ANGLE FACTS INCLUDING ON PARALLEL LINES

Geometry and Measures

Key Concepts

Angles in a **triangle equal 180º**.

Angles in a **quadrilateral equal 360º**.

Vertically opposite angles are equal in size.

Angles on a **straight line equal 180º**.

Base angles in an isosceles triangle are equal.

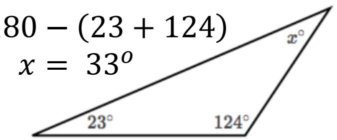
Alternate angles are equal in size.

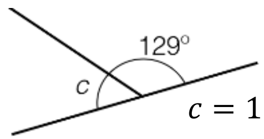
Corresponding angles are equal in size.

Allied/co-interior angles are equal 180º.

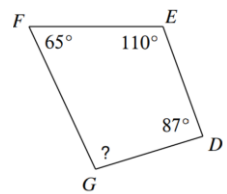
Examples

$x = 180 - (23 + 124)$
$x = 33^o$

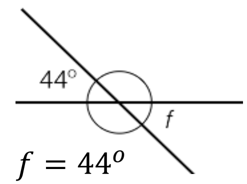




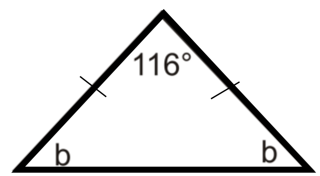
$c = 180 - 129$
$x = 51^o$



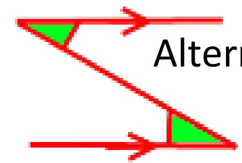
$? = 360 - (65 + 110 + 87)$
$? = 98^o$



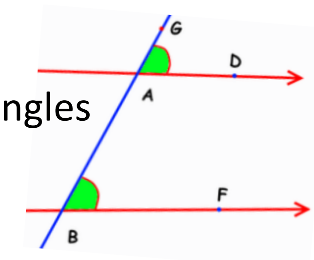
$f = 44^o$



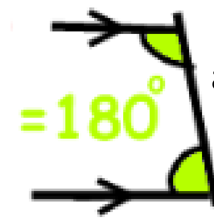
$b = (180 - 116) \div 2$
$b = 32^o$



Alternate angles are equal



Corresponding angles are equal



Allied/co-interior angles equal 180º

MathsWatch

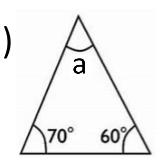
45, 121, 122, 123

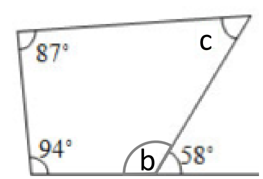
Key Words

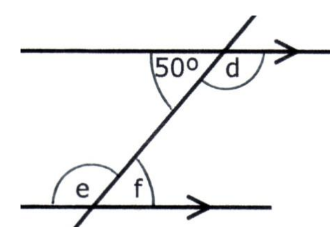
Angle
Vertically opposite
Straight line
Alternate
Corresponding
Allied
Co-interior

Questions

Calculate the missing angle:

a) 

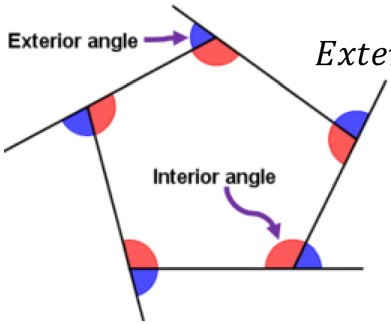
b) 

c) 

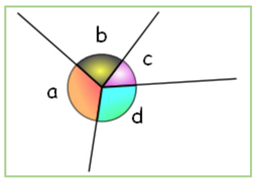
ANSWERS: 1) a=50º 2) b=122º c=57º 3) d=130º e=130º f=50º

ANGLE PROPERTIES
Geometry and Measures

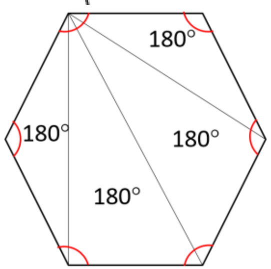
Key Concepts



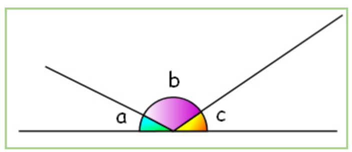
$$Exterior = \frac{360}{no.\ of\ sides}$$



Angles at a point add to 360°



$$Sum\ of\ interior = 180° \times 4 = 720°$$



Angles on a line add to 180°

Key Words

Angle: This is formed by two lines joined by a common endpoint.

Quadrilateral: 4 sided shape.

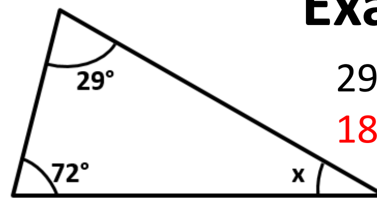
Polygon: Many sided shape.

Regular polygon: All sides and angles are equal.

Interior angle: The angle inside a polygon.

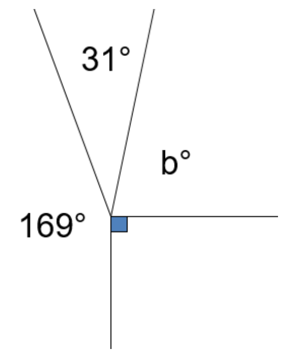
Exterior angle: The angle formed when a side length of a polygon is continued.

Examples



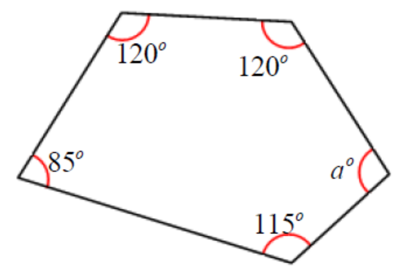
29° + 72° = 101°

180° – 101° = 79°



169° + 31°+ 90° = 290°

360° – 290° = 70°



120° + 120°+ 85° + 115° = 440°

540° – 440° = 100°

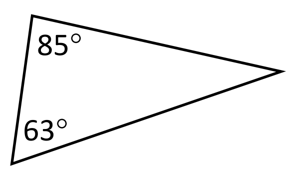
45, 121, 122,

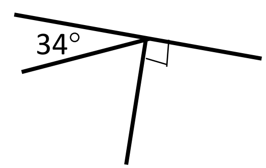
Tip

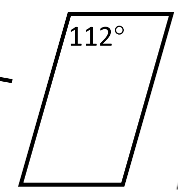
Remember isosceles triangles have two equal angles and equilateral triangles have three equal angles.

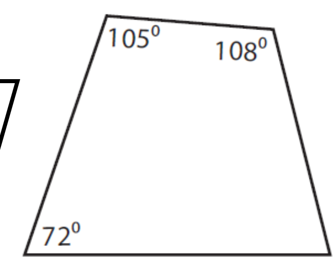
Questions

1) Find the missing angles:









ANSWERS: 1) 32° 2) 56° 3) 68°, 112°, 68° 4) 75°

AREA AND PERIMETER OF BASIC SHAPES
Geometry and Measures

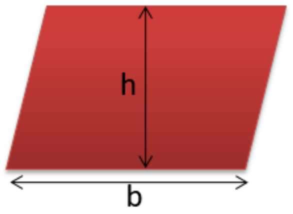
Key Concepts

The **area** of a 2D shape is the space inside it. It is measured in units squared e.g. cm^2

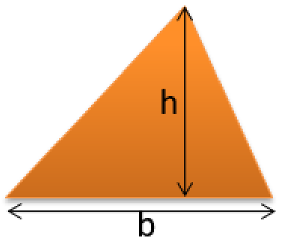
The **perimeter** of a shape is the distance around the edge of the shape. Units of length are used to measure perimeter e.g. mm, cm, m

A **compound shape** is a shape made up of others joined together.

