Calculating methods

**Addition**

**Example 534 + 2678**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Place the digits in the correct “place value” columns with the numbers under each other. |  | Th | H | T | O |
| Begin adding in the ones column. |  |  | 5 | 3 | 4 |
| Show any carrying in the next column. | **+** | **1**2 | **1**6 | **1**7 | 8 |
|  |  | **3** | **2** | **1** | **2** |

**Subtraction**

**Example: 7689 - 749**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Place the digits in the correct “place value” columns with the numbers under each other. |  | Th | H | T | O |
| Begin subtracting in the ones column. |  | **6**7 | **1**6 | **7**8 | **1**6 |
| You can’t subtract 9 from 6 so move 1 ten from  the 8 tens to the 6 ones to make 16 ones. | **-** |  | 7 | 4 | 9 |
|  | **6** | **9** | **3** | **7** |
| Note that the same has happened with the hundreds. | | |  |  |  |

**Multiplication**

**Example 56 x 34**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Separate the 56 and 34 into tens and ones. |  |  | x | **50** | **6** |
| Multiply the columns with the rows and place the answers in the grey boxes. |  |  | **30** | **1500** | **180** |
|  |  | **4** | **200** | **24** |
| **Add the numbers: 1500 + 180 + 200 + 24**  **= 1904** |  |  |  |  |  |
|  |  |  |  |  |

**Division**

**Example: 432 ÷ 15**

**Long division method**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | **2** | **8** |  | 4 is not divisible by 15, so you divide 43 by 15. |
| **15** | **4** | **3** | **2** |  | 3 x 15 = 45 which is more than 43 so choose **2** x 15 = **30**. |
|  | **3** | **0** | **↓** |  | Subtract 30 from 43 to give a remainder of 13. |
|  | **1** | **3** | **2** |  | Bring the **2** down in order to make **132**. |
|  | **1** | **2** | **0** |  | **8** x 15 = **120**. |
|  |  | **1** | **2** |  | Subtract 120 from 132 to give a remainder of 12. |
|  |  |  |  |  |  |
|  |  |  |  |  | There are no more numbers to bring down, therefore, the answer is: |
| **28 r 12** | | | |  | **28 with a remainder of 12.** |

**Concise method**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  | 4 is not divisible by 15, so you divide 43 by 15. |
|  |  | **2** | **8** | r12 |  | 3 x 15 = 45 which is more than 43 so choose  **2** x 15 = **30**. |
| **15** | **4** | **3** | **132** |  |  |
|  |  |  |  |  |  | Subtract 30 from 43 to give a remainder of 13. |
|  |  |  |  |  |  | Write 13 in front of the 2 to give 132. |
|  |  |  |  |  |  | **8** x 15 = 120. |
|  |  |  |  |  |  | Subtract 120 from 132 to give a remainder of 12. Therefore, the answer is: **28 r 12** |

**Division without tears!**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **x** | 15 | Sum |  | We use the 10, 5, 2 and 1 tables which are easier. |
| 10 | 150 | 150 |  | 10 x 15 = 150 which is a great deal less than 432. |
| 10 | 150 | 300 |  | Another 10 x 15 will make a total of 300. |
| 5 | 75 | 375 |  | Another 10 x 15 will give a total of 450 which is more than 432 so we use 5 x 15 = 75 giving a total of 375. |
| 2 | 30 | 405 |  | 5 x 15 is too big, so use 2 x 15 = 30 gives 405. |
| 1 | 15 | 420 |  | 2 x 15 is too big, so use 1 x 15 = 15 to give 420. |
| 28 |  | r12 |  | 1 x 15 is too big, therefore, the remainder is  432 – 420 = **12**. |
|  |  |  |
|  |  |  |  | By adding the “**x**” column we can see how many 15s there are in 432. Answer: 10 + 10 + 5 + 2 + 1 = **28**. |

Even numbers Square numbers

2, 4, 6, 8, 10, 12, ………… 12 = 1 x 1 = 1

2 divides exactly into every even number. 22 = 2 x 2 = 4

32 = 3 x 3 = 9

Odd numbers 42 = 4 X 4 = 16

52 = 5 X 5 = 25

1, 3, 5, 7, 11, ………… 62 = 6 x 6 = 36

2 doesn’t divide exactly into odd numbers. 72 = 7 x 7 = 49

The first 7 square numbers

are: 1, 4, 9, 16, 25, 36, 49

Triangular numbers Factors



1 = 1 A factor is a number that

1 + 2 = 3 divides exactly into another

1 + 2 + 3 = 6 number.

1 + 2 + 3 + 4 = 10 The factors of 12 are:

1 + 2 + 3 + 4 + 5 = 15 1, 2, 3 ,4, 6, 12

1 + 2 + 3 + 4 + 5 + 6 = 21

1 + 2 + 3 + 4 + 5 + 6 + 7 = 28 The factors of 13 are 1 and 13

The first seven triangular numbers are:

1, 3, 6, 10, 15, 21, 28

Prime numbers

A prime number hasexactly **two**

factors namely 1 and itself.

