TYPES OF ANGLE AND ANGLES IN POLYGONS

Key Concepts

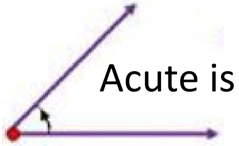
Regular polygons have equal lengths of sides and equal angles.

Angles in polygons
Sum of interior angles
$= (number\ of\ sides - 2) \times 180$

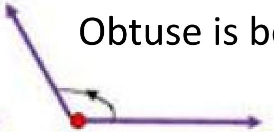
Exterior angles of **regular** polygons = $\frac{360}{number\ of\ sides}$

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

Examples



Acute is less than 90°

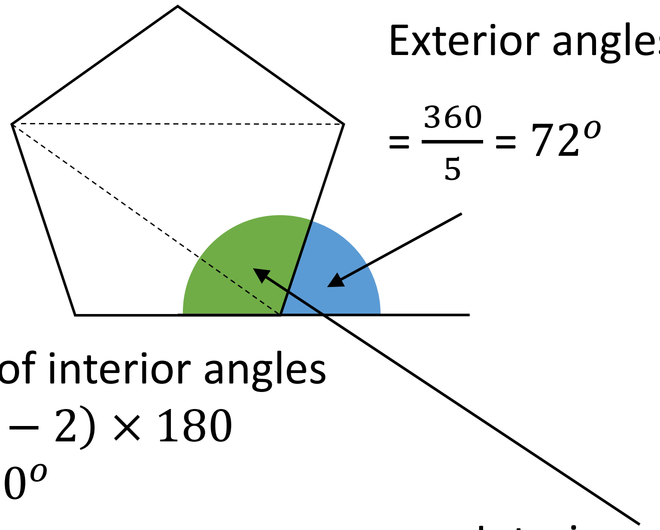


Obtuse is between 90° and 180°

Right angled is 90°

Reflex is between 180° and 360°

Regular Pentagon



Exterior angles

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

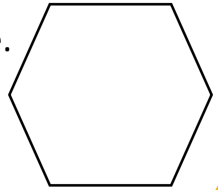
Sum of interior angles
$= (5 - 2) \times 180$
$= 540^o$

Interior

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

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.



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ANSWERS: 1) 720° 2) 60° 3) 120°

ANGLE FACTS INCLUDING ON PARALLEL LINES

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.

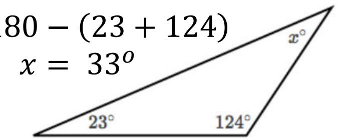
Alternate angles are equal in size.

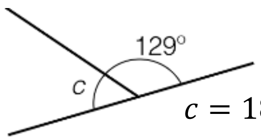
Corresponding angles are equal in size.

Allied/co-interior angles are equal 180º.

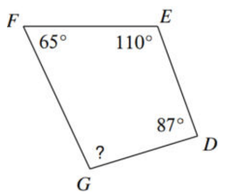
Examples

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

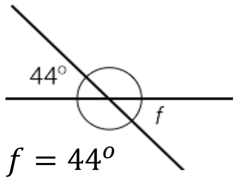




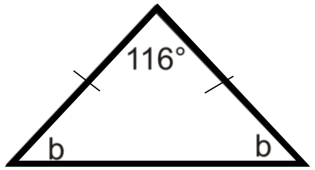
$c = 180 - 129$
$x = 51^o$



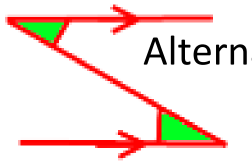
$? = 360 - (65 + 110 + 87)$
$? = 98^o$



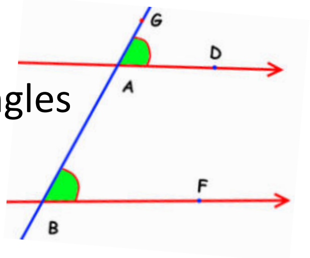
$f = 44^o$



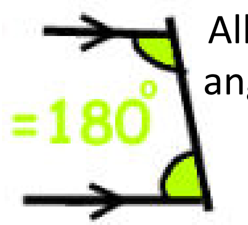
$b = (180 - 116) \div 2$
$b = 32^o$



Alternate angles are equal



Corresponding angles are equal



Allied/co-interior angles equal 180º

sparx

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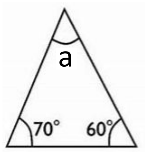
Key Words