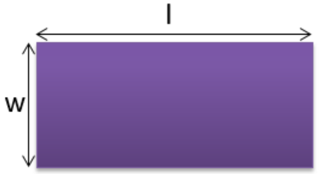
Examples



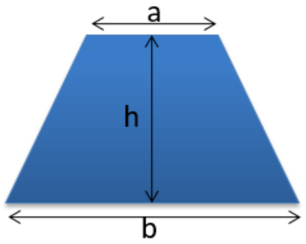
A = b × h



$A = \frac{b \times h}{2}$

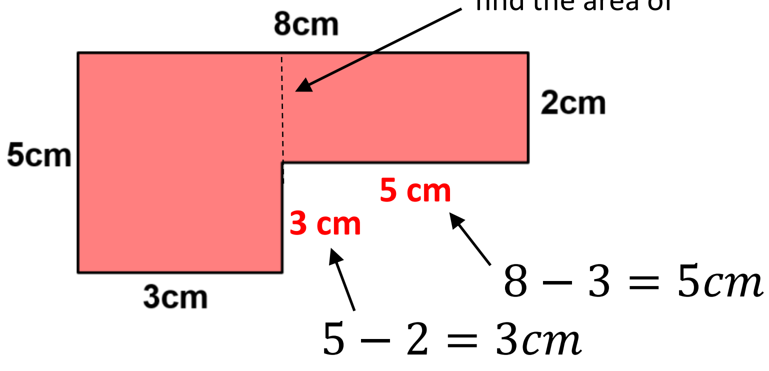


A = l × w



$A = \frac{(a + b) \times h}{2}$

Split the shape into shapes that you can find the area of



$$Area = (5 \times 3) + (2 \times 5) = 25cm^2$$

$$Perimeter = 3 + 5 + 8 + 2 + 5 + 3 = 26cm$$

MathsWatch

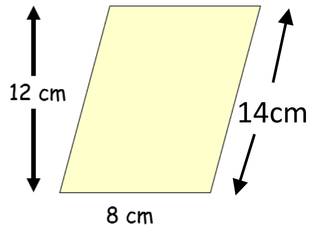
53, 54, 55, 56, 117

Key words

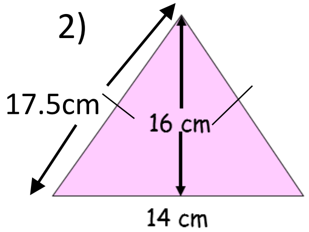
Area
Perimeter
Base
Height
Width
Length

Calculate the area and perimeter of each shape:

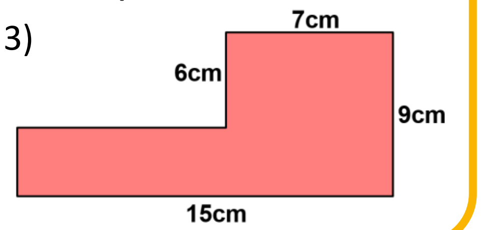
1)



2)



3)



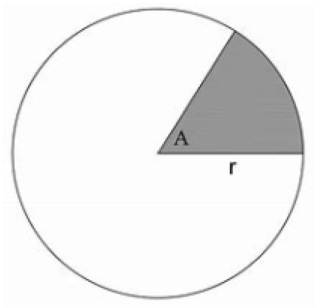
ANSWERS: 1) A = 96 cm^2 P = 44cm 2) A = 112 cm^2 P = 49cm 3) A = 87 cm^2 P = 48cm

AREA OF CIRCLES AND PART CIRCLES
Geometry and measures

Key Concepts

The **area** of a circle is calculated by πr^2

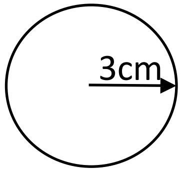
The **area of a sector** is calculated by $\frac{\theta}{360}\pi r^2$



Examples

Calculate:

a) **Area**



A = $\pi \times 3^2$
= 9π
or = 28.3cm²

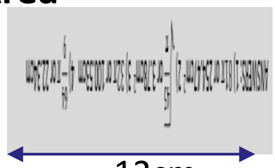
b) **Radius** when the area is 20cm²

A = $\pi \times r^2$
20 = $\pi \times r^2$
$\frac{20}{\pi} = r^2$

$\sqrt{\frac{20}{\pi}} = r$

Or $2.52cm$

c) **Area**



$P = \frac{\pi \times r^2}{2}$

$P = \frac{\pi \times 6^2}{2}$

$P = 18\pi$

Or = 56.55cm²

d) **Area of a sector**

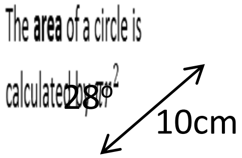
$\text{Arc} = \frac{\theta}{360} \times \pi \times r^2$

$\text{Arc} = \frac{28}{360} \times \pi \times 10^2$

$\text{Arc} = \frac{28}{360} \times \pi \times 100$

$\text{Arc} = \frac{70}{9}\pi$

Or = 24.43cm

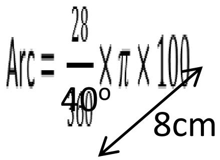


MathsWatch

116, 117, 118, 167

Key Words
Circle
Area
Radius
Diameter
Pi
Sector

Calculate:
1) The area of a circle with a radius of 9cm
2) The radius of a circle with an area of 45cm²
3) The area of a semicircle with diameter of 16cm
4) The area of the sector in the diagram



ANSWERS: 1) 81π or 254.47cm² 2) $\sqrt{\frac{45}{\pi}}$ or 3.78cm² 3) 32π or 100.53cm 4) $\frac{64}{9}\pi$ or 22.34cm

BEARINGS
Geometry and Measures

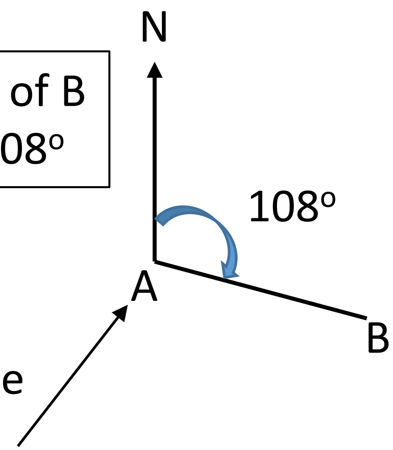
Key Concepts

Bearings are a type of angle that are used in real life directional instructions. They have **three rules** that they must conform to:

1) They must always be **measured from North**.
2) They must always be measured in a **clockwise direction**.
3) They must always have **3 figures** e.g. 72° is written as 072°

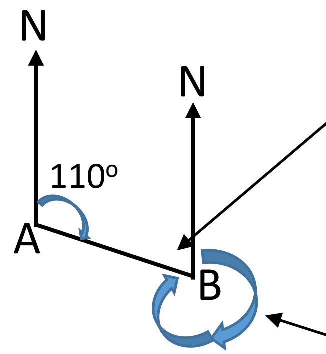
Examples

The bearing of B **from** A is 108°



Where we start measuring from using our **protractor**

We don't always need a protractor to find bearings, we can use our angle facts knowledge.



Because we know co-interior angles sum to 180°, this angle must be 70°.

The angle we are finding is the clockwise angle from B. We know angles around a point sum to 360°.

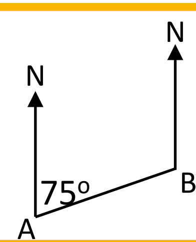
The bearing of A **from** B is 290°

MathsWatch

124

Key Words

Bearing
Clockwise
North
Angle
Protractor



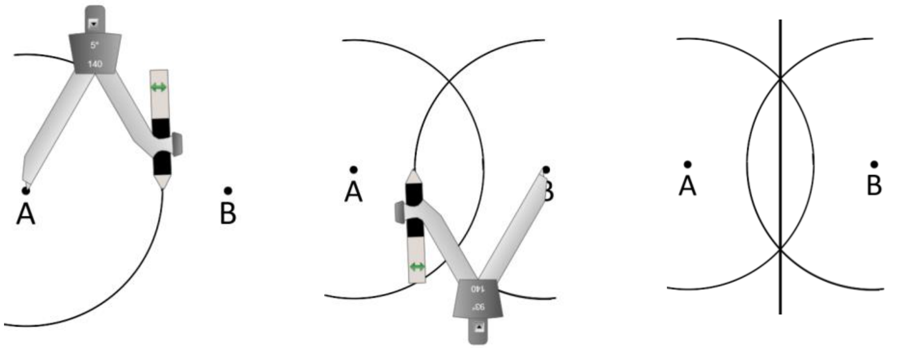
The bearing of B **from** A is 075°.
Calculate the bearing of A **from** B.

