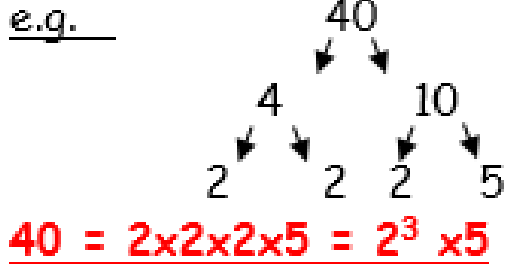


# Year 9 Term 1: Numbers and the Number System



## Express a number as the product of its prime factors (mathswatch 78)



## Highest Common Factor

Eg. Find the highest common factor of 12 and 18:

The factors of 12 are 1, 2, 3, 4, 6 and 12

The factors of 18 are 1, 2, 3, 6, 9 and 18

The highest number in both lists and the lowest common multiple is 6!

## Lowest Common Multiple

Eg. Find the lowest common multiple of 6 and 8:

The multiples of 6 are 6, 12, 18, 24, 30...

The multiples of 8 are 8, 16, 24, 32, 40...

The lowest number in both lists and the lowest common multiple is 24!

## Standard Form (Mathswatch 83)

$$\sim a \times 10^n$$

a is between 1 & 10; n is an integer

~ When mult/div in standard form, work out number part separate from the power of 10 part

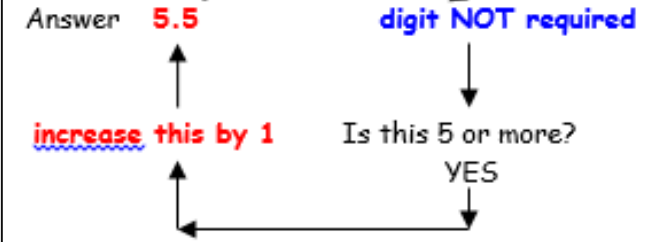
$$\text{e.g. } 3 \times 10^5 \times 4 \times 10^3 = 12 \times 10^8 = 1.2 \times 10^9$$

~ With a calculator use  $\boxed{\text{EXP}}$  or  $\boxed{\times 10^x}$

## Rounding decimals (Mathswatch 31 and 32)

- Look at the digit required
- Look at the first digit NOT required

e.g. To round 5.**4**7 to 1dp



e.g. To round 5.**4**3 to 1dp



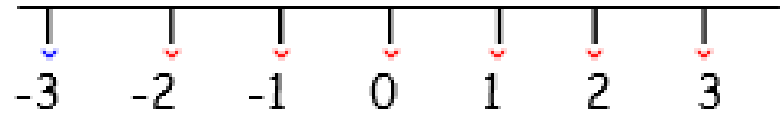
## Round to one significant figure

(Mathswatch 90)

These all have ONE significant figure

<u>3</u> 00	<u>8</u> 0	<u>2</u>
0. <u>7</u>	0.0 <u>5</u>	0.00 <u>3</u>

### Negative numbers (Mathswatch 23 and 68)



$2 > -2 \rightarrow$  We say 2 is bigger than -2

$-1 < 3 \rightarrow$  We say -1 is less than 3

Remember the rules:

- When subtracting go down the number line
- When adding go up the number line
- $8 + - 2$  is the same as  $8 - 2 = 6$
- $8 - + 2$  is the same as  $8 - 2 = 6$
- $8 - - 2$  is the same as  $8 + 2 = 10$