The factors of 17 are 1 and 17,

therefore 17 is a prime number.

The prime numbers between 1 and 100

are:

2, 3, 5, 7, 11, 13, 17, 19, 23,

29, 31, 37, 41, 43, 47, 53, 59, 61,

67, 71, 73, 79, 83, 89, 97

**Note: 1 is not a prime number!**

**Place value**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Thousands  (1000) | Hundreds  (100) | Tens  (10) | Ones  (1) | **.** | Tenths  1  10 | Hundredths  1  100 | Thousandths  1  1000 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 10 ones | = | 1 ten | 10 thousandths | = | 1 hundredth |
| 10 tens | = | 1 hundred | 10 hundredths | = | 1 tenth |
| 10 hundreds | = | 1 thousand | 10 tenths | = | 1 unit |

The placement of the digits within the number gives us the value of that digit.

The digit 4 has the value of The digit 5 has the value

4 thousand of 5 tenths ( 5/10 )

4 2 8 4 . 5 6 7

(4000)

The digit 8 has the value The digit 7 has the value

8 tens (80) 7 thousandths ( 7/1000 )

**Inverse operations**

Inverse operations allow you to undo a sum.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Operator |  | Inverse Operation |  |
|  | + |  | – |  |
|  | – |  | + |  |
|  | ÷ |  | x |  |
|  | x |  | ÷ |  |

We use inverse operations when we work with function machines.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Input | **?** | **→** | **÷ 3** | **→** | **– 7** | **=** | **3** | Output |
|  |  |  |  |  |  |  |  |  |
| If the output is **3**, the input **?** must be **30**. | **30** | **=** | **x 3** | **←** | **+ 7** | **←** | **3** |  |

# Fractions

The **numerator** is the number

**3**

**4**

on the top of the

fraction

The **denominator** is the

number on the bottom

|  |  |  |
| --- | --- | --- |
| If we have a number and a fraction mixed we call it a **mixed fraction**. | 3 | **7** |
| **8** |

|  |  |
| --- | --- |
| When the numerator is larger than the denominator we call this an **improper** fraction. | **9** |
| **7** |

## Equivalent fractions

All the fractions below represent the same proportion. Therefore they are called equivalent fractions.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| **1/2** | |  | **2/4** | |  | **4/8** | | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | = | 2 | = | 3 | = | 4 | = | 5 | = | . . . . |
| 2 | 4 | 6 | 8 | 10 |
|  |  |  |  |  |  |  |  |  |  |  |
| 1 | = | 2 | = | 3 | = | 4 | = | 5 | = | . . . . |
| 3 | 6 | 9 | 12 | 15 |
|  |  |  |  |  |  |  |  |  |  | etc. |
| 1 | = | 2 | = | 3 | = | 4 | = | 5 | = | . . . . |
| 4 | 8 | 12 | 16 | 20 |
|  |  |  |  |  |  |  |  |  |  |  |
| 3 | = | 6 | = | 9 | = | 12 | = | 15 | = | . . . . |
| 4 | 8 | 12 | 16 | 20 |

# Decimals

A decimal is any number that contains a decimal point.

The following are examples of decimals.

0⋅549 1⋅25 256⋅4 3⋅406

# Percentages

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
|  | **The symbol** | **%** | **means** | **1** |  |
|  | **100** |  |
|  |  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 7% | means | **7/100** |  |
|  | 63% | means | **63/100** |  |
|  | 100% | means | **100/100** | or 1 whole. |
|  | 120% | means | **120/100** | It is possible to have a percentage that is greater than 1 whole. |

### Changing decimals and fractions into percentages

To change a decimal or fraction to a percentage you have to multiply with 100%.

0⋅75 x 100% = 75%

13 x 5~~100~~% = 65%

1~~20~~

To change a fraction into a decimal you have to divide the numerator with the denominator.

3 = 3 ÷ 8 = 0⋅375

8

It is also possible to change a fraction into a percentage like this:

2 = 2 ÷ 3 = 0⋅6666 . . . = 0⋅67 ( to 2 decimal places )

3

then 0⋅67 x 100% = 67%

Therefore **2/3 = 67% ( to the nearest one part of a hundred )**

#### **Useful fractions, decimals and percentages**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Fraction** | | **Decimal** | | **Percentage** |
|  | 1 |  | 1⋅0 | 100% |
|  | **1/2** |  | 0⋅5 | 50% |
|  | **1/3** |  | 0⋅33..... | 33% |
|  | **1/4** |  | 0⋅25 | 25% |
|  | **3/4** |  | 0⋅75 | 75% |
|  | **1/10** |  | 0⋅1 | 10% |
|  | **2/10** ( = 1/5 ) |  | 0⋅2 | 20% |
|  | **3/10** |  | 0⋅3 | 30% |

##### Ratio

Ratio is used to make a comparison between two things.

Example

**☺ ☺ ☺ ☹ ☺ ☺ ☺ ☹ ☺ ☺ ☺ ☹**

In this pattern we can see that there are 3 happy faces **to**  every sad face.