ANSWERS 255°

CONSTRUCTIONS
Geometry and Measures

Examples

Bisect the distance between two points.

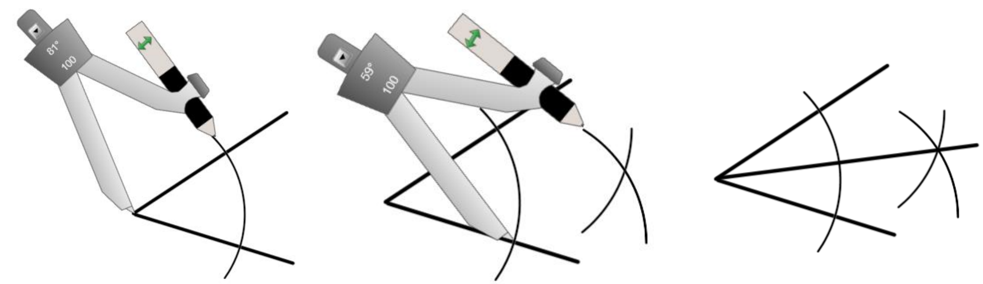


1) Open your compasses past halfway between the two points and draw an arc.

2) Keep your compasses at the same width and repeat from the other point.

3) Draw a line joining the two points where the arcs cross

Bisect an angle.



1) Open your compasses and draw an arc over both lines from the angle

2) Keep your compasses at the same width and draw two further arcs with the point of your compasses at the intersections.

3) Draw a line joining the two points where the arcs cross and the angle point

MathsWatch

47, 145a, 145b, 145c, 147

Key Words

Compass
Bisect
Angle
Arc

Try and recreate the above two constructions on paper using a pair of compasses and a pencil and ruler.

ANSWERS

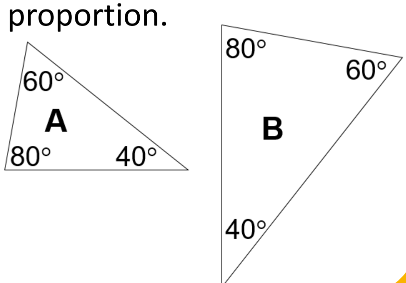
ENLARGEMENT, SIMILARITY & CONGRUENCE
Geometry and Measures

Key Concept

Properties of similar shapes:

- The corresponding angles will be the same if shapes are similar.

- Corresponding edges must remain in proportion.



MathsWatch

144, 148, 201, 181a, 181b, 12b

Key Words

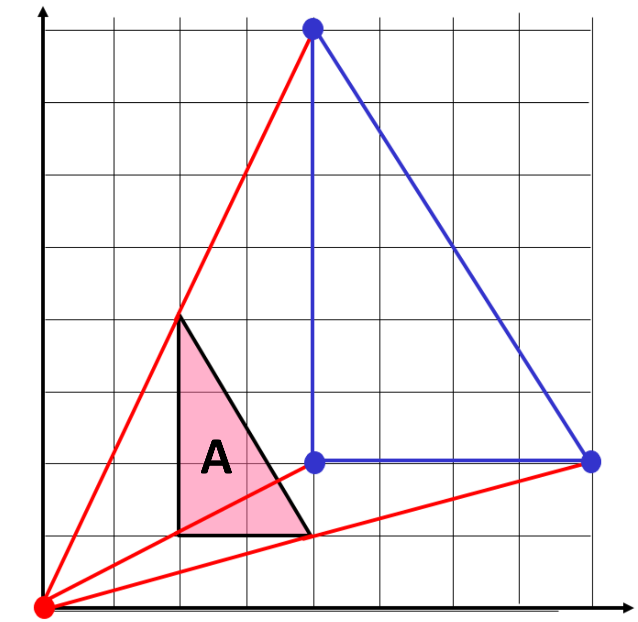
Transformation: This means something about the shape has 'changed'.
Reflection: A shape has been flipped.
Rotation: A shape has been turned.
Translation: A movement of a shape.
Enlargement: A change in size, either bigger or smaller.
Congruent: These shapes are the same shape and same size but can be in any orientation.
Similar: Two shapes are mathematically similar if one is an enlargement of the other.

Tip

To find the centre of enlargement connect the corresponding vertices.

Examples

Enlarge shape A, scale factor 2, centre (0, 0).



Scale factor 2 - Double the distance between each vertex and the centre of enlargement.

Questions

1) A triangle has lengths 3cm, 4cm and 5cm. What will they be if enlarged scale factor 3.
2) Rectangle A measures 3cm by 5cm, B measures 15cm by 25cm. What is the scale factor of enlargement?

ANSWERS: 1) 9cm, 12cm and 15cm 2) 5.

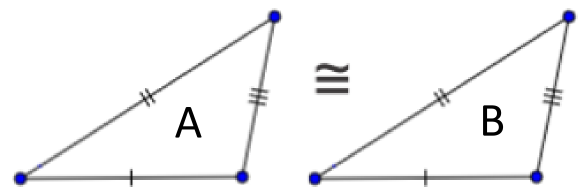
FOUR RULES OF CONGRUENCE
Geometry and Measures

Key Concepts

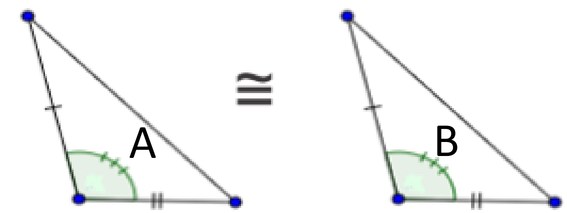
Congruent triangles are triangles that have the **same size and shape**. This means that the corresponding sides are equal and the corresponding angles are equal.

There are four rules of congruency that prove whether a triangle is congruent or not.

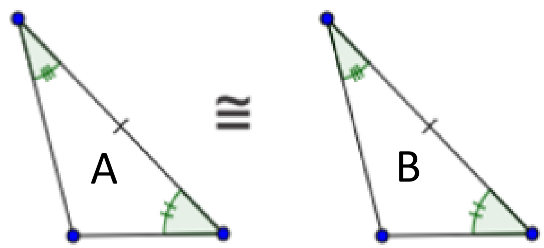
Examples



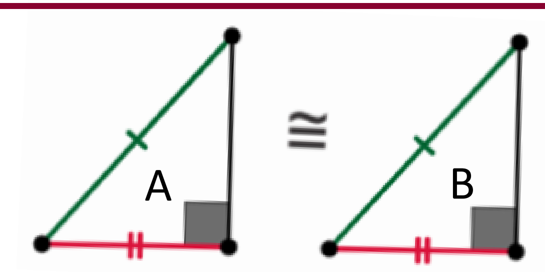
SSS = 3 sides on triangle A are equal to those on triangle B



SAS = 2 sides with the included angle on triangle A are equal to those on triangle B



ASA = 2 angles with the included side on triangle A are equal to those on triangle B



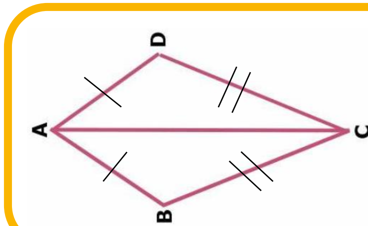
RHS = When the hypotenuse and another side on right angled triangle A are equal to those on triangle B

MathsWatch

12b, 166

Key Words

Congruent
Angle
Side



Prove that triangle ACD and ABC are congruent to one another.

ANSWERS AD = AB, CD = BC, AC is common to both triangles, therefore they are congruent proved by the SSS rule.

