

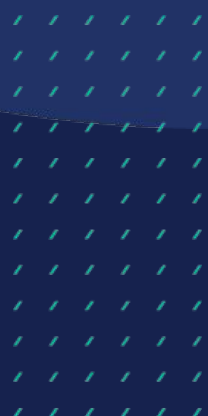
2022 GCSE Advance Information

Sparx Topics & Key Questions

We are always looking for ways to support maths teachers and students. In order to help you and your year 11s this year we've pulled together a list of key questions which may be useful to practise with your students based on the exam board topic lists.

These 65 key questions are all taken from our library of over 45,000 high-quality questions in Sparx Maths. If you are a Sparx Maths School then your students can use the Topic Codes provided to search the full content library directly within the independent learning section of Sparx Maths to help target their revision.

Please note this is not an exhaustive topic guide it is simply designed to help you pull together some key questions to use to check for understanding in lessons, starters, or as worksheets with your learners.



Geometry and measures	Topics	Sparx Topic Codes
<u>Shape</u>	<u>Transformations</u>	U196, U799, U696, U134, U766
<u>Angles</u>	<u>Angles in a polygon</u>	U427
	<u>Circle theorems</u>	U459, U251, U489, U130
<u>Length, area, and volume</u>	<u>Area of a rectangle</u>	U934
	<u>Area of a sector</u>	U373
	<u>Surface area of a cuboid</u>	U929
	<u>Volume of a cube</u>	U786
	<u>Volume of composite solid</u>	U543
	<u>Similar triangles</u>	U578
<u>Pythagoras's Theorem and Trigonometry</u>	<u>Pythagoras's Theorem</u>	U385, U541
	<u>Trigonometry</u>	U283, U545, U967, U170
	<u>Sine and Cosine Rules</u>	U952, U591
	<u>Trigonometry in 3-D</u>	U170
	<u>Exact trigonometric values</u>	U627
<u>Vectors</u>	<u>Column vectors</u>	U632, U564, U781
	<u>Vector geometry</u>	U781, U560

Shape - Transformations

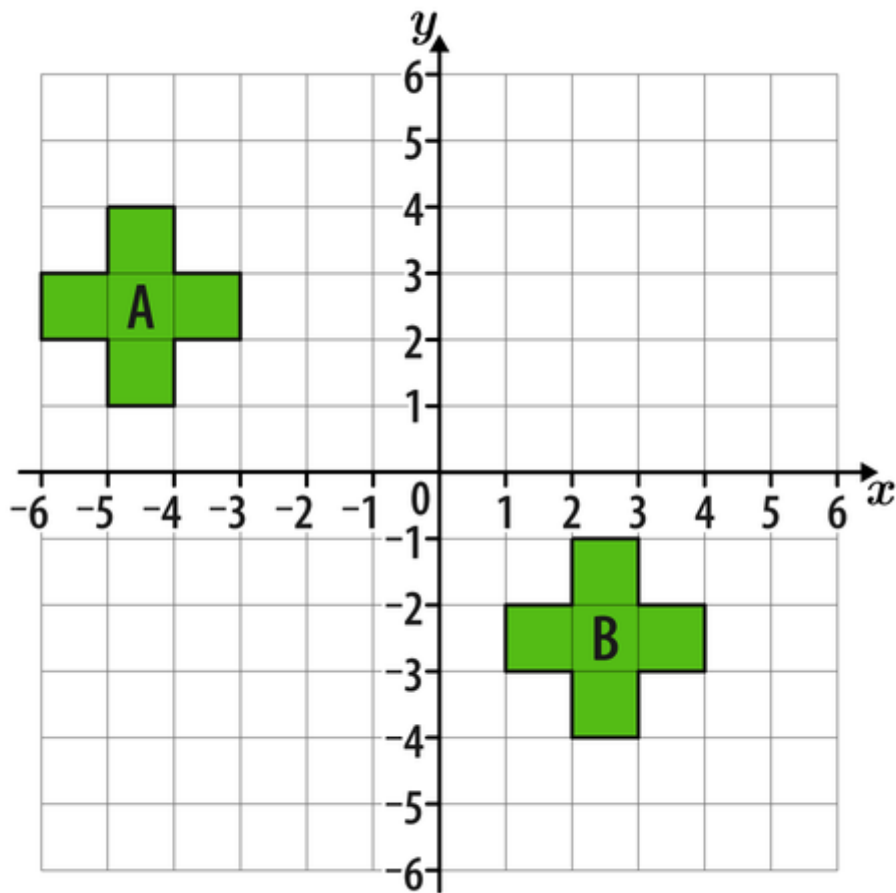
Translation

U196

What vector describes the translation from

a) shape A to shape B?

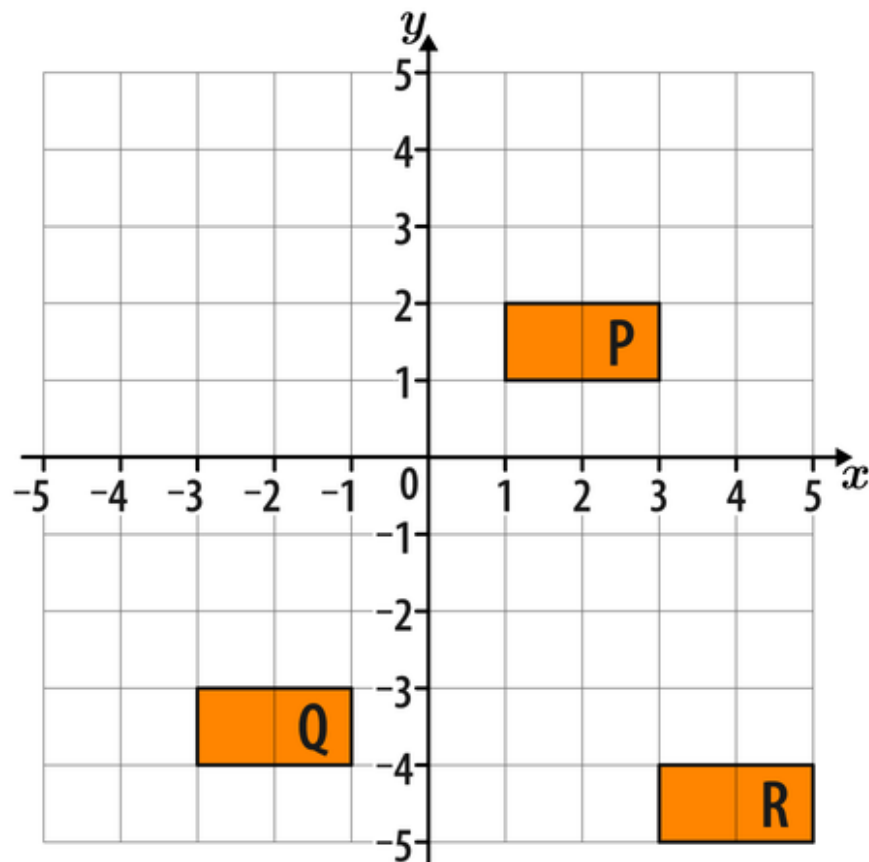
b) shape B to shape A?



Shape **P** is translated by $\begin{pmatrix} -4 \\ -5 \end{pmatrix}$ to give shape **Q**.

Shape **Q** is translated by $\begin{pmatrix} 6 \\ -1 \end{pmatrix}$ to give shape **R**.

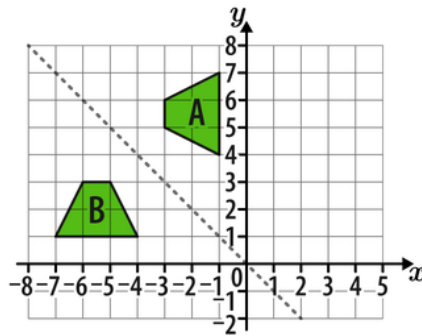
- a) Using the grid, work out the vector that describes the translation from shape **P** to shape **R**.
- b) Can you work out this vector without using the grid? Write a sentence to explain your answer.



Reflection

U799

Copy and complete both sentences below.



Shape B is a reflection of shape A in the line with equation

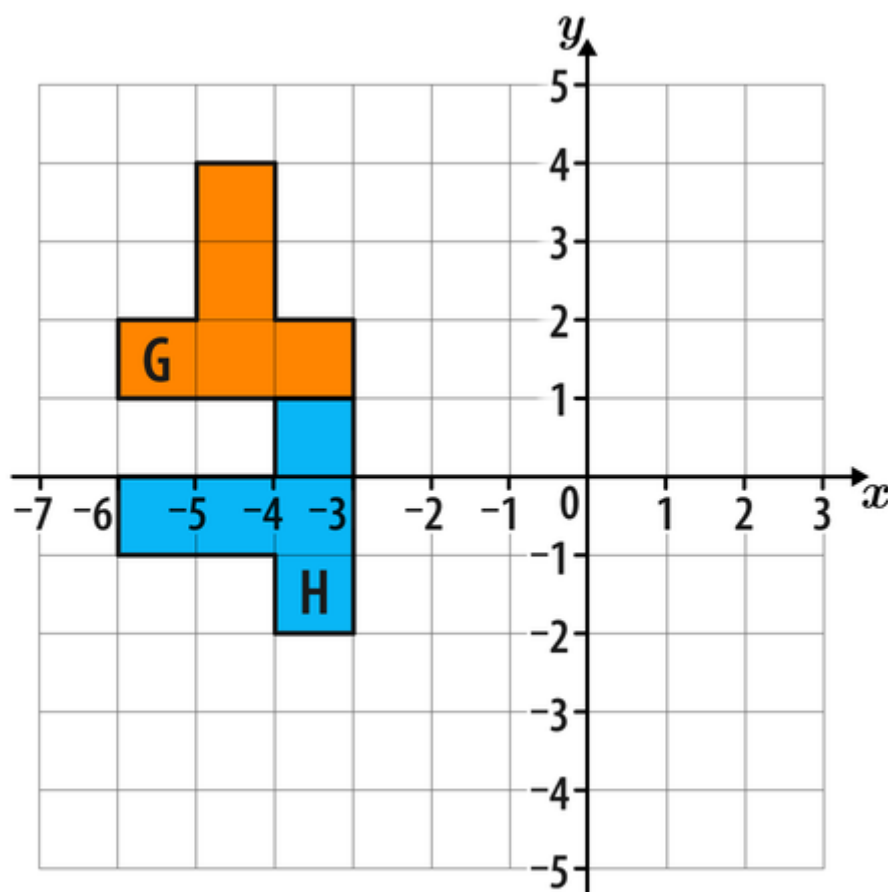
Shape A is a reflection of shape B in the line with equation

Rotation

U696

Shape G has been rotated clockwise/anticlockwise by °

about the point $\left(\begin{array}{c} \text{ } \\ \text{ } \end{array} \right)$ to give shape H.

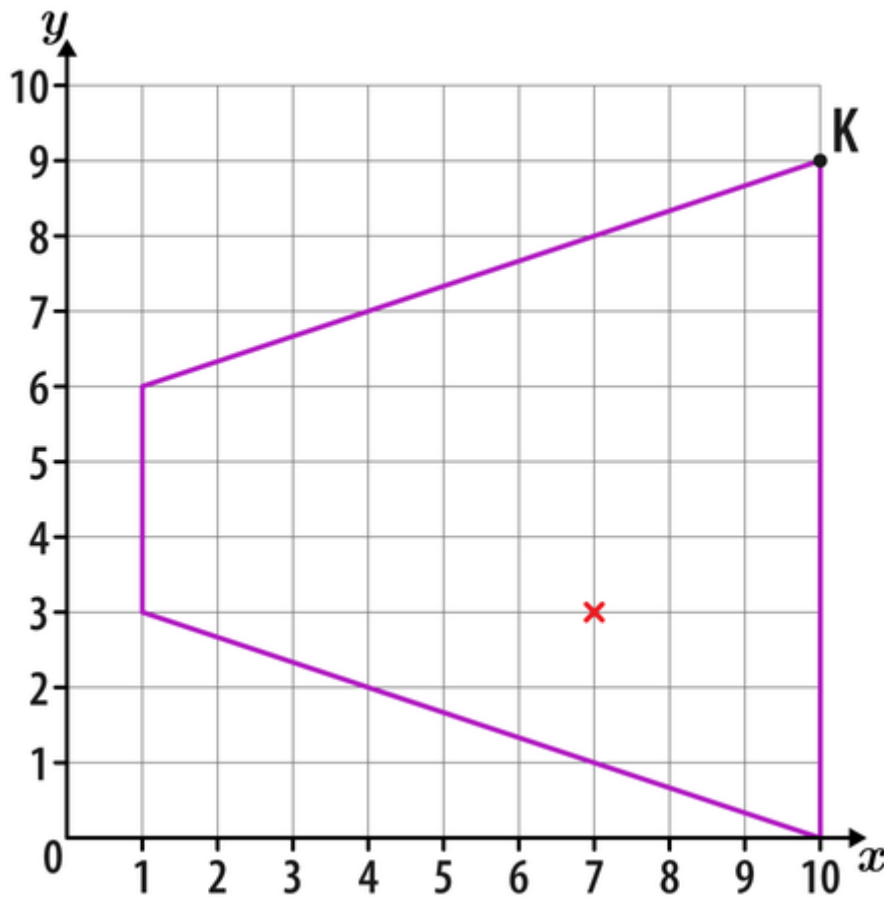


Enlargement by a positive or negative scale factor

U134

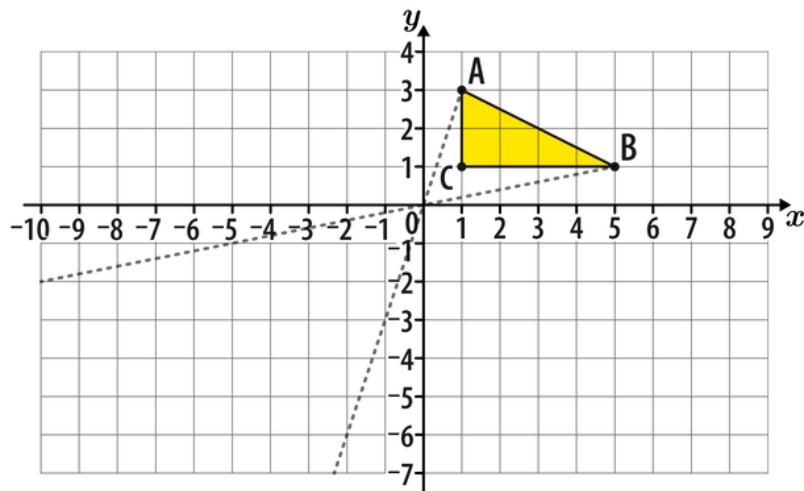
This shape is being enlarged using a scale factor of $\frac{1}{3}$ and centre $(7, 3)$.

