

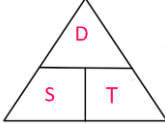
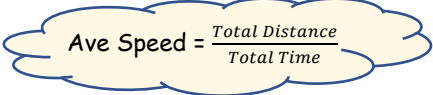


Topic 1: Arithmetic

1) The Basics:

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

$$\% \text{ Profit or Mark-Up} = \frac{\text{Profit}}{\text{Cost Price}} \times 100\%$$

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

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

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

c) VAT:

VAT excluded:

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

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

$$= 120 \times 0.0135 = €16.20$$

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

VAT included:

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

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

$$\Rightarrow 113.5\% = €340.50$$

$$\Rightarrow 1\% = €3$$

$$\Rightarrow 100\% = €300$$

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...
Tax @ Lower Rate + Tax @ Higher Rate
- **Part 2:** Calculation of Tax Payable using the equation
Tax Paid = Gross Tax - Tax Credits
- **Part 3:** Working out Net Income by taking off all deductions including Tax Paid, USC and PRSI (See below), Union Fees, Health Insurance etc.

c) USC/PRSI:

USC: Have to be given the rates and bands:

- 2% of the first €10036 = €200.72
- 4% of the next €5980 = €239.20
- 7% on the balance of income => need to subtract (10036 + 5980) from Gross Income and then get 7%

PRSI:

- Usually in class A, €127/week is free of PRSI deductions
=> €127 x 52 = \$6604 (needs to be taken from gross income)
- Then pay 4% on the remainder of your income.

4) Compound Interest/Depreciation:

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.

c) Depreciation: (items losing value)

- The formula on the right can be used for Depreciation problems.....just replace the '+' with a '-'.....see below.
- The rate must be the same each year to use the formula.

$$F = P(1 - i)^t$$

See Tables
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where **F** is the Final value, **P** is the starting value, **i** is the Rate of Depreciation as a **decimal** (e.g. 2.5% = 0.025) and **t** is the time in years.

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

Method 2: Formula

$$F = P(1 + i)^t$$

See Tables
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where **F** is the Amount, **P** is the Principal, **i** is the Rate of Interest as a **decimal** (e.g. 3% = 0.03) and **t** is the time in years the money is invested/borrowed for.

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.

Units used = Current Reading - Previous Reading

$$= 21836 - 21310 = 526 \text{ units}$$

Cost for electricity = $526 \times €0.15 = €78.90$

Standing Charge = €21.60

=> Total Before VAT = €78.90 + €21.60 = €100.50

VAT = 13.5% of €100.50 = €13.57

=> Final Bill = €100.50 + €13.57 = €114.07