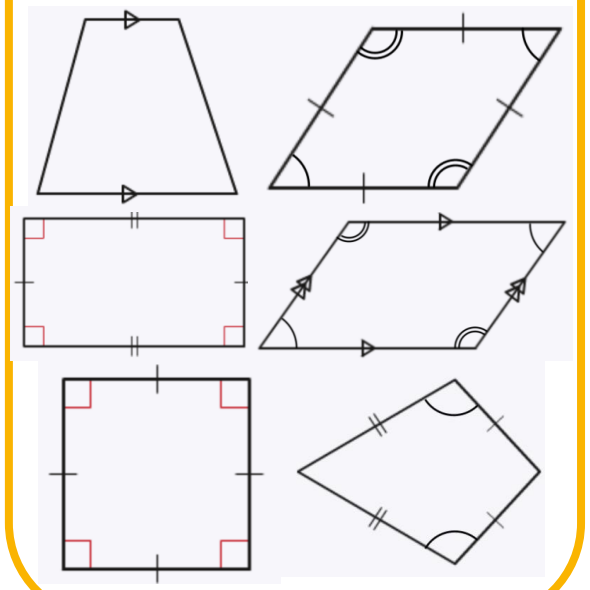
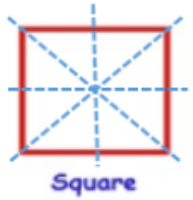
PROPERTIES OF SHAPES

Key Concept
Quadrilaterals

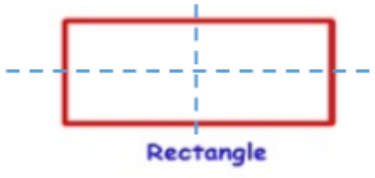


Key Words
Angle: This is formed by two lines, joined by a common endpoint.
Symmetry: A shape has symmetry if there is a line which forms two equal parts which are a mirror image of each other.
Reflection: This is where a shape is flipped.
Rotation: This is where a shape is turned.

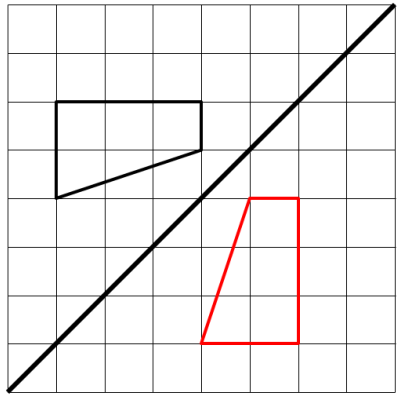
Examples
Lines of symmetry and reflection



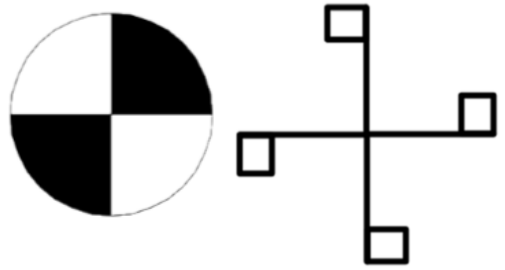
4 lines of symmetry



2 lines of symmetry



Rotational Symmetry



Order = 2 Order = 4

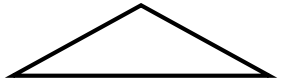
sparx

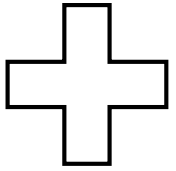
M541, M780, M290, M178, M910, M276, M618, M523

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) 

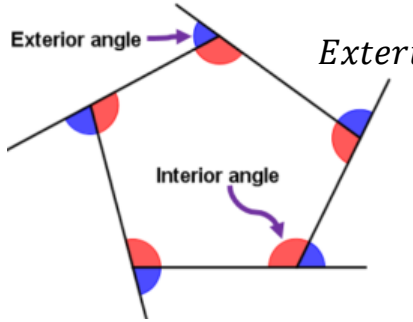
2) 

3) 

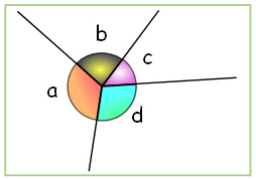
ANSWERS: 1) 2 lines of symmetry, order = 2 2) 1 line of symmetry, order = 1 3) 4 lines of symmetry, order = 4.

