

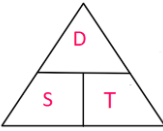
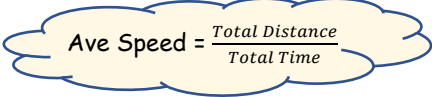


## Topic 1: Arithmetic

### 1) The Basics:

<p><b>a) Types of Numbers:</b></p> <ul style="list-style-type: none"> <li><b>Natural (N):</b> Positive Whole Numbers: e.g. 1, 2, 3, .....</li> <li><b>Integers (Z):</b> Positive and Negative Whole Numbers: e.g. -3, -2, -1, 0, 1, 2, 3,.....</li> <li><b>Real (R):</b> All numbers: e.g.s -3, -1.4, 0.2, 6, 7/2, <math>\sqrt{8}</math>.....</li> <li><b>Rational (Q):</b> Numbers that <u>can</u> be written in the form <math>\frac{a}{b}</math> e.g.s -5, 3, 1/2, -9/4.....</li> <li><b>Irrational:</b> Numbers that <u>cannot</u> be written in the form <math>\frac{a}{b}</math> e.g.s <math>\sqrt{3}</math>, <math>\sqrt{2}</math>, <math>\pi</math>.....</li> <li><b>Prime:</b> A natural number bigger than 1 with only itself and 1 as divisors. e.g.s 2, 3, 5, 7, 11, 13, 17.....</li> <li><b>Composite:</b> A number that is not prime. e.g.s., 6, 9, 15, 20</li> </ul>	<p><b>b) Rounding:</b></p> <p><b>Rounding to Decimal Places:</b></p> <ul style="list-style-type: none"> <li>To round to 2 decimal places, look at the 3rd number after the decimal point. <ul style="list-style-type: none"> <li>- If it's 5 or more we round UP the 2nd number</li> <li>- If it's 4 or less we round DOWN the 2nd number</li> </ul> </li> <li>Similar approach for rounding to other decimal places</li> </ul> <p><b>Examples:</b> i) 4.768 = 4.77    ii) 3.2745 = 3.27</p> <p><b>Rounding to Significant Figures:</b></p> <ul style="list-style-type: none"> <li>To round to 3 significant figures, we look at the 4<sup>th</sup> significant figure. <ul style="list-style-type: none"> <li>- If it's 5 or more we round UP the 3<sup>rd</sup> number and replace subsequent numbers with 0s</li> <li>- If it's 4 or less we round DOWN the 3<sup>rd</sup> number and replace subsequent numbers with 0s</li> </ul> </li> </ul> <p><b>Examples:</b> i) 132,421 = 132,000    ii) 0.00472543 = 0.00473</p>
<p><b>c) Scientific Notation</b></p> <p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>A number is in scientific notation if it's in the form <math>a \times 10^n</math>, where 'a' has to be between 1 and 10.</li> </ul> <p><b>Examples:</b> i) 3400 = <math>3.4 \times 10^3</math>    ii) 0.004 = <math>4 \times 10^{-3}</math></p> <ul style="list-style-type: none"> <li>On a Casio calculator the button you will need to type in numbers in scientific notation is:</li> </ul>  <ul style="list-style-type: none"> <li>To type in <math>7 \times 10^4</math>, press "7" and the button above and then "4"</li> <li>To convert numbers into scientific notation on your calculator: <ul style="list-style-type: none"> <li>- Type in the number and press = to enter it on the screen.</li> <li>- Press "Shift" + "Mode" and select "Sci" from the menu. Then press "0".</li> </ul> </li> </ul>	<p><b>d) Foreign Exchange</b></p> <p><b>Steps:</b></p> <ol style="list-style-type: none"> <li>Write the conversion with the currency you want on the right.</li> <li>Get a 1 on the left-hand side, by dividing both sides.</li> <li>Multiply both sides to get the value you want.</li> </ol> <p><b>Example:</b> If €1 = \$1.32, how many euro would you get for \$200?</p> <p>Step 1: Put euro on the right \$1.32 = €1</p> <p>Step 2: Get a 1 on the left-hand side <math>\\$1 = \text{€} \frac{1}{1.32}</math> (dividing both sides by 1.32)</p> <p>Step 3: Multiply both sides <math>\\$200 = \frac{1}{1.32} \times 200 = \text{€}151.52</math></p>