What are the coordinates of the vertex of the new shape that corresponds to K?

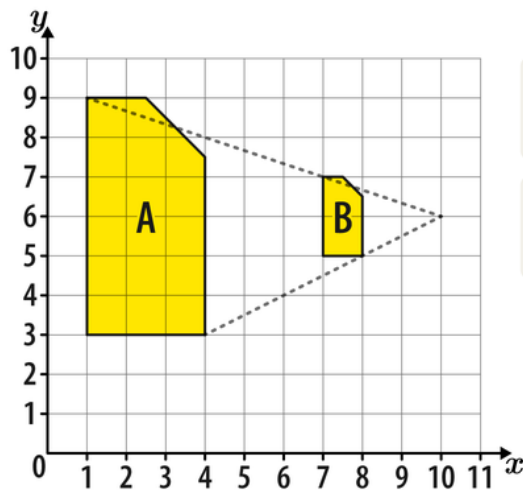


Triangle ABC is being enlarged using a scale factor of -2 and the origin as the centre to give triangle $A'B'C'$.

Work out the coordinates of A' and B' .



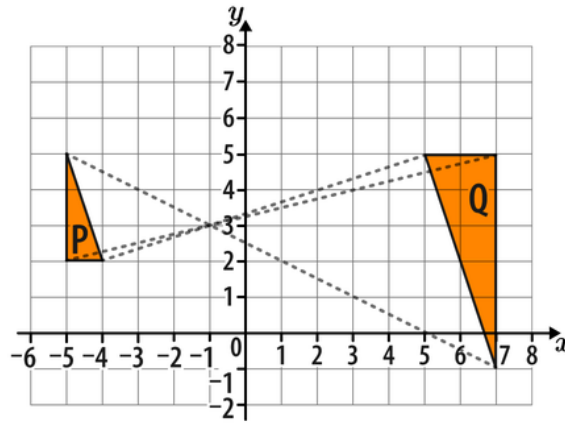
Complete the sentences below to fully describe the enlargements.



A to B: Enlargement with a scale factor of and centre (,)

B to A: Enlargement with a scale factor of and centre (,)

Complete the sentence below to fully describe the transformation that maps triangle P onto triangle Q.



Enlargement with a scale factor of and centre (,)

Combining transformations

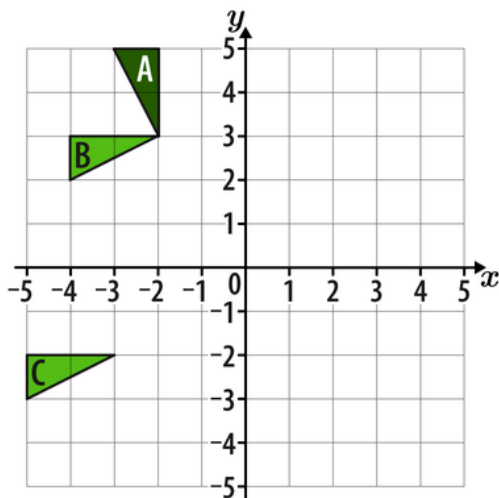
U766

Fill in the gaps below to describe the transformations

a) from A to B.

b) from B to C.

c) from A to C.



A to B

A rotation by ° anticlockwise
about (,)

B to C

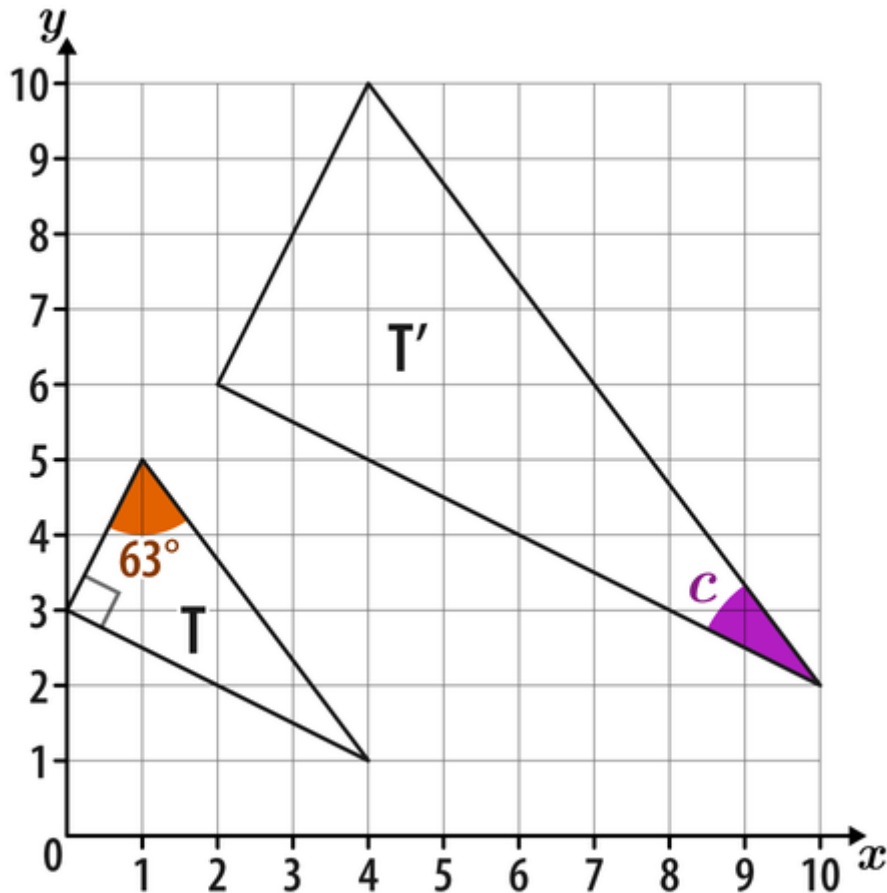
A translation by vector $\begin{pmatrix} \text{ } \\ \text{ } \end{pmatrix}$

A to C

A rotation by °
 clockwise / anticlockwise about $(0, 0)$

Triangle T has been translated by $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$ and then enlarged by a scale factor of 2 using $(2, 6)$ as the centre.

What is the size of angle C ?



Angles - Angles in a polygon

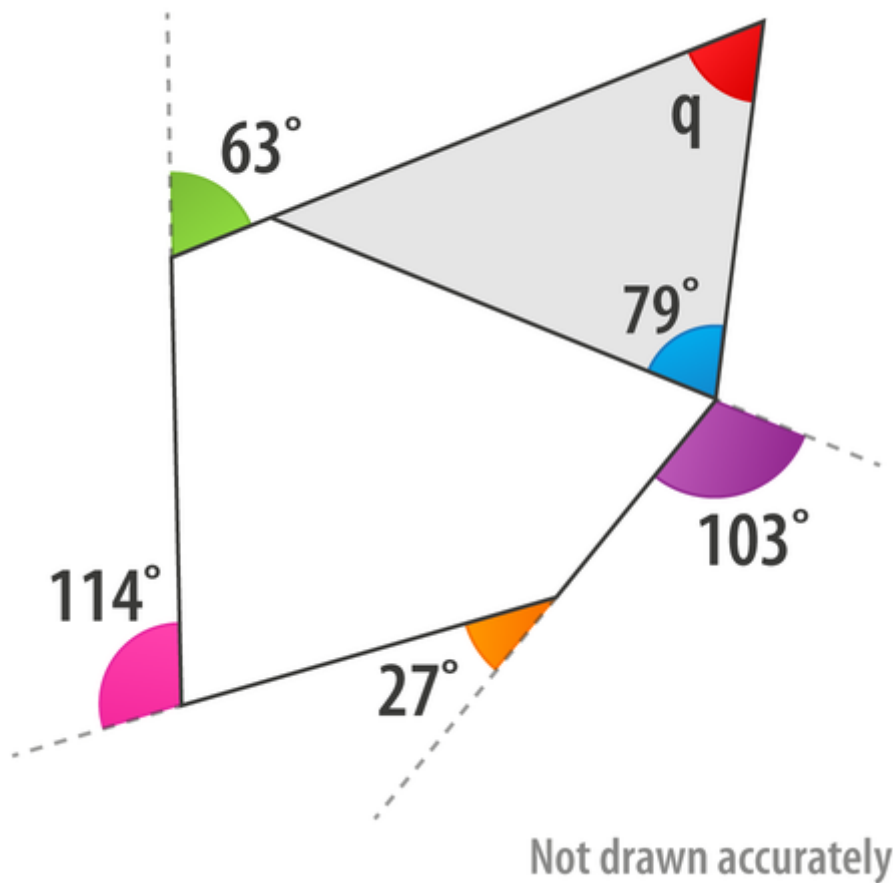
Angles in polygons

U427

A triangle is placed on top of an irregular pentagon, as shown.

Work out the size of the angle marked q .

Give your answer in degrees ($^{\circ}$).



Each of the interior angles of a regular polygon is 156° .

How many sides does this polygon have?

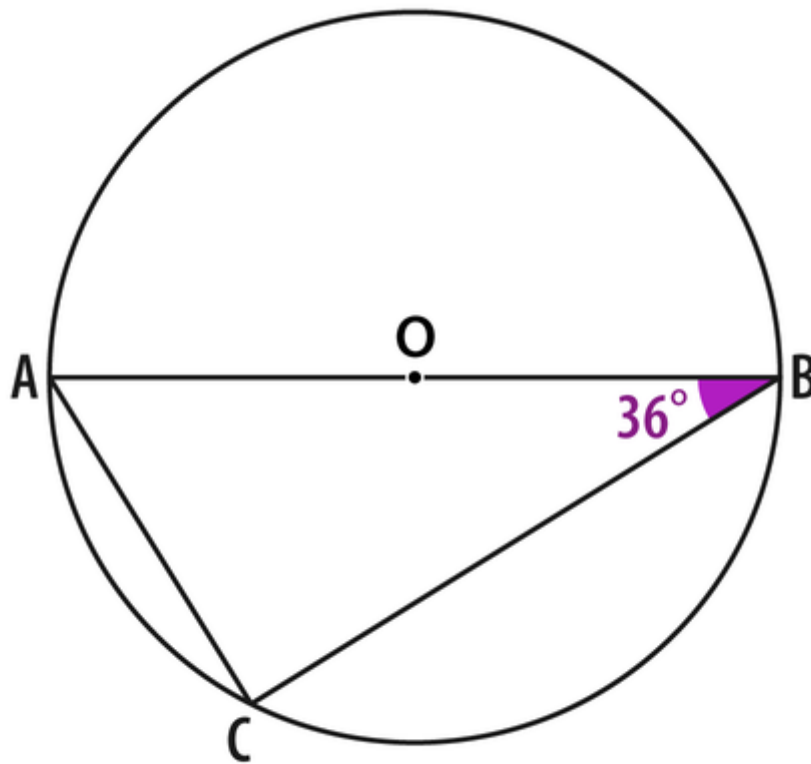
Angles - Circle theorems

Angles subtended at the centre or circumference of a circle

U459

O is the centre of this circle.