### Order of operations (Mathswatch 75)

**B**racket

**I**ndices

**D**ivide

**M**ultiply

**A**dd

**S**ubtract

} Do these in the order they appear

} Do these in the order they appear

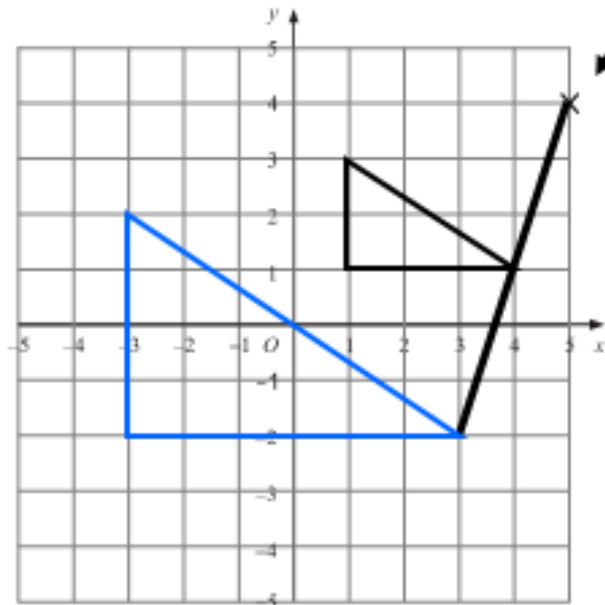
e.g.  $3 + 4 \times 6 - 5 = 22$

↑  
first

## Enlarge a shape (Mathswatch 148)

You need to know:

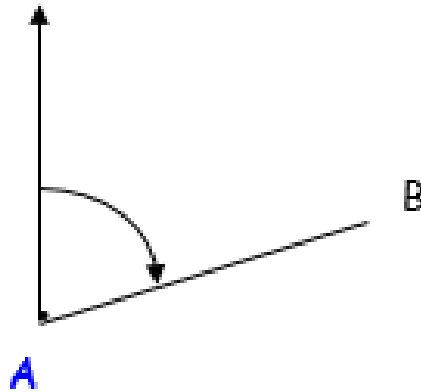
- Centre e.g. (5, 4)
- Scale factor e.g. 2



## Know & use bearings (Mathswatch 124)

- A bearing is a direction measured as an angle clockwise from the North
- It needs 3 digits so may need a 0 in front e.g. 072°
- Bearings are given from a fixed point so look for the fixed point after the word 'FROM'

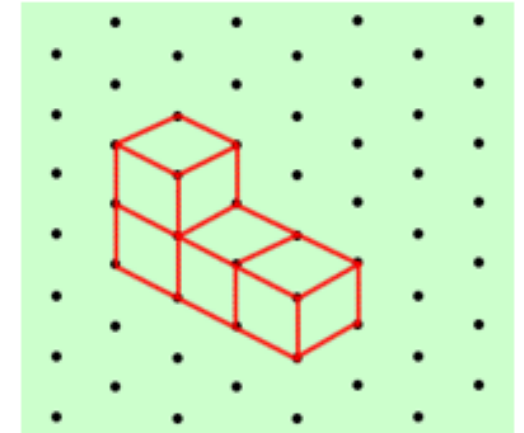
e.g. A bearing of 072° from A to B



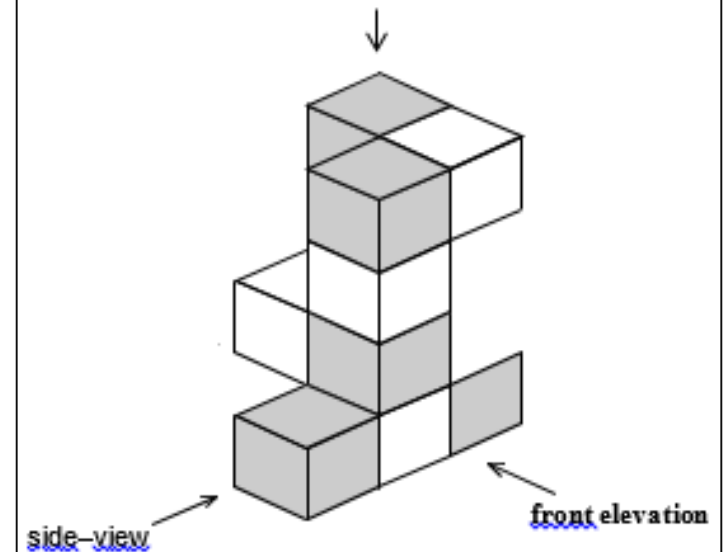
## 2D representations of 3D shapes

(Mathswatch 51 and 44)

- **3D drawing on isometric paper**  
(notice NO horizontal lines)