<p><b>e) HCF/LCM using Prime Factors:</b></p> <p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>When asked to find the HCF and LCM of 2 numbers using <b>prime factors</b>, use your calculator.</li> <li>Type in the number first and then press Shift + Button below.</li> </ul>  <ul style="list-style-type: none"> <li>For <b>HCF</b>: pick the <b>lowest</b> power of each prime number.</li> <li>For <b>LCM</b>: pick the <b>highest</b> power of each prime number.</li> </ul> <p><b>Example:</b> Find the HCF and LCM of 60 and 80. Using calculator: <math>60 = 5^1 \times 3^1 \times 2^2</math>    <math>80 = 2^4 \times 5^1</math></p> <p><b>HCF:</b></p> <ul style="list-style-type: none"> <li>- Lowest Power of 2 is <math>2^2</math></li> <li>- Lowest Power of 3 is <math>3^1</math>.....but <math>3^1</math> doesn't go into 80 so exclude</li> <li>- Lowest Power of 5 is <math>5^1 \Rightarrow</math> HCF of 60 and 80 is <math>2^2 \times 5^1 = 20</math></li> </ul> <p><b>LCM:</b></p> <ul style="list-style-type: none"> <li>- Highest Power of 2 is <math>2^4</math></li> <li>- Highest Power of 3 is <math>3^1</math></li> <li>- Highest Power of 5 is <math>5^1 \Rightarrow</math> LCM of 60 and 80 is <math>2^4 \times 3^1 \times 5^1 = 240</math></li> </ul>	<p><b>f) Speed, Distance and Time:</b></p> <p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>For all speed, distance and time calculations remember: "Dads Silly Triangle"</li> </ul>  <p>If you want <b>Distance</b>, you cover the <b>D</b> in the triangle, so: <math>D = S \times T</math> (Units are usually m or km)</p> <ul style="list-style-type: none"> <li>➤ If you want <b>Time</b>, you cover the <b>T</b> in the triangle, so: <math>T = D / S</math> (Units are usually secs or hrs)</li> <li>➤ If you want <b>Speed</b>, you cover the <b>S</b> in the triangle, so: <math>S = D / T</math> (Units might be m/s or km/h)</li> <li>➤ Average speed can be calculated using:</li> </ul>  <ul style="list-style-type: none"> <li>➤ <b>Careful with units of time.</b> E.g. 1hr 45mins = 1.75hrs etc.</li> </ul>
<p><b>g) Ratio</b></p> <p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>Ratio shows how to break up a quantity proportionally.</li> <li>When given a ratio, add the values in the ratio together to get the total number of parts the quantity is being broken into.</li> <li>Write down the fraction each person gets.</li> </ul> <p><b>Example:</b> Divide €200 between Alan and Brian in the ratio 3:2. 3:2 means there are 3 + 2 = 5 parts <math>\Rightarrow</math> Alan gets <math>\frac{3}{5}</math> and Brian gets <math>\frac{2}{5} \Rightarrow</math> Alan gets <math>\frac{3}{5}</math> of €200 = €120 and Brian gets <math>\frac{2}{5}</math> of €200 = €80</p>	

