Place value in numbers to 10million

The position of the digit gives its value

Ten millions	Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Units
1	2	3	4	5	6	7	8

Example

The value of the digit '1' is 10 000 000
The value of the digit '2' is 2 000 000
The value of the digit '3' is 300 000
The value of the digit '4' is 40 000

Round whole numbers

Example 1– Round 634 679 to the nearest 10 000

- Step 1 – Find the 'rounding off digit' - 3
- Step 2 – Move one digit to the right - 4

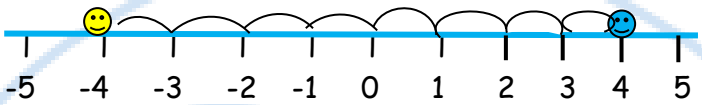
4 or less? YES – leave 'rounding off digit' the same
- Replace following digits with zeros
ANSWER – 630 000

Example 2– Round 345 679 to the nearest 10 000

- Step 1 – Find the 'rounding off digit' - 4
- Step 2 – Move one digit to the right - 5

5 or more? YES – add one to 'rounding off digit'
- Replace following digits with zeros
ANSWER – 350 000

Negative numbers



4 > -4 → We say 4 is larger than -4

-4 < 4 → We say -4 is less than 4

Remember the rules:

- When subtracting go down the number line

When adding go up the number line

Mental methods for addition

- Start from LEFT to RIGHT

Example 1 – think of:
55 + 44 as 55 + 40 + 4

- But in your head say:

55 95 99

Example 2 – think of:
2347 + 536 as 2347 + 500 + 30 + 6

- But in your head say:

2347 2847 2877 2883

Mental methods for subtraction

Example 1 – think of:
78 – 43 as 78 – 40 – 3

- But in your head say:

78 38 35

Example 2 – think of:
2347 - 536 as 2347 - 500 - 30 - 6

- But in your head say:

2347 1847 1811

Addition

- Line up the digits in the correct columns

e.g. 64p + £3.29 + £8

```
   0 . 64
   3 . 29
  +8 . 00
 £11 . 93
      1
```

Subtraction

- Line up the digits in the correct columns

e.g. 645 - 427

```
   H  T  U
   6 ³4 ¹5
 - 4  2  7
 ---------
   2  1  8
```

Multiply numbers

e.g. 264 x 32

COLUMN METHOD

```
  264
 x 32
  528
 7920
 8448
```

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Divide numbers

Division using a formal method

- **By a ONE-DIGIT number**

e.g. 9138 ÷ 6

$$6\overline{)9^{3}1^{1}3^{1}8} = 1526$$

- **By a TWO-DIGIT number**

LONG DIVISION METHOD

4928 ÷ 32 =

(Except write down some of your tables down first)

32
64
96
128
160

Divide
Subtract
Bring down - Make a new number
Divide ...

e.g. 4928 ÷ 32

```
 0 1 5 4
32 4 9 2 8
-3 2
 1 7 2
-1 6 0
     1 2 8
    -1 2 8
       0 0 0
```

4928 ÷ 32 = **154**

With a remainder also expressed as a fraction

```
  0 2 8
15 4 3 2
-3 0
  1 3 2
 -1 2 0
    1 2
```

ANSWER - 432 ÷ 15 = **28 r 12**

$= 28\frac{12}{15}$

With a remainder expressed as a decimal

```
  0 2 8 . 8
15 4 3 2 . 0
-3 0
  1 3 2
 -1 2 0
    1 2
```

$$15\overline{)4^{4}3^{13}2.^{12}0} = 028.8$$

ANSWER - 432 ÷ 15 = **28.8**

Order of operations

Bracket
Indices
Divide, **M**ultiply } Do these in the order they appear
Add, **S**ubtract } Do these in the order they appear

e.g. 3 + 4 x 6 – 5 = 22

first

(2 + 1) x 3 = 9

first

Factors, multiples & primes

- **FACTORS** are what divides exactly into a number

e.g. Factors of 12 are:

1	12
2	6
3	4

Factors of 18 are:

1	18
2	9
3	6

The common factors of 12 & 18 are: 1, 2, 3, 6,
The Highest Common Factor is: 6

- **PRIME NUMBERS** have only TWO factors

e.g. Factors of 7 are: 1 7

Factors of 13 are 1 13

So 7 and 13 are both prime numbers

- **MULTIPLES** are the times table answers

e.g. Multiples of 5 are: 5 10 15 **20** 25 .....

Multiples of 4 are: 4 8 12 16 **20** .....