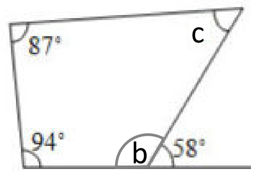
Angle
Vertically opposite
Straight line
Alternate
Corresponding
Allied
Co-interior

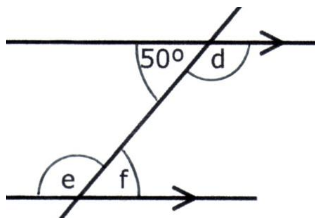
Questions

Calculate the missing angle:

a)





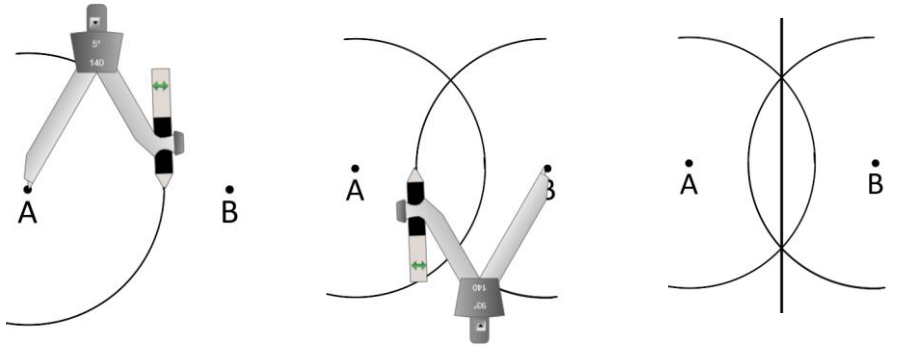


ANSWERS: 1) a=50º 2) b=122º c=57º 3) d=130º e=130º f=50º

CONSTRUCTIONS

Examples

Bisect the distance between two points.

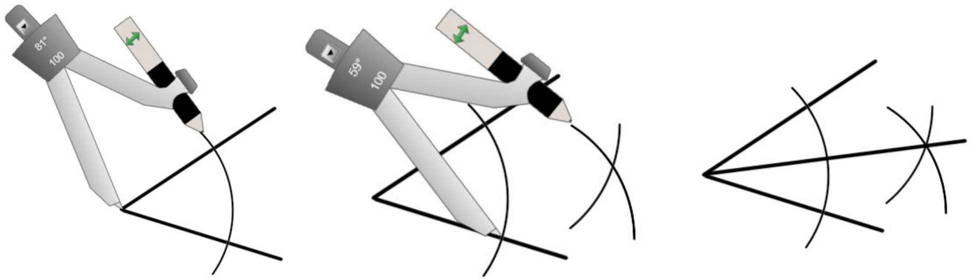


1) Open your compasses past halfway between the two points and draw an arc.

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

sparx

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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

PYTHAGORAS AND TRIGONOMETRY

Key Concepts

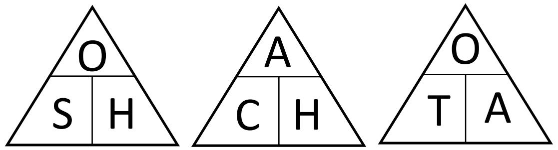
Pythagoras' theorem and basic trigonometry both only work with **right angled triangles**.

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

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

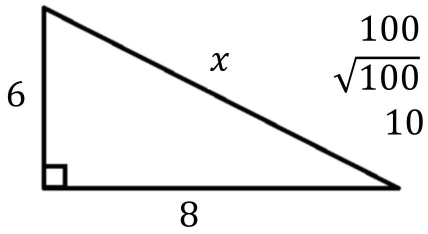
c is always the hypotenuse (longest side)

