The Institution of Engineering and Technology

Secondary

Education

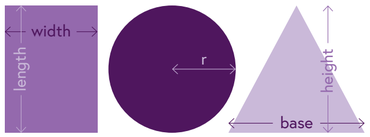
Maths for engineering

Area

Area of a rectangle
length x width = L x W

Area of a circle π r2

Area of a triangle
half (base x height) = ½ (B x H)



For complicated shapes, calculate the area by breaking them down into simple shapes.

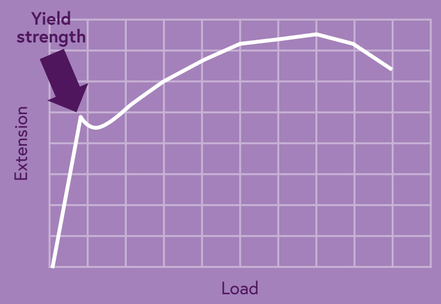
Testing materials

Stress
σ = force / cross sectional area = F / A

Strain
change in length / length = δl / l

Young's modulus
E = stress / strain = σ / ε

Factor of safety
FoS = yield strength / load = σy / L

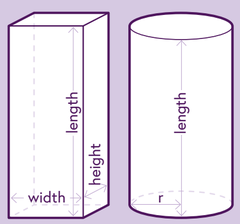


Volume and density

Volume of a cuboid
V = length x width x height = L x W x H

Volume of a cylinder
V = area of circle x length = A x L = π r2 x L

Density
ρ = mass / volume = m / V



Ohms Law and resistance

Voltage
V = current, **I** x resistance, **R**
V = IR rearranging this,
I = V/R and **R = V/I**

For resistors in series:

$R_T = R_1 + R_2$

For resistors in parallel:

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$$

Cost

Cost of material in a part =
mass of material x cost per unit mass
(or cost of material = area of material x cost per unit area)

Labour to make a product =
labour time x charge rate

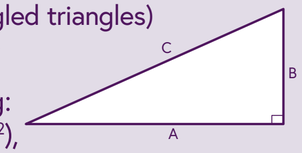
Total cost of parts in a product =
£ part1 + £ part2 + £ part3 etc.

Total cost to make a product =
cost of parts + cost of materials + labour cost

Profit = sales price – total cost

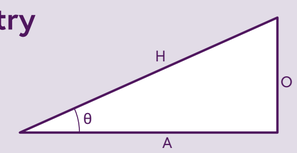
Dimensions of a triangle

Pythagoras theorem
(for right angled triangles)
$A^2 + B^2 = C^2$



Rearranging:
$A = \sqrt{(C^2 - B^2)}$,
$B = \sqrt{(C^2 - A^2)}$,
$C = \sqrt{(A^2 + B^2)}$

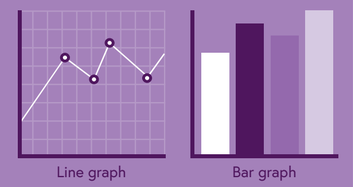
Trigonometry
tan θ = O / A
sin θ = O / H
cos θ = A / H



Graphs

Graphs are used to communicate data and show relationships between data. Commonly used graphs include **line graphs**, **bar graphs** and **pie charts**.

Formula for a straight line graph: y = mx + c

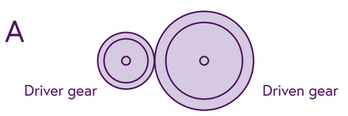


Power transmission

Gear ratio = $\frac{\text{number of teeth on driven gear}}{\text{number of teeth on driver gear}} = \frac{N_{driven}}{N_{driver}} = \frac{Speed_{driver}}{Speed_{driven}}$

Velocity ratio = $\frac{\text{Size of output wheel}}{\text{Size of input wheel}} = \frac{N_{driven}}{N_{driver}} = \frac{Speed_{driver}}{Speed_{driven}}$

Pressure P = force / area = F / A



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