The Lowest Common Multiple of 5 and 4 is: **20**

Equivalent fractions

- To simplify a fraction

Example: $\frac{27}{36}$

First find the highest common factor of the numerator and denominator – which is 9, then divide

$$\frac{27}{36} \overset{\div 9}{\underset{\div 9}{}} = \frac{3}{4}$$

- To change fractions to the same denominator

Example: $\frac{3}{4}$ and $\frac{2}{3}$

Find the highest common multiple of the denominators – which is 12, then multiply:

$$\frac{3}{4} \overset{\times 3}{\underset{\times 3}{}} = \frac{9}{12} \text{ and } \frac{2}{3} \overset{\times 4}{\underset{\times 4}{}} = \frac{8}{12}$$

Add & subtract fractions

- Make the denominators the same

e.g. $\frac{1}{5} + \frac{7}{10}$ $= \frac{2}{10} + \frac{7}{10}$ $= \frac{9}{10}$	e.g. $\frac{4}{5} - \frac{2}{3}$ $= \frac{12}{15} - \frac{10}{15}$ $= \frac{2}{15}$

Do not add denominators

Multiply fractions

- Write 5 as $\frac{5}{1}$
- Multiply numerators & denominators

e.g. $5 \times \frac{2}{3}$ $= \frac{5}{1} \times \frac{2}{3}$ $= \frac{10}{3} = 3\frac{1}{3}$	e.g. $\frac{4}{5} \times \frac{2}{3}$ $= \frac{8}{15}$

Divide fractions

- Write 5 as $\frac{5}{1}$
- Invert the fraction after ÷ sign
- Multiply numerators & denominators

e.g. $\frac{2}{3} \div 5$ $= \frac{3}{2} \times \frac{1}{5}$ $= \frac{3}{10}$	e.g. $\frac{4}{5} \div \frac{2}{3}$ $= \frac{4}{5} \times \frac{3}{2}$ $= \frac{12}{10} = 1\frac{2}{10} = 1\frac{1}{5}$

Fraction of quantity

- $\frac{4}{5}$ means ÷ 5 x 4

e.g. To find $\frac{4}{5}$ of £40

£40 ÷ 5 x 4 = £40

Multiply/divide decimals by 10, 100

thousands	hundreds	tens	units	•	tenths	hundredth s	thousandt hs
4	3	5	2	•	6	1	7

- **To multiply by 10,** move each digit one place to the left

e.g. 35.6 x 10 = 356

Hundreds	Tens	Units	•	tenths
	3	5	•	6
3	5	6	•	

- **To divide by 10,** move each digit one place to the right

e.g. 35.6 ÷ 10 = 356= 3.56

Tens	Units	•	tenths	hundredths
3	5	•	6	
	3	•	5	6

- **To multiply by 100,** move each digit 2 places to the left
- **To divide by 100,** move each digit 2 places to the right

AN ALTERNATE METHOD

Instead of moving the digits

Move the decimal point the opposite way

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Multiply decimals

Step 1 – remove the decimal point
Step 2 – multiply the two numbers
Step 3 – Put the decimal back in

Example: 0.06 x 8
=> 6 x 8
=> 48
=> 0.48

6/11 Divide decimals

Use the bus shelter method
Keep the decimal point in the same place
Add zeros for remainders

Example: 6.28 ÷ 5

$$5\overline{)\,6.^{1}2^{2}8^{3}0} \quad 1.256$$

Percentage of quantity

Use only

- 50% - $\frac{1}{2}$
- 10% - $\frac{1}{10}$
- 1% - $\frac{1}{100}$

A percentage can also be calculated by using long multiplication and dividing the answer by 100

Example : To find 35% of £400
10% = £40
20% = £80
5% = £20
35% = £140

Fraction, decimal, percentage equivalents

LEARN THESE:

$\frac{1}{4}$ = 0.25 = 25%	$\frac{3}{4}$ = 0.75 = 75%
$\frac{1}{2}$ = 0.5 = 50%	$\frac{1}{10}$ = 0.1 = 10%