KINEMATIC FORMULAE AND CONVERSION OF UNITS
Geometry and Measures

Key Concepts

a *is constant acceleration*
u *is initial velocity*
v *is final velocity*
s *is displacement from the position when the time* $= 0$

$$v = u + at$$

Velocity is speed in a given direction.

$$s = ut + \frac{1}{2}at^2$$

Initial velocity is speed in a given direction at the start of the motion.

$$v^2 = u^2 + 2as$$

Acceleration is the rate of change of velocity i.e. how the speed changes with time

Examples

Write $90km/h$ in m/s.

$90km/h$
↓ × 1000
$90000m/h$
↓ ÷ 60
$1500m/min$
↓ ÷ 60
$25m/sec$

Write $72mph$ in m/s.

$72mph$
↓ × 1.6
$115.2km/h$
↓ × 1000
$115200m/h$
↓ ÷ 60
$1920m/min$
↓ ÷ 60
$32m/sec$

MathsWatch

112, 142

Key Words
Acceleration
Velocity
Speed
Time
Units

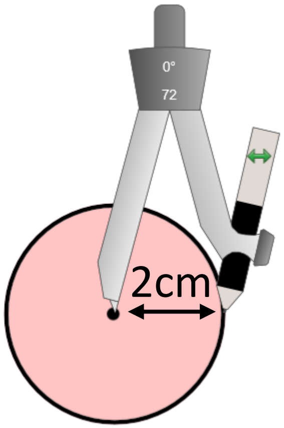
1) Use 5 $miles$ = 8 km to write $60mph$ in km/h
2) Write $60km/h$ in m/s
3) Write $6m/s$ in mph

ANSWERS 1) 96 km/h 2) 16.7m/s 3) 13.5 mph

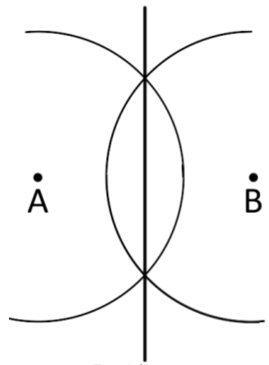
LOCI
Geometry and Measures

Examples

Shading a **region** within 2cm from a **given point**.

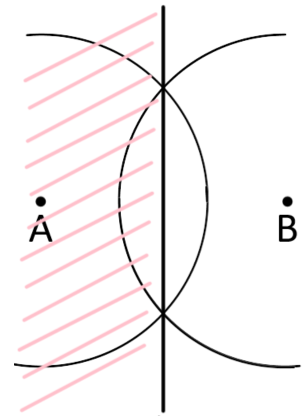


Find where a point can be **equidistant** from two others.



Use your skills from constructions and complete the **perpendicular bisector**.

Shading a **region** which is **closer to point A than point B**.



Use your skills from constructions and complete the **perpendicular bisector**. Then shade in the side of the line closer to the given point.

MathsWatch

146

Key Words

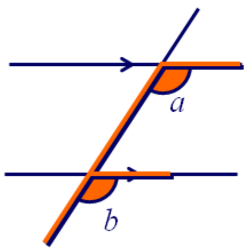
Compass
Bisect
Shade
Region
Equidistant

Try and recreate the above two loci and constructions on paper using a pair of compasses and a pencil and ruler.

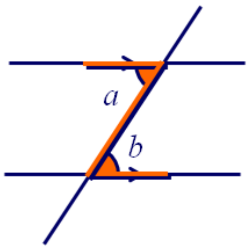
ANSWERS

PARALLEL LINES AND ANGLES
Geometry and Measures

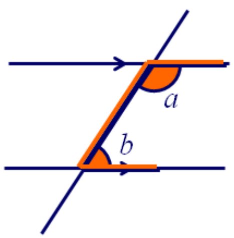
Key Concepts



Corresponding angles are equal.



Alternate angles are equal.



Co-interior angles add to 180°.

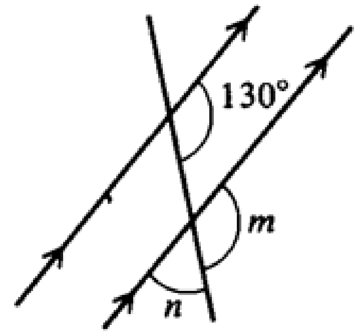
Key Words

Intersect: Two lines which cross.

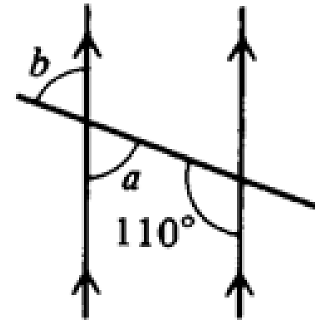
Parallel: Two lines which never intersect. Marked by an arrow on each line.

Transversal: A line which intersects two parallel lines.

Examples



m = 130° as corresponding angles are equal.
n = 50° as angles on a line add to 180°



a = 70° as co-interior angles add to 180°
b = 70° as vertically opposite angles are equal

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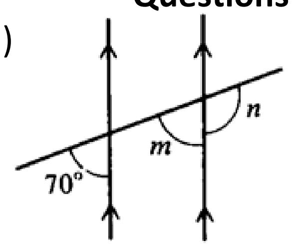
120

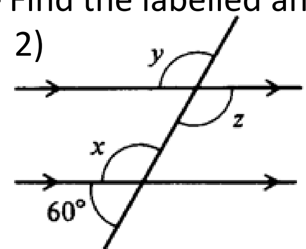
Tip
These angle properties can be used alongside all the other angle properties that you have learnt.

Questions – Find the labelled angles, give reasons.

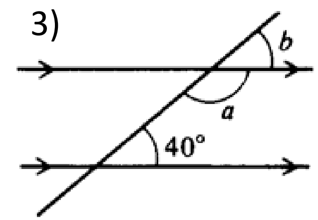
1)



2)



3)

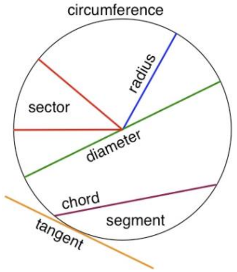


ANSWERS: 1) m = 70°, n = 110° 2) x = 120°, y = 120°, z = 120° 3) a = 140°, b = 40°

PERIMETER AND CIRCUMFERENCE
Geometry and Measures

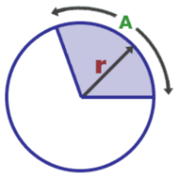
Key Concepts

Parts of a circle



Circumference of a circle is calculated by πd and is the distance around the circle.

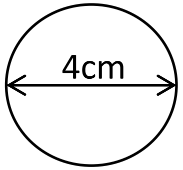
Arc length of a sector is calculated by $\frac{\theta}{360}\pi d$.



Examples

Calculate:

a) **Circumference**



C = $\pi \times 4$

= 4π

or = 12.57cm

b) **Diameter** when the circumference is 20cm

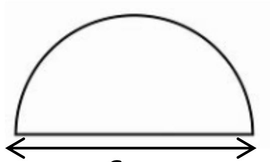
C = $\pi \times d$

20 = $\pi \times d$

$\frac{20}{\pi} = d$

Or $6.37cm$

c) **Perimeter**



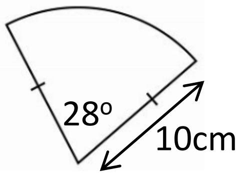
$P = \frac{\pi \times d}{2} + d$

$P = \frac{\pi \times 6}{2} + 6$

$P = 3\pi + 6$

Or = 15.42cm

d) **Arc length**



Arc $= \frac{\theta}{360} \times \pi \times d$

Arc $= \frac{28}{360} \times \pi \times 2 \times 10$

Arc $= \frac{28}{360} \times \pi \times 20$

Arc $= \frac{14}{9}\pi$

Or = 4.89cm

MathsWatch

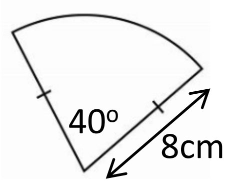
116, 117, 118, 167

Key Words

Circle
Perimeter
Circumference
Radius
Diameter
Pi
Arc

Calculate:

