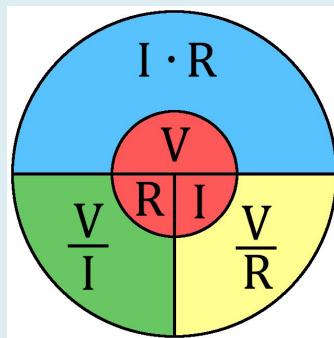


Describing engineering processes

Engineering often involves the need to understand calculations and apply mathematical techniques. These include:

Formulae

- **Ohm's Law** is used to calculate resistance, current and voltage. A typical application may be to calculate the correct value of resistor in an LED circuit.



Mechanical advantage

- When using mechanisms, you can calculate the mechanical advantage (MA) of the system using the formula:

$$(MA) = \text{Load/Effort}$$

Velocity ratio

- Calculating the velocity ratio (VR) of a mechanism requires the information of the distances moved by the load and the distances moved by the effort.

$$VR = \frac{\text{Distance moved by effort}}{\text{Distance moved by load}}$$

Calculations

- Calculations for mechanisms formula above should include an understanding of application on gears, levers and pulleys.

Areas and volumes

- Calculating areas of engineered parts where subtractions or additions of materials are made by:
 - calculating volumes of cylinders
 - calculating volumes of shapes
 - working out areas of objects.

Estimating costs and materials

- Using a range of sourced costs to calculate the cost of material needed to manufacture a part or component in the engineering outcome.

Scale

- Being able to apply and understand scale factors when reading or producing an engineering drawing is a vital skill. Scales are shown as ratios, for example 2:1 or 1:5.

Units

- Using metric and imperial units for measurements and calculating costs such as:
 - **millimetres** and metres – used in giving sizes on engineering drawings and during manufacture of products
 - **pounds** and pence – used for estimating and working out costs of materials etc
 - **time** in hours, minutes and seconds – used in planning stages for manufacture.

Graphs

- A range of graphs can be applied in planning the manufacture or other relevant areas.

Technical details in engineering drawings

Engineering drawings may be made up of several different parts to the drawing. All elements of an engineering drawing must conform to a standard convention.

Orthographic views

- These are the views of a product or part, which appear on engineering drawings. Typical views are Plan View, End View and Front View.

Hidden detail

- Hidden detail lines are used to show surfaces that are not directly visible. All surfaces must be shown in all views. If an edge or surface is blocked from view by another feature, it is drawn using a hidden detail line.

Section view

- A sectional view or a section looks inside an object. Sections are used to clarify the interior construction of a part that cannot be clearly described by hidden lines in exterior views.

Isometric views

- Isometric projection is a method for visually representing three-dimensional objects in two dimensions in technical and engineering drawings.