Percentage to decimal to fraction

27% = 0.27 = $\frac{27}{100}$

7% = 0.07 = $\frac{7}{100}$

70% = 0.7 = $\frac{70}{100}$ = $\frac{7}{10}$

Decimal to percentage to fraction

0.3 = 30% = $\frac{3}{10}$

0.03 = 3% = $\frac{3}{100}$

0.39 = 39% = $\frac{39}{100}$

Fraction to decimal to percentage

$\frac{4}{5}$ = $\frac{80}{100}$ = 80% = 0.8

Change to 100

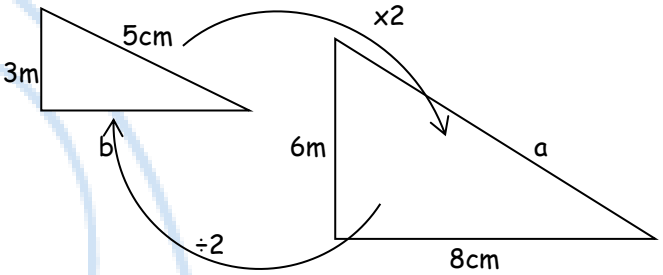
$\frac{3}{8}$ = 3 ÷ 8 = $8\overline{)\,3.^{3}0^{6}0^{4}0}$ = 0.375 = 37.5%

$\frac{9}{12}$ = $\frac{3}{4}$ = 0.75 = 75%

Cancel by 3

Similar shapes

When a shape is enlarged by a scale factor the two shapes are called SIMILAR shapes



Scale factor = 6 ÷ 3 = 2
Length a = 5 x 2 = 10cm
Length b = 8 ÷ 2 = 4cm

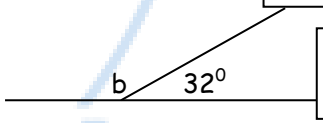
Express missing numbers algebraically

An unknown number is given a letter

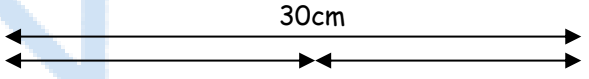
Examples

2a – 4 = 8

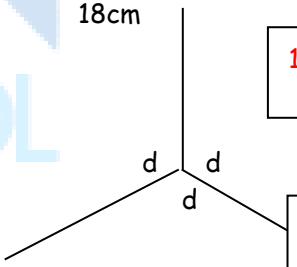
2a = 12 so a = 6



b + 32 = 180 so b = 148⁰



18 + c = 30 so c = 12



3d = 360⁰ so d = 120⁰

Use a word formula

Example: -Time to cook a turkey
Cook for 45min per kg weight
Then a further 45min

For a 6kg turkey, follow the formula:
45min x 6 + 45min
=270min + 45min
=315min
= 5h 15min

Number sequences

- **Understand position and term**

Position	1	2	3	4
Term	3	7	11	15

+4

Term to term rule = +4
Position to term rule is x 4 - 1
(because position 1 x 4 – 1 = 3)
nth term = n x 4 -1 = 4n – 1

- **Generate terms of a sequence**

If the nth term is 5n + 1
1st term *(n=1)* = 5x1 + 1 = 6
2nd term *(n=2)* = 5x2 + 1= 11
3rd term *(n=3)* = 5x3 + 1 = 16

Possible solutions of a number sentence

Example: x and y are numbers
Rule: x + y = 5
Possible solutions: x = 0 and y = 5
x = 1 and y = 4
x = 2 and y = 3
x = 3 and y = 2
x = 4 and y = 1
x = 5 and y = 0

Convert units of measure METRIC

When converting measurements follow these rules:

- When converting from a **larger unit to a smaller** unit we **multiply** (x)
- When converting from a **smaller unit to a larger** unit we **divide** (÷)

UNITS of LENGTH
10mm = 1cm
100cm = 1m
1000m = 1km

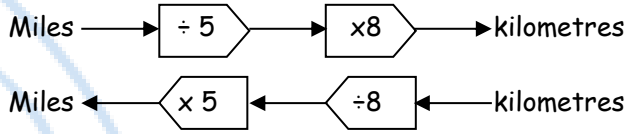
UNITS of TIME
60sec = 1 min
60min = 1 hour
24h = 1 day
365days = 1 year

UNITS of MASS
1000g = 1kg
1000kg = 1tonne

UNITS of VOLUME
1000ml = 1 litre
100cl = 1litre

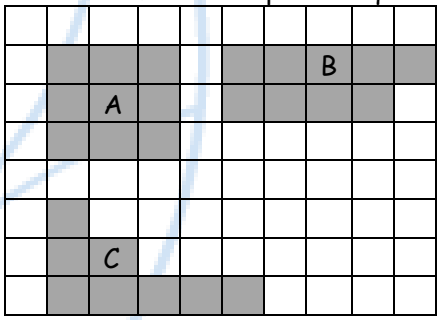
Convert units of measure METRIC/IMPERIAL

