Pressure Practice

1 A farmer needs to drive a van into a muddy field.
To stop it getting stuck in the mud, the farmer gets some planks of wood. They put them across the field, and drive the van so that the wheels stay on the planks.
The farmer explains it like this: The planks have a large _____ and spread out the _____ so that the _____ is much lower. This means that the wheels don't sink.
Fill in the blanks using the words **force**, **pressure** and **area**.

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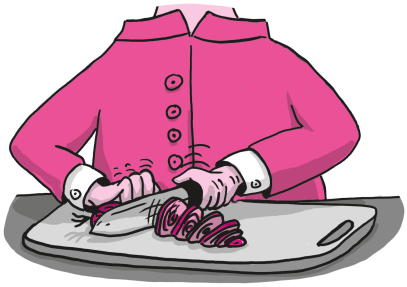
2 Do you want a high