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 a fraction**
- $\frac{7}{11}, \frac{-21}{13}$

**Any number** (including irrational)
- $\pi, \sqrt{2}, \sqrt{11}, \ldots$

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**Natural Numbers**

You must know the difference between factors and multiples.

A **factor** is a number that divides evenly into the original number.

- **Example**: The factors of 32 are $1, 2, 4, 8, 16, 32$.

**Reminder**

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

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

- **Example**: $4 \times 1 = 4$, $4 \times 2 = 8$, $4 \times 3 = 12$, $4 \times 4 = 16$.

These are the multiples of 4.

You can work these out by counting up in 4's: 4, 8, 12, 16, etc.

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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 1 x 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

1. Start by writing out all the factors

<table>
<thead>
<tr>
<th>Try 1</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Try 2</td>
<td>1 x 24</td>
</tr>
<tr>
<td>Try 3</td>
<td>2 x 12</td>
</tr>
<tr>
<td>Try 4</td>
<td>2 x 12</td>
</tr>
<tr>
<td>Try 5</td>
<td>2 x 12</td>
</tr>
</tbody>
</table>

   3 x 8

   4 x 6

   5 x 8

2. Now circle the highest number that is common to both lists.

   **The biggest number that divides into 24 and 40**

**L.C.M. (Lowest Common Multiple)**

1. First we need to remember what a multiple is. (Check on previous page)

2. The easiest way to write out a list of multiples is to count up in whatever number you're interested in.

3. To find the lowest common multiple, do this for the two numbers, then play SNAP!!

eg LCM of 3 and 5

3 6 9
5 10 15

LCM = 15
**Integers**

- whole numbers
- can be positive or negative
- zero is an integer

**Adding and Subtracting**

Use numberline or think of it like + money you have - money you owe.

**Multiplying / Dividing**

\[
\begin{array}{c}
+ \times + = + \\
+ \times - = - \\
- \times + = - \\
- \times - = + \\
\end{array}
\]

Same signs = +

Different signs = -

Very important this only works for \[x\] or \[\div\]

\[8\]

(2) + (-4) = -2

(2) \times (-4) = -8

(-2) + (-4) = -6

(-2) \times (-4) = +8

Make sure you get this stuff!

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

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.

MULTIPLYING = EASY
\[
\frac{\text{top}}{\text{bot}} \times \frac{\text{top}}{\text{bot}}
\]

\[\text{eg} \quad \frac{1}{2} \times \frac{3}{4} = \frac{3}{8}\]

DIVIDING = EASY BUT REMEMBER TRICK

\[\text{TRICK: FLIP 2nd FRACTION THEN MULTIPLY}\]

\[\text{eg} \quad \frac{1}{2} \div \frac{2}{3} = \frac{1}{2} \times \frac{3}{2} = \frac{3}{4}\]

ADDING/SUBTRACTING = HARD

NEED SAME NUMBER ON BOTTOM

\[\text{eg} \quad \frac{1}{7} + \frac{5}{7} = \frac{6}{7}\]

\[\text{eg HARD} \quad \frac{2}{3} + \frac{3}{4}\]

\[\quad \frac{8}{12} + \frac{9}{12}\]

\[\quad = \frac{17}{12}\]

STEP 1: GET SAME NUMBER ON BOTTOM (FIND L.C.D. (SNAP))

\[\frac{3}{4} \quad \text{L.C.D.} = 12\]

STEP 2: CONVERT EACH FRACTION TO HAVE BOTTOM 12

\[\frac{2}{3} \quad \frac{8}{12} \quad \frac{3}{4} \quad \frac{9}{12}\]

STEP 3: ADD/SUBTRACT

\[\frac{17}{12}\]
DECIMAL PLACES

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

\[ 3.16 \text{ or } 5.27 \]

**EXAMPLES**

(i) **IF WE WANT TO ROUND**

\[ 23.483 \]

TO (i) 2 DECIMAL PLACES

(ii) 1 DECIMAL PLACE

(i) **23.483**

DRAW A LINE AFTER THE REQUIRED NUMBER OF DECIMAL PLACES

ANS = 23.4

Check the next number. IF this is 5 OR BIGGER, WE NEED TO ROUND 23.488

(ii) **23.483**

THIS BIGGER THAN 5, SO 1 ROUND 23.4 UP TO

ANS = 23.5

SIGNIFICANT FIGURES

**IGNORE ZEROS AT START / END**

\[ \sqrt{183,000} \]

\[ 0.000354 \]

**1ST SIGNIFICANT FIGURE**

**OTHERWISE, IT'S VERY SIMILAR TO**

**EXAMPLES**

(i) **ROUND (i) 72,471**

(ii) **0.00456**

TO 2 SIGNIFICANT FIGURES

(i) **72,471**

LESS THAN 5: DON'T ROUND UP

ANS = 72,000

(ii) **0.00456**

GREATER THAN 5

2 SF

ANS = 0.0046
SCIENTIFIC NOTATION

FOR VERY BIG / VERY SMALL NUMBERS

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

DECIMAL POINT MOVES 11 PLACES.

\[ 368 = 3.68 \times 10^2 \]

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

RECIrocALS

("FLIP" WHAT'S A RECIproCAL?)

A NUMBER \( x \) IT'S RECIproCAL = \( \frac{1}{x} \)

\[ \text{eg} \quad \frac{2}{3} \times \frac{3}{2} = \frac{6}{6} = 1 \]

\[ \text{RECIPROCAL of } \frac{2}{3} \]

To FIND A RECIproCAL, EITHER USE THE \( x^{-1} \) BUTTON ON YOUR CALCULATOR OR

"FLIP" THE NUMBER UPSIDE-DOWN

BE CAREFUL/REMEMBER \( \text{eg} \quad 4 \text{ is } \frac{4}{1} \)

So RECIPROCAL of 4 is \( \frac{1}{4} \)

\[ \text{eg} \quad \text{RECIPROCAL of } \frac{2}{5} \text{ is } \frac{5}{2} \]
BINDAS

B = BRACKETS
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

\[
\begin{align*}
\text{eq } & \quad 2 \times 4 + 3 \\
& \quad \frac{(6+5)}{} \\
= & \quad \frac{2 \times 4 + 3}{11} \\
= & \quad \frac{8 + 3}{11} = \frac{11}{11} = 1
\end{align*}
\]

Actually, it could be DM or MD

or SA instead.

eg \[3 \times 2^4 = 3 \times 16 = 48 \text{ NOT } 3 \times 2^4 = 6^4 = 1296\]