LEARN: 5 miles = 8km



Perimeter and area of shapes

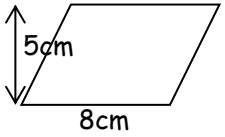
Shapes can have the SAME area but different perimeters
The area of each shape is 9 squares



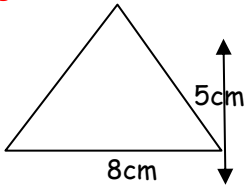
Perimeter of each shape is different
A – 12; B – 14; C -16

Area of parallelogram & triangle

Area of parallelogram
Area of parallelogram = b x h
= 8 x 5
= 40cm²



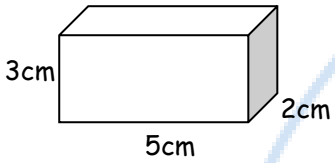
Area of triangle (½ a parallelogram)
Area of triangle = $\frac{b \times h}{2}$
= $\frac{8 \times 5}{2}$
20cm²



Volume

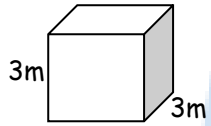
- **Volume of cuboid**

Volume = l x w x h
= 5 x 3 x 2
= 30cm^3



- **Volume of cube**

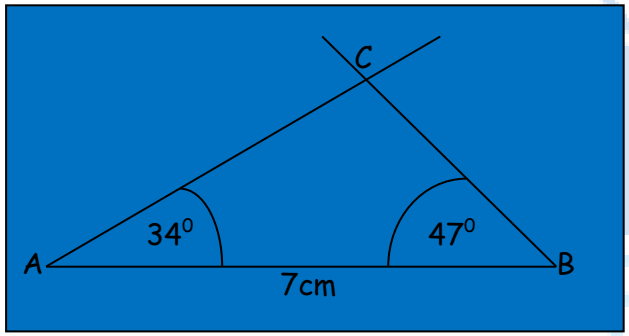
Volume = l x w x h
= 3 x 3 x 3
= 27m^3



Construct 2D shapes

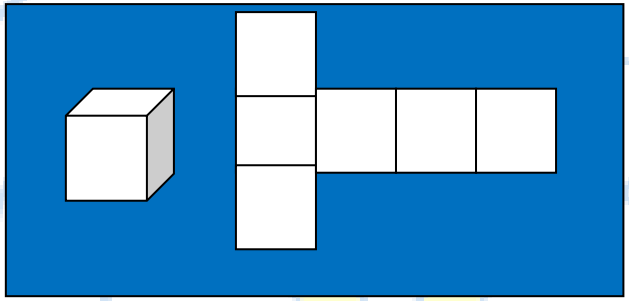
Example : Triangle with side and angles given

- Draw line AB = 7cm
- Draw angle 34^0 at point A from line AB
- Draw angle 47^0 at point B from line AB
- Extend to intersect the lines at C

