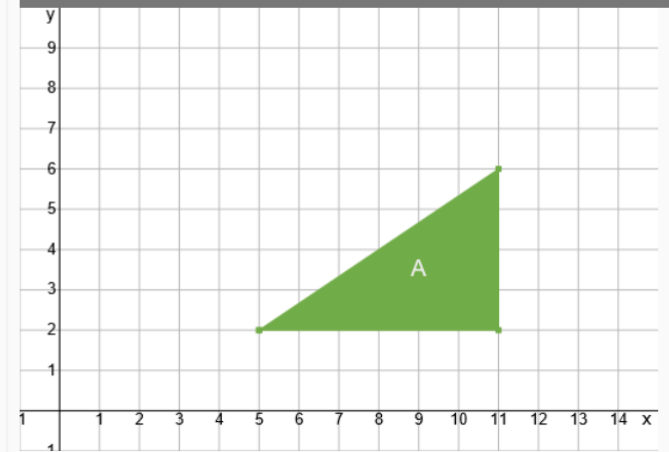# Securing grade 5 – Shape – Transformations and Vectors

Triangle **A** and triangle **B** are drawn on the grid.

Describe fully the single transformation which maps triangle **A** onto triangle **B**.
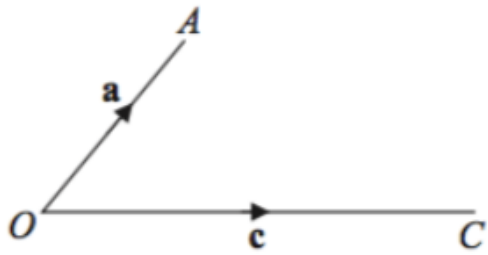

Describe the transformation from A to B:

---

a) Rotate shape B by 90º anticlockwise from the origin

b) Reflect shape A in the line x = 1

Enlarge shape A by scale factor $\frac{1}{2}$ about the point $(5, 8)$.

Click/Press each point of your polygon.

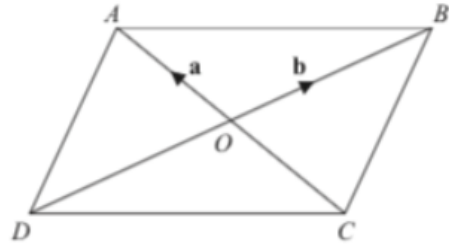In the diagram $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$.

Find $\overrightarrow{CA}$ in terms of $\mathbf{a}$ and $\mathbf{c}$.

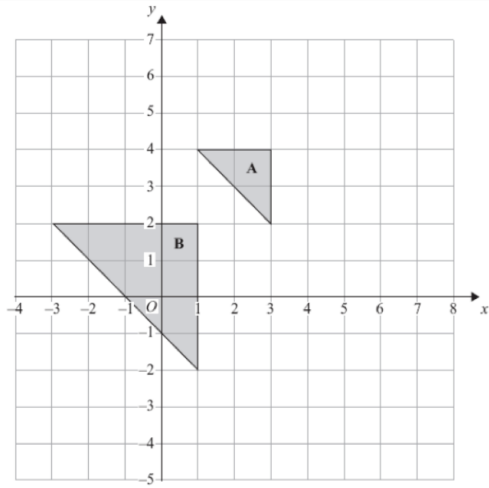$ABCD$ is a parallelogram.
The diagonals of the parallelogram intersect at O.

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$

Find, in terms of $\mathbf{a}$ and $\mathbf{b}$, the vector $\overrightarrow{AB}$

Vector $\mathbf{p} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$ and vector $\mathbf{q} = \begin{pmatrix} -2 \\ 2 \end{pmatrix}$

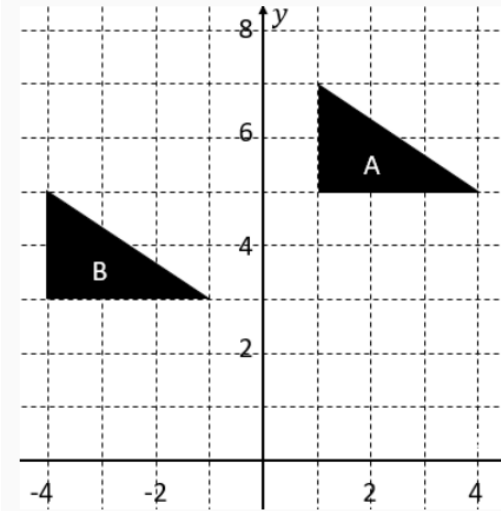Calculate $\mathbf{p} + \mathbf{q}$

Triangle **A** and triangle **B** are drawn on the grid.

