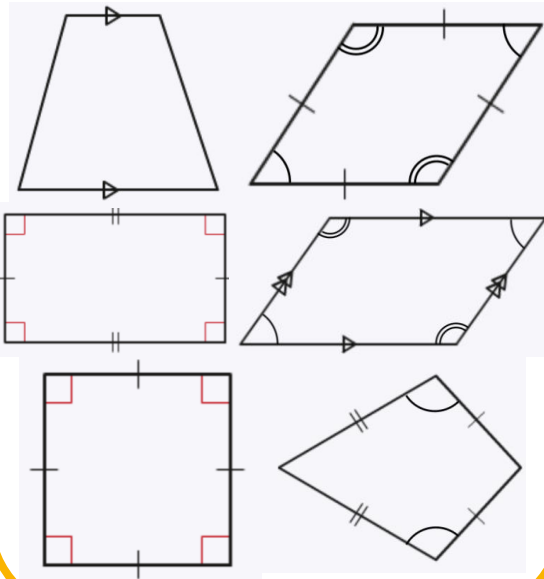


# PROPERTIES OF SHAPES

## Key Concept Quadrilaterals



## Key Words

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

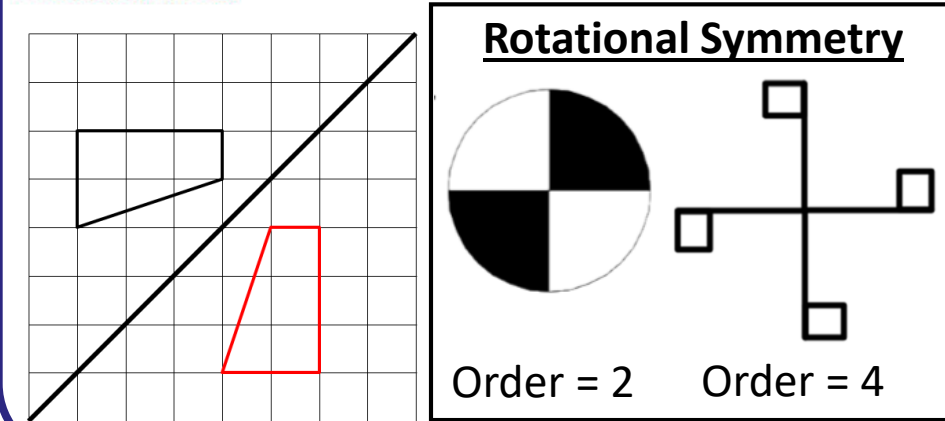
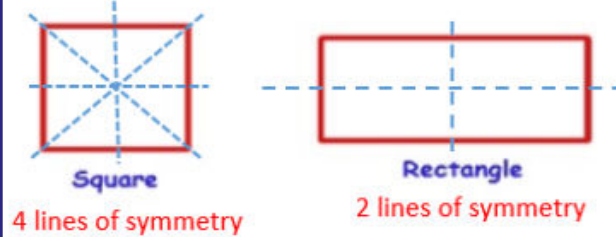
**Symmetry:** A shape has symmetry if there is a line which forms two equal parts which are a mirror image of each other.

**Reflection:** This is where a shape is flipped.

**Rotation:** This is where a shape is turned.

## Examples

### Lines of symmetry and reflection



**sparx**

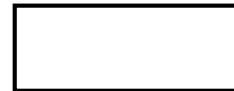
M541, M780, M290,  
M178, M910, M276,  
M618, M523

## Tip

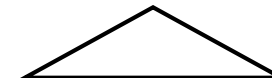
- The smallest the order of rotational symmetry can be, is 1.
- To see if a line of symmetry works fold along the line and see if the both halves lie exactly on top of each other.

