Numbers

- Natural Numbers \((\mathbb{N})\)
- Integers \((\mathbb{Z})\)
- Rational Numbers \((\mathbb{Q})\)
- Real Numbers \((\mathbb{R})\)

Positive Whole Numbers: \(1, 2, 3, 4, \ldots\)
Any Whole Numbers (incl. 0): \(-1, 0, 7, \ldots\)
Can be written as fractions: \(\frac{7}{11}, \frac{-21}{13}, \ldots\)
Any Number (including irrational): \(\pi, \sqrt{2}, \sqrt{11}, \ldots\)

Natural Numbers

You must know the difference between

- Factors
- Multiples

A Factor is a number that divides evenly into the original number.

Eg. The factors of 32 are 1, 2, 4, 8, 16, 32

\[
\begin{align*}
1 & \times 32 \\
2 & \times 16 \\
4 & \times 8
\end{align*}
\]

Factors occur in pairs.

In a factory, you make big things by combining smaller things.

\((\text{Factors})\)

A Multiple is what you get when you multiply by the original number.

Eg. \(4 \times 1 = 4\)
\(4 \times 2 = 8\)
\(4 \times 3 = 12\)
\(4 \times 4 = 16\)

These are the "multiples" of 4

\[4, 8, 12, 16, \ldots\]

You can work these out by counting up in 4's.

If a question mentions factors or multiples, stop and think about which one they mean.
PRIME NUMBERS (HAVE ONLY 2 FACTORS, ITSELF AND 1)

**eg** 2, 3, 5, 7, 11, 13, 17

9 IS **NOT** A PRIME NUMBER BECAUSE 9 FACTORS → 3 x 3

A NUMBER WHICH IS NOT A PRIME NUMBER IS CALLED **COMPOSITE**

H.C.F. (HIGHEST COMMON FACTOR)

**eg** WHAT IS THE H.C.F. OF 24 AND 40

- START BY WRITING OUT ALL THE FACTORS
  
  
  TRY 1
  
  TRY 2
  
  TRY 3
  
  TRY 4
  
  TRY 5

- NOW CIRCLE THE HIGHEST NUMBER THAT IS COMMON TO BOTH LISTS

**eg** THE BIGGEST NUMBER THAT DIVIDES INTO 24 AND 40

L.C.M. (LOWEST COMMON MULTIPLE)

**SNAP!!**

- FIRST WE NEED TO REMEMBER WHAT A MULTIPLE IS (CHECK ON PREVIOUS PAGE)

- THE EASIEST WAY TO WRITE OUT A LIST OF MULTIPLES IS TO COUNT UP IN WHATEVER NUMBER YOU'RE INTERESTED IN

- TO FIND THE LOWEST COMMON MULTIPLE, DO THIS FOR THE TWO NUMBERS, THEN PLAY **SNAP!!**

eg LCM

<table>
<thead>
<tr>
<th>3</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>12</td>
<td>15</td>
</tr>
</tbody>
</table>

LCM = 15
**Integers**

* Whole numbers
  * Can be positive or negative
  * Zero is an integer

**Adding and Subtracting**

![Number line example]

**Multiplying and Dividing**

| + × + = + | + × − = − | − × + = − | − × − = + |

**Different Signs**

| Same Signs = + | Different Signs = − |

**Very Important**

This only works for \( \times \) or \( ÷ \)

\[ \begin{align*}
(2) + (-4) &= -2 \\
(2) \times (-4) &= -8 \\
(-2) + (-4) &= -6 \\
(-2) \times (-4) &= +8
\end{align*} \]

Make sure you get this stuff!

When in doubt, you should use a calculator.
RATIONAL NUMBERS

Any number which can be written as a fraction. (can be + or -)

Be very careful about adding/subtracting fractions.

In general, use your calculator for fractions. The magic fraction button is brilliant.

There are some very strange numbers which can't be represented as fractions.

\( \sqrt{2}, \pi \)

These are called irrational numbers.

Irrational numbers have

- non-terminating
- non-recurring decimals
DECIMAL PLACES

"2 DECIMAL PLACES" MEANS
THERE WILL BE 2 DIGITS
AFTER THE DECIMAL POINT

\[ 3.16 \text{ or } 5.27 \]

\[ \text{IF WE WANT TO ROUND} \]

\[ 23.483 \]

TO (i) 2 DECIMAL PLACES
(ii) 1 DECIMAL PLACE

(i) \[ 23.4 \]

DRAW A LINE AFTER
THE REQUIRED NUMBER
OF DECIMAL PLACES

ANS = 23.48

CHECK THE NEXT
NUMBER - IF
THIS IS 5 OR
GREATER, WE NEED
TO ROUND 23.48 UP TO
23.5

(ii) \[ 23.483 \]

THIS BIGGER THAN 5, SO
1 ROUND 23.4 UP TO
23.5

ANS = 23.5

SIGNIFICANT FIGURES

1ST SIGNIFICANT FIGURE
\[ 183,000 \]

OR

0.000354

\[ \text{UP} \]

1ST SIGNIFICANT FIGURE

OTHERWISE, IT'S VERY
SIMILAR TO

\[ \text{ROUND TO 2 SIGNIFICANT FIGURES} \]

(i) \[ 72,471 \]

(ii) \[ 0.00456 \]

LESS THAN 5: DON'T ROUND UP

ANS = 72,000

EVERYTHING ELSE BECOMES A 0

(ii) \[ 0.00456 \]

\[ 0.0045 \rightarrow \text{GREATER THAN 5} \]

2 S.F.

ANS = 0.0046
**SCIENTIFIC NOTATION**

**Example 1:**

\[725,000,000,000 = 7.25 \times 10^{10}\]

Decimal point moves 11 places.

**OR**

\[0.00000056 = 5.6 \times 10^{-6}\]

Very big numbers: \(10^+\)

Very small numbers: \(10^-\)

**Method:**

1. Write number
2. Put the decimal point immediately after the 1st significant figure.
3. Count how many places the decimal place has had to move.

If you're given a question with scientific notation, you might need to convert from scientific notation into normal notation.

**Example 2:**

\[3.5 \times 10^7 + 4.36 \times 10^{-4}\]

\[= 35,000,000 + 0.000436\]

\[= 35,000,436\]
**B** = BRACKETS

WHAT ORDER DO I HAVE TO DO STUFF?

THIS MEANS IF THERE IS ANYTHING INSIDE A BRACKET, DO THIS FIRST.

**I** = INDICES

THEN DO YOUR INDICES / POWERS

**M** = MULTIPLICATION

**D** = DIVISION

**A** = ADDITION

**S** = SUBTRACTION

ACTUALLY, IT COULD BE DM OR MD

OR SA INSTEAD.

**eg**

\[
\frac{2 \times 4 + 3}{(6 + 5)}
\]

\[
= \frac{2 \times 4 + 3}{11}
\]

\[
= \frac{8 + 3}{11} = \frac{11}{11} = 1
\]

THIS IS LIKE AN "AUTOMATIC BRACKET"