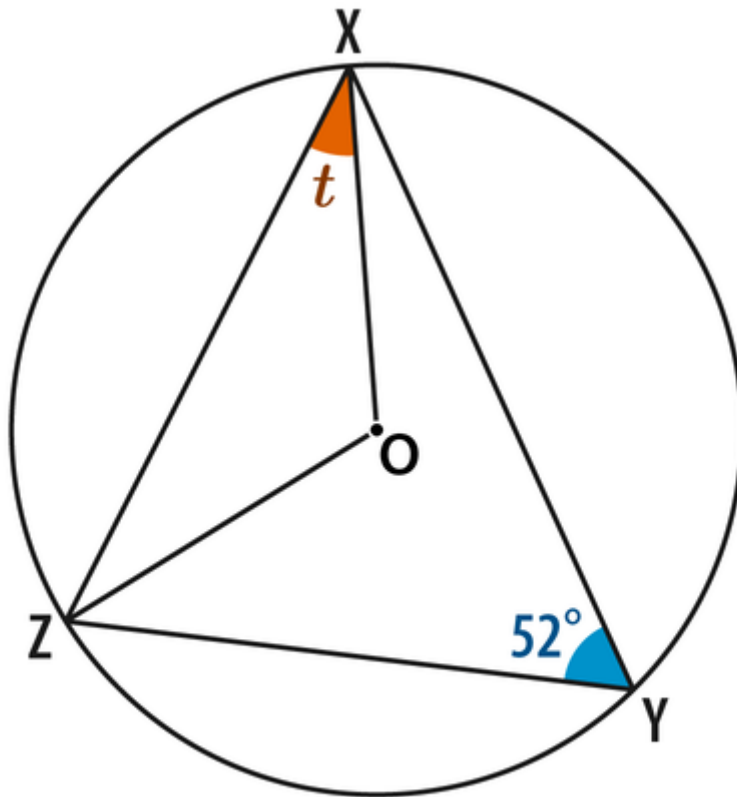
Work out the size of angle CAB.
Give reasons for your answer.



Not drawn accurately

The circle below is centred at O .

Calculate the size of angle t .
Fully justify your answer.



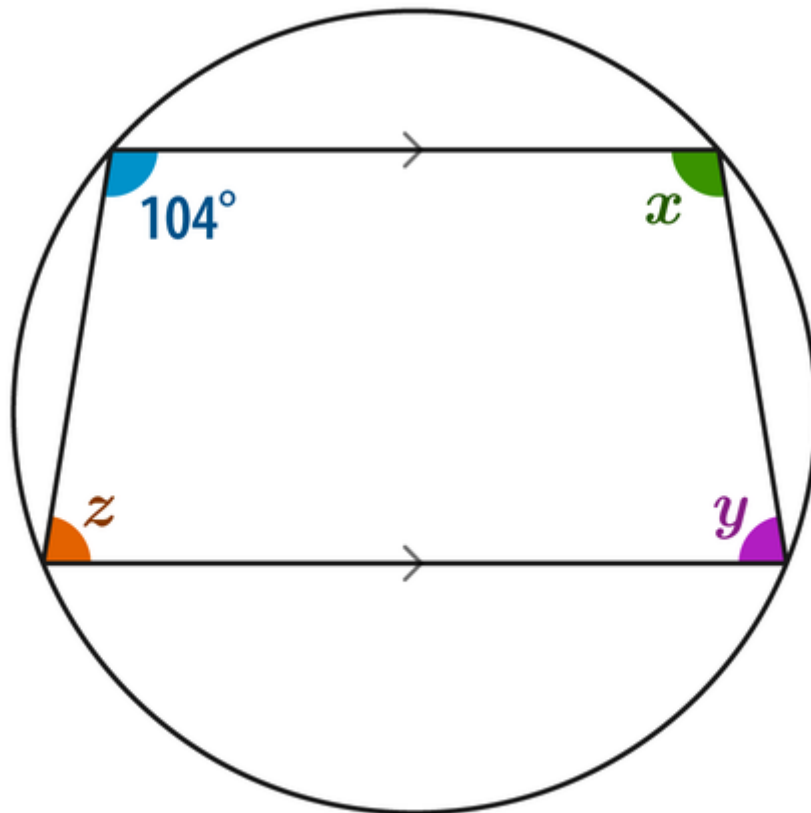
Not drawn accurately

Angles in segments and cyclic quadrilaterals

U251

Find the sizes of angles x , y and z .

Give a reason for each of your answers.

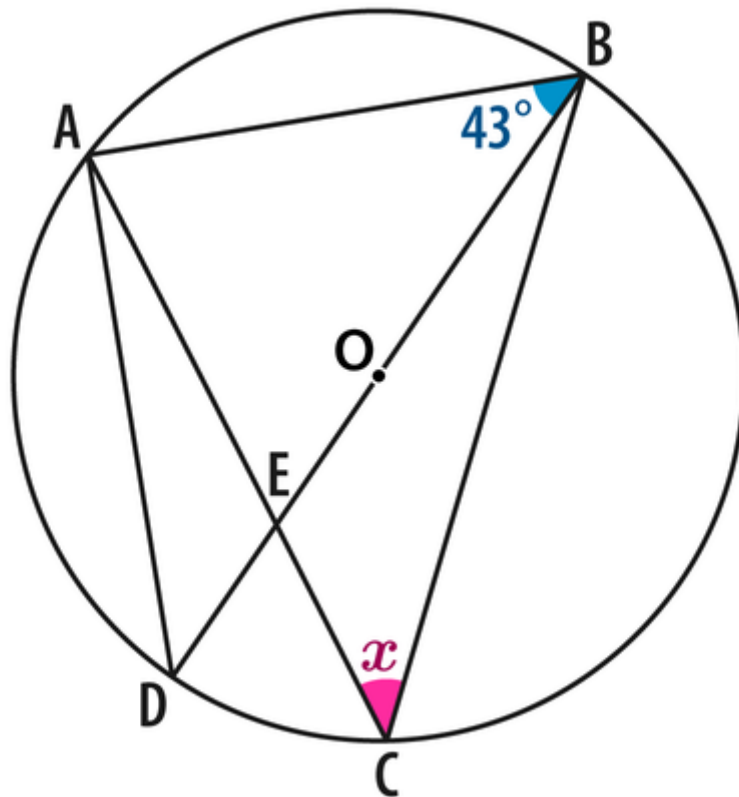


Not drawn accurately

This circle is centred at O .

Find the size of angle x .

Justify your answer.

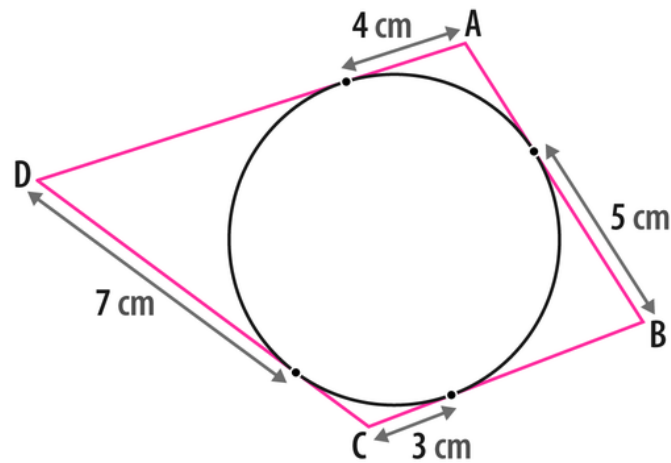


Not drawn accurately

Circle theorems for chords and tangents

U489

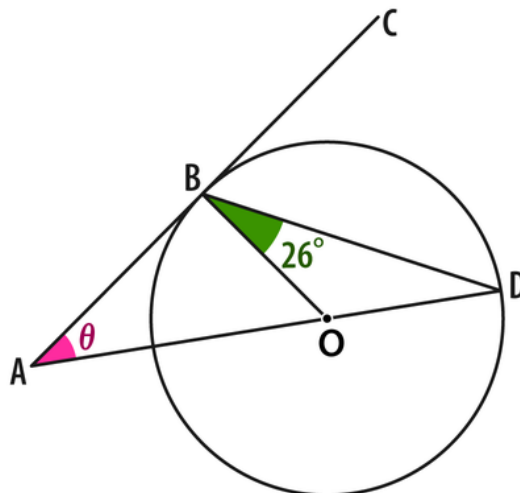
Calculate the perimeter of quadrilateral $ABCD$ below.
Justify your answer.



Not drawn accurately

ABC is a tangent to the circle below.
 O is the centre of the circle.

Work out the size of angle θ .
Give reasoning to justify your answer.



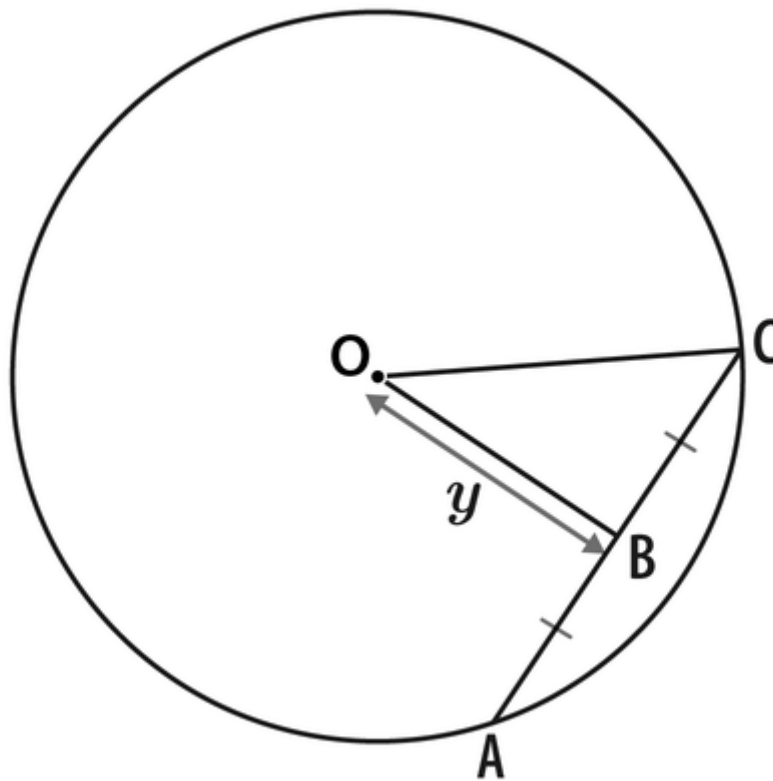
Not drawn accurately

The circle below, centred at O , has a radius of 13 cm .

$$BC = 8\text{ cm}.$$

Work out the length y to 1 d.p.

Fully justify your answer.



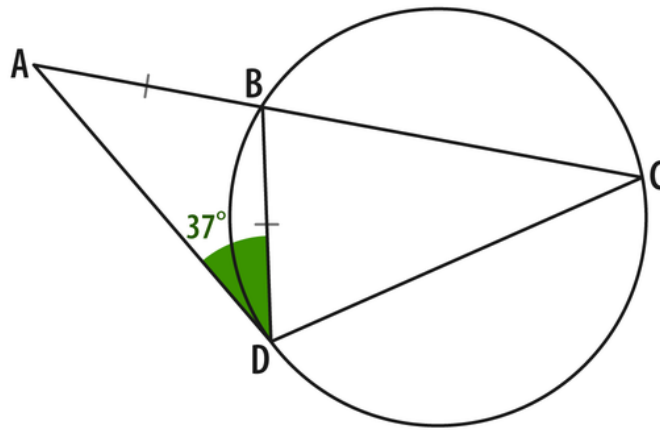
Not drawn accurately

Alternate segment theorem

U130

AD is a tangent to the circle below.

Work out the size of angle CDB .
Give reasons for your answer.



Not drawn accurately

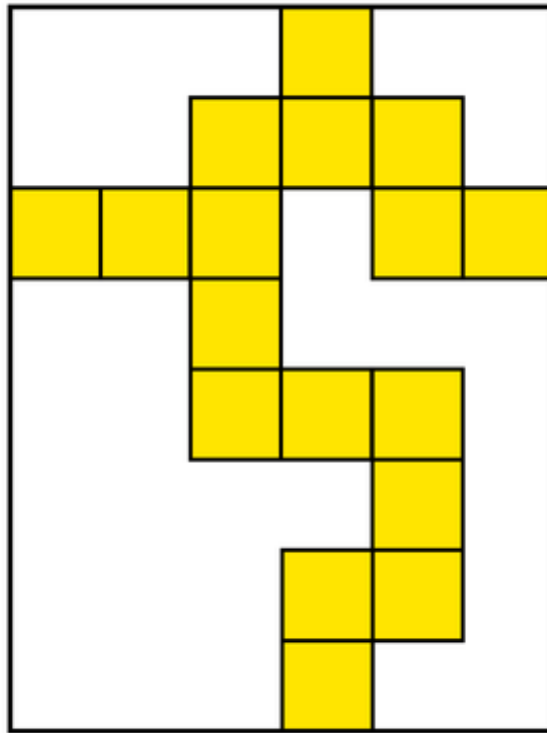
Length, area, and volume - Area of a rectangle

Problem solving: Area and perimeter of rectangles and compound shapes
(Higher)

U934

Each of the small shaded squares inside the rectangle below has an area of 9 cm^2 .