We use the symbol: to represent **to** in the above statement, therefore we write the ratio like this:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Happy | : | Sad | Sad | : | Happy |
| 3 | : | 1 | 1 | : | 3 |

Ratio is used in a number of situations:

* In a cooking recipe
* In building when mixing concrete
* It is used in the scale of maps

e.g. if a scale of **1 : 100 000** is used,

it means that **1 cm** on the map represents

**100 000 cm** in reality which is **1 km**.

**Integers / Directed numbers**

The negative sign ( - ) tells us the number is below zero e.g. **-4**. The number line is useful when working with negative numbers. Below is a part of the number line.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Negative direction ← | | | | | | | | |  | → Positive direction | | | | | |
| -9 | -8 | -7 | -6 | -5 | **-4** | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 |

The numbers on the right are greater than the numbers on the left e.g. 5 is greater than 2 and 2 is greater than -3. **Note** that -3 is greater than -8.

**Adding and subtracting integers**

The **Number line game** can be used to add and subtract negative numbers:

**Rules:**

Start at zero facing the positive direction.

Ignore any **+** signs.

The **–** sign means **“make half a turn”** .

When you see a number, step the value of the number in the direction you are facing.

After stepping, face the positive direction before continuing with the sum.

Your position at the end will be the answer.

**Example**: **– 3 – 4 + 6**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sum | -8 | -7 | -6 | -5 | -4 | -3 | -2 | -1 | 0 | 1 | Method |
|  |  |  |  |  |  |  |  |  | **→** |  | Start at zero. |
| **-** |  |  |  |  |  |  |  |  | **←** |  | Make half a turn. |
| **3** |  |  |  |  |  | **←** |  |  |  |  | Step 3. |
|  |  |  |  |  |  | **→** |  |  |  |  | Face the positive. |
| **-** |  |  |  |  |  | **←** |  |  |  |  | Make half a turn. |
| **4** |  | **←** |  |  |  |  |  |  |  |  | Step 4. |
|  |  | **→** |  |  |  |  |  |  |  |  | Face the positive. |
| **+** |  | **→** |  |  |  |  |  |  |  |  | Ignore the +. |
| **6** |  |  |  |  |  |  |  | **→** |  |  | Step 6. |
|  |  |  |  |  |  |  |  | **☺** |  |  | **The answer is -1.** |

**Example**: **2 + – 8 – – 9**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **•** |  |  |  |  |  | **•** |  | **•** | **•** |  |  |  |
| -9 | -8 | -7 | -6 | -5 | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  | **☺** |  |  |  |

**•** Start at zero facing the positive direction.

• Step 2 and face the positive direction.

• Ignore the + , make half a turn, step 8 and face the positive direction.

• Make half a turn, make half a turn, step 9 and note your position.

The answer is **3** :

**Multiplying and dividing integers**

We multiply and divide directed numbers in the usual way while remembering these very important rules:

Two signs the same, a positive answer.

Two different signs, a negative answer.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **×** | + | - |  | **÷** | + | - |
| + | + | - |  | + | + | - |
| - | - | + |  | - | - | + |

**Remember, if there is no sign before the number, it is positive.**

**Examples**:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **5** | **x** | **-7** | **=** | **-35** |  | **(different signs give a negative answer)** |
| **-4** | **x** | **-8** | **=** | **32** |  | **(two signs the same give a positive answer)** |
| **48** | **÷** | **-6** | **=** | **-8** |  | **(different signs give a negative answer)** |
| **-120** | **÷** | **-10** | **=** | **12** |  | **(two signs the same give a positive answer)** |

**Coordinates**

We use coordinates to describe location.

0

**1**

**2**

**3**

**-3**

**-2**

**-1**

**3**

**2**

**1**

**-1**

**-2**

**-3**

A

B

C

D

***x***

***y***

The coordinates of the points are:

**A(1,2) B(-2,3) C(-2,-2) D(3,-2)**

There is a special name for the point **(0,0)**  which is  **the origin**.

The first number (**x-coordinate**) represents the distance across from the origin.

The second number (**y-coordinate**) represents the distance going up or down.

**Example :** The point (**1**,**2**) is **one across**  and **two up** from the origin.

**Inequalities**

We us the **=** sign to show that two sums are **equal**. If one sum is greater than or less than the other we use inequalities:

**<** less than **>** more than

**<** less than or equal to **>** more than or equal to

**Examples :**

**5 < 8** **43 > 6** ***x* < 8** ***y* > 17**

# Names of two dimensional shapes

A polygon is a closed shape made up of straight lines.