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

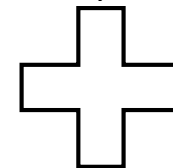
1)



2)



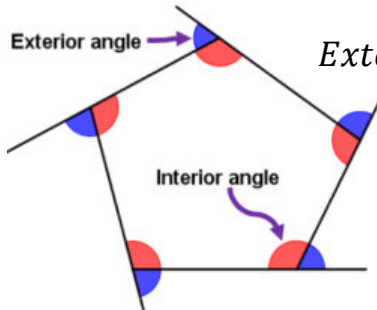
3)



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

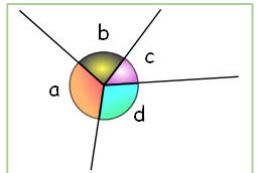
# ANGLE PROPERTIES

## Key Concepts

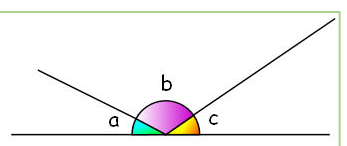


Exterior angle

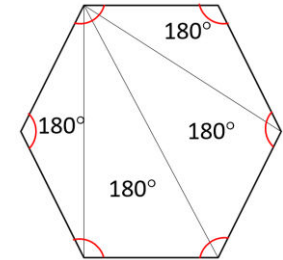
Interior angle

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


Angles at a point add to  $360^\circ$



Angles on a line add to  $180^\circ$



Sum of interior  
 $= 180^\circ \times 4 = 720^\circ$

## Key Words

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

**Quadrilateral:** 4 sided shape.

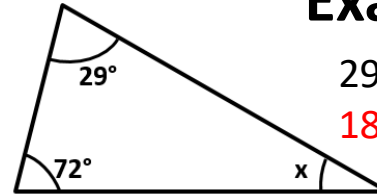
**Polygon:** Many sided shape.

**Regular polygon:** All sides and angles are equal.

**Interior angle:** The angle inside a polygon.

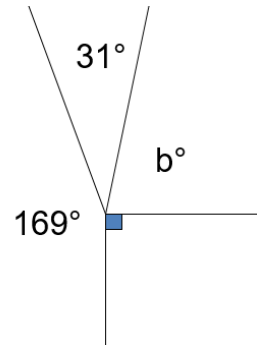
**Exterior angle:** The angle formed when a side length of a polygon is continued.

## Examples



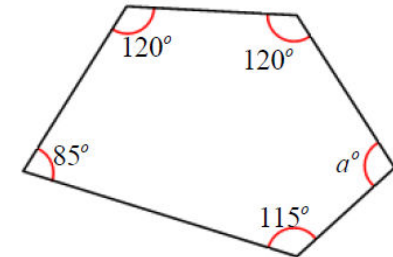
$$29^\circ + 72^\circ = 101^\circ$$

$$180^\circ - 101^\circ = 79^\circ$$



$$169^\circ + 31^\circ + 90^\circ = 290^\circ$$

$$360^\circ - 290^\circ = 70^\circ$$



$$120^\circ + 120^\circ + 85^\circ + 115^\circ = 440^\circ$$

$$540^\circ - 440^\circ = 100^\circ$$

**sparx**

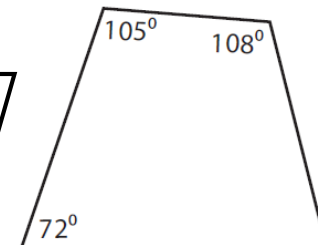
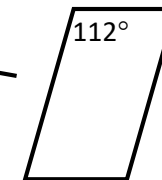
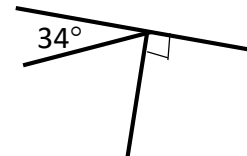
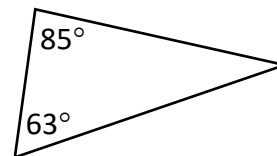
M818, M679,  
M653, M351,

## Tip

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

## Questions

1) Find the missing angles:



ANSWERS: 1)  $32^\circ$  2)  $56^\circ$  3)  $68^\circ, 112^\circ, 68^\circ$  4)  $75^\circ$

# TYPES OF ANGLE AND ANGLES IN POLYGONS

## Key Concepts

**Regular polygons** have equal lengths of sides and equal angles.

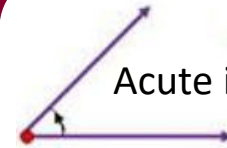
### Angles in polygons

Sum of interior angles  
 $= (\text{number of sides} - 2) \times 180$

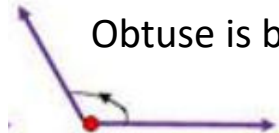
Exterior angles of **regular** polygons  $= \frac{360}{\text{number of sides}}$

