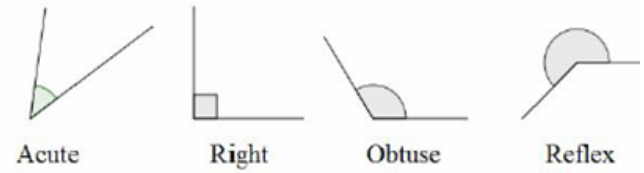
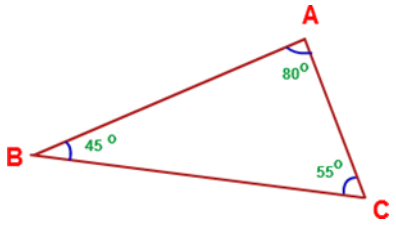
Types of Angles

Acute angles are less than 90°
Right angles are exactly 90°
Obtuse angles are greater than 90° but less than 180°
Reflex angles are greater than 180° but less than 360°



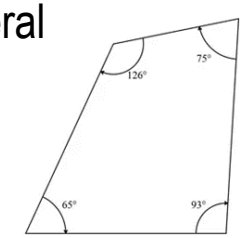
Angles in a triangle

Angles in a triangle add up to 180°



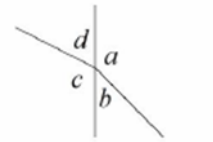
Types of angles in a quadrilateral

Angles in a quadrilateral add up to 360°



Angles at a point

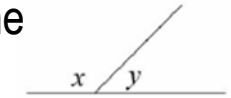
Angles around a point add up to 360°



$a+b+c+d=360^{o}$

Angles on a straight line

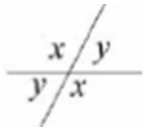
Angles around a point on a straight line add up to 180°



$x+y=180^{o}$

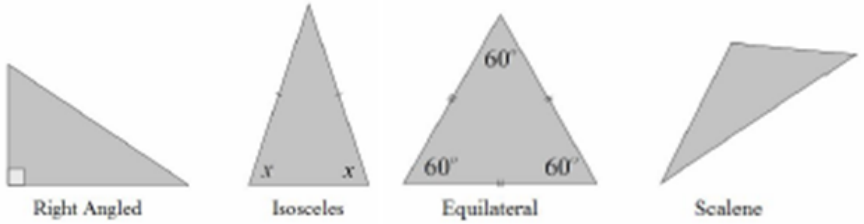
Opposite angles

Vertically opposite angles are equal

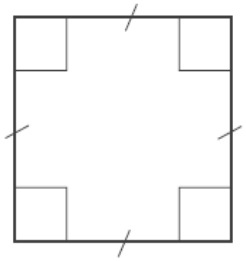


Types of triangles

Right angle triangles have 90° angle in
Isosceles triangles have 2 equal sides and 2 equal base angles
Equilateral triangles have 3 equal sides and 3 equal angles
Scalene triangles have different sides and different angles
Base angles in an isosceles triangle are equal



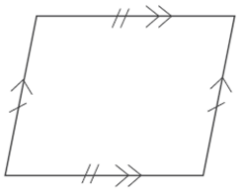
Square



- **4 equal sides**
- **4 right angles**
- **Opposite sides parallel**
- **Diagonals bisect** each other at **right angles**
- **4 lines** of **symmetry**

Rotational symmetry of order four

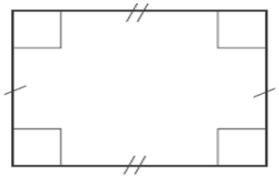
Parallelogram



- **2 pairs of equal sides**
- **Diagonally opposite angles are equal**
- **Opposite sides parallel**
- **Diagonals bisect** each other, **not at right angles**
- **No lines of symmetry**

Rotational symmetry of order two

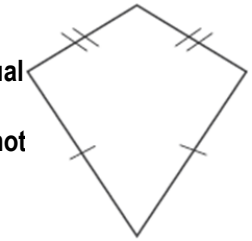
Rectangle



- **2 pairs of equal sides**
- **4 right angles**
- **Opposite sides parallel**
- **Diagonals bisect** each other, **not at right angles**
- **2 lines or symmetry**