A **regular polygon** has equal sides and equal angles.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **hafalochrog** |  | **onglsgwar** |  | **isosgeles** |
| **Equilateral triangle** |  | **Right angled triangle** |  | **Isosceles triangle** |
|  |  |  |  |  |
| **anghyfochrog** |  | **sgwar** |  | **petryal** |
| **Scalene triangle** |  | **Square** |  | **Rectangle** |
|  |  |  |  |  |
| **paralelogram** |  | **rhombws** |  | **trapesiwm** |
| **Parallelogram** |  | **Rhombus** |  | **Trapezoid** |
| Opposite sides parallel and equal. |  | Opposite sides parallel, all sides equal. |  | One pair of opposite sides parallel. |
|  |  |  |  |  |
| **barcud** |  | **pentagon** |  | **hecsagon** |
| **Kite** |  | **Pentagon** |  | **Hexagon** |
|  |  |  |  |  |
| **septagon** |  | **octagon** |  | **cylch** |
| **Heptagon** |  | **Octagon** |  | **Circle** |

# 3D shapes

**3D means three dimensions – 3D shapes have length, width and height.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Shape | Name | Faces | Edges | Vertices (corners) |
| tetrahedron | Triangular Pyramid | 4 | 6 | 4 |
| ciwb | Cube | 6 | 12 | 8 |
| ciwboid | Rectangular Prism | 6 | 12 | 8 |
| octahedron | Octahedron | 8 | 12 | 6 |
| pyramid | Square  pyramid | 5 | 8 | 5 |
| prism | Triangular prism | 5 | 9 | 6 |

**Euler’s formula:**

**Number of faces - Number of edges + Number of vertices = 2**

# The circle

Center

Diameter

Radius

Chord

Tangent

Circumference

# Circumference of a circle

The circumference of a circle is the distance around the circle.

Circumference = π x diameter

Circumference = πd

Since the diameter is **twice** the length of the radius, we can also write

Circumference = π x 2 x radius

Circumference = 2πr

# π (pi)

# π is a Greek letter which represents 3•1415926535897932384 . . . . . (a decimal that carries on for ever without repetition)

# We round π to 3•14 in order to make calculations or we use the π button on the calculator.Perimeter

Perimeter is the distance around the outside of a shape. We measure the perimeter in millimeters (mm), centimeters (cm), meters (m), etc.

This shape has been drawn on a 1cm grid. Starting on the orange circle and moving in a clockwise direction, the distance travelled is . . .

1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 2 + 1 + 2 = 14cm

Perimeter = 14cm

**Area of 2D Shapes**

The area of a shape is how much surface it covers. We measure area in square units e.g. centimeters squared (cm2) or meters squared (m2).

# Areas of irregular shapes

Given an irregular shape, we estimate its area through drawing a grid and counting the squares that cover the shape.

Whole square –

count as one.

Half a square or more –

count as one.

Less than half a square - ignore.

**1**

**5**

**6**

**11**

**2**

**3**

**10**

**9**

**8**

**4**

**7**

Area = 11cm².

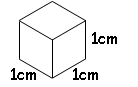
**Remember** that this is an estimate and not the exact area.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Area formula | | | | | | |
| **Rectangle** | | |  | **Triangle** | | |
| rectangle | | |  | triangle | | |
| Multiply the length with the width. | | |  | Multiply the base with the height and divide by two. | | |
| Area = | l x w | |  | Area = | b x h |
|  | 2 |
|  |  | |  |  |  | | |
| **Trapezoid** | | |  | **Parallelogram** | | | |
| trapezium | | |  | parallelogram | | | |
| Add the parallel sides, multiply with the height and divide by two. | | |  | Multiply the base with the height. | | | |
| Area = | (a + b) h |  | | Area = | b x h | | |
| 2 |  | |
|  |  | |  |  |  | | |
| **Circle** | | |  |  |  | | |
| circle | | |  |  |  | | |
| Multiply the radius with itself, then multiply with π. | | |  |  |  | | |
| Area = | r x r x **π**  =  **π**r² | |  |  |  | | |
|  |  |  | | |

Volume

Volume is the amount of space that an object contains or takes up. The object can be a solid, liquid or gas.

Volume is measured in cubic units e.g. cubic centimeters (cm3) and cubic meters (m3).



**Rectangular Prism**

Note that a rectangular prism has six rectangular faces.

|  |  |  |
| --- | --- | --- |
| **lengthwidthheight** |  | **Volume rect. prism= length x width x height** |
|  |

**Prism**

A prism is a 3-dimensional object that has the same shape throughout its length

i.e. it has a uniform cross-section.

