**Solving Mechanical Calculation Problems – Suggested Process**

Most calculation problems are worth multiple marks. You will receive more marks the further you get into the question. By following the process outlined below you will be able to break the problem down into logical steps and work towards the correct solution and possible full marks.

Tips : - set your working out clearly so it is easy for the examiner to follow your thinking

- complete all calculations (a note for the advanced maths students)

- double check your calculations and unitso

**Sample (2017 HSC Question 26 b ii)**

*A 20 mm diameter hole is to be punched through the top of the electric cable cover before folding.*

*The ultimate shear stress of the material used to manufacture the cover is 110 MPa.*

*Calculate the force required to punch out the hole sheet metal if the thickness of the sheet metal is 0.5 mm.*

**Process.**

1. Highlight all relevant information and analyse the question.

A 20 mm diameter hole is to be punched through the top of the electric cable cover before folding.

The ultimate shear stress of the material used to manufacture the cover is 110 MPa.

Calculate the force required to punch out the hole if the thickness of the sheet metal is 0.5 mm.

*Analysis (mental notes to self)*

- *shear stress so area in shear = perimeter x thickness*
- *area in $mm^2$ = δ in MPa*

2. Refer to your formula sheet to determine which formula will best allow calculation of solution and note all given data. Complete any secondary calculations

**δ = F/A**

δ = 110MPa
F = ?
A = perimeter x thickness
= πd x t  d = 20mm
= π x 20 x 0.5  t = 0.5mm
= 31.42 $mm^2$ (work to 2dp for accuracy)

3. Substitute and calculate answer

**δ = F/A**
**110 = F/31.42**
F = 110 x31.42
= 3 455.76 N
**F = 3.46 kN**

δ = 110MPa
F = ?
A = perimeter x thickness
= πd x t  d = 20mm
= π x 20 x 0.5  t = 0.5mm
= 31.42$mm^2$

4. Write answer clearly in appropriate space and check your units

By setting out and showing working examiners can see if simple calculation or substitution errors have been made which generally result in minimal penalty.