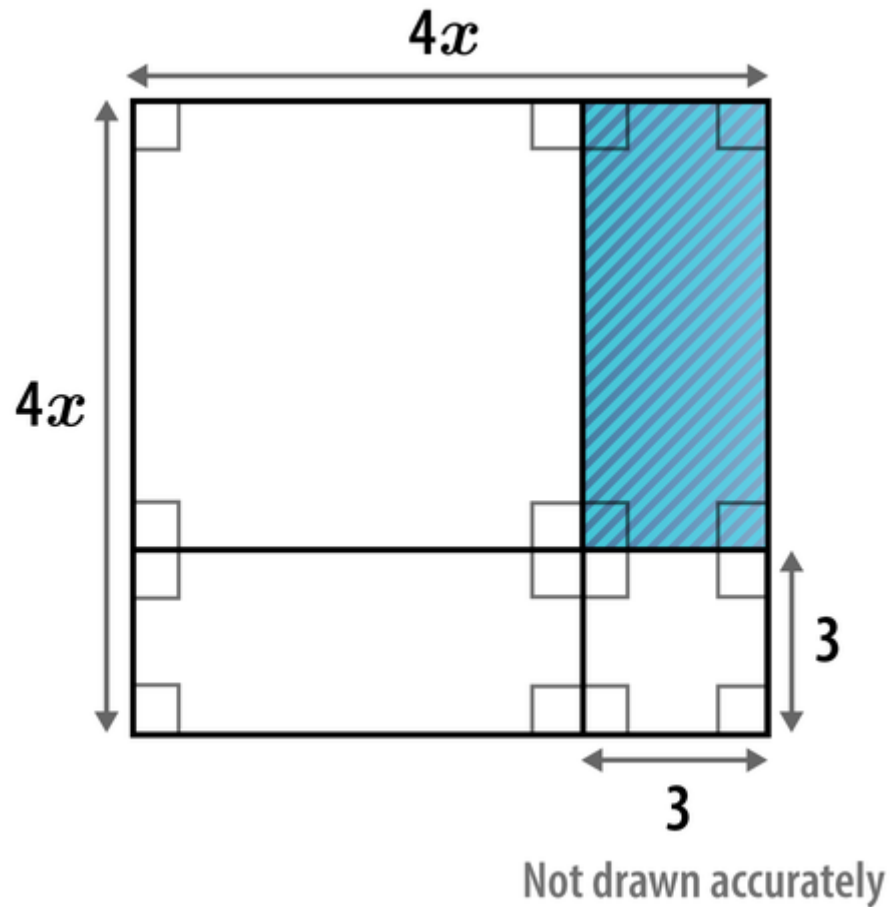
What area of the rectangle is **unshaded**?
Give your answer in cm^2 .



Not actual size

Write an expression for the area of the shaded region of the shape below.

Expand any brackets and fully simplify your answer.



Length, area, and volume - Area of a sector**Finding the area of sectors****U373**

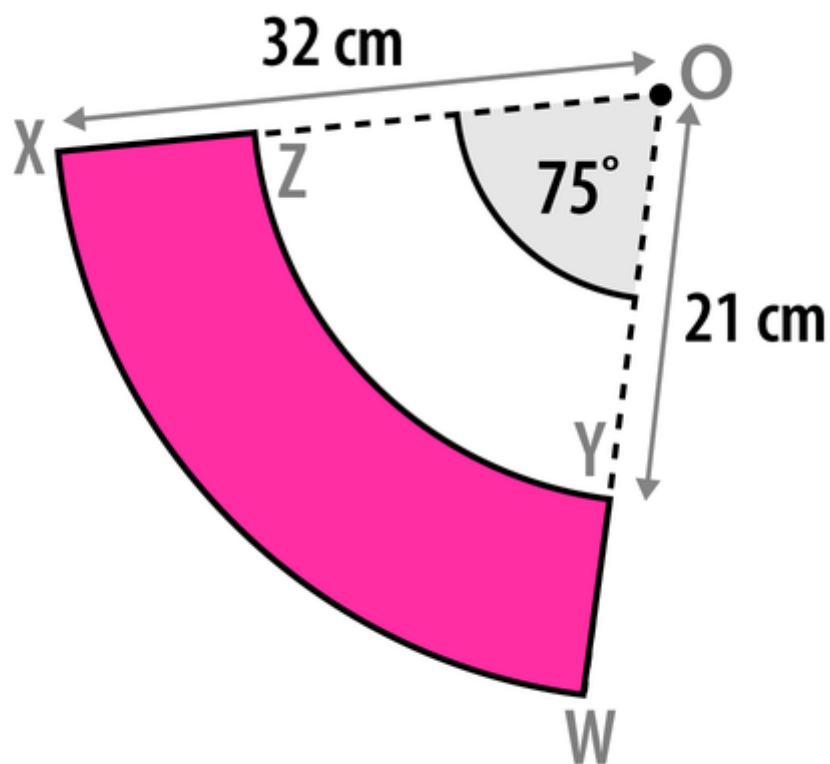
OWX is a sector of a circle with a radius of 32 cm .

OYZ is a sector of a circle with a radius of 21 cm .

The central angle of both sectors is 75° .

Work out the area of the shaded shape $WXZY$.

Give your answer in cm^2 to 1 d.p.

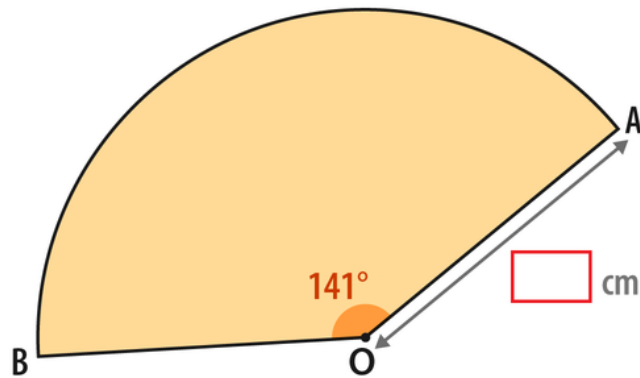


Not drawn accurately

OAB is a sector of a circle. The area of OAB is 16.4 cm^2 .

Calculate the radius of the circle.

Give your answer to 1 d.p.



Not drawn accurately

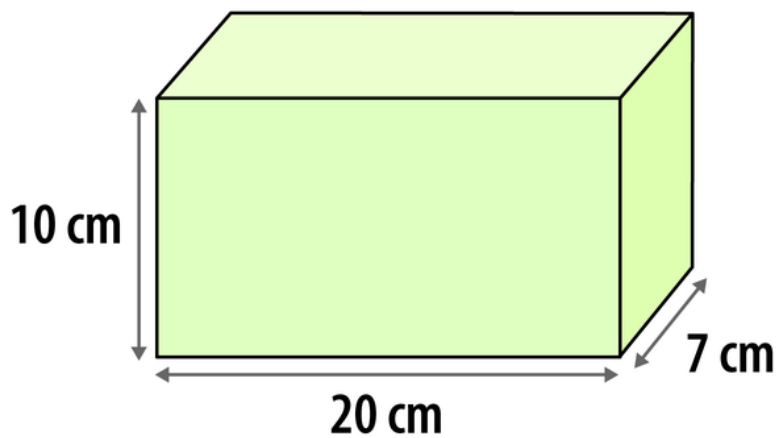
Length, area, and volume - Surface area of a cuboid

Finding the surface area of cubes and cuboids

U929

Aliyah has a tin of purple paint which will cover $49,200 \text{ cm}^2$.

How many cuboids like the one shown below could Aliyah completely cover with the paint?



Not drawn accurately

Length, area, and volume - Volume of a cube

Finding the volume of cubes and cuboids

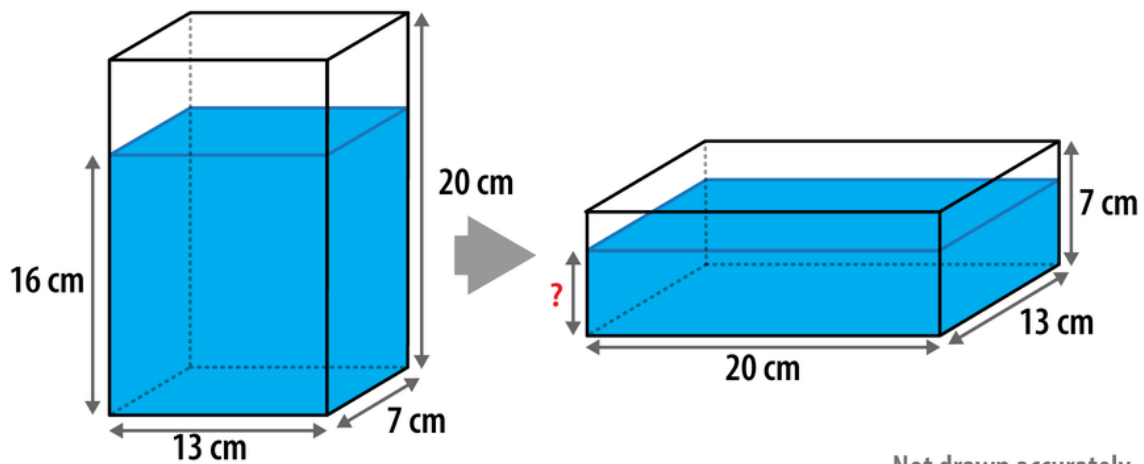
U786

A sealed cuboid-shaped container is filled with water to a depth of 16 cm.

The container is then rotated as shown below.

What is the new depth of the water?

Give your answer in centimetres (cm), and give any decimal answers to 1 d.p.



Not drawn accurately

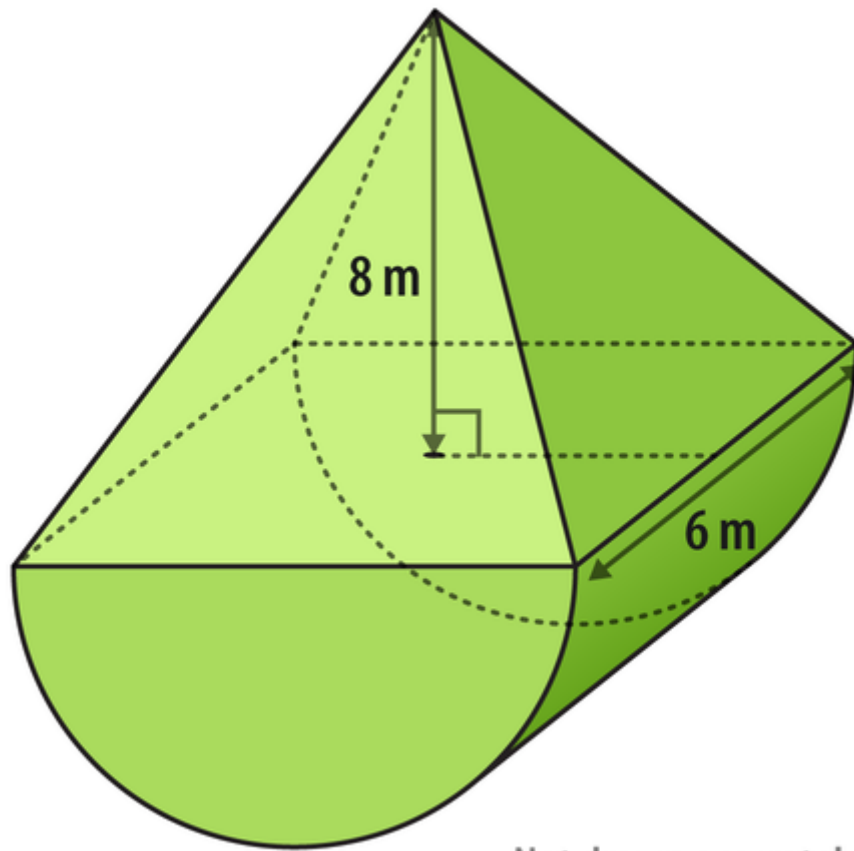
Length, area, and volume - Volume of composite solid

Finding the volume of composite shapes

U543

The shape below is made from half of a cylinder with a square-based pyramid on top.

Work out the volume of the shape.
Give your answer to 1 d.p.

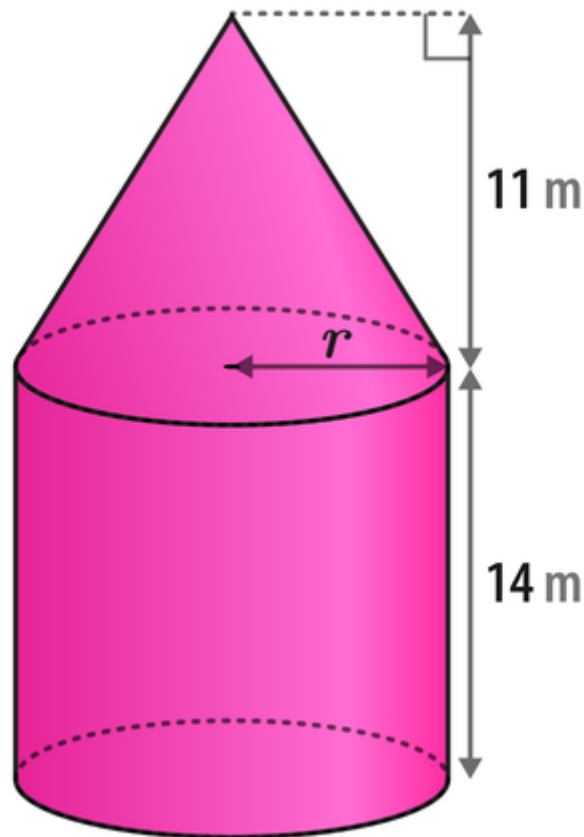


Not drawn accurately

volume of a cone = $\frac{1}{3}\pi r^2 h$, where r is the radius and h is the height.

The shape below is made from a cone and a cylinder. The total volume of the shape is 4450 m^3 .

Work out the radius, r , to 2 d.p.