|  |  |  |
| --- | --- | --- |
| **prism saes** |  | **Volume of a prism = area of the base x length** |
|  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Metric units of length | | | | | | | |
| Millimeter |  | mm | |  | | tape 210 mm = 1 cm 1 000 mm = 1 m | |
| Centimeter |  | cm | |  | | 100 cm = 1 m 100 000 cm = 1 km | |
| Meter |  | m | |  | | 1 000 m = 1 km | |
| Kilometer |  | km | |  | |  | |
|  |  |  | |  | |  | |
| Imperial/Standard units of length | | | | | | | |
| Inch |  | in or ” | |  | | 12 in = 1 ft | |
| Foot |  | ft or ’ | |  | | 3 ft = 1 yd | |
| Yard |  | yd | |  | | 1 760 yd = 1 mile | |
| Mile |  |  | |  | |  | |
|  |  |  | |  | |  | |
| Metric units of mass | | | | | | | |
| Milligram |  | mg | |  | | 1 000 mg = 1 g 1 000 000 mg = 1 kg | |
| Gram |  | g | |  | | 1 000 g = 1 kg | |
| Kilogram |  | kg | |  | | 1 000 kg = 1 t | |
| Metric ton |  | t | |  | | clorian | |
|  |  |  | |  | |  | |
| Imperial/Standard units of mass | | | | | | | |
| Ounce |  | oz | |  | | 16 oz = 1 lb | |
| Pound |  | lb | |  | | 2000 lb = 1 ton | |
|  |  |  | |  | |  | |
| jwgMetric units of volume | | | | | | | |
| Milliliter |  | ml | |  | | 1 000 ml = 1 l | |
| Liter |  | l | |  | |  | |
|  |  |  | |  | |  | |
| Imperial/Standard units of volume | | | | | | | |
| Ounce oz  Cup c  Pint | pt | |  | | 8 oz = 1 c | |
| Quart qt  Gallon | gal | |  | | 4 qt = 1 gal | |
|  |  | |  | |  | |

# Converting between imperial and metric units

|  |  |  |
| --- | --- | --- |
| Length |  |  |
| 1 inch | ≈ | 2.5 cm |
| 1 foot | ≈ | 30 cm |
| 1 mile | ≈ | 1.6 km |
| 5 miles | ≈ | 8 km |
|  |  |  |
| Weight/Mass | |  |
| 1 pound | ~ | 454 g |
| 2.2 pounds | ~ | 1 kg |
| 1 ton | ~ | 1 metric tonne |
|  |  |  |
| Volume |  |  |
| 1 gallon | ≈ | 4.5 litre |
| 1 pint | ≈ | 0.6 litre(568 ml) |
| 1¾ pints | ≈ | 1 litre |

# photo-thermometer

# Temperature

**Converting from Celsius (°C) to Fahrenheit (°F)**

Use the following formula

F = 1.8 x C + 32

**Converting from Fahrenheit (°F) to Celsius (°C)**

Use the following formula

C = (F – 32) ÷ 1.8

Look at the thermometer:

The freezing point of water is 0°C or 32°F

**Time**

|  |  |  |  |
| --- | --- | --- | --- |
| 1000 | years | = | 1 millennium |
| 100 | years | = | thirty days1 century |
| 10 | years | = | 1 decade |
|  |  |  |  |
| 60 | seconds | = | 1 minute |
| 60 | minutes | = | 1 hour |
| 24 | hours | = | 1 day |
| 7 | days | = | 1 week |
|  |  |  |  |
| 12 | months | = | 1 year |
| 52 | weeks | ≈ | 1 year |
| 365 | days | ≈ | 1 year |
| 366 | days | ≈ | 1 leap year |

**The Yearly Cycle**

|  |  |  |
| --- | --- | --- |
| **Season** | **Month** | spring**Days** |
| 003 gaeaf | January | 31 |
| 003 gaeaf | February | 28 |
| 004 gwan | March | 31 |
| 004 gwan | April | 30 |
| 004 gwan | May | 31 |
| 001 haf | June | 30 |
| 001 haf | July | 31 |
| 001 haf | August | 31 |
| 002 hyd | September | 30 |
| 002 hyd | October | 31 |
| 002 hyd | November | 30 |
| 003 gaeaf | December | 31 |

# The 24 hour and 12 hour clock

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **24 hour** |  | **12 hour** |  |
| Midnight | 00:00 |  | 12.00 a.m. | Midnight |
| The 24 hour clock always uses 4 digits to show the time.  **The 24 hour system does not use a.m. nor p.m.** | 01:00 |  | 1:00 a.m. | The 12 hour clock shows the time with a.m. before mid-day and p.m. after mid-day. |
| 02:00 |  | 2:00 a.m. |
| 03:00 |  | 3:00 a.m. |
| 04:00 |  | 4.00 a.m. |
| 05:00 |  | 5:00 a.m. |
| 06:00 |  | 6:00 a.m. |
| 07:00 |  | 7:00 a.m. |
| 08:00 |  | 8:00 a.m. |
| 09:00 |  | 9:00 a.m. |
| 10:00 |  | 10:00 a.m. |
| 11:00 |  | 11:00 a.m. |
| Mid-day | 12:00 |  | 12:00 p.m. | Mid-day |
| Jas1650 | 13:00 |  | 1:00 p.m. | resize |
| 14:00 |  | 2:00 p.m. |
| 15:00 |  | 3:00 p.m. |
| 16:00 |  | 4:00 p.m. |
| 17:00 |  | 5:00 p.m. |
| 18:00 |  | 6:00 p.m. |
| 19:00 |  | 7:00 p.m. |
| 20:00 |  | 8:00 p.m. |
| 21:00 |  | 9.00 p.m. |
| 22:00 |  | 10.00 p.m. |
| 23:00 |  | 11:00 p.m. |

**Time vocabulary**

|  |  |  |
| --- | --- | --- |
| 02:10 | Ten past two in the morning | 2:10 a.m. |
| 07:15 | Quarter past seven in the morning | 7:15 a.m. |
| 15:20 | Twenty past three in the afternoon | 3:20 p.m. |
| 21:30 | Half past nine in the evening | 9:30 p.m. |
| 14:40 | Twenty to three in the afternoon | 2:40 p.m. |
| 21:45 | Quarter to ten at night | 9:45 p.m. |

# Bearings

A bearing describes direction. A compass is used to find and follow a bearing.