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



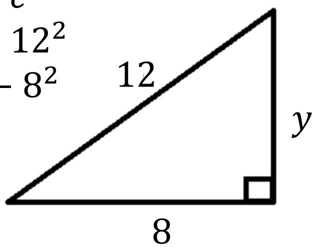
Examples

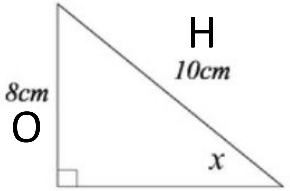
Pythagoras' Theorem

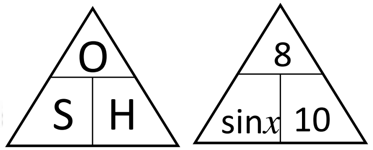


$$a^2 + b^2 = c^2$$
$$6^2 + 8^2 = x^2$$
$$100 = x^2$$
$$\sqrt{100} = x$$
$$10 = x$$

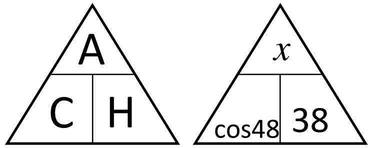
$$a^2 + b^2 = c^2$$
$$y^2 + 8^2 = 12^2$$
$$y^2 = 12^2 - 8^2$$
$$y^2 = 80$$
$$y = \sqrt{80}$$
$$y = 8.9$$



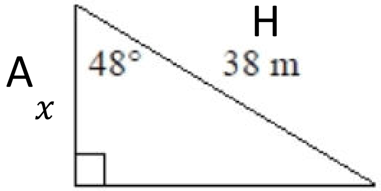




$$\sin x = \frac{8}{10}$$
$$x = \sin^{-1}\left(\frac{8}{10}\right) = 53.1^o$$



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



sparx

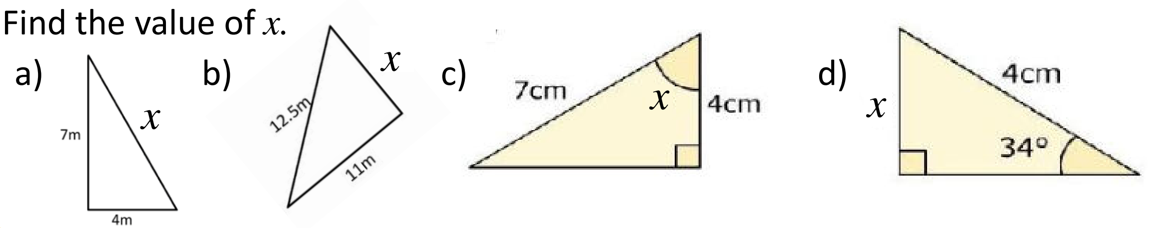
M677

Key Words

Right angled triangle
Hypotenuse
Opposite
Adjacent
Sine
Cosine
Tangent

Questions

Find the value of x.



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

PYTHAGORAS AND TRIGONOMETRY

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

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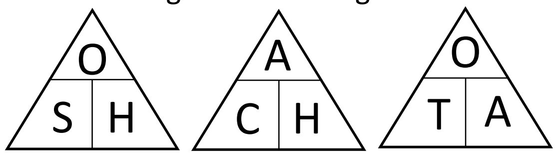
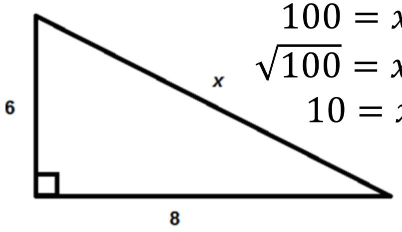


When finding the missing angle we must press **SHIFT** on our calculators first.

Examples

Pythagoras' Theorem



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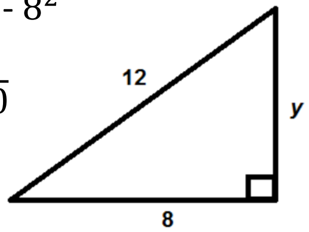

