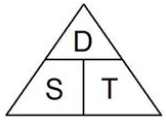
Year 10 higher topic 11

Multiplicative reasoning

What careers would use these skills?

Finance, car sales, scientists, sports analyst, formula 1 engineers, athletes.

Speed, distance and time calculations



James runs at a speed of 4 miles an hour, he runs for 2 hours 15 mins, how far does he run?

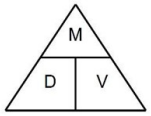
(Convert time to decimals)

2h15 = 2.25 hours

D = S x T

D = 4 x 2.25 = 9 miles

Density, mass and volume calculations



The density of an object is 8kg/m³ and has a mass of 2000g. Calculate the volume of the object.

(convert mass to kg as the units for density are kg/m³)

V = M ÷ D

Metric/imperial conversions

5 miles ≈ 8 kilometres

1 gallon ≈ 4.5 litres

2.2 pounds ≈ 1 kilogram

1 inch ≈ 2.5 centimetres

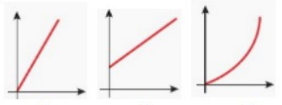
Metric conversions

1km = 1000m

1m = 100cm

Direct proportion

- The graph is a straight line that goes though the origin
- If one variable is multiplied by n, so is the other



A B C

A is in direct B and C are not

Inverse proportion

One variable increases at a constant rate as the second variable decreases

Symbols and notation

"y is proportional to x"

$$y \propto x$$

$$y = kx$$

"y is inversely proportional to x"

$$y \propto \frac{1}{x}$$

$$y = \frac{k}{x}$$

Calculate percentage change

$$\frac{\text{Difference}}{\text{Original}} \times 100\%$$

Eg.

A games console is bought for £200 and sold for £250. What is the percentage change?

The difference is 250 — 200 = 50

% change = 50 x 100

200

Repeated percentage change (use decimal multipliers)

Compound interest = Interest paid on the original amount and the accumulated interest

Example A bank pays 5% compound interest a year. Bob invests £3000. How much will he have after 7 years.

3000 x 1.05^7 = £4221.30

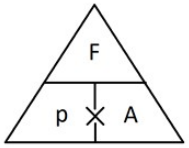
Depreciation = a decrease in value of an item over time

Example A car costs £19,000, it depreciates in value by 10% a year, how much is it worth after 6 years?

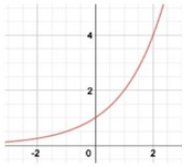
19000 x 0.9^6 = £10097.38 (remember to round money to 2 decimal places)

Pressure, force and area calculations

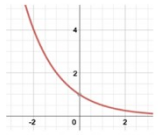
Pressure is a measure of how much force is applied over a given area of an object, so it is calculated by dividing the amount of force being applied by the area over which its being applied.



Growth and decay problems



Exponential growth = When we multiply a number repeatedly by the same number (≠ 1) , resulting in the number increasing by the same proportion each time. The original amount can grow very quickly in exponential growth.



Exponential decay = When we multiply a number repeatedly by the same number (0 < x < 1), resulting in the number decreasing by the same proportion each time. The amount can decrease very quickly.