The diagram below shows the main compass points and their bearings.

NE

N

SW

NW

SE

W

S

E

000°

045°

315°

270°

225°

135°

180°

N – North, S – South, E – East, W - West

090°

The bearing is an angle measured clockwise from the North.

Bearings are always written using three figures e.g. if the angle from the North is 5°, we write 005°.

Data

We collect data in order to highlight information to be interpreted.

There are two types of data:

|  |  |
| --- | --- |
| Discrete data Things that are not measured: | Continuous data Things that are measured: |
| * Colors * Days of the week * Favorite drink * Number of boys in a family * Shoe size | * Pupil height * Volume of a bottle * Mass of a chocolate bar * Time to complete a test * Area of a television screen |

# Discrete data

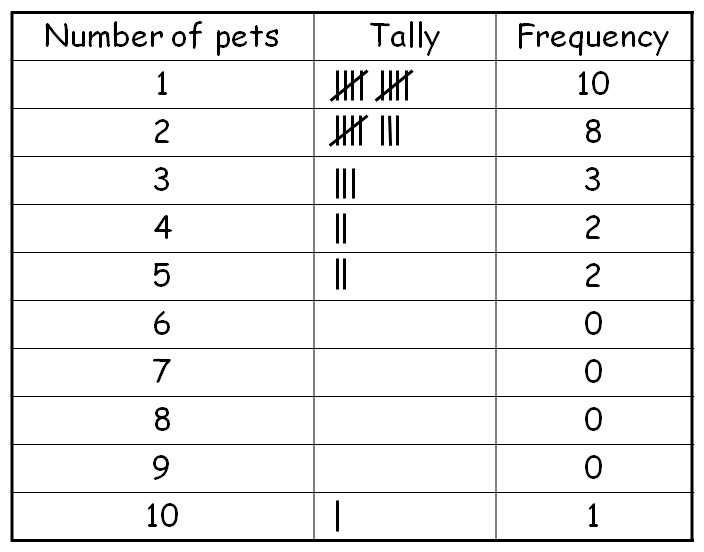
# Collecting and recording

We can record data in a list

e.g. here are the numbers of pets owned by pupils in form 9C:

1 , 2 , 1 , 1 , 2 , 3 , 2 , 1 , 2 , 1 , 1 , 2 , 4 , 2 , 1 , 5 , 2 , 3 , 1 , 1 , 4 , 10 , 3 , 2 , 5 , 1

A frequency table is more structured and helps with processing the information.



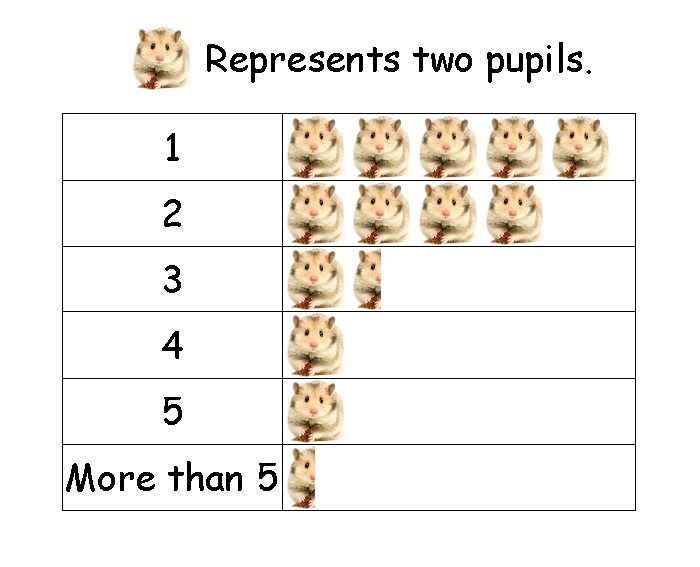
# Displaying

In order to communicate information, we use statistical diagrams. Here are some examples:

# Pictogram

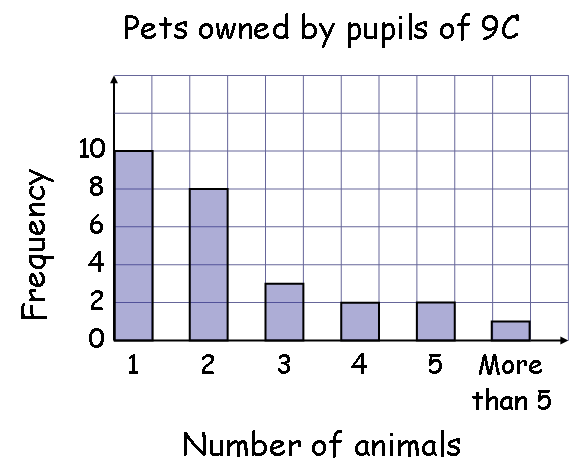
A pictogram uses symbols to represent frequency. We include a key to show the value of each symbol.