ANGLE PROPERTIES

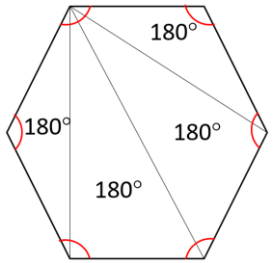
Key Concepts



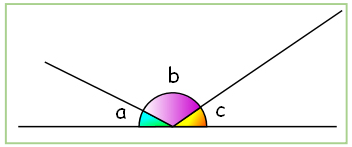
$$Exterior = \frac{360}{no.\,of\ sides}$$



Angles at a point add to 360°



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

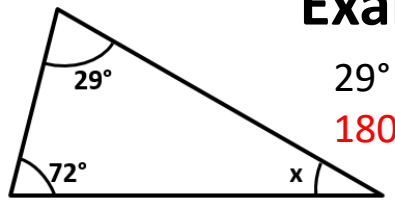


Angles on a line add to 180°

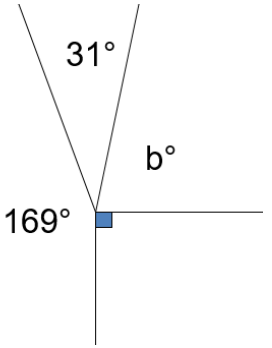
Key Words

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.

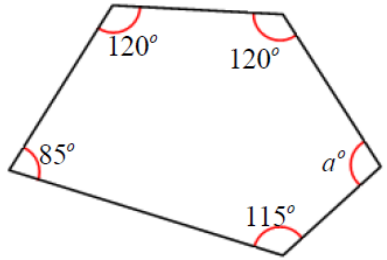
Examples



29° + 72° = 101°
180° – 101° = 79°



169° + 31°+ 90° = 290°
360° – 290° = 70°



120° + 120°+ 85° + 115° = 440°
540° – 440° = 100°

sparx

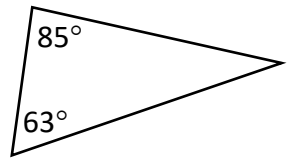
M818, M679, M653, M351,

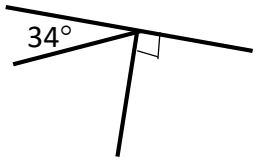
Tip

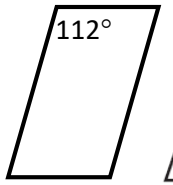
Remember isosceles triangles have two equal angles and equilateral triangles have three equal angles.

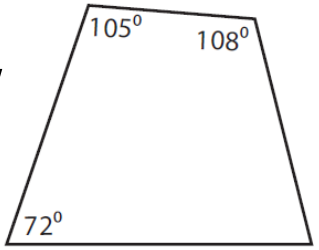
Questions

1) Find the missing angles:









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

TYPES OF ANGLE AND ANGLES IN POLYGONS

Key Concepts

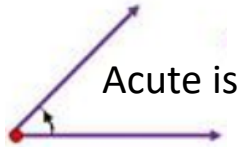
Regular polygons have equal lengths of sides and equal angles.

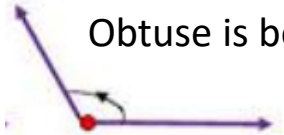
Angles in polygons
Sum of interior angles
$= (number\ of\ sides - 2) \times 180$

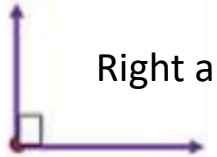
Exterior angles of **regular** polygons $= \frac{360}{number\ of\ sides}$

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

Examples

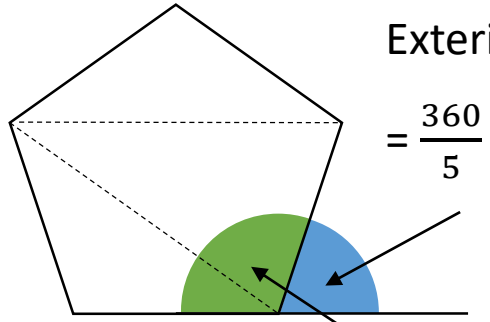

Acute is less than 90°


Obtuse is between 90° and 180°


Right angled is 90°


Reflex is between 180° and 360°

Regular Pentagon



Exterior angles

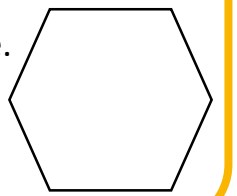
$= \frac{360}{5} = 72^o$

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

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

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.



sparx

M502
M679
M653

Key Words
Polygon
Interior angle
Exterior angle
Acute
Obtuse
Right angle
Reflex

ANSWERS: 1) 720° 2) 60° 3) 120°

ANGLE FACTS INCLUDING ON PARALLEL LINES

Key Concepts

Angles in a **triangle equal 180°**.