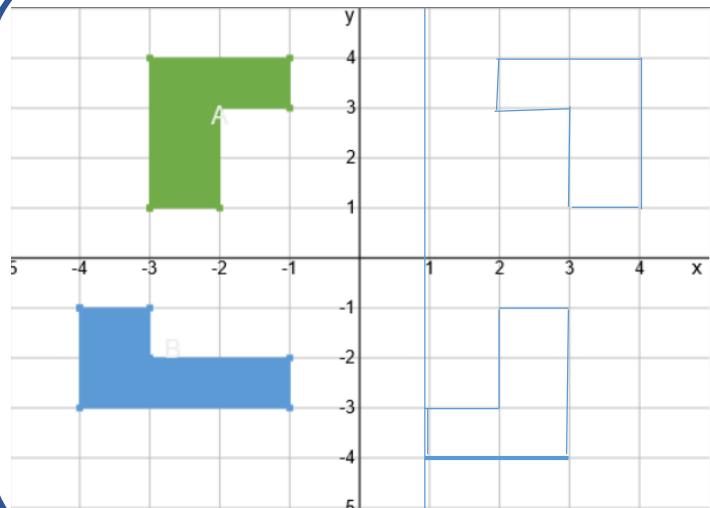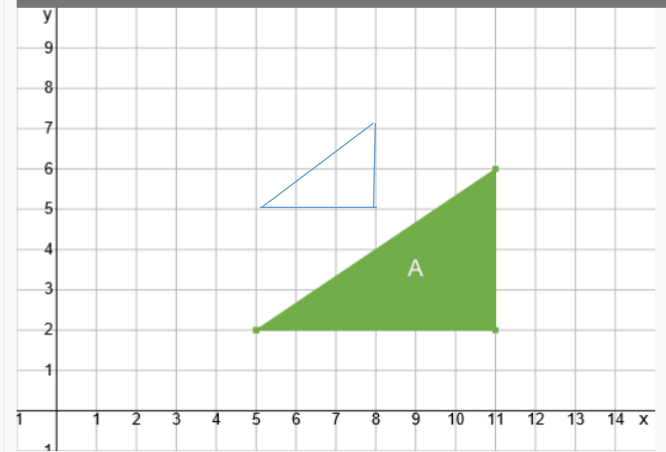Describe fully the single transformation which maps triangle **A** onto triangle **B**.

Enlargement
Scale factor 2
From the point (5,6)

Describe the transformation from A to B:

Translation
-5
-2

a)   Rotate shape B by 90° anticlockwise from the origin
b)   Reflect shape A in the line x = 1
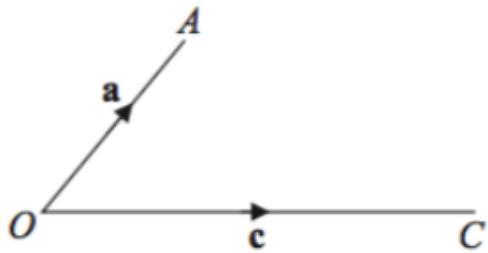
Enlarge shape A by scale factor $\frac{1}{2}$ about the point $(5, 8)$.

Click/Press each point of your polygon.

DELTA
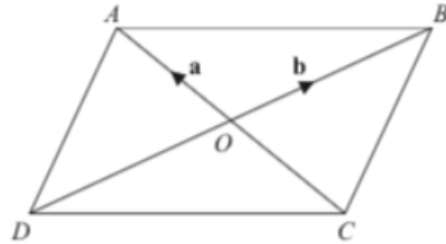Academies Trust

In the diagram $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$.

Find $\overrightarrow{CA}$ in terms of $\mathbf{a}$ and $\mathbf{c}$.

= -c + a

$ABCD$ is a parallelogram.
The diagonals of the parallelogram intersect at O.

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$

Find, in terms of $\mathbf{a}$ and $\mathbf{b}$, the vector $\overrightarrow{AB}$

= -a + b

Vector $\mathbf{p} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$ and vector $\mathbf{q} = \begin{pmatrix} -2 \\ 2 \end{pmatrix}$

Calculate $\mathbf{p} + \mathbf{q}$

1
1