1) The circumference of a circle with a diameter of 12cm
2) The diameter of a circle with a circumference of 30cm
3) The perimeter of a semicircle with diameter 15cm
4) The arc length of the diagram

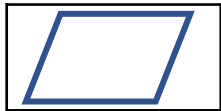
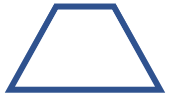
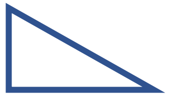
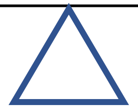


ANSWERS: 1) 12π or 37.7cm 2) $\frac{30}{\pi}$ or 9.54cm 3) 38.56cm 4) $\frac{16}{9}\pi$ or 5.59cm

PERIMETER
Geometry and Measures

Key Concept

2D Shapes

	Parallelogram
	Trapezium
	Right-angled triangle
	Isosceles triangle
	Equilateral triangle

MathsWatch

10, 52, 118

Key Words

Perimeter: The distance around the outside of the shape.
Unit of measure: This could be any unit of length cm, inch, m, foot, etc.
Dimensions: The lengths which give the size of the shape.
Circumference: The perimeter of a full circle.

Tip

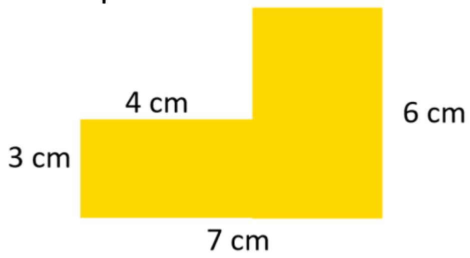
- Always include units with your answer.
- If you don't have a calculator use pi as 3.14.

Formula

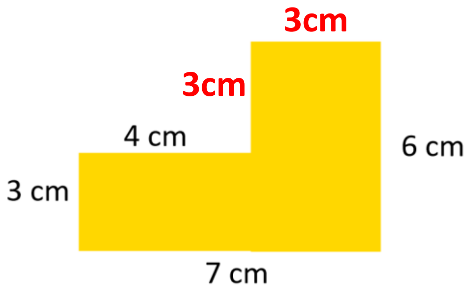
$Circumference = \pi d$

Examples

Find the perimeter



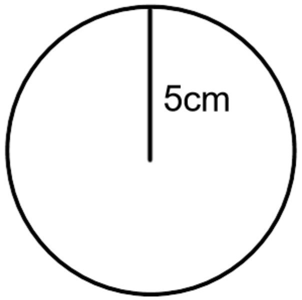
Step 1 – Find the missing lengths.



Step 2 – Add the lengths

3 + 4 + 3 + 3 + 6 + 7 = **26 cm**

Find the circumference to 1dp



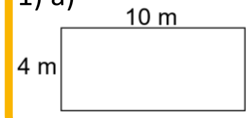
Radius = 5,   Diameter = 10

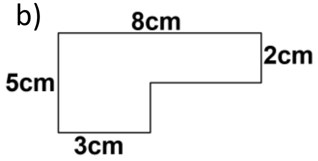
$Circumference = \pi \times d$

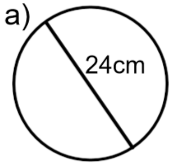
$Circumference = \pi \times 10$

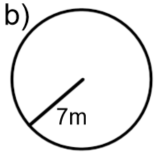
$Circumference = 31.4\ cm$

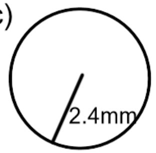
Questions – Find the perimeter of each shape to 1dp

1) a) 

b) 

2) a) 

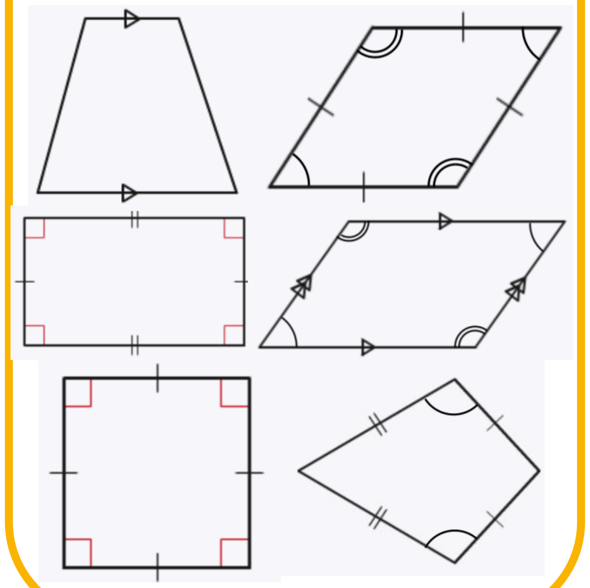
b) 

c) 

ANSWERS: 1) a) 28 m   b) 26 cm   2) a) 75.4 cm   b) 44.0 m   c) 15.1 mm

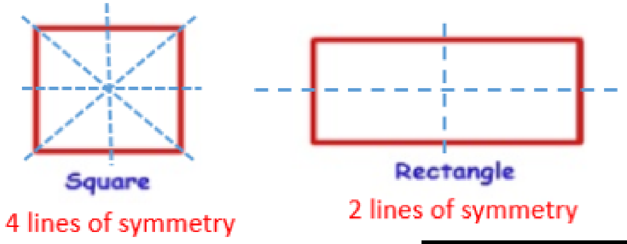
PROPERTIES OF SHAPES
Geometry and Measures

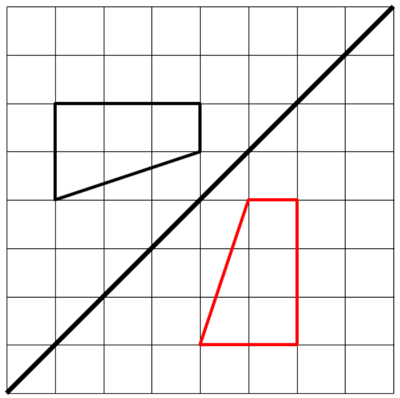
Key Concept
Quadrilaterals



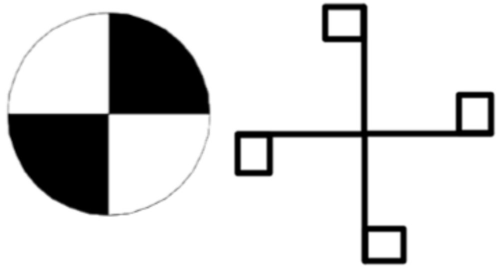
Key Words
Angle: This is formed by two lines, joined by a common endpoint.
Symmetry: A shape has symmetry if there is a line which forms two equal parts which are a mirror image of each other.
Reflection: This is where a shape is flipped.
Rotation: This is where a shape is turned.

Examples
Lines of symmetry and reflection





Rotational Symmetry



Order = 2 Order = 4

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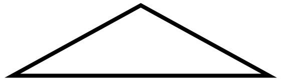
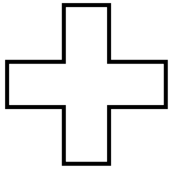
9, 11, 48

Tip
- The smallest the order of rotational symmetry can be, is 1.
- To see if a line of symmetry works fold along the line and see if the both halves lie exactly on top of each other.

Questions - For the shapes below draw on their lines of symmetry and state their order of rotational symmetry.

1) 

2) 

3) 

ANSWERS: 1) 2 lines of symmetry, order = 2 2) 1 line of symmetry, order = 1 3) 4 lines of symmetry, order = 4.

PROPERTIES OF SHAPES
Geometry and Measures

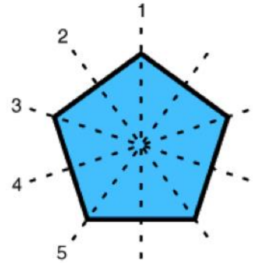
Key Concepts

Lines of symmetry
The number of lines that cut an image in half such that each half of the figure is the mirror image of the other half.