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

Vertically opposite angles are equal in size.

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

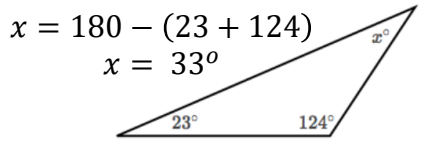
Base angles in an isosceles triangle are equal.

Alternate angles are equal in size.

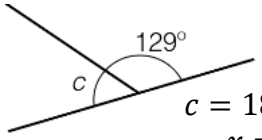
Corresponding angles are equal in size.

Allied/co-interior angles are equal 180°.

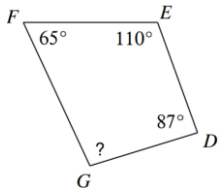
Examples



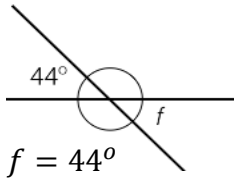
$x = 180 - (23 + 124)$
$x = 33^o$



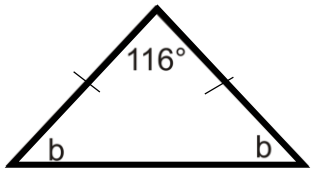
$c = 180 - 129$
$x = 51^o$



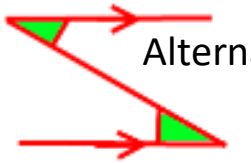
$? = 360 - (65 + 110 + 87)$
$? = 98^o$



$f = 44^o$

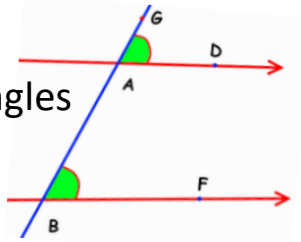


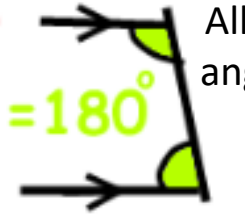
$b = (180 - 116) \div 2$
$b = 32^o$



Alternate angles are equal

Corresponding angles are equal





Allied/co-interior angles equal 180°

sparx

M331

M606

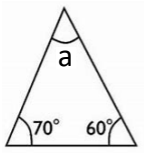
Key Words

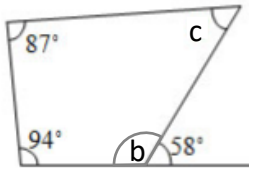
Angle
Vertically opposite
Straight line
Alternate
Corresponding
Allied
Co-interior

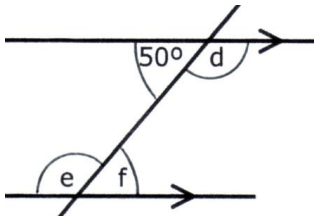
Questions

Calculate the missing angle:

a)







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

TYPES OF DATA AND GRAPHS

Key Concepts

Qualitative data: data collected that is described in words **not** numbers.
e.g. race, hair colour, ethnicity.

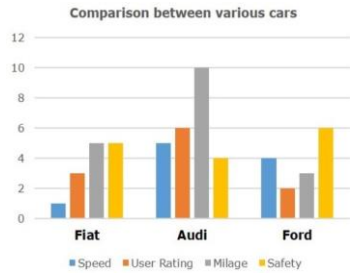
Quantitative data: this is the collection of numerical data that is either discrete or continuous.

Discrete data: numerical data that is categorised into a finite number of classifications.
e.g. number of siblings in a family, shoe size, .

Continuous data: numerical data that can take any value. This data is usually measured on a large number scale.
e.g. height, weight, time, capacity.

Examples

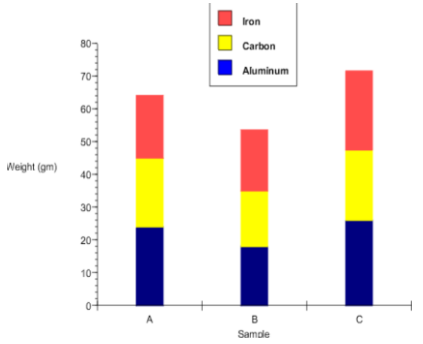
Comparative bar charts



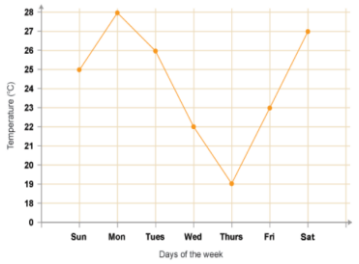
Tally charts

Colour	Tally	Frequency
Red	𝍸 𝍸 | | |	13
Blue	𝍸 | | | |	9
White	𝍸 𝍸 𝍸 𝍸 | | | |	24
Black	𝍸 𝍸 | |	12
Other	𝍸 | | | |	9