Not drawn accurately

Length, area, and volume - Similar triangles

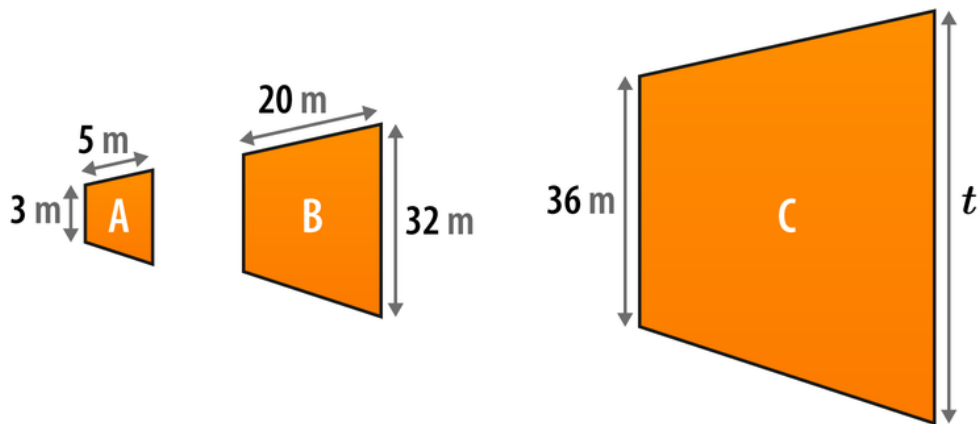
Finding unknown sides in similar shapes

U578

Quadrilaterals A, B and C are similar.

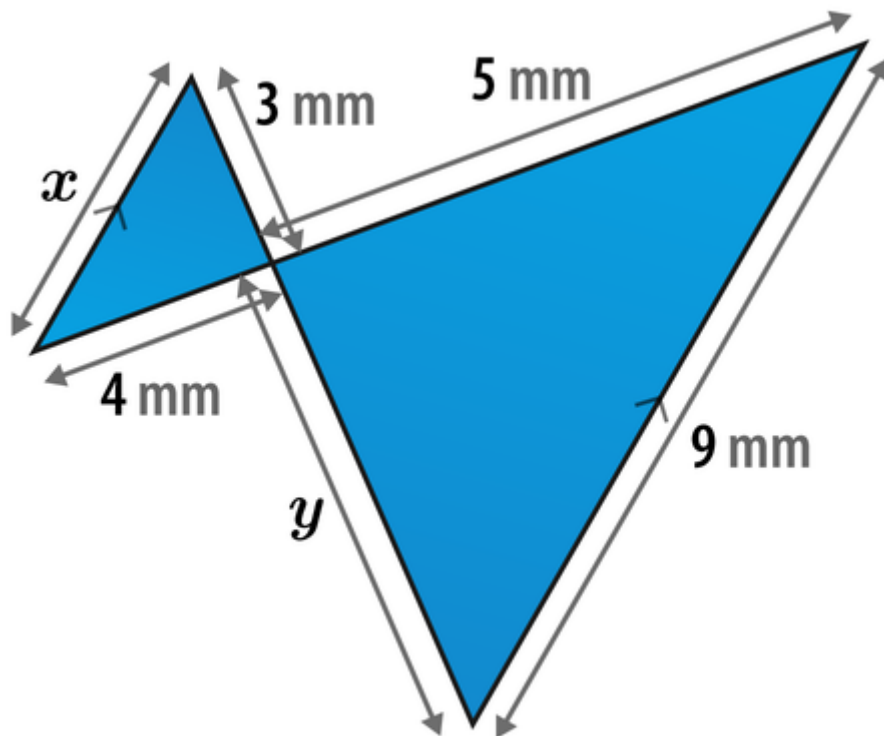
Work out the unknown length, t .

Give your answer as an integer or as a fraction in its simplest form.



Not drawn accurately

Work out the unknown lengths, x and y , in the shape below.
Give each answer as an integer or as a fraction in its simplest form.



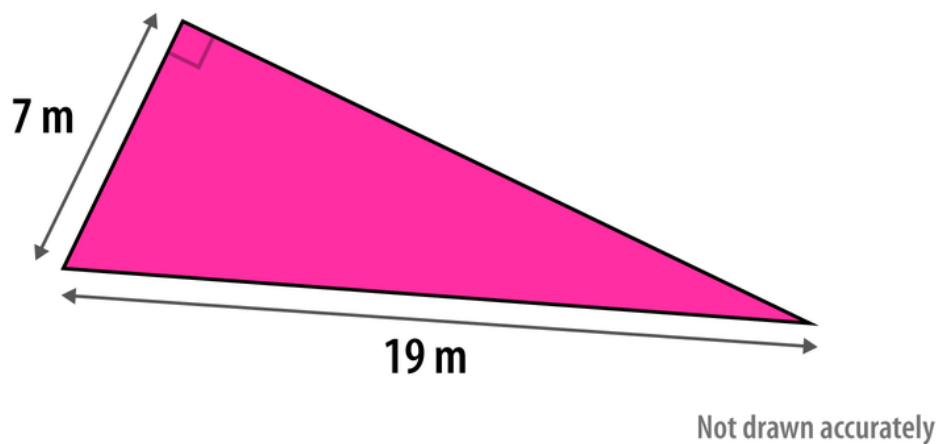
Not drawn accurately

Pythagoras's Theorem and Trigonometry - Pythagoras's Theorem

Using Pythagoras' theorem in 2D

U385

Calculate the **perimeter** of this right-angled triangle.
Give your answer in metres (**m**) to 1 d.p.



At the start of the day, a decorator rested a **3 m** ladder against a vertical wall so that the foot of the ladder was **60 cm** away from the base of the wall.

During the day, the ladder slipped down the wall, causing the foot of the ladder to move **80 cm** further away from the base of the wall.

How far down the wall, in centimetres, did the ladder slip?
Give your answer to the nearest **1 cm**.

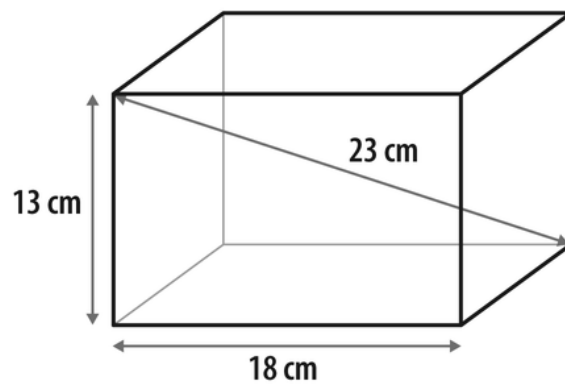
Using Pythagoras' theorem in 3D

U541

Calculate the volume of the cuboid shown below.

Give your answer in cm^3 .

If your answer is a decimal, then round it to 1 d.p.



Not drawn accurately

Pythagoras's Theorem and Trigonometry - Trigonometry

Finding unknown sides in right-angled triangles

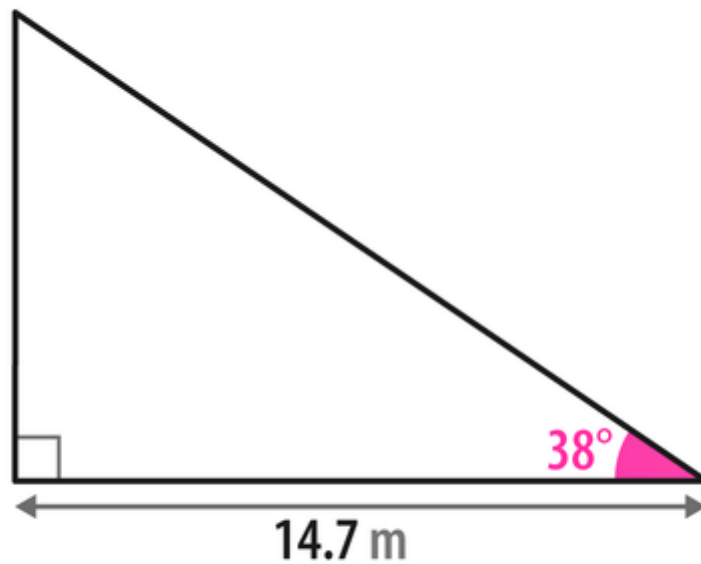
U283

$$\text{Solve } \frac{6}{k} = \cos 46^\circ$$

Give your answer to 2 d.p.

Using trigonometry, work out the perimeter of the right-angled triangle below.

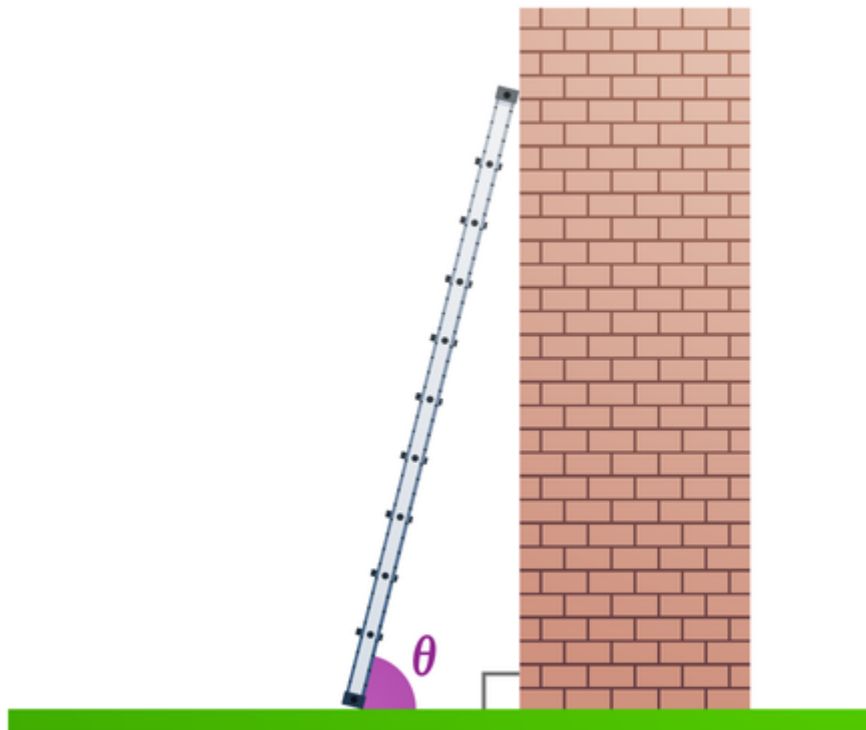
Give your answer in metres to 1 d.p.



Not drawn accurately

Jessica wants to use her 8.61 m long ladder against a wall, as shown below.
The instructions state that the angle between her ladder and the ground should be in the range 74° to 77° .

Calculate the maximum distance that the base of her ladder should be placed from the wall.
Give your answer in metres to 2 d.p.



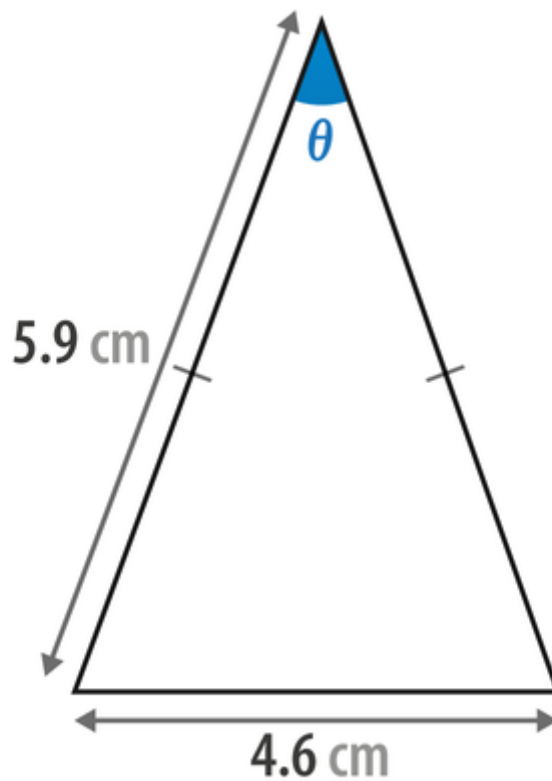
Not drawn accurately

Finding unknown angles in right-angled triangles

U545

Calculate the size of angle θ in the isosceles triangle below.

Give your answer in degrees to 1 d.p.

