

Circles, Arcs, Sectors:

- radius r
- diameter $2r = d$
- chord
- sector
- tangent

Area of a circle = πr^2

Arc length = $\frac{\theta}{360} \times \pi d$

Circumference of a circle = πd OR $2\pi r$

Area of a sector = $\frac{\theta}{360} \times \pi r^2$

Arc length = $\frac{\theta}{360} \times \pi d$

In 3-D shapes

Volume of = Cross-sectional Area x Height

Volume of pyramid = $\frac{1}{3} \times \text{Base Area} \times \text{Height}$

Volume of cone = $\frac{1}{3} \times \pi r^2 \times h$

Volume of cylinder = $\pi r^2 \times \text{height}$

Volume of prism = Cross-sectional Area x Height

Pythagoras (only in a)

$a^2 + b^2 = c^2$

The 2 smaller areas = the larger square's area.

To find AY length

First calculate ZY

Now use ZY to find AY

diagonal across the space of the cuboid

base of cuboid

height of cuboid

Volumes & Areas

Area = Length x Width

Area = $\frac{1}{2} \times \text{Base} \times \text{Height}$

Area = Base x Perpendicular Height

Area = $\frac{h}{2} (a + b)$

Volume = Length x Width x Height

Volume = $\frac{1}{2} \times \text{Base} \times \text{Height} \times \text{length}$

Volume = $\pi r^2 \times \text{height}$

Volume of pyramid = $\frac{1}{3} \times \text{Base Area} \times \text{Height}$

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Volume of prism = Cross-sectional Area x Height

Units

METRIC

10mm = 1cm

1000m = 1km

1000mg = 1g

1000g = 1kg

1000kg = 1t

1ml = 1cm³

1000cm³ = 1 Litre

IMPERIAL

1 mile = 1.6km

1 inch = 2.54cm

1kg = 2.2lbs

1 Litre = 1.75pints

1 gallon = 4.5 Litres

5 miles = 8km

Trigonometry

SOH CAHTOA

$\sin \theta = \frac{\text{Opp}}{\text{Hyp}}$

$\cos \theta = \frac{\text{Adj}}{\text{Hyp}}$

$\tan \theta = \frac{\text{Opp}}{\text{Adj}}$

Similar = same slope

Similar = same proportion of sides

Similar = same angles but different size

Similar = same shape

HIGHER FACTS & FORMULA

Cumulative Frequency

The frequency is added on to get a cumulative value.

Plot this against the top value of each group.

f	0	5	8	17
Group	0 < 5	5 < 10	10 < 15	15 < 20
cf	0	5	13	20
Group	< 5	< 10	< 15	< 20

Upper quartile = 14

Median = 10

Lower quartile = 5

Upper & Lower Bounds

Rounding calculations and the range of values possible → least/greatest

42cm to the nearest cm

41 ↓ 42 ↓ 43

41.5 ↓ 42.5

least ↑ greatest

85cm to nearest 5ml

80 ↓ 85 ↑ 90

82.5ml ↓ 87.5ml

least ↑ greatest

Trapezium Rule

Used on a velocity/time graph to calculate the area under the curve

Distance = $\frac{1}{2} [(a_0 + a_n) + 2(a_1 + a_2 + \dots + a_{n-1})]$

Trapezium Rule

Rule = $\frac{1}{2} [(a_0 + a_n) + 2(a_1 + a_2 + \dots + a_{n-1})]$

For n number of sections

area between t=2, t=3 is gradient of chord

area between t=1, t=2 is gradient of tangent

accel at t=1 is gradient of tangent

Scatter graphs

Draw a STRAIGHT LINE as a line of best fit to show correlation

POSITIVE

NEGATIVE

NONE

Example

Mean = $\frac{\text{Sum of Freq} \times \text{midpt}}{\text{Sum of Freq}}$

Mean = $\frac{(2.5) + (8.5) + (14.5) + (20.5)}{7+13+9+4}$

Velocity/Time Graphs

The curve shows the acceleration of the object

workout the GRADIENT to calculate the acceleration

Either draw a TANGENT at a point & find the gradient of the tangent, OR draw a CHORD between 2 points & find the gradient.

Parallel lines $m_1 = m_2$

Perpendicular lines $m_1 \times m_2 = -1$

Straight lines $y = mx + c$

$m = \text{gradient} = \frac{\text{change in y values}}{\text{change in x values}}$

$c = \text{intercept} = (0, c)$ where it crosses the y axis

Histograms

The AREA of the bar represents the frequency (total of each group).

Height of bar = $\frac{\text{Frequency}}{\text{Width of group}}$

Sampling

STRATIFIED → sample is in proportion to the group sizes

Group size x sample size = total population

RANDOM → population is given a unique No. A random number generator provides numbers which is used to identify from the unique No's.

Linear Relationships

Straight lines represent a linear relationship between 2 variables.

The gradient shows the relationship value. The intercept shows any service charge/value.

$y = mx + c$

$m = \frac{1}{2}$

$c = 2$

eg $y = \frac{1}{2}x + 2$

Standard Form

$3 \times 10^6 \rightarrow 3 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10$

3000000

$3 \times 10^{-4} \rightarrow 3 \div 10 \div 10 \div 10 \div 10$

0.0003

Ratio

Example Split

3:5

3+5 = 8 parts

£160 ÷ 8 = £20

3 x £20 = £60

5 x £20 = £100

Example

Jane + John split winnings in the ratio 6:5, Jane gets £72

How much did they win?

£72 ÷ 6 = £12

5 x £12 = £60

£72 + £60 = £132

Plot

draw a curve

freehand

Median = 1/2 way

LQ = 1/4 way

UQ = 3/4 way

INTERQUARTILE RANGE

UQ - LQ