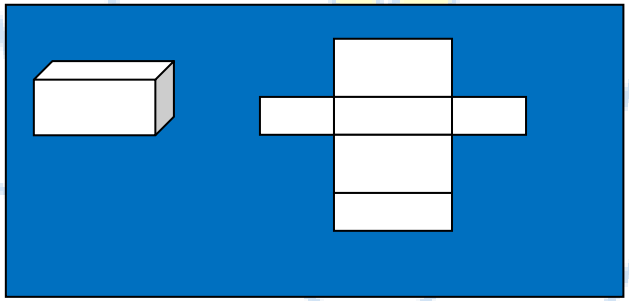


Construct 3D shapes

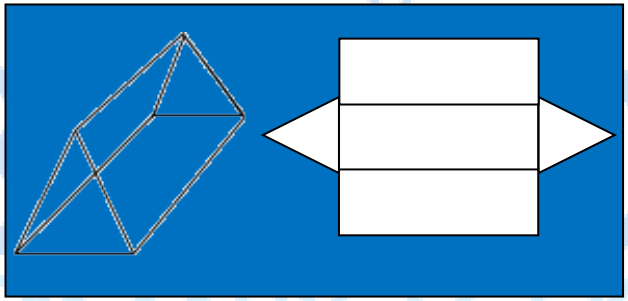
CUBE & its net



CUBOID & its net



TRIANGULAR PRISM & its net

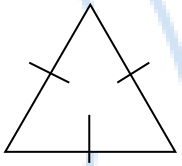


Properties of shapes

TRIANGLES – sum of angles = 180^0

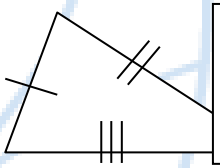
ISOSCELES triangle

2 equal sides & 2 equal angles



EQUILATERAL triangle

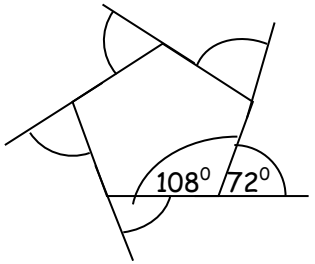
3 equal sides & ALL angles 60^0



SCALENE triangle

All sides & angles different

- Sum of exterior angles is always 360^0

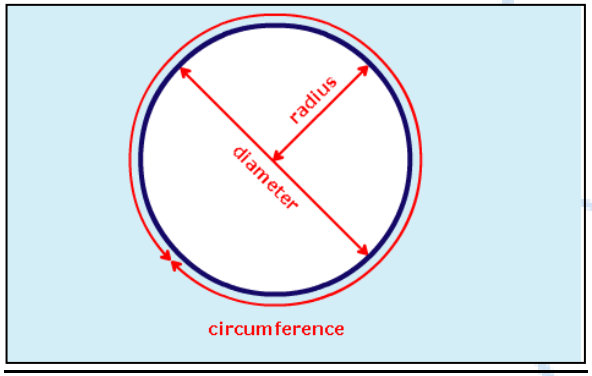


- interior & exterior angle add up to 180^0
- the interior angles add up to:

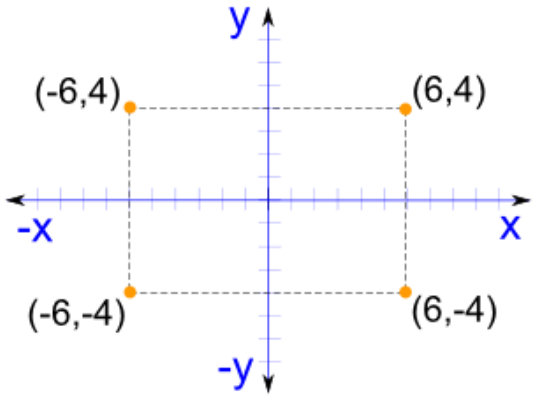
Triangle =1 x 180^0 = 180^0
Quadrilateral =2 x 180^0 = 360^0
Pentagon =3 x 180^0 = 540^0
Hexagon =4 x 180^0 = 720^0

Parts of a circle

- The circumference is the distance all the way around a circle.
- The diameter is the distance right across the middle of the circle, passing through the centre.
- The radius is the distance halfway across the circle.
- The radius is always half the length of the diameter. (d = 2 x r) or (r = ½ x d)

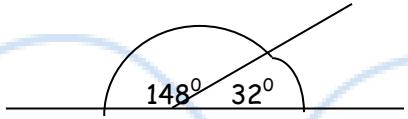


Position on a co-ordinate grid



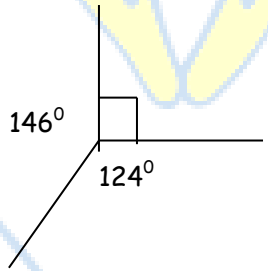
Angles and straight lines

- Angles on a straight line add up to 180^0



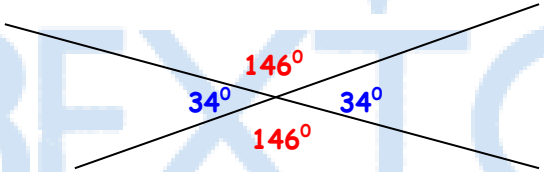
$148^0 + 32^0 = 180^0$

- Angles about a point add up to 360^0



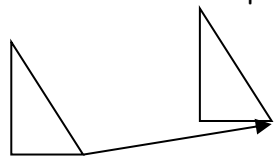
$146^0 + 90^0 + 124^0 = 360^0$

- Vertically opposite angles are equal



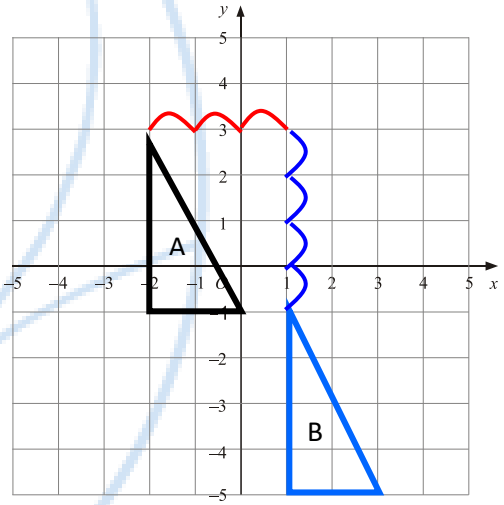
Transformations

- **Translation** – A shape moved along a line



Example – Move shape A 3 right & 4 down

Can also be written as a vector $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$ Right / Down