Order of rotation
The number of times a figure fits into itself in one complete rotation of 360 degrees.

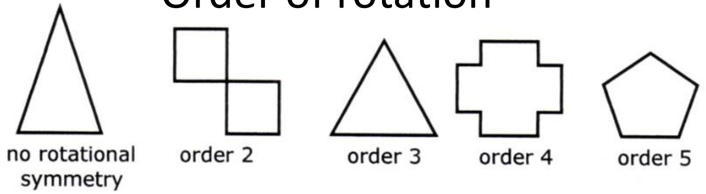
Congruent shapes
Images that are identical to one another. They can be flipped or rotated, not enlarged.

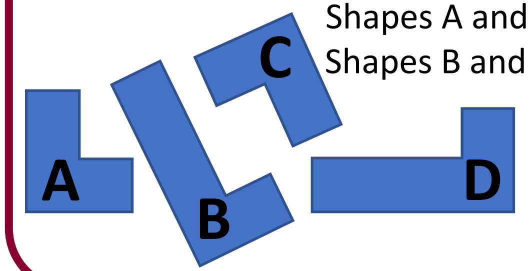
Examples



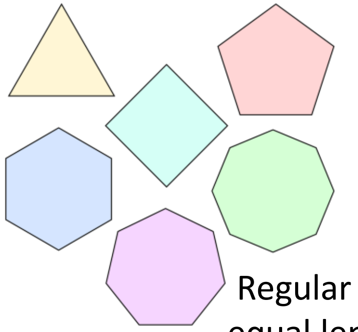
This regular polygon has 5 lines of symmetry

Order of rotation





Shapes A and C are congruent.
Shapes B and D are congruent.



Regular shapes have equal lengths of sides and equal angles.

MathsWatch

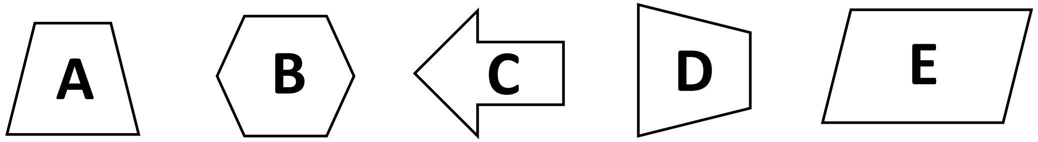
11, 12b

Key Words

Rotation
Symmetry
Congruent
Regular
Irregular

Questions

1) How many lines of symmetry does shape B have?
2) What is the order of rotation of shape E?
3) Which shape is congruent to shape A?
4) Which shape is regular?



ANSWERS: 1) 6 2) 2 3) D 4) B, regular hexagon

PYTHAGORAS AND TRIGONOMETRY
Geometry and Measures

Key Concepts

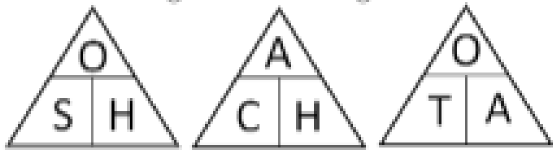
Pythagoras' theorem and basic trigonometry both work with **right angled triangles.**

Pythagoras' Theorem – used to find a missing length when two sides are known

$$a^2 + b^2 = c^2$$

c is always the hypotenuse (the longest side)

Basic trigonometry SOHCAHTOA – used to find a missing side or an angle

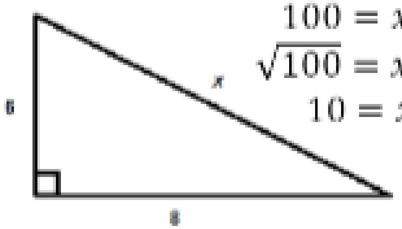


When finding the missing angle we must press **SHIFT** on our calculators first.

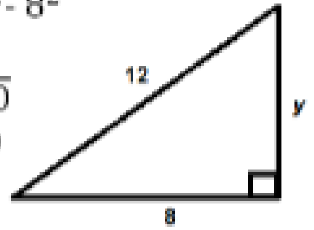
Examples

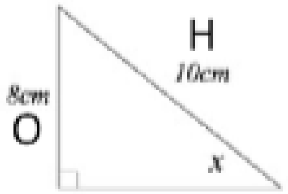
Pythagoras' Theorem

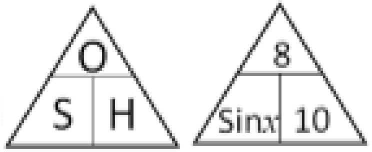
$$a^2 + b^2 = c^2$$
$$6^2 + 8^2 = x^2$$
$$100 = x^2$$
$$\sqrt{100} = x$$
$$10 = x$$



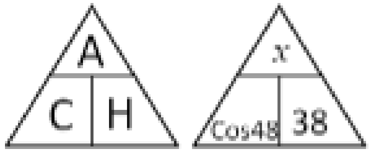
$$a^2 + b^2 = c^2$$
$$a^2 + 8^2 = 12^2$$
$$a^2 = 12^2 - 8^2$$
$$a^2 = 80$$
$$a = \sqrt{80}$$
$$a = 8.9$$



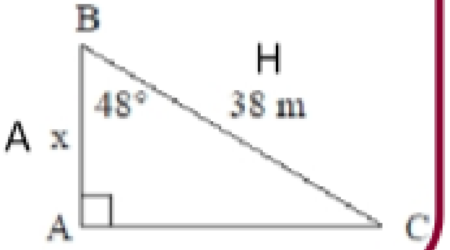




$$\sin x = \frac{8}{10}$$
$$x = \sin^{-1}\left(\frac{8}{10}\right)$$
$$x = 53.1^o$$



$$\cos 48 = \frac{x}{38}$$
$$38 \times \cos 48 = x$$
$$x = 25.4m$$



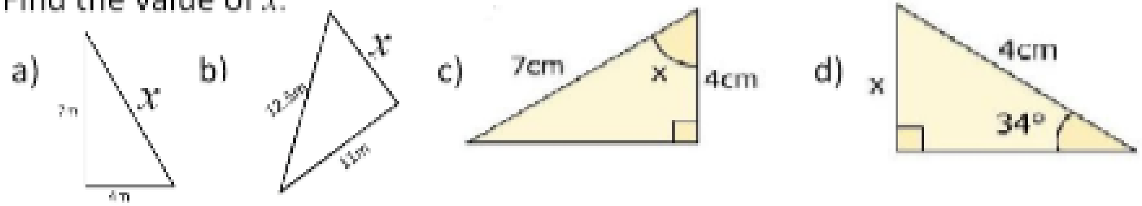
MathsWatch

150 a,b,c, 168

Key Words

Right angled triangle
Hypotenuse
Opposite
Adjacent
Sine
Cosine
Tangent

Find the value of x.



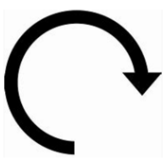
ANSWERS: a) 8.06m b) 5.94m c) 55.15° d) 2.34cm

REFLECTION AND ROTATION
Geometry and Measures

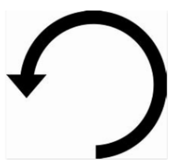
Key Concepts

A **reflection** creates a mirror image of a shape on a coordinate graph. The mirror line is given by an equation eg. $y = 2, x = 2, y = x$. The shape does not change in size.

A **rotation** turns a shape on a coordinate grid from a given point. The shape does not change size but does change orientation.