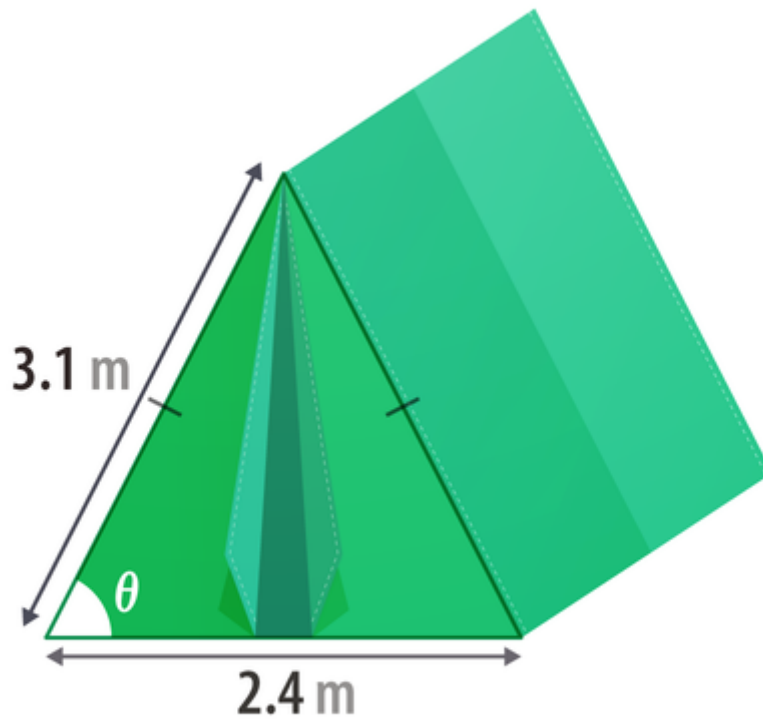


Not drawn accurately

The front of the tent shown in the diagram below is an isosceles triangle.

Calculate the size of angle θ .

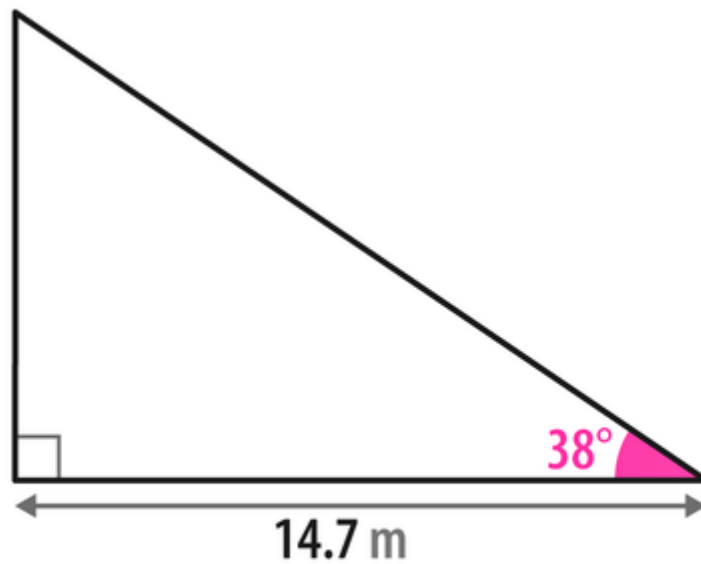
Give your answer in degrees to the nearest integer.



Not drawn accurately

Using trigonometry, work out the perimeter of the right-angled triangle below.

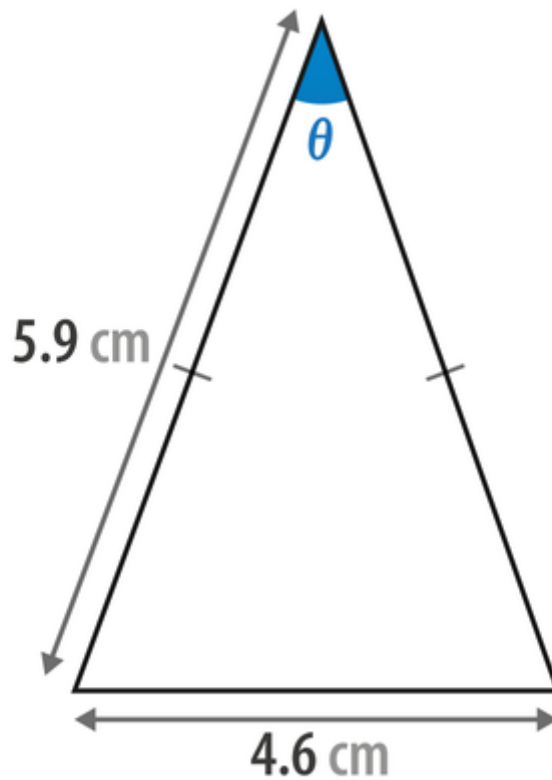
Give your answer in metres to 1 d.p.



Not drawn accurately

Calculate the size of angle θ in the isosceles triangle below.

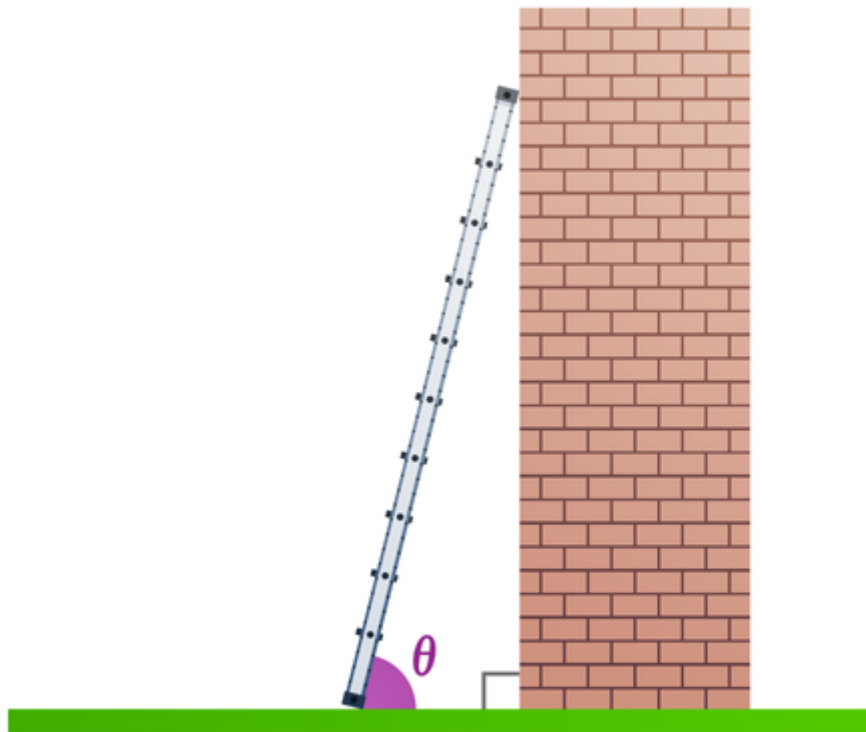
Give your answer in degrees to 1 d.p.



Not drawn accurately

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Calculate the maximum distance that the base of her ladder should be placed from the wall.
Give your answer in metres to 2 d.p.

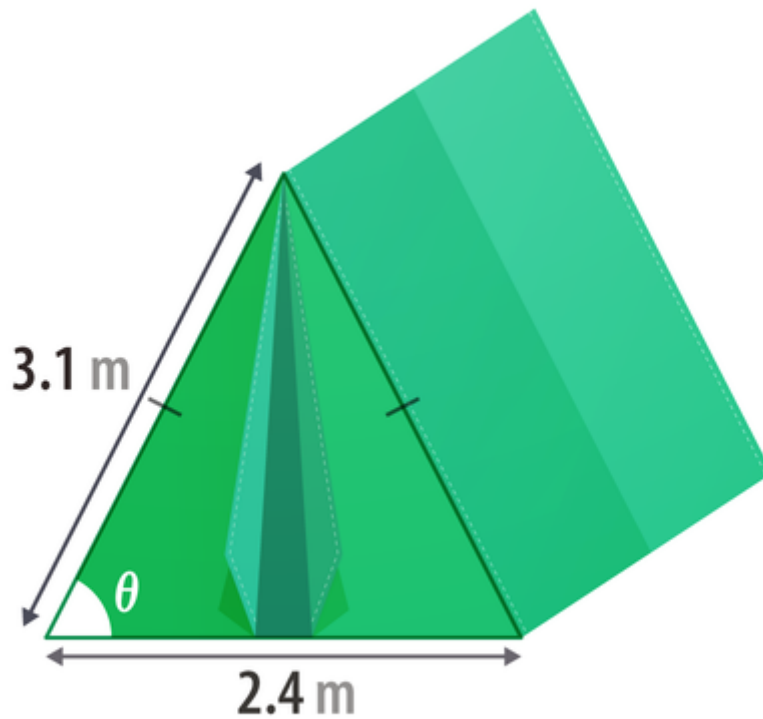


Not drawn accurately

The front of the tent shown in the diagram below is an isosceles triangle.

Calculate the size of angle θ .

Give your answer in degrees to the nearest integer.



Not drawn accurately

Angles of elevation and depression

U967

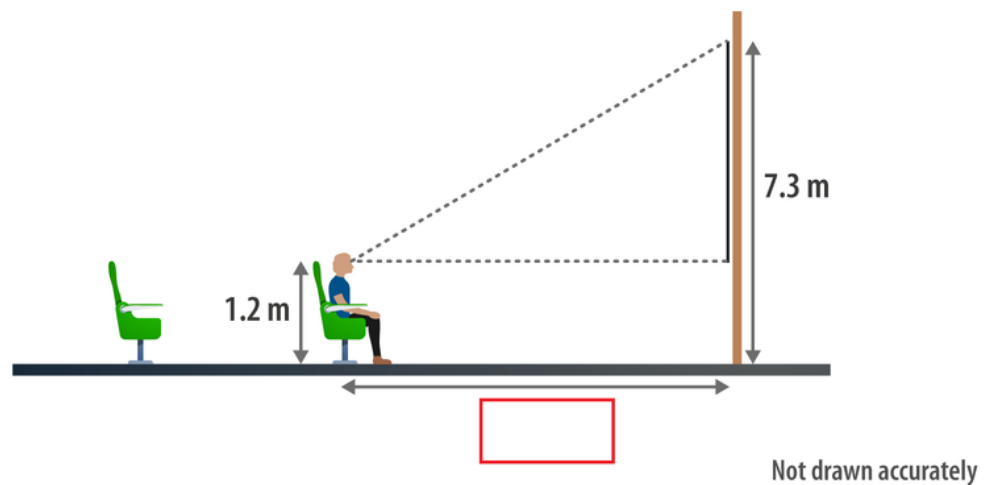
Use the information below to work out the closest distance that a cinema can put seats to the screen.

Give your answer to 1 d.p.

Safety rules say that the angle of elevation from a customer's eyes to the top of the screen must be no more than 31° .

The top of the cinema screen is 7.3 m above the floor.

Customers' eyes are 1.2 m above the floor when they are sat on a seat.



Trigonometry in 3D shapes

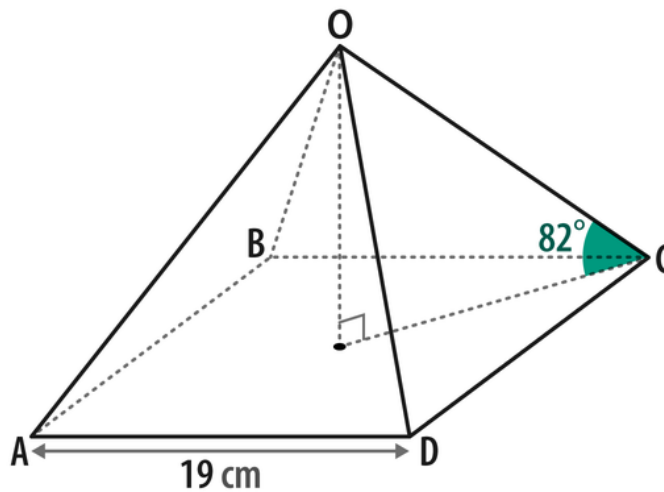
U170

The diagram below shows a square-based pyramid.

Point O is directly above the centre of the base.

- a) Work out the length of AC .
- b) Work out the perpendicular height of the pyramid.

Give each of your answers to 3 s.f.



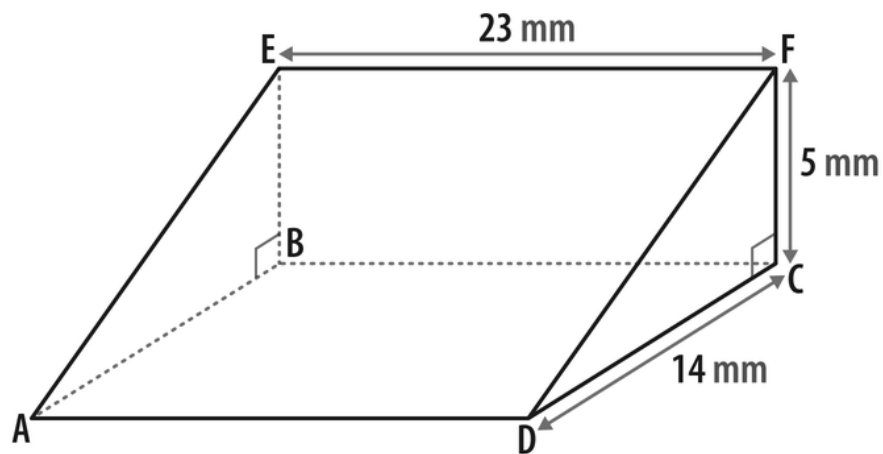
Not drawn accurately

The shape below is a triangular prism.

Work out

- a) the length of AF .
- b) the size of angle CAF .

Give each of your answers to 2 d.p.