The diagram below shows the number of pets owned by pupils in 9C.



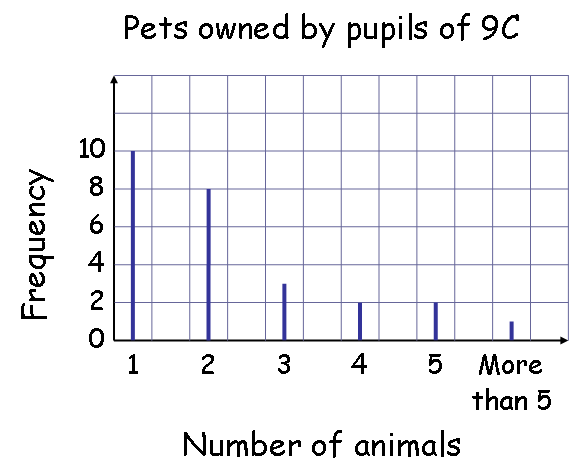
# Bar chart

The height of each bar represents the frequency. All bars must be the same width and have a constant space between them. Notice that the scale of the frequency is constant and starts from 0 every time. Remember to label the axes and give the chart a sensible title.



# Vertical line graph

A vertical line graph is very similar to a bar chart except that each category has a line instead of a bar. Notice that the category labels are directly below each line.



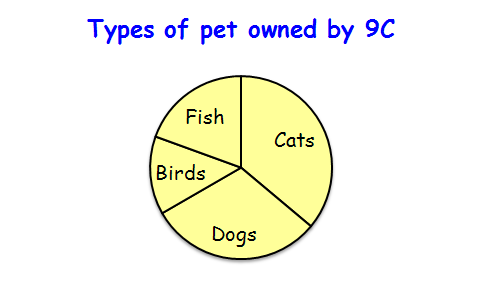
# Pie chart/ Circle Graph

The complete circle represents the total frequency. The angles for each sector are calculated as follows:

Here is the data for the types of pets owned by 9C

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Type of pet | Frequency | Angle of the sector | | | | | Divide 360° by the total of the frequency:  360° ÷ 36 = 10°  Therefore 10° represents one animal |
| Cats | 13 | 13 | x | 10° | = | 130° |
| Dogs | 11 | 11 | x | 10° | = | 110° |
| Birds | 5 | 5 | x | 10° | = | 50° |
| Fish | 7 | 7 | x | 10° | = | 70° |
| Total | 36 |  |  |  |  | 360° |

Remember to check that the angles of the sectors add up to 360°.



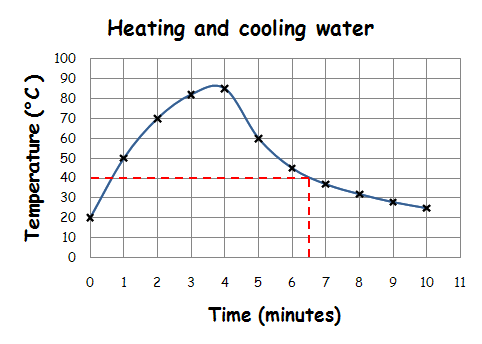
# Continuous data

**Displaying**

With graphs representing continuous data, we can draw lines to show the relationship between two variables. Here are some examples:

# Line graph

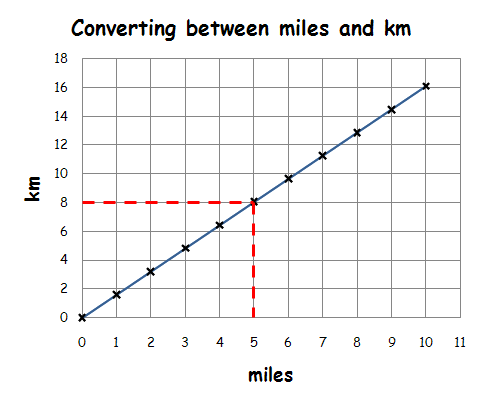
The temperature of water was measured every minute as it was heated and left to cool. A cross shows the temperature of the water at a specific time. Through connecting the crosses with a curve we see the relationship between temperature and time.



The line enables us to estimate the temperature of the water at times other than those plotted e.g. at 6½ minutes the temperature was approximately 40 °C.

# Conversion graph

We use a conversion graph for two variables which have a linear relationship. We draw it in the same way as the above graph but the points are connected with a straight line.



From the graph, we see that 8 km is approximately 5 miles.