- **3 views of a 3D shape**  
Plan view



**Probability** (Mathswatch 14 and 59)

- **Probability words are used to describe how likely it is that an event will happen.**

Examples of probability words are

- **certain**
- **likely**
- **even chance**
- **unlikely**
- **impossible**

Other words:

- **Equally likely** - when all outcomes have the same chance of occurring
- **Biased** - when all outcomes do NOT have the same chance of occurring
- **Probability as a fraction**

$$P(\text{event}) = \frac{\text{No. of outcomes which give the event}}{\text{Total number of outcomes}}$$

**Probability** (Mathswatch 59 and 60)

- **Calculate probability**

$$P(\text{event}) = \frac{\text{No. of outcomes which give the event}}{\text{Total number of outcomes}}$$

- **Probability of an event NOT happening**

$$\text{If } p(\text{event}) = p$$

$$P(\text{event NOT happening}) = 1 - p$$

$$\text{e.g. If } p(\text{rain}) = 0.3$$

$$p(\text{no rain}) = 1 - 0.3 = 0.7$$

### Manipulate expressions

(Mathswatch 7 and 136)

**Only like terms can be added & subtracted**

e.g.  $a + 2b$  cannot be added

$a^2 - 2a$  cannot be subtracted

$$a + 2a = 3a$$

$$5a^2 - 2a^2 = 3a^2$$

**Terms can be simplified when multiplying**

e.g.  $a \times b = ab$

$$2a \times 3a = 6a^2$$

### Rearrange a formula (Mathswatch 136)

- Use the same balancing steps as when you solve equations

e.g. Make 't' the new subject in:

$$v = u + at \quad (-u \text{ from each side})$$

$$v - u = at \quad (\div a \text{ each side})$$

$$\frac{v - u}{a} = \frac{at}{a}$$

$$t = \frac{v - u}{a}$$

$$a$$

### Index Notation Mathswatch 131

**For matching bases (or big number)**

$$t^2 \times t^3 = t \times t \times t \times t \times t = t^5$$

for multiplies we  
add the powers

$$\text{So } t^a \times t^b = t^{a+b}$$

$$\frac{t^5}{t^3} = \frac{t \times t \times t \times t \times t}{t \times t \times t} = t^2$$

for divides or  
fractions subtract  
the powers

**Powers in brackets**

$$(t^3)^2 = t^3 \times t^3 = t^6$$

for bracketed powers  
multiply the powers

$$(p^3)^4 = p^{3 \times 4} = p^{12}$$

### Factorise an expression (Mathswatch 94)

This is the opposite of expand - put bracket back in

$$4y - 12 = 4(y - 3)$$

$$y^2 + 7y = y(y + 7)$$

### Apply the index laws (Mathswatch 82)

When multiplying ADD the indices

When dividing SUBTRACT the indices

Treat numbers as normal

$$\text{e.g. } 3a^2 \times 2a^3 = (3 \times 2)a^{2+3} = 6a^5$$

$$10a^6 \div 5a^2 = (10 \div 5)a^{6-2} = 2a^4$$

### Substitution (Mathswatch 95)

- Write down the formula
  - Substitute the numbers given
  - Work out the unknown quantity
- e.g.  $v = u + at$  when  $v = 19$ ,  $a = 7$  and  $t = 2$

$$19 = u + 7 \times 2$$

$$19 = u + 14$$

$$u = 5$$

**Simplify fraction** (Mathswatch 26)

See what number divides exactly into both the numerator and denominator

$$\begin{array}{ccc} & \div 4 & \\ \text{e.g. } & \frac{8}{12} & \rightarrow \frac{2}{3} \\ & \div 4 & \end{array}$$

$$\begin{array}{ccc} & \div 5 & \\ \text{e.g. } & \frac{15}{40} & \rightarrow \frac{3}{8} \\ & \div 5 & \end{array}$$

**• Decimal to percentage to fraction**

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

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

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

**Fraction, decimal, percentage**

**Equivalents** (Mathswatch 85)

**LEARN THESE:**

$$\frac{1}{4} = 0.25 = 25\%$$

$$\frac{1}{2} = 0.5 = 50\%$$

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

**When ordering- make them all decimals**