Composite bar charts

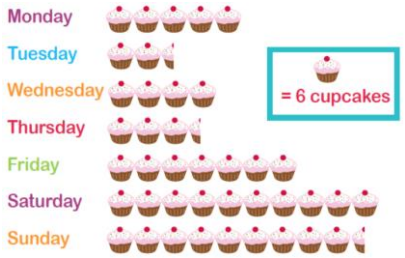


Line graphs



Pie charts

Pictograms



sparx

U363 U557
U506 U508
U983 U814

Key Words

Data
Discrete
Continuous
Qualitative
Quantitative
Graph

What types of data is each of the following?

1) Eye colour
2) Time it takes to run 100m
3) Number of goals scored in a match
4) Length of a car (to the nearest cm)
5) Number of pets a person owns

ANSWERS: 1) Qualitative 2) Continuous, quantitative 3) Discrete, quantitative 4) Continuous, quantitative 5) Discrete, quantitative

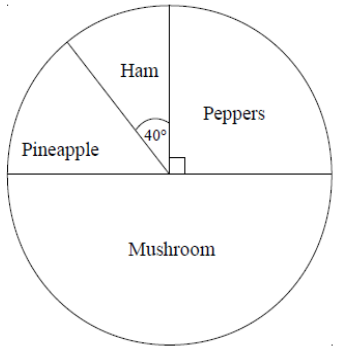
PIE CHARTS AND SCATTER-GRAPHS

Key Concepts

Pie charts use angles to represent, proportionally, the quantity of each group involved.

Pie charts can only be compared to one another when the total frequency or populations are given.

Scatter-graphs show the relationship between two variables. This relationship is called the **correlation**.



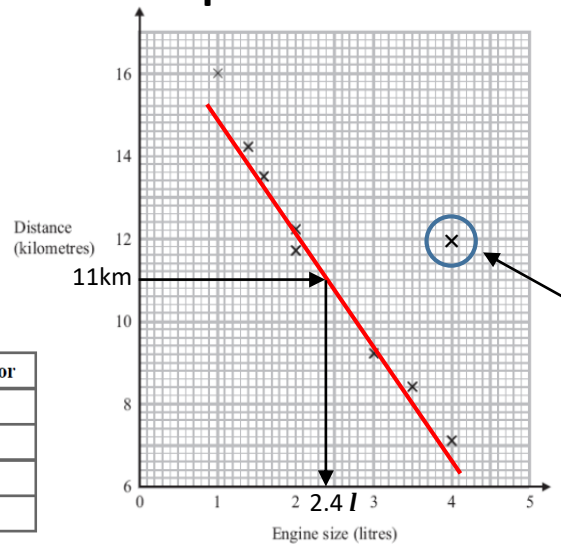
Topping	Frequency	Angle of Sector
Peppers	18	90°
Mushroom	36	180°
Pineapple	10	50°
Ham	8	40°

Total=72 360°

360° ÷ 72

×5

Examples



A scatter-graph is drawn to show the relationship between the engine size of a car and how far it can travel.

It shows negative correlation.

This is an **outlier**.
It does not match the trend.

We draw a **line of best fit** through the data points to help estimate readings, based on the data sample. For example, estimating the engine size of a car that can travel 11km would be 2.4 litres.

sparx

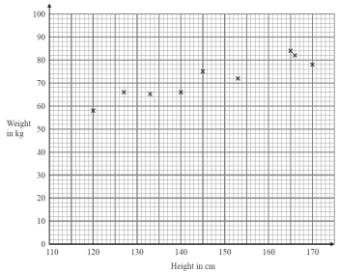
U508 U172
U854 U199
U277 U128

Key Words

Pie chart
Scatter-graph
Correlation
Outlier
Variable

1) Calculate the angle for each category:

Region	Frequency
Southern England	9
London	23
Midlands	16
Northern England	12
Total	60



2a) What type of correlation is shown?
b) Using a line of best fit estimate the weight when the height is 135cm.

ANSWERS: 1) 360°÷60=6° , Angles = 54°, 138°, 96°, 72° 2) a) positive b) 64kg-66kg