### Types of angle

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



Acute is less than  $90^\circ$



Obtuse is between  $90^\circ$  and  $180^\circ$



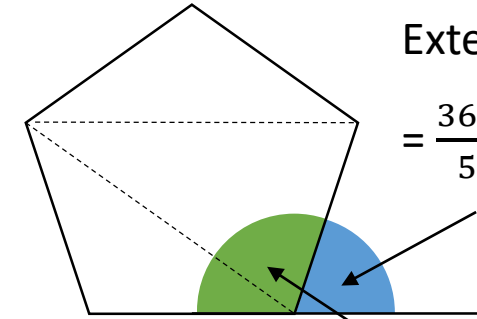
Right angled is  $90^\circ$



Reflex is between  $180^\circ$  and  $360^\circ$

## Examples

### Regular Pentagon



Exterior angles

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

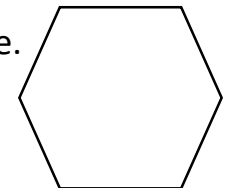
Sum of interior angles  
 $= (5 - 2) \times 180$   
 $= 540^\circ$

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

Interior

## 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

# 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.

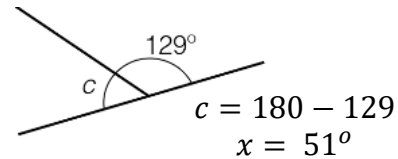
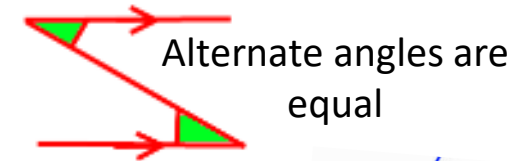
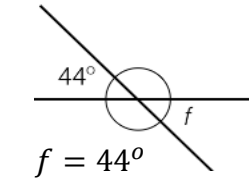
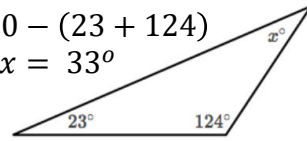
**Corresponding angles** are equal in size.

**Allied/co-interior angles** are equal 180°.

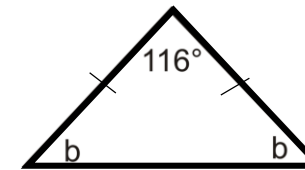
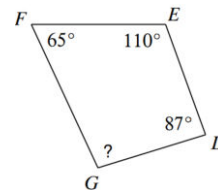
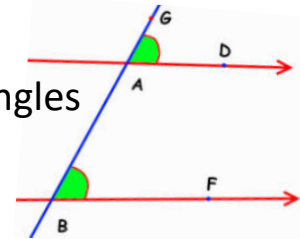
## Examples

$$x = 180 - (23 + 124)$$

$$x = 33^\circ$$

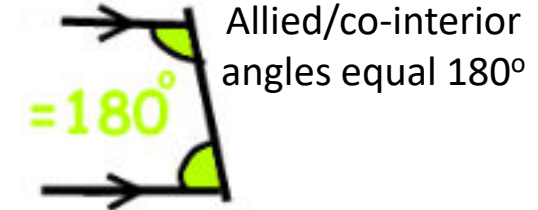


Corresponding angles are equal



$$b = (180 - 116) \div 2$$

$$b = 32^\circ$$



$$? = 360 - (65 + 110 + 87)$$

$$? = 98^\circ$$

**sparx**

**M331**

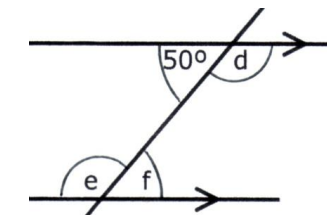
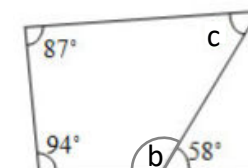
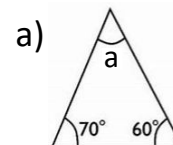
**M606**

## Key Words

Angle  
Vertically opposite  
Straight line  
Alternate  
Corresponding  
Allied  
Co-interior

## Questions

Calculate the missing angle:



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

# TYPES OF DATA AND GRAPHS

## Key Concepts

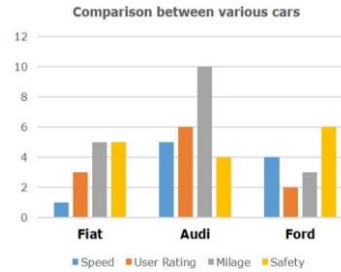
**Qualitative data:** data collected that is described in words **not** numbers.  
e.g. race, hair colour, ethnicity.

