Year 10 — Using Number...
Non-calculator methods

What do I need to be able to do?

By the end of this unit you should be able to:

- Use mental/written methods for the four number operations
- Use four operations for fractions
- Write exact answers
- Round to decimal places and significant figures
- Estimate solutions
- Understand limits of accuracy
- Understand financial maths

Keywords

Truncate: to shorten, to shorten a number (no rounding), to shorten a shape (remove a part of the shape)

Round: making a number simpler, but keeping its place value close the what it originally was

Credit: money that goes into a bank account

Debit: money that leaves a bank account

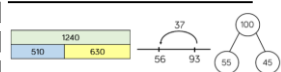**Profit:** the amount of money after income - costs

Tax: money that the government collects based on income, sales and other activities.

Balance: The amount of money in a bank account

Overestimate: Rounding up — gives a solution higher than the actual value

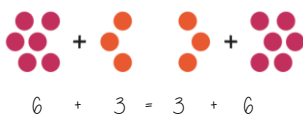**Underestimate:** Rounding down — gives a solution lower than the actual value

Addition/ Subtraction

Modelling methods for addition/ subtraction
- Bar models
- Number lines
- Part/ Whole diagrams

Addition is **commutative**

$6 + 3 = 3 + 6$

The order of addition does not change the result

Subtraction the order has to stay the same

$360 - 147 = 360 - 100 - 40 - 7$

- Number lines help for addition and subtraction
- Working in 10's first aids mental addition/ subtraction
- Show your relationships by writing fact families

Formal written methods (R)

Remember the place value of each column. You may need to move 10 ones to the ones column to be able to subtract

Decimals have the same methods remember to align the place value

Division methods

$3584 \div 7 = 512$

Short division

$7 \overline{)3\ ^3 5\ ^5 8\ ^1 4}$ → 5 1 2

Complex division

$\div 24 = \div 6 \div 4$

Break up the divisor using factors

Division with decimals

The placeholder in division methods is essential — the decimal lines up on the dividend and the quotient

$24 \div 0.02 \longrightarrow 24 \div 0.2 \longrightarrow 240 \div 2$

All give the same solution as represent the same proportion. Multiply the values in proportion until the divisor becomes an integer

Multiplication methods

Long multiplication (column)

Grid method

→ Repeated addition

Less effective method especially for bigger multiplication

Multiplication with decimals (R)

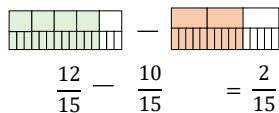Perform multiplications as integers e.g $0.2 \times 0.3 \longrightarrow 2 \times 3$

Make **adjustments** to your answer to match the question: $0.2 \times 10 = 2$
$0.3 \times 10 = 3$

Therefore $6 \div 100 = \underline{0.06}$
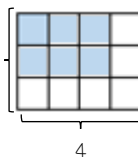
Four operations with fractions

Addition and Subtraction

$\frac{4}{5} - \frac{2}{3}$

$\frac{12}{15} - \frac{10}{15} = \frac{2}{15}$

Multiplication

$\frac{3}{4} \times \frac{2}{3}$

$= \frac{6}{12} = \frac{1}{2}$

Division

$\frac{2}{5} \div \frac{3}{4}$

$\frac{2}{5} \times \frac{4}{3}$

Multiplying by a reciprocal gives the same outcome

$= \frac{8}{15}$

Exact Values

Leave in terms of π

$= \frac{120}{360} \times 36\pi$

$= \frac{1}{3} \times 36\pi = \underline{12\pi}$

Leave as a surd

$Tan30 = \frac{1}{\sqrt{3}}$

Rounding (R)

2.46192 (to 12dp) - Is this closer to 246 or 247

246 ⟵ 247

$2.46|192$

This shows the number is closer to 246

Significant Figures

370 to 1 significant figure is 400

37 to 1 significant figure is 40

37 to 1 significant figure is 4

0.37 to 1 significant figure is 0.4

0.0000037 to 1 significant figure is 0.0000004

SF: Round to the first nonzero number

Estimation (R)

Round to 1 significant figure to estimate

$21.4 \times 3.1 \approx 20 \times 3 \approx 60$

The equal sign changes to show it is an estimation

This is an **underestimate** because both values were rounded down

It is good to check all calculations with an estimate in all aspects of maths — it helps you identify calculation errors.

Limits of accuracy

A width w has been **rounded** to 6.4cm correct to 1dp.

< 6.35 the values would round to 6.3

Error interval
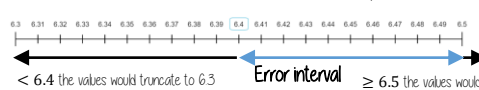
≥ 6.45 the values would round to 6.5
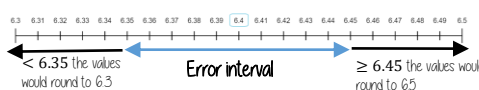
The error interval

$6.35 \leq w < 6.45$

Any value within these limits would round to 6.4 to 1dp

A width w has been **truncated** to 6.4cm correct to 1dp.

< 6.4 the values would truncate to 6.3

Error interval

≥ 6.5 the values would truncate to 6.5

$6.4 \leq w < 6.5$

Any value within these limits would **truncate** to 6.4 to 1dp