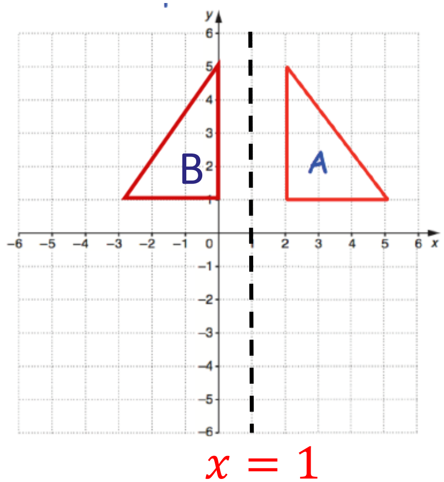
Clockwise



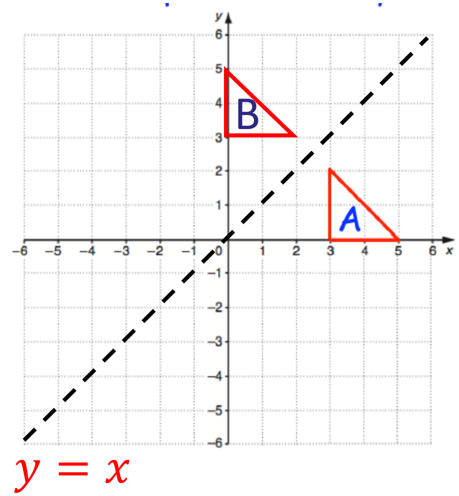
Anticlockwise

Examples

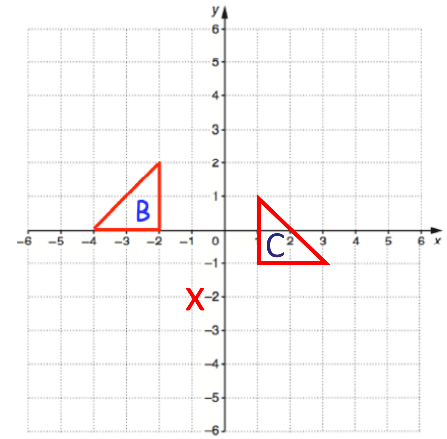
Reflect shape A in the line $x = 1$. Label it B.



Reflect shape A in the line $y = x$. Label it B.



Rotate shape B from the point (-1, -2)



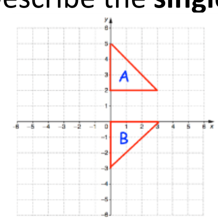
MathsWatch

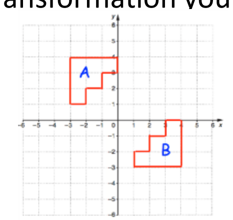
48, 49

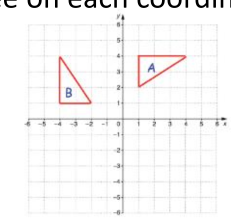
Key Words

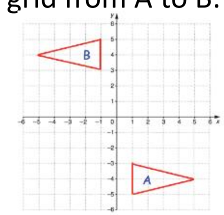
Rotate
Clockwise
Anticlockwise
Centre
Degrees
Reflect
Mirror image

Describe the **single** transformation you see on each coordinate grid from A to B:









ANSWERS: a) reflection, $y = 1$ b) reflection $y = x$ c) rotation, centre (0,0), 90° anticlockwise
d) rotation, centre (0,0), 180°

SIMILARITY – LENGTHS
Geometry and Measures

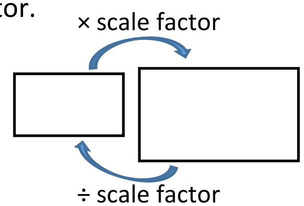
Key Concepts

Similar shapes are an enlargement of one another.

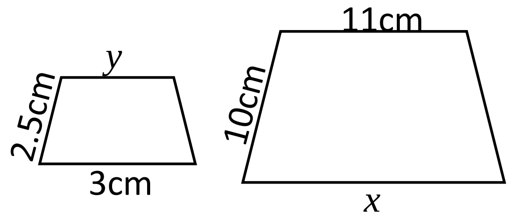
A **scale factor** is used, whereby all lengths are multiplied by the same number.

When finding a missing length on the larger shape we **multiply** by the scale factor.

When finding a missing length on the smaller shape we **divide** by the scale factor.



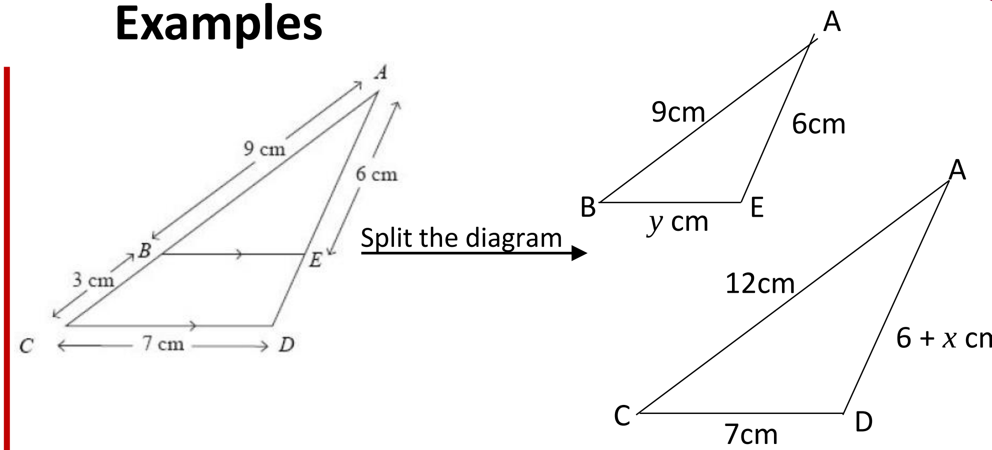
Examples



$$Scale\ factor = \frac{10}{2.5} = 4$$

$$x = 3 \times 4 = 12cm$$

$$y = 11 \div 4 = 2.75cm$$



$$Scale\ factor = \frac{12}{9} = \frac{4}{3}$$

$$x + 6 = 6 \times \frac{4}{3}$$

$$x + 6 = 8$$

$$x = 8 - 6$$

$$x = 2cm$$

$$y = 7 \div \frac{4}{3} = 5.25cm$$

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144, 201

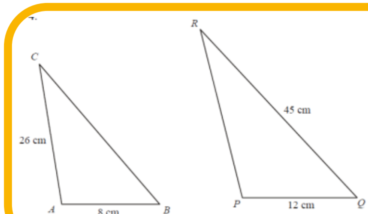
Key Words

Similar

Scale factor

Enlarge

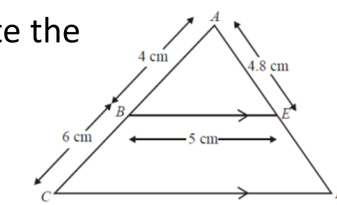
Length



1) Calculate the length of:

a) PR

b) BC



2) Calculate the length of:

a) CD

b) ED

ANSWERS 1a) 39cm b) 30cm 2a) 12.5cm b) 7.2cm

TRANSLATION AND ENLARGEMENT
Geometry and Measures

Key Concepts

A **translation** moves a shape on a coordinate grid. Vectors are used to instruct the movement:

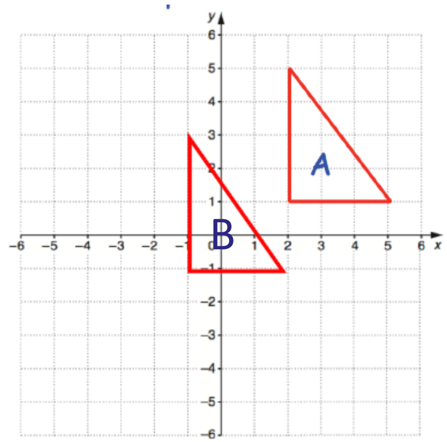
$\begin{pmatrix} x \\ y \end{pmatrix}$

- x: Positive-Right, Negative - Left
- y: Positive-Up, Negative - Down

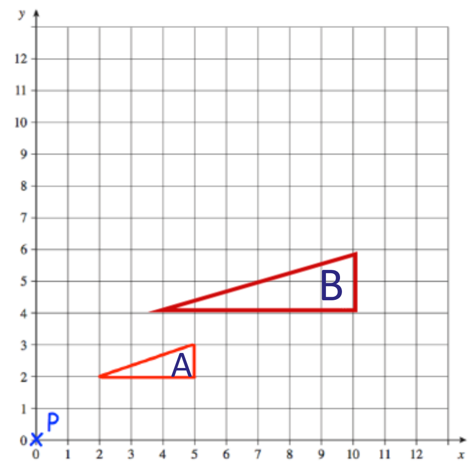
An **enlargement** changes the size of an image using a scale factor from a given point.