Not drawn accurately

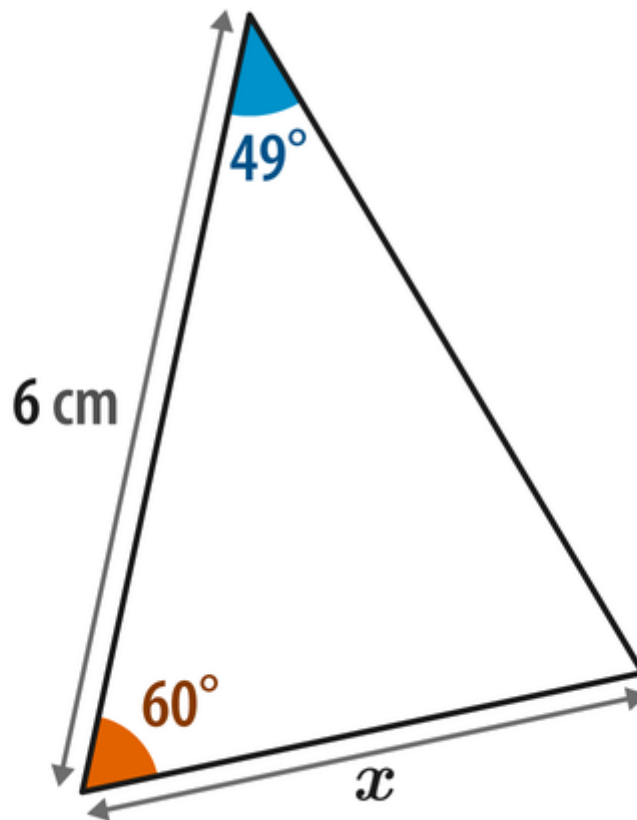
Pythagoras's Theorem and Trigonometry - Sine and Cosine Rules

The sine rule

U952

Calculate the length x .

Give your answer to 2 s.f.

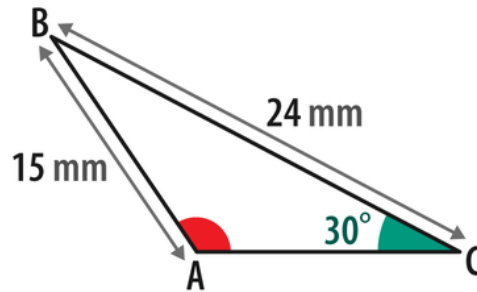
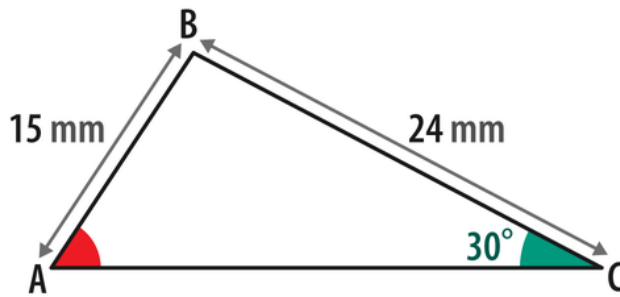


Not drawn accurately

There are two ways to draw a triangle ABC so that angle $BCA = 30^\circ$, $AB = 15$ mm and $BC = 24$ mm.

In one of the drawings below angle BAC is acute, and in the other it is obtuse.

- Show that $\sin(BAC) = \frac{4}{5}$ in both drawings.
- Work out angle BAC in the drawing where it is **acute**.
- Work out angle BAC in the drawing where it is **obtuse**.
Give each angle to 1 d.p.



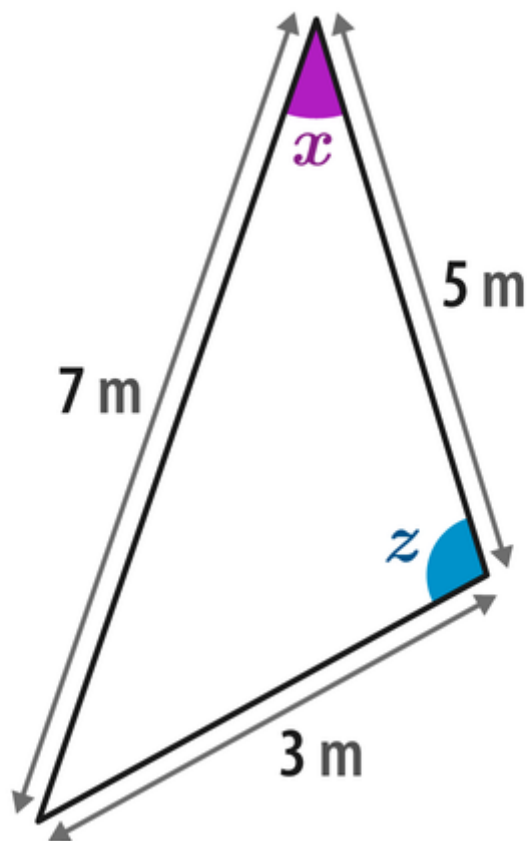
Not drawn accurately

The cosine rule

U591

a) What is the value of $\cos x$?b) What is the value of $\cos z$?

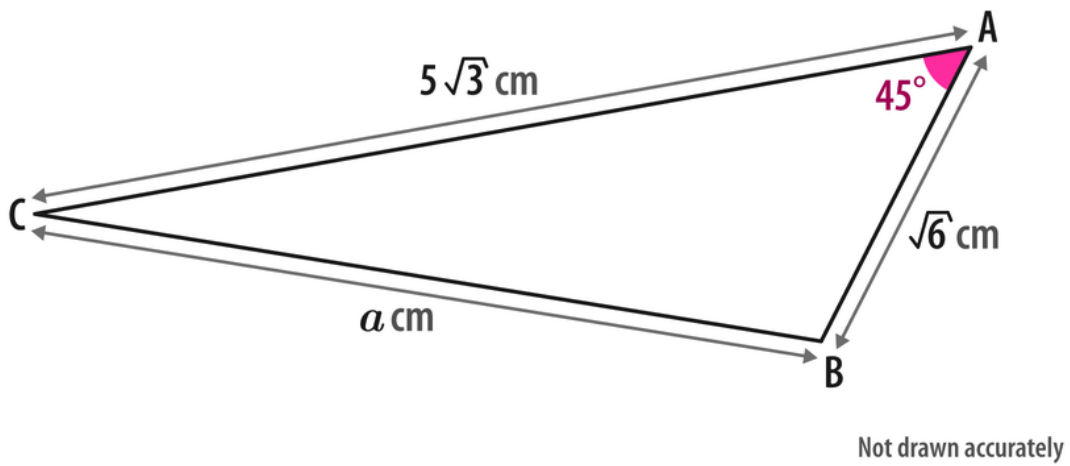
Give your answers as fractions in their simplest forms.



Not drawn accurately

Show that $a = \sqrt{n}$, where n is an integer.

What is the value of n ?



Pythagoras's Theorem and Trigonometry - Trigonometry in 3-D

Trigonometry in 3D shapes

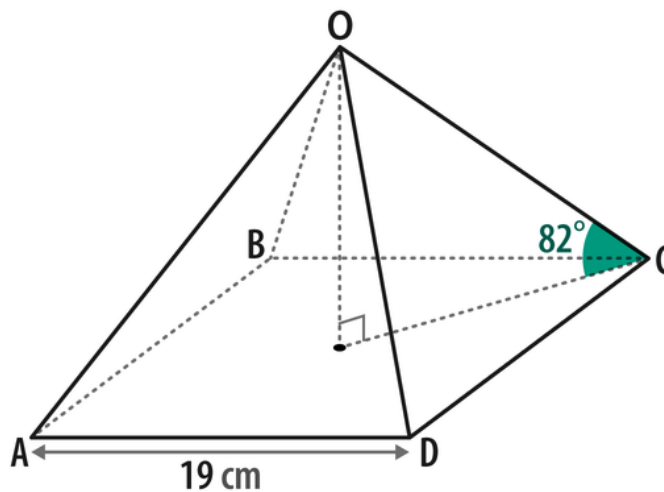
U170

The diagram below shows a square-based pyramid.

Point O is directly above the centre of the base.

- a) Work out the length of AC .
- b) Work out the perpendicular height of the pyramid.

Give each of your answers to 3 s.f.



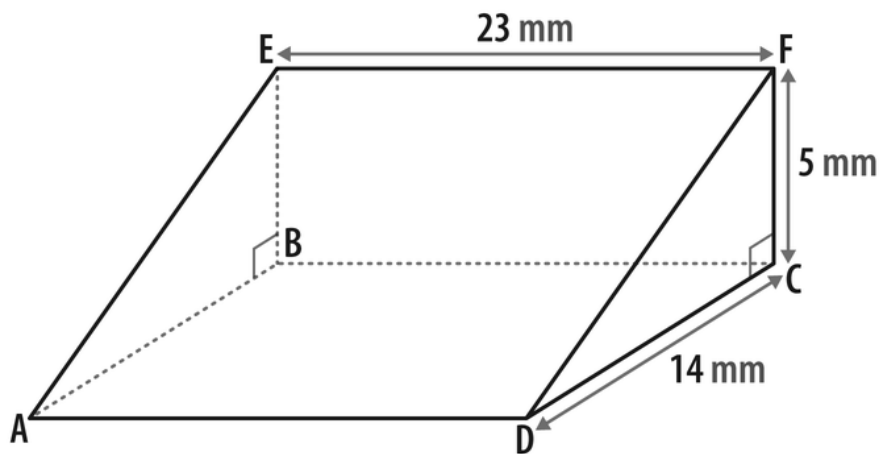
Not drawn accurately

The shape below is a triangular prism.

Work out

- a) the length of AF .
- b) the size of angle CAF .

Give each of your answers to 2 d.p.



Not drawn accurately

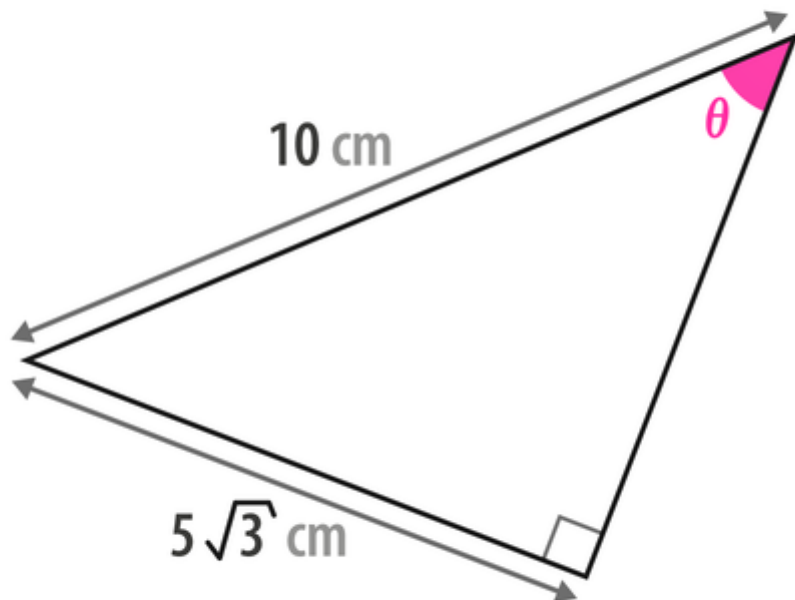
Pythagoras's Theorem and Trigonometry - Exact trigonometric values

Using the exact values of trigonometric ratios

U627

Work out the size of angle θ in the triangle below.

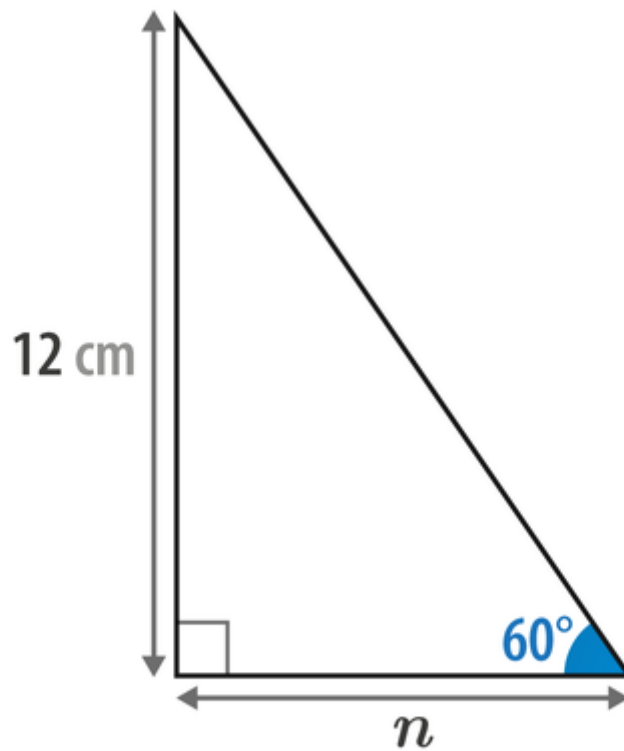
Give your answer in degrees.



Not drawn accurately

Work out the length of side n .

Give your answer in its simplest form, rationalising the denominator if necessary.



