Pressure

Pressure tells us whether a force is focused or spread out over an area.

When you push **drawing pin** with your thumb, the small area of the point has a very high pressure. This enables it to go into the wall. The flat bit you push has a larger area. The force is more spread out. There is less pressure which is why it doesn't go into your thumb.

1   Do you want a high or low pressure? How did you decide?
    (a) Cat's claws when it climbs a tree

    (b) Standing on soft snow when you don't want to sink in

    (c) A tractor's wheels in a muddy field

    (d) Scissor blades cutting paper

2   Fill in the gaps to complete the explanation:
    A bar of chocolate has six chunks joined with thinner pieces of chocolate. When you try to bend the bar, the _____ is greatest where the bar is _____. This helps you break off one chunk of chocolate at a time.

3   A chef is chopping carrots with a sharp knife. Complete the table to compare the force, pressure and area of the knife handle compared with its blade. Choose from the words **larger**, **smaller** and **equal**.

	On handle compared to blade edge,
Area	area is
Pressure	pressure is
Force	force is
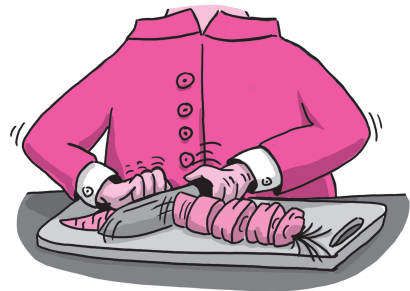
A pressure of 30 N/cm^2 means that there is a force of 30 N on each square centimetre.

If this pressure is on a 4 cm^2 area, then the force will be $30 \times 4 = 120$ N.

4   Calculate the force on these areas if the pressure is 20 N/cm^2.
    (a) 2 cm^2,   (c) 30 cm^2,

    (b) 4 cm^2,   (d) 0.04 cm^2.

If there is a force of 60 N spread over an area of 4 cm^2, then the force on each square centimetre is $60 \div 4 = 15$ N. The pressure is 15 N/cm^2.

5   Calculate the pressure for these forces and areas.
   (a) 20 N over 2 cm^2,   (c) 60 N over 12 cm^2,

   (b) 20 N over 0.2 cm^2,   (d) 60 N over 3 cm^2.

If there is a pressure of 60 N/cm^2 then the force on each square centimetre is 60 N. If the force is 240 N the area must be $240 \div 60 = 4$ cm^2.

6   A force is 300 N. Calculate the area to make these pressures.
   (a) 150 N/cm^2,   (c) 15 N/cm^2,

   (b) 30 N/cm^2,   (d) 600 N/cm^2.

---

7   Complete the word equations using **Force**, **Pressure** and **Area**.
   (a) Force =   (b) Pressure =   (c) Area =

8   Rewrite your word equations using symbols.
   F is the force, P is the pressure and A is the area.
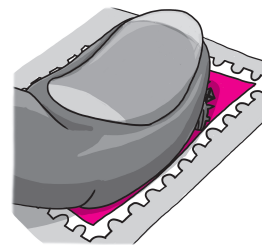   (a) $F =$ (b) $P =$ (c) $A =$

---

9   Use your understanding of pressure, or the formulae, to calculate
   (a) the pressure when a 48 N force squeezes a 1.2 cm^2 stamp,

   (b) the force when a 20 N/cm^2 pressure fluid pushes a 5 cm^2 piston,

   (c) the area if a 900 N force makes a 90 N/cm^2 pressure.

Areas can also be measured in square metres. 1 m^2 = 100 cm $\times$ 100 cm = 10 000 cm^2.

A pressure of 50 000 N/m^2 can also be written as 50 000 Pa (pascals) or 50 kPa (kilopascals).

10 A van with weight 25 000 N is supported by tyres with total area 0.25 m^2. Calculate the
   (a) pressure in kPa,   (b) area in cm^2,   (c) pressure in N/cm^2.