Notice:

- The new shape stays the same way up
- The new shape is the same size

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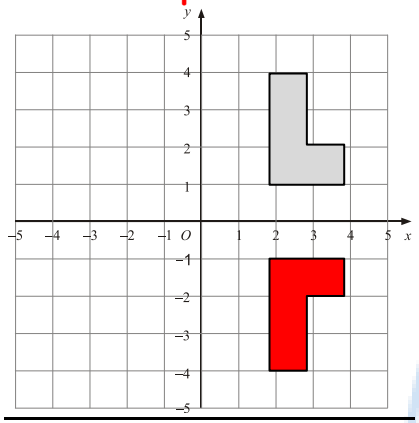
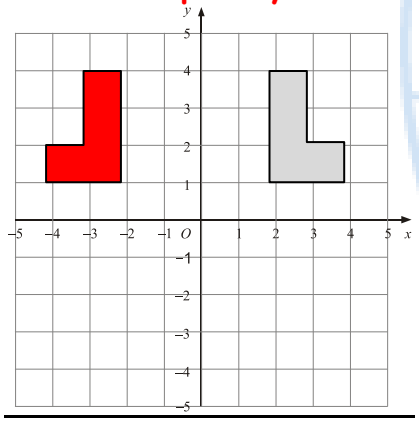
○ Reflect a shape in x-axis



○ Reflect a shape in y-axis



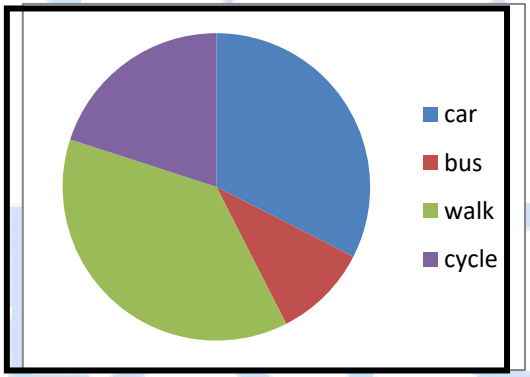
Graphs

○ Pie chart

Transport	Frequency	Angle
Car	13	13 x 9=117^0
Bus	4	4 x 9=36^0
Walk	15	15 x 9=135
Cycle	8	8 x 9=72

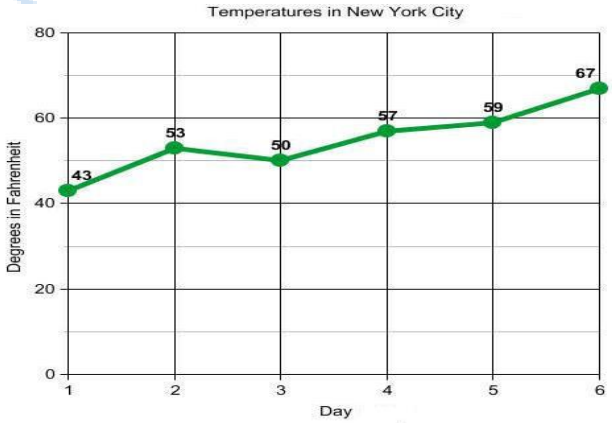
Total frequency = 40

360^0 ÷ 40 = 9^0 per person



○ Line graph

Line graphs show changes in a single variable – in this graph changes in temperature can be observed.



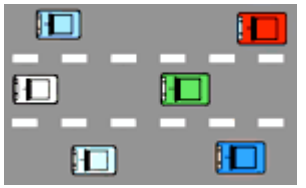
The mean

The mean is usually known as the average.
The mean is not a value from the original list.
It is a typical value of a set of data

Mean = total of measures ÷ no. of measures

e.g.- Find mean speed of 6 cars travelling on a road

Car 1 – 66mph
Car 2 – 57mph
Car 3 – 71mph
Car 4 – 54mph
Car 5 – 69mph
Car 6 – 58mph



Mean = $\frac{66+57+71+54+69+58}{6}$

= $\frac{375}{6}$

= 62.5mph

Mean average speed was 62.5mph

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