Not drawn accurately

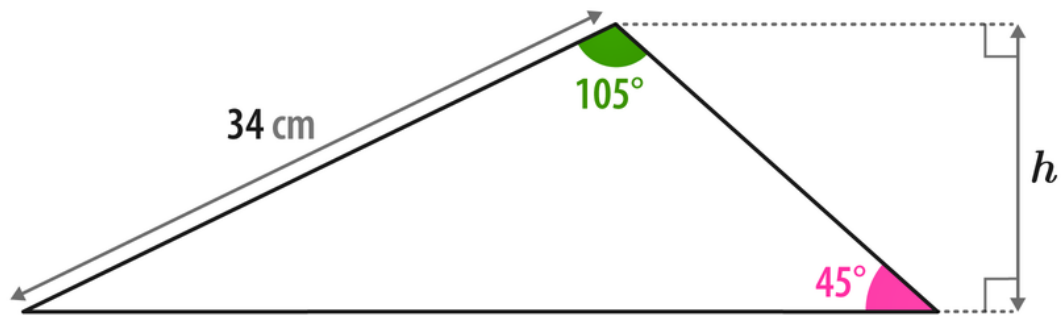
Work out the value of

$$10 \sin(60^\circ) + 12 \tan(30^\circ)$$

Give your answer in its simplest form.

Work out the height, h , of the triangle below.

Give your answer in its simplest form.



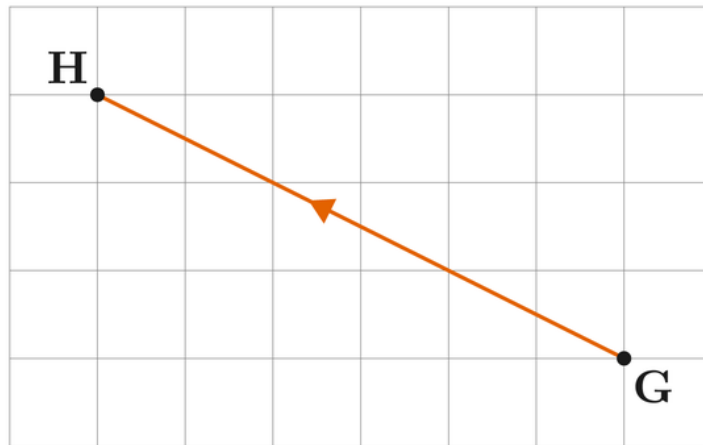
Not drawn accurately

Vectors - Column vectors

Understanding column vectors

U632

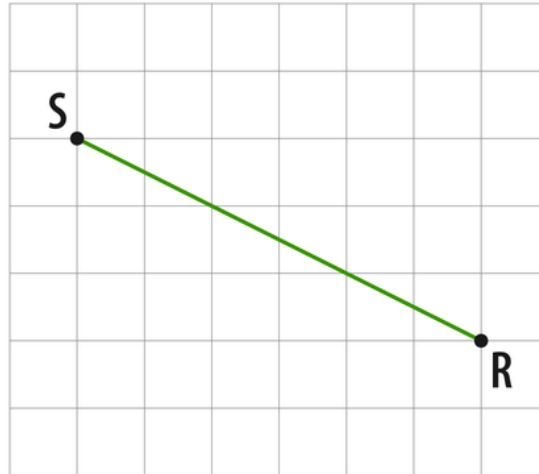
Write \overrightarrow{GH} as a column vector.



a) Write \overrightarrow{RS} as a column vector.

b) Write \overrightarrow{SR} as a column vector.

c) Write a sentence to explain what you notice about your answers.



Multiplying column vectors by a scalar

U564

$$\mathbf{a} = \begin{pmatrix} -9 \\ 7 \end{pmatrix}, \mathbf{b} = \begin{pmatrix} 12 \\ -20 \end{pmatrix} \text{ and } \mathbf{c} = \begin{pmatrix} 0 \\ -16 \end{pmatrix}$$

$$\text{Calculate } 3\mathbf{a} - \frac{1}{4}(\mathbf{c} - \mathbf{b})$$

Give your answer as a column vector.

$$\mathbf{a} = \begin{pmatrix} 2 \\ -9 \end{pmatrix} \text{ and } \mathbf{b} = \begin{pmatrix} 6 \\ y \end{pmatrix}$$

\mathbf{a} and \mathbf{b} are parallel vectors.

Work out the value of y .

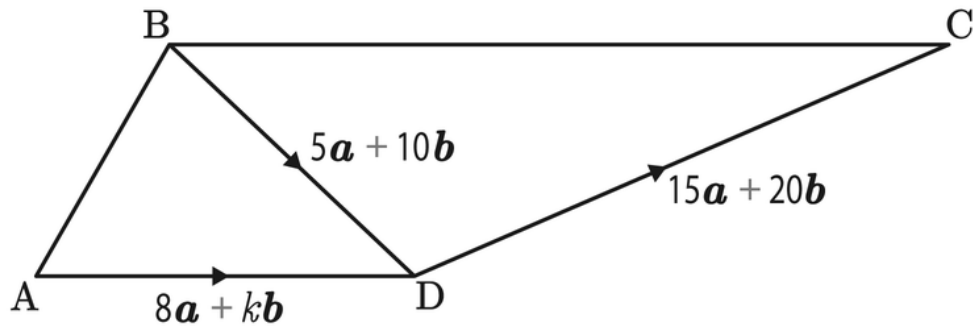
Solving geometric problems using vectors

U781

ABCD is a trapezium, where AD is parallel to BC.

$$\overrightarrow{AD} = 8\mathbf{a} + k\mathbf{b} \quad \overrightarrow{BD} = 5\mathbf{a} + 10\mathbf{b} \quad \overrightarrow{DC} = 15\mathbf{a} + 20\mathbf{b}$$

Given that k is a scalar quantity, work out the value of k .



Not drawn accurately

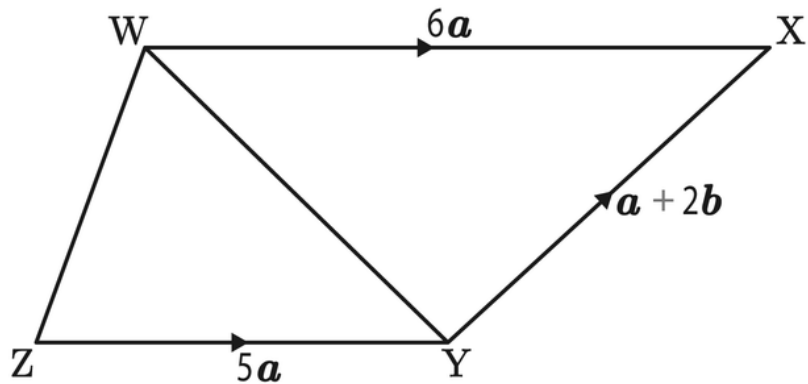
WXYZ is a trapezium.

$$\overrightarrow{ZY} = 5\mathbf{a} \quad \overrightarrow{YX} = \mathbf{a} + 2\mathbf{b} \quad \overrightarrow{WX} = 6\mathbf{a}$$

P is a point on YW such that $\overrightarrow{YP} = \frac{1}{5} \overrightarrow{YW}$.

Express \overrightarrow{ZP} in terms of \mathbf{a} and \mathbf{b} .

Fully simplify your answer, giving any values as integers or fractions.



Not drawn accurately

Vectors - Vector geometry

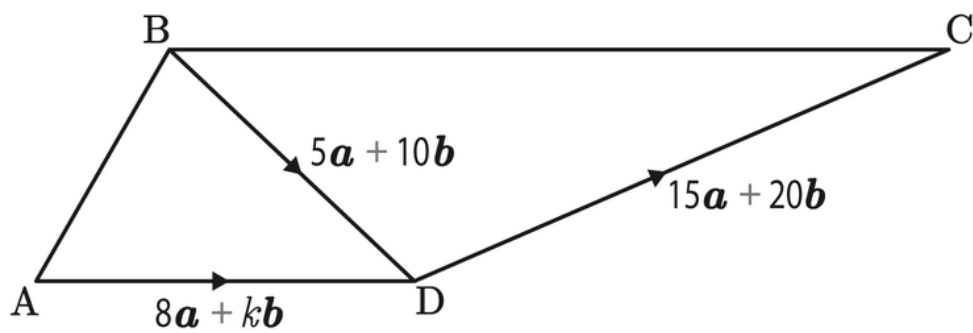
Solving geometric problems using vectors

U781

ABCD is a trapezium, where AD is parallel to BC.

$$\overrightarrow{AD} = 8\mathbf{a} + k\mathbf{b} \quad \overrightarrow{BD} = 5\mathbf{a} + 10\mathbf{b} \quad \overrightarrow{DC} = 15\mathbf{a} + 20\mathbf{b}$$

Given that k is a scalar quantity, work out the value of k .



Not drawn accurately

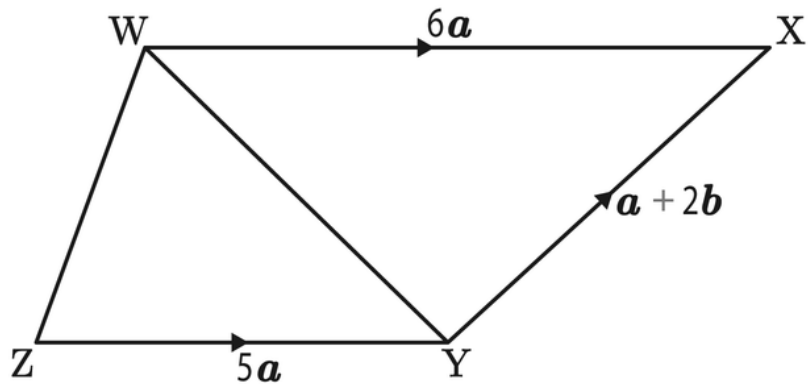
WXYZ is a trapezium.

$$\overrightarrow{ZY} = 5\mathbf{a} \quad \overrightarrow{YX} = \mathbf{a} + 2\mathbf{b} \quad \overrightarrow{WX} = 6\mathbf{a}$$

P is a point on YW such that $\overrightarrow{YP} = \frac{1}{5} \overrightarrow{YW}$.

Express \overrightarrow{ZP} in terms of \mathbf{a} and \mathbf{b} .

Fully simplify your answer, giving any values as integers or fractions.



Not drawn accurately

ABC is a triangle.

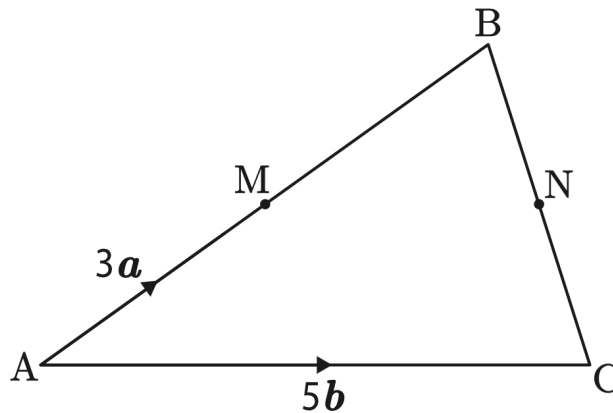
M is the midpoint of AB and N is the midpoint of BC .

$$\overrightarrow{AM} = 3\mathbf{a}$$

$$\overrightarrow{AC} = 5\mathbf{b}$$

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

b) Prove that MN is parallel to AC . Hence, calculate how many times longer AC is than MN .



Not drawn accurately

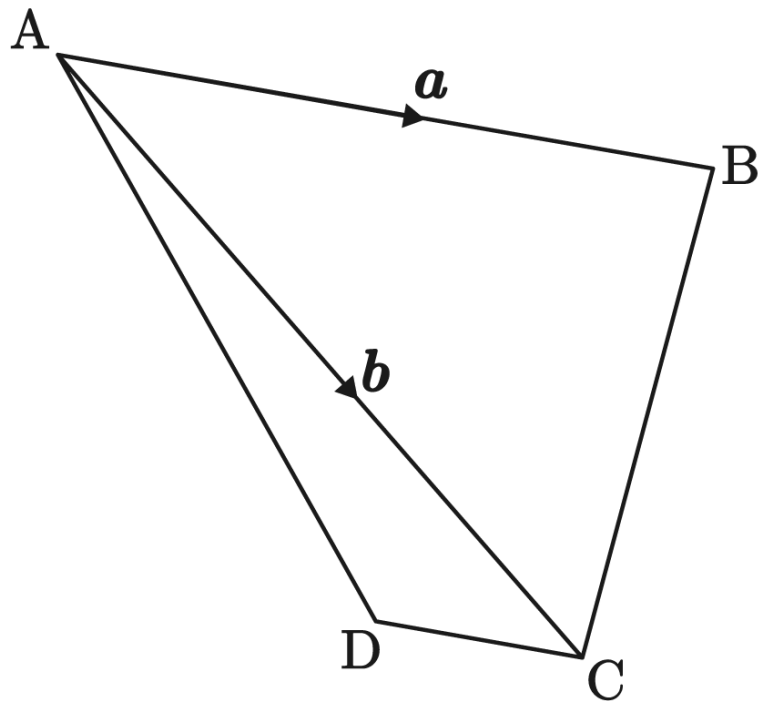
$ABCD$ is a trapezium.

P is a point along AC such that $AP = 5PC$.

$$DC = \frac{1}{5}AB.$$

- a) Express \overrightarrow{PB} in terms of \mathbf{a} and \mathbf{b} in its simplest form.
b) Express \overrightarrow{DP} in terms of \mathbf{a} and \mathbf{b} in its simplest form.

c) Does DPB form a straight line? Write a sentence to explain your answer.



Not drawn accurately