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

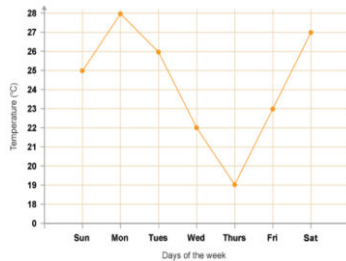
**Discrete data:** numerical data that is categorised into a finite number of classifications.  
e.g. number of siblings in a family, shoe size, .

**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.

## Comparative bar charts



## Line graphs



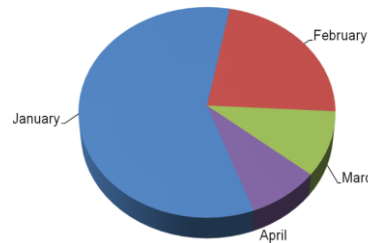
## Examples

### Tally charts

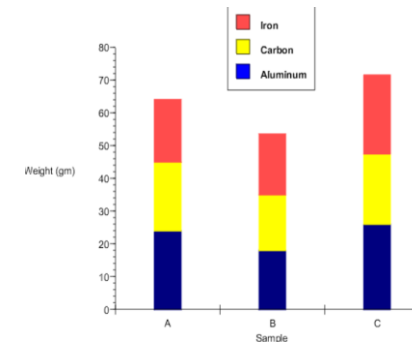
Colour	Tally	Frequency
Red		13
Blue		9
White		24
Black		12
Other		9

### Pie charts

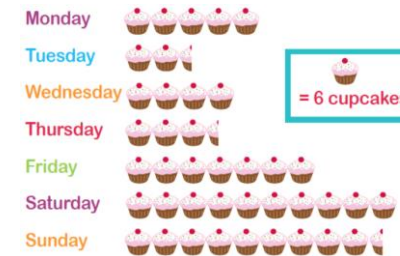
Sales split month wise



## Composite bar 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



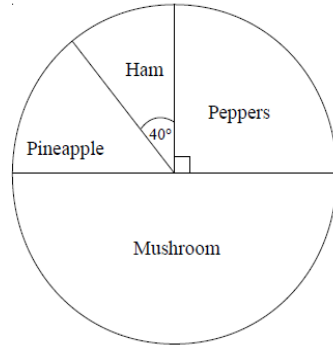
# PIE CHARTS AND SCATTER-GRAPHS

## 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**.

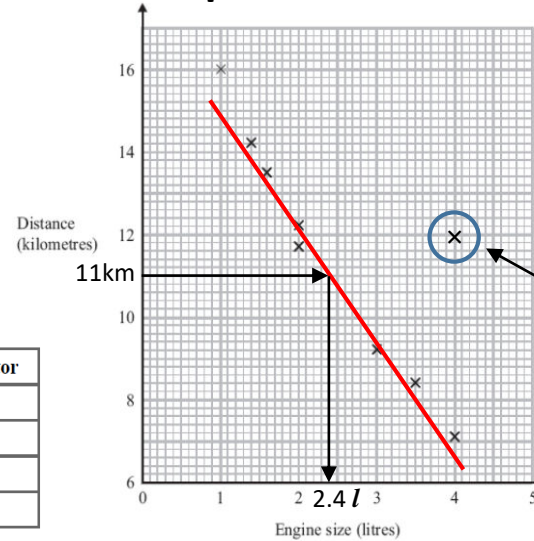


Topping	Frequency	Angle of Sector
Peppers	18	90°
Mushroom	36	180°
Pineapple	10	50°
Ham	8	40°

Total=72      360°

$360^\circ \div 72 \times 5$

## 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**

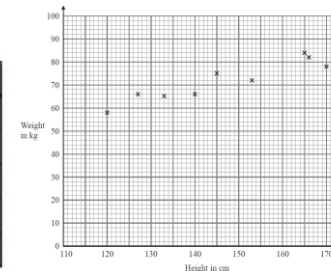
U508 U172  
U854 U199  
U277 U128

## 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.