Rotational symmetry of order two

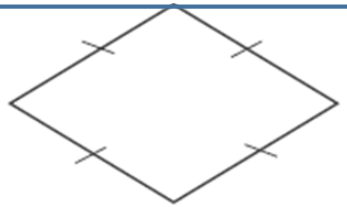
Kite



- **2 pairs of adjacent side of equal length**
- **1 pair of diagonally opposite angles are equal** (where different length sides meet)
- **Diagonals intersect at right angles, but do not bisect**
- **1 line of symmetry**

No rotational symmetry

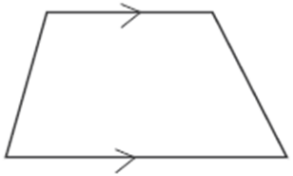
Rhombus



- **4 equal sides**
- **Diagonally opposite angles are equal**
- **Opposite sides parallel**
- **Diagonals bisect** each other at **right angles**
- **2 lines of symmetry**

Rotational symmetry of order two

Trapezium

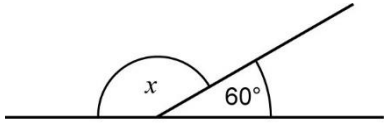


- **1 pair of parallel sides**
- **No lines of symmetry**
- **No rotational symmetry**

Special Case: Isosceles Trapeziums have one line of symmetry

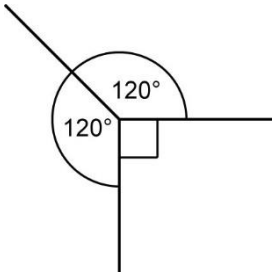
Try these……

1 Work out the size of angle x.



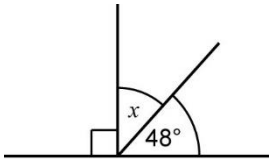
2 Jamal says, 'I know without measuring that the size of at least one angle in this diagram is wrong.'

Explain how you know that he is correct.

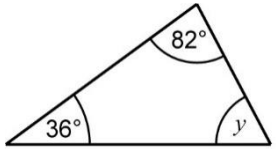


3 Find the size of angles x and y.

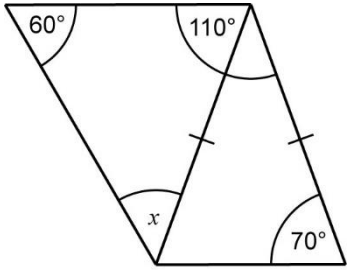
a)



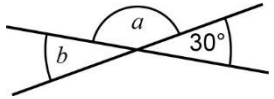
b)



4 Work out the size of angle x.



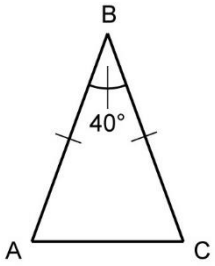
5



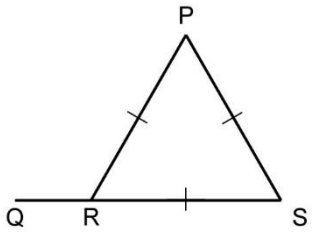
Find the size of
a) angle a
b) angle b

Try these……

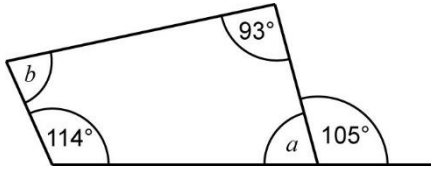
6 Here is a isosceles triangle ABC.
Work out the size of angle BAC.



7 QRS is a straight line.
PSR is an equilateral triangle.
Work out the size of angle PRQ.



8 Find the size of
a) angle a
b) angle b.



9 KITE
SQUARE
TRAPEZIUM
RECTANGLE
RHOMBUS

From this list of quadrilaterals, write down the names of all those that have
a) only 1 pair of parallel sides
b) all sides equal.