## 2) Percentages/Profit/Loss/VAT:

### a) Percentages:

To find the percentage of a number:

**Example:** Find 24% of 250.

Method 1: Calculate  $\frac{24}{100} \times \frac{250}{1} = 60$

Method 2: Multiply 250 by 0.24 = 60

To find the total when given percentage:

**Example:** 25% of the marks in an exam are going for the practical part. If there are 50 marks for the practical, how many marks is the whole exam worth?

Steps:

1) Let % = value you're given

$$25\% = 50$$

2) Find what 1% represents by dividing both sides

$$1\% = \frac{50}{25} = 2$$

3) Find 100% by multiplying by 100:

$$100\% = 2 \times 100 = 200 \text{ marks}$$

**Note:**

In this particular example, we could also have just multiplied 50 by 4, as 25% represents  $\frac{1}{4}$  of the total marks

### b) % Profit / Loss / Discount:

$$\% \text{ Profit} = \frac{\text{Profit}}{\text{Cost Price}} \times 100\%$$

$$\% \text{ Loss} = \frac{\text{Loss}}{\text{Cost Price}} \times 100\%$$

$$\% \text{ Discount} = \frac{\text{Discount}}{\text{Cost Price}} \times 100\%$$

### c) VAT:

**VAT excluded:**

**Example:** Bill comes to €120. Find final bill with 13.5% VAT.

$$\text{VAT} = 13.5\% \text{ of } 120$$

$$= 120 \times 0.0135 = \text{€}16.20$$

$$\Rightarrow \text{Final Bill} = \text{€}120 + \text{€}16.20 = \text{€}136.20$$

**VAT included:**

**Example:** Bill including VAT comes to €340.50. Find bill without VAT, if VAT is 13.5%.

$$\text{Bill} + \text{VAT} = \text{€}340.50$$

$$\Rightarrow 113.5\% = \text{€}340.50$$

$$\Rightarrow 1\% = \text{€}3$$

$$\Rightarrow 100\% = \text{€}300$$

## 3) Income Tax:

### a) Income Tax Terminology:

- **Gross Income:** total pay someone gets before any taxes or deductions are taken
- **Net Income:** Take home pay or pay that we get after all taxes and deductions
- Rates Of Tax: **Higher Rate** (usually about 42%) and **Standard Rate** (usually about 20%)
- **Standard Rate Cut-Off Point:** Anything you earn up to this is taxed at the standard rate of tax
- **Gross Tax:** Total tax owing to the government before credits are deducted
- **Tax Credits:** Money deducted from the gross tax
- **Tax Payable:** Tax that you actually pay
- **Statutory Deductions:** Payments that you have to make to the government e.g. income tax (P.A.Y.E.)
- **Non-statutory Deductions:** Voluntary deductions that somebody pays e.g.s trade union fees or health insurance

### b) Answering Questions:

- The questions are nearly always made up of 3 parts:

- **Part 1:** Calculation of Gross Tax by adding...  
 $\text{Tax @ Lower Rate} + \text{Tax @ Higher Rate}$
- **Part 2:** Calculation of Tax Payable using the equation  
 $\text{Tax Paid} = \text{Gross Tax} - \text{Tax Credits}$
- **Part 3:** Working out Net Income by taking off all deductions including Tax Paid

## 4) Compound Interest:

### a) Terminology:

- **Principal:** Amount of money invested or borrowed
- **Interest:** Money added by the bank
- **Rate:** what percentage the interest is added at
- **Amount or Final Value:** The value of money at the end of the term it has been borrowed or invested for.

### b) Answering Compound Interest Questions:

**Method 1:** Used if rates change from year to year or payments/withdrawals are being made between years

- Lay out Year 1, Year 2, Year 3 etc.
- Work out interest each year and add to Principal at start of the year

## 5) Household Bills:

### Notes:

- With utility bills (e.g.s. gas, electricity, water) there is usually a unit rate i.e. a charge per unit used
- To calculate the units used, subtract the previous units reading from the current units reading
- With many bills there is also a standing charge that has to be added on.
- VAT is also added to the bills.
- With Gas Bills, there is also a Carbon Tax that needs to be added on.

**Example:** Calculate the cost of electricity if the previous meter reading was 21310 and the current reading is 21836, with a standing charge of €21.60. The cost per unit is €0.15 and VAT of 13.5% is added on.

$$\text{Units used} = \text{Current Reading} - \text{Previous Reading}$$
$$= 21836 - 21310 = 526 \text{ units}$$

$$\text{Cost for electricity} = 526 \times \text{€}0.15 = \text{€}78.90$$

$$\text{Standing Charge} = \text{€}21.60$$

$$\Rightarrow \text{Total Before VAT} = \text{€}78.90 + \text{€}21.60 = \text{€}100.50$$

$$\text{VAT} = 13.5\% \text{ of } \text{€}100.50 = \text{€}13.57$$

$$\Rightarrow \text{Final Bill} = \text{€}100.50 + \text{€}13.57 = \text{€}114.07$$