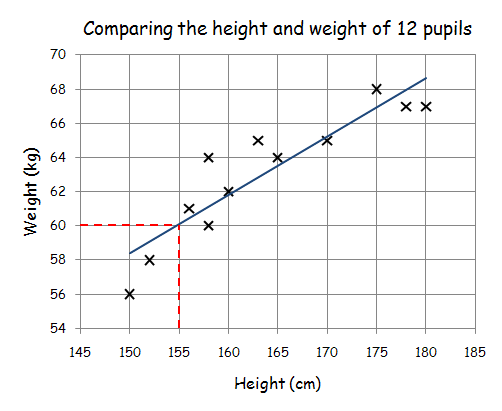
# Scatter Plot

We plot points on the scatter plot in the same way as for the line graph. We do not join the points but look for a correlation between the two sets of data.

Positive correlation No correlation Negative correlation

If there is a correlation, we can draw a line of best fit on the diagram and use it to estimate the value of one variable given the other.

The following scatter graph shows a positive correlation between the weights and heights of 12 pupils.



The line of best fit estimates the relationship between the two variables.  
Notice that the line follows the trend of the points.  
There are approximately the same number of points above and below the line.

We estimate that a pupil 155 cm tall has a weight of 60 kg.

## **Important things to remember when drawing graphs**

* Title and label axes
* Sensible scales
* Careful and neat drawing with a pencil

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Average | | | | |
| The average is a measure of the middle of a set of data. We use the following types of average: | | | | |
| Mean | - | We add the values in a set of data, and then divide by the number of values in the set. | | |
| Median | - | Place the data in order starting with the smallest then find the number in the middle. This is the median. If you have two middle numbers then find the number that’s halfway between the two. | | |
| Mode | - | This is the value that appears most often. | | |
| Spread | | | | |
| The spread is a measure of how close together are the items of data. We use the following to measure spread: | | | | |
| Range | - | The range of a set of data is the difference between the highest and the lowest value. | | |
| Example | | | | |
| Find the mean, median, mode, and range of the following numbers: | | | | |
| **4 , 3 , 2 , 0 , 1 , 3 , 1 , 1 , 4 , 5** | | | | |
| Mean |  | 4 + 3 + 2 + 0 + 1 + 3 + 1 + 1 + 4 + 5 |  | = 2·4 |
|  | 10 |
| Median |  | 0 , 1 , 1 , 1 , 2 , 3 , 3 , 4 , 4 , 5 | 2+3 | = 2·5 |
|  | 2 |
| Mode |  | 0 , 1 , 1 , 1 , 2 , 3 , 3 , 4 , 4 , 5 |  | = 1 |
| Range |  | 0 , 1 , 1 , 1 , 2 , 3 , 3 , 4 , 4 , 5 | 5 - 0 | = 5 |

**Vocabulary**

|  |  |
| --- | --- |
| Acceleration |  |
| Acute angle |
| **Add** |
| Angle |
|  |
| Approximation |
| Area |
| Average |
| Axis |
|  |  |
| Balance |
| Bearing |
| Bills |
| Bisect/Halve |
| Boundary |
|  |
| Calculator |
| Capacity |
| Cash |
| Circle |
| Circumference |
| Clockwise |
| Column |
| Compass (drawing circles) |
| Compass (points North) |
| Cone |
| Co-ordinates |
| Corresponding  Counter-clockwise |
| Cross-section |
| Cube |
| Curve |
| Cylinder |
| Cheapest |
|  |
| Decimal |
| Density |
| Deposit |
| Depth |
| Diagonal |
| Diameter |
| Dice |
| Digit |
| Dimension |
| Discount |
| Drawn to scale |
|  |
| East |
| Edge |
| Enlarge |
| Equal/Unequal |
| Equivalent |
| Estimate |
| Even number |
| Extend |
|  |
| Factor |
| Fraction |
| Frequency |
|  |
| Gradient (slope) |
|  |
| Height |
| Horizontal |
|  |
| Index |
| Interest (rate) |
| Intersection |
| Interval |
| Invest |
| Irregular |
|  |
| Layer/Tier |
| Length |
| Loan |
| Loss |
| Lower/Reduce |
|  |
| Mass |
| Maximum |
| Mean |
| Measure |
| Median |
| Minimum |
| Mode |
| Multiple |
|  |
| Net |
| North |
|  |
| Obtuse angle |
| Octagon |
| Odd number |
|  |
| Parallel |
| Percent |
| Perimeter |
| Perpendicular |
| Power |
| Pressure |
| Prime number  Prism |
| Probability |
| Profit  Pyramid |
|  |
| Quadrilateral |
|  |
| Radius |
| Range |
| Rate of exchange |
| Ratio |
| Rectangle |
| Reduce/Decrease |
| Reflection |
| Reflex angle |
| Remainder |
| Right angle |
| Round off |
| Row |
|  |
| Salary (income) |
| Save |
| Scale |
| Solution |
| South |
| Space |
| Speed |
| Sphere |
| Square |
| Square number |
| Square Root |
| Substitute |
| Symmetry |
|  |
| Total |
| Triangle |
| Triangular number |
|  |
| Unknown |
| Unlikely |
|  |
|  |
| Velocity |
| Vertex |
| Vertical |
| Volume |
|  |
| Weight |
| West |
| Width |