

# USING NUMBER...

## Non-calculator methods

### What do I need to be able to do?

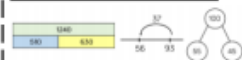
By the end of this unit you should be able to:

- 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 to 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



Modeling methods for addition/ subtraction

- Bar models
- Number lines
- Part/ Whole diagrams

Addition is commutative



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

	H	T	O
+	1	8	7
+	5	4	2

	H	T	O
-	4	2	7
-	2	4	9

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

Short division  $512 \div 7 = 73 \text{ R } 5$

Complex division  $24 \div 6 = 4$   
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

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

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

Perform multiplications as integers eg  $0.2 \times 0.3 \rightarrow 2 \times 3$

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

Therefore  $6 \div 100 = 0.06$

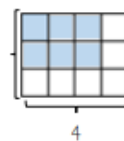
### Four operations with fractions

#### 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  $\pi$   
 $\frac{120}{360} \times 36\pi = \frac{1}{3} \times 36\pi = 12\pi$

Leave as a surd  
 $\tan 30^\circ = \frac{1}{\sqrt{3}}$

### Estimation

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

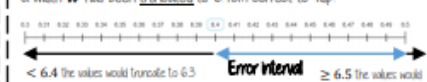
A width  $w$  has been rounded to 6.4m correct to 1dp



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 6.4m correct to 1dp

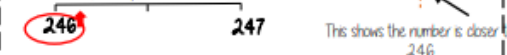


The error interval  $6.4 \leq w < 6.5$

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

### Rounding

2.46192 (to 1dp) - is this closer to 2.46 or 2.47



#### Significant Figures

- 370 to 1 significant figure is 400
- 37 to 1 significant figure is 40
- 3.7 to 1 significant figure is 4
- 0.37 to 1 significant figure is 0.4
- 0.00000037 to 1 significant figure is 0.0000004

SF: Round to the first nonzero number