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$$a = \sqrt{80}$$
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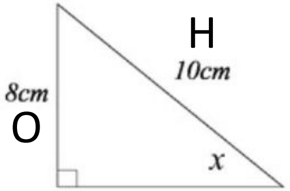
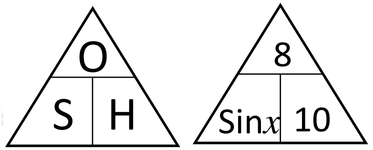
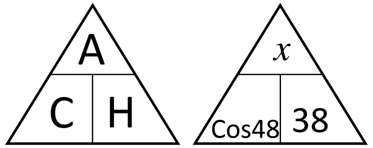
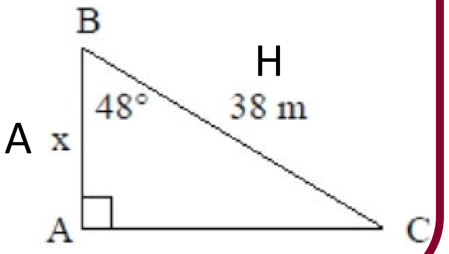




$$\sin x = \frac{8}{10}$$
$$x = \sin^{-1}\left(\frac{8}{10}\right)$$
$$x = 53.1^o$$



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



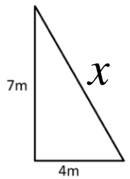
sparx

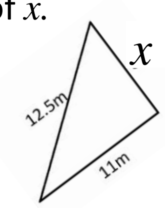
M677

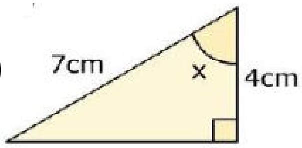
Key Words

Right angled triangle
Hypotenuse
Opposite
Adjacent
Sine
Cosine
Tangent

Find the value of x.

a) 

b) 

c) 

d) 

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

TRANSLATION AND ENLARGEMENT

Key Concepts

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

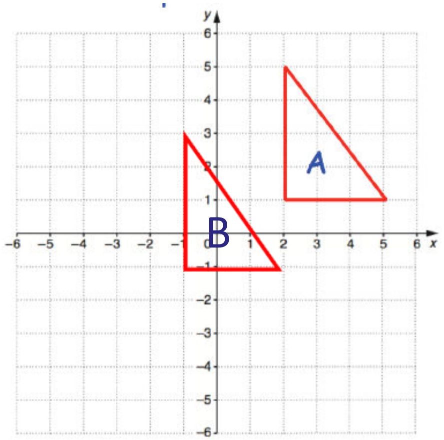
$\begin{pmatrix} x \\ y \end{pmatrix}$

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

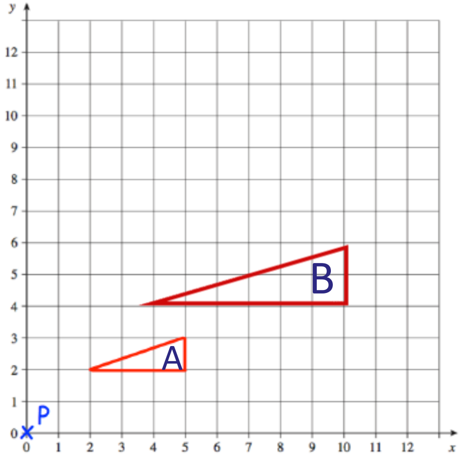
An **enlargement** changes the size of an image using a scale factor from a given point.

Examples

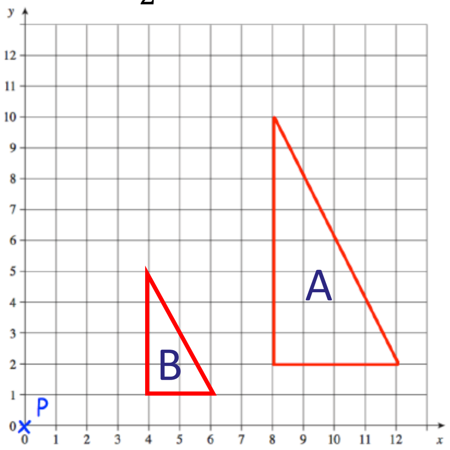
Translate shape A by $\begin{pmatrix} -3 \\ -2 \end{pmatrix}$. Label it B



Enlarge shape A by scale factor 2 from point P.



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



sparx

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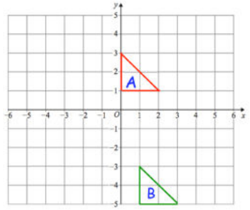
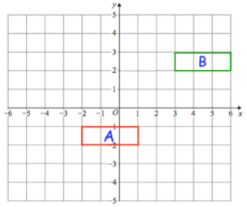
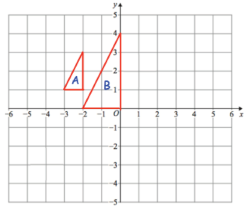
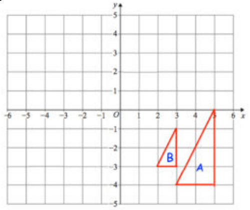
Key Words
Translation
Enlargement
Scale factor
Centre
Positive
Negative

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

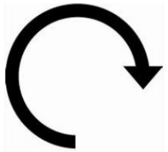
ANSWERS: a) translation $\begin{pmatrix} 1 \\ -6 \end{pmatrix}$ b) translation $\begin{pmatrix} 5 \\ 4 \end{pmatrix}$ c) enlarge, centre (-4,2) scale factor 2
d) enlarge, centre (1,-2) scale factor $\frac{1}{2}$

REFLECTION AND ROTATION

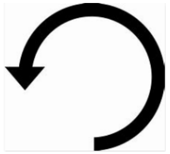
Key Concepts

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.



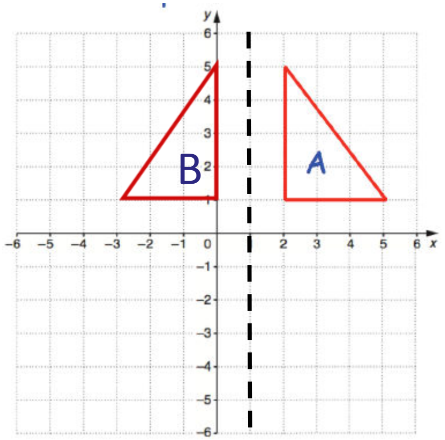
Clockwise



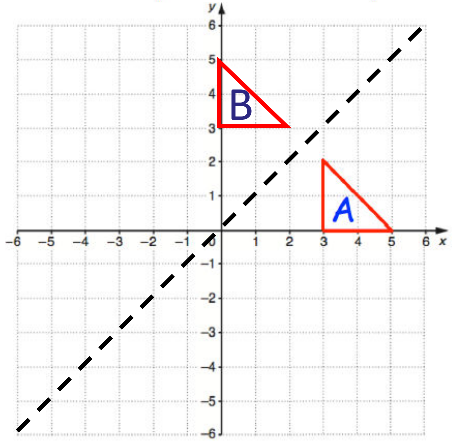
Anticlockwise

Examples

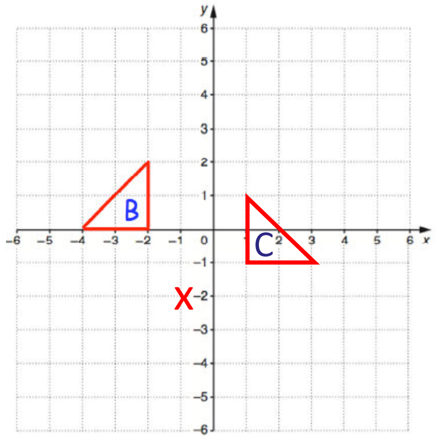
Reflect shape A in the line $x = 1$. Label it B.



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



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



sparx

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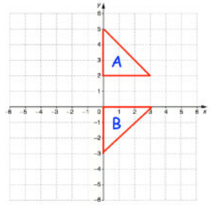
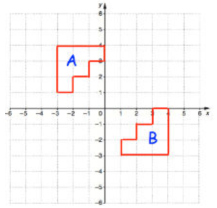
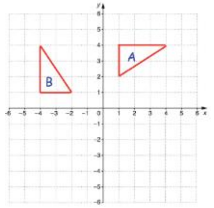
Key Words

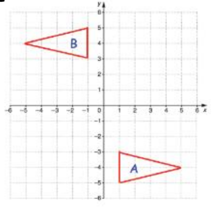
Rotate
Clockwise
Anticlockwise
Centre
Degrees
Reflect
Mirror image

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°