Examples

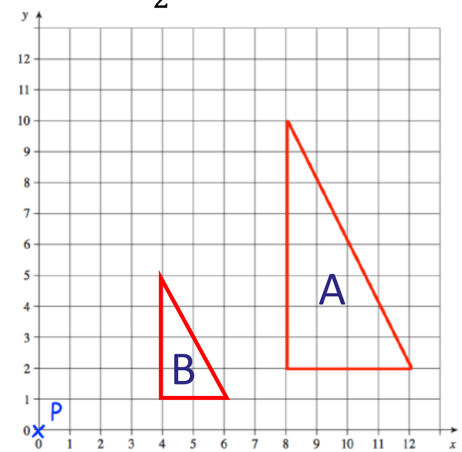
Translate shape A by $\begin{pmatrix} -3 \\ -2 \end{pmatrix}$. Label it B



Enlarge shape A by scale factor 2 from point P.



Enlarge shape A by scale factor $\frac{1}{2}$ from point P.



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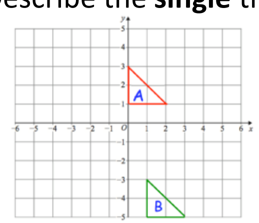
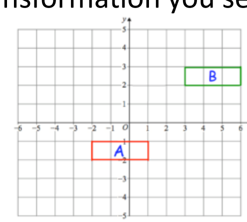
50, 148, 181a

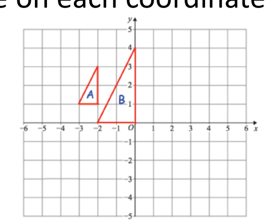
Key Words

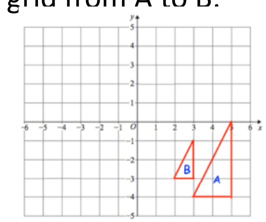
Translation
Enlargement
Scale factor
Centre
Positive
Negative

Describe the **single** transformation you see on each coordinate grid from A to B:









ANSWERS: a) translation $\begin{pmatrix} 1 \\ -6 \end{pmatrix}$ b) translation $\begin{pmatrix} 5 \\ 4 \end{pmatrix}$ c) enlarge, centre (-4,2) scale factor 2

d) enlarge, centre (1,-2) scale factor $\frac{1}{2}$

TYPES OF ANGLE AND ANGLES IN POLYGONS

Geometry and Measures

Key Concepts

Regular polygons have equal lengths of sides and equal angles.

Angles in polygons

Sum of interior angles

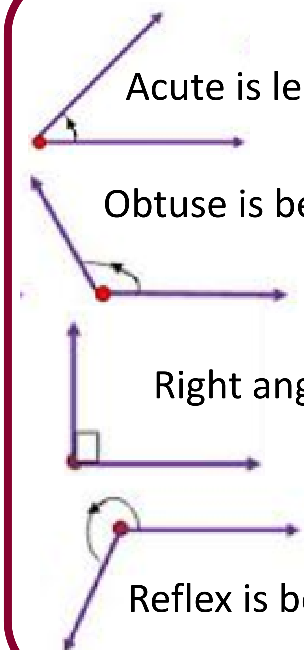
$= (number\ of\ sides - 2) \times 180$

Exterior angles of **regular** polygons = $\frac{360}{number\ of\ sides}$

Types of angle

There are four types which need to be identified – acute, obtuse, reflex and right angled.

Examples



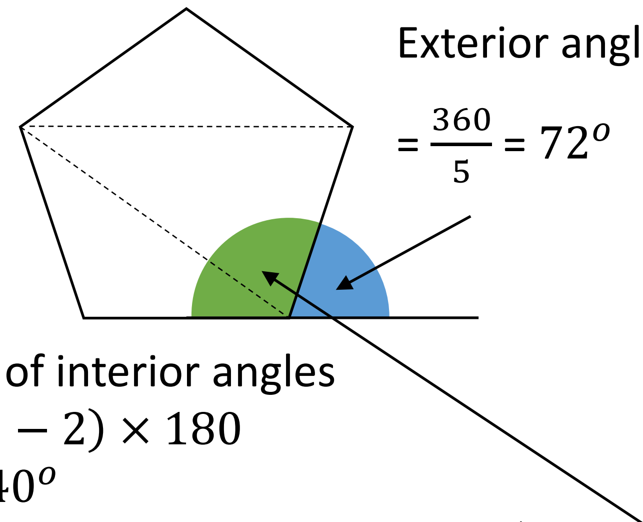
Acute is less than 90°

Obtuse is between 90° and 180°

Right angled is 90°

Reflex is between 180° and 360°

Regular Pentagon



Exterior angles

$= \frac{360}{5} = 72^o$

Sum of interior angles

$= (5 - 2) \times 180$

$= 540^o$

Interior angle = $\frac{540}{5} = 108^o$

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13, 123

Key Words

Polygon

Interior angle

Exterior angle

Acute

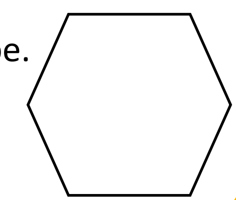
Obtuse

Right angle

Reflex

Questions

1) Calculate the sum of the interior angles for this regular shape.
2) Calculate the exterior angle for this regular shape.
3) Calculate the size of one interior angle in this regular shape.

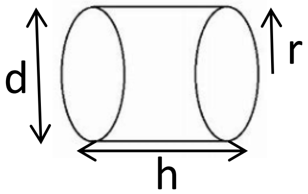


ANSWERS: 1) 720° 2) 60° 3) 120°

VOLUME AND SURFACE AREAS OF CYLINDERS
Geometry and Measures

Key Concepts

A **cylinder** is a **prism** with the cross section of a circle.

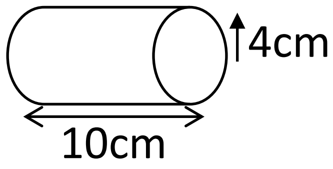


The **volume** of a cylinder is calculated by $\pi r^2 h$ and is the space inside the 3D shape

The **surface area** of a cylinder is calculated by $2\pi r^2 + \pi d h$ and is the total of the areas of all the faces on the shape.

Examples

From the diagram calculate:



a) **Volume**

$V = \pi \times r^2 \times h$

$V = \pi \times 4^2 \times 10$

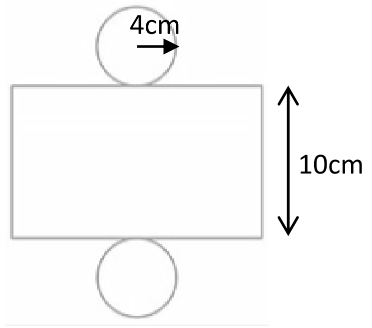
$V = 160\pi$

Or $= 502.65cm^3$

b) **Surface Area –** You can use the net of the shape to help you

$Area\ of\ two\ circles$
$= 2 \times \pi \times r^2$
$= 2 \times \pi \times 4^2$
$= 32\pi$

$Area\ of\ rectangle$
$= \pi \times d \times h$
$= \pi \times 8 \times 10$
$= 80\pi$



$Surface\ Area = 32\pi + 80\pi$
$= 112\pi$
or $= 351.86cm^3$

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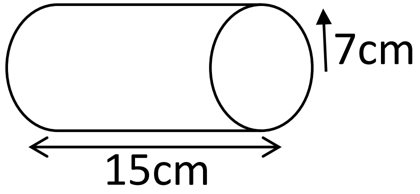
119

Key Words
Cylinder
Surface Area
Radius
Diameter
Pi
Volume
Prism

Calculate the volume and surface area of this cylinder



ANSWERS: Volume = 735π or $2309.07cm^3$ Surface area = 308π or $967.61cm^3$