10 Draw the triangle XYZ with XY = 5 cm, YZ = 7 cm and angle XYZ = 35°.

Topic/skill

Definition/Tips

Example

Arithmetic Sequence

A number pattern with a common difference.

2, 5, 8, 11… is an arithmetic sequence

Term

Each value in a sequence is called a term.

In the sequence 2, 5, 8, 11…, 8 is the third term of the sequence.

Term-to-term rule

A rule, which allows you to find the next term in a sequence if you know the previous term.

First term is 2. Term-to-term rule is 'add 3'
Sequence is: 2, 5, 8, 11…

nth term

A rule, which allows you to calculate the term, that is in the nth position of the sequence.
Also known as the 'position-to-term' rule.
n refers to the position of a term in a sequence.

nth term is $3n - 1$
The 100th term is $3 \times 100 - 1 = 299$

Finding the nth term of a linear sequence

1. Find the difference.
2. Multiply that by $\boldsymbol{n}$.
3. Substitute $n = 1$ to find out what number you need to add or subtract to get the first number in the sequence.

Find the nth term of: 3, 7, 11, 15…
1. Difference is +4
2. Start with $4n$
3. $4 \times 1 = 4$, so we need to subtract 1 to get 3.
nth term = $4n - 1$

Fibonacci type sequences

The Fibonacci sequence is:

$$1,1,2,3,5,8,13,21,34 \ldots$$

An example of a Fibonacci-type sequence is:

$$4, 7, 11, 18, 29 \ldots$$

A sequence where the next number is found by **adding up the previous two terms**

Topic/skill

Definition/Tips

Example

Geometric Sequence

A sequence of numbers where each term is found by **multiplying the previous one** by a number called the **common ratio, r**.

An example of a geometric sequence is:

$$2, 10, 50, 250 \ldots$$

The common ratio is 5

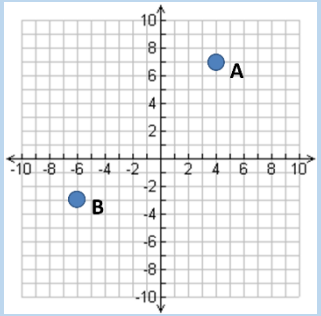
Another example of a geometric sequence is:

$$81, -27, 9, -3, 1 \ldots$$

The common ratio is $-\frac{1}{3}$

Coordinates

Written in **pairs**. The **first** term is the **x-coordinate** (movement **across**). The **second** term is the **y-coordinate** (movement **up or down**)



A: (4,7)
B: (-6,-3

Midpoint of a Line

Method 1: add the x coordinates and divide by 2, add the y coordinates and divide by 2

Method 2: Sketch the line and find the values half way between the two x and two y values.

Find the midpoint between (2,1) and (6,9)

$\frac{2+6}{2} = 4$ and $\frac{1+9}{2} = 5$

So, the midpoint is (4,5)

Plotting Linear Graphs

Table of Values

Construct a table of values to calculate coordinates.

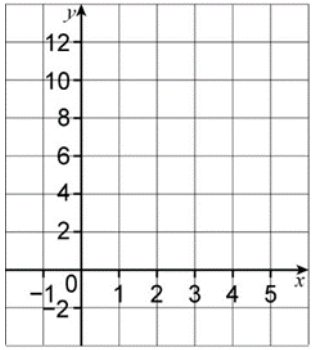
x	-3	-2	-1	0	1	2	3
y= x +3	0	1	2	3	4	5	6

Try these……

1 a) Complete the table for the graph of $y = 2x + 2$

x	1	2	3	4	5
y	4	6			

b) Draw the graph of $y = 2x + 2$ on the grid



(3 marks)

2 The *n*th term of a sequence is $n + 2$

Work out the value of the 10th term

---------- (1 mark)

3 Write an expression for the *n*th term of the sequence

a) 4 8 12 16 20 ----------

b) 3 7 11 15 19 ----------

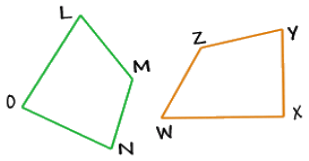
(2 marks)

4 4 9 14 19 24 is an arithmetic sequence. Explain why

---------- (1 mark)

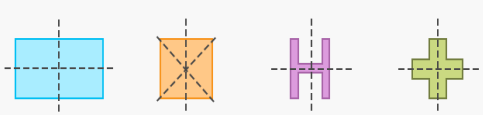
Congruent

The new shape is **same shape** and **same size**



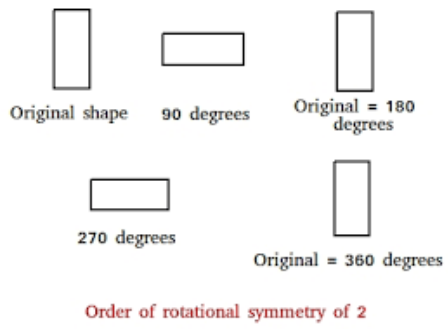
Line of Symmetry

imaginary line that passes through the centre of the shape or object and divides it into identical halves.



Rotational Symmetry

When a shape is rotated 360°, the **order of rotational symmetry** is the number of times it looks exactly like it did at the start

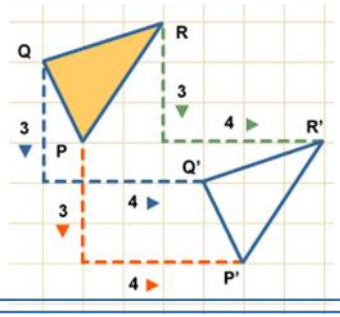


Order of rotational symmetry of 2

Translation

Translate means to **move a shape**.
The shape does not change size or **orientation**; it is **congruent**.
The 2 instructions are **Left/Right** and **Up/Down** or a **column vector**.

Method; count squares



Column Vector

In a column vector, the **top** number moves **left (-) or right (+)** and the **bottom** number moves **up (+) or down (-)**

$\begin{pmatrix}2\\3\end{pmatrix}$ means '2 right, 3 up'

$\begin{pmatrix}-1\\-5\end{pmatrix}$ means '1 left, 5 down'

Reflection

T shape is '**flipped**' like in a **mirror**.
The shape is congruent.
Use the **Line of Reflection**

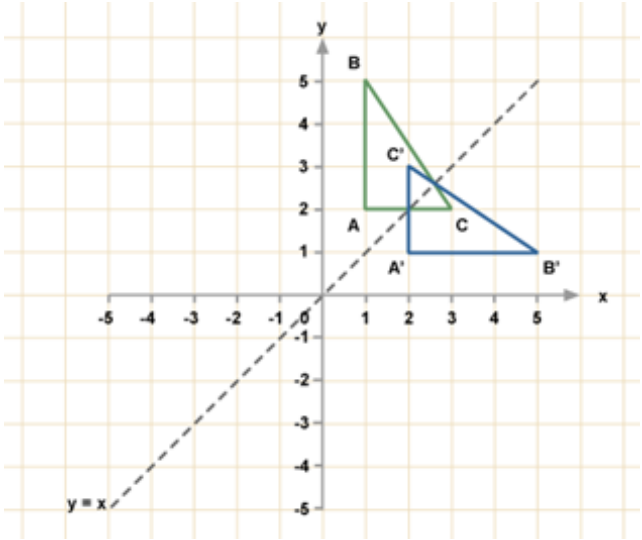
Line x =? is a **vertical line**

Line y =? is a **horizontal line**

Line $y = x$ is a **diagonal line**

The 2 shapes are equidistant (equally far) from the line of reflection.

Method; flip tracing paper



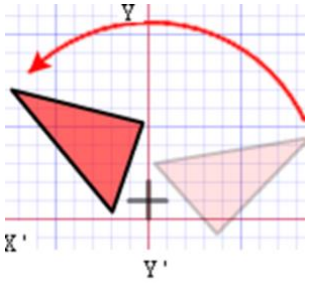
Reflect shape C in the line $y = x$

Rotation

The shape is **turned around a point**, the **Centre of Rotation**. Shape is congruent

The instructions give the C of R, the amount of turn in degrees and the direction of turn (clockwise or anti-clockwise)

Method; rotate tracing paper.



Rotate Shape A 90° anti-clockwise about (0,1)

Enlargement

The shape will get **bigger or smaller**. Multiply each side by the **scale factor**.

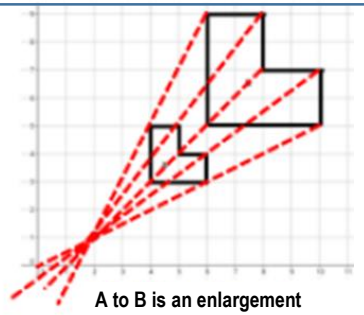
Scale Factor = 3 means '3 times larger = multiply by 3'

Scale Factor = ½ means 'half the size = divide by 2'

Centre of Enlargement

Draw **straight lines** through **corresponding corners** of the two shapes.
The centre of enlargement is the point **where all the lines cross over**.

Be careful with negative enlargements as the corresponding corners will be the other way around.



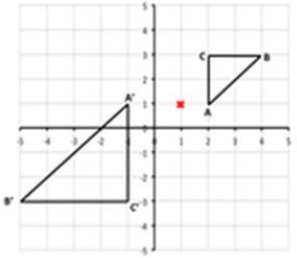
A to B is an enlargement SF 2 about the point (2,1)

Negative Scale Factor Enlargements

Negative enlargements will look like they have been rotated.

$SF = -2$ will be rotated, and also twice as big.

The lines will cross at the Centre of Enlargement *



Describing Transformations

Give the correct information when describing each transformation:
Including the **name of the type of transformation** as well as the other details.

(Look at the number of marks in the question for a hint of how many pieces of information are needed.)

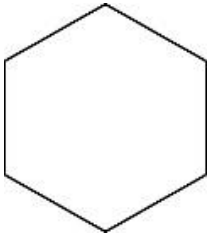
- **Translation**; Vector (L/R up/down)
- **Rotation**; Direction, Angle, Centre of rotation
- **Reflection**; Equation of mirror line
- **Enlargement**; Scale factor, Centre of enlargement

Try these……

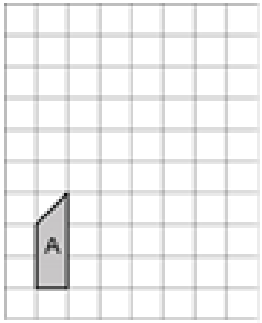
1

a) Draw on the hexagon all its lines of symmetry

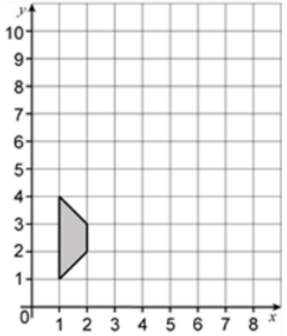
b) Write the order of rotational symmetry of the hexagon



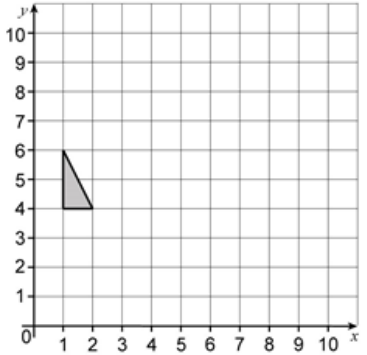
2 Translate this shape 2 units to the right and 3 units up



3 Reflect this shape in the line x=4



4 Rotate this shape 90° clockwise about point (5,5)



5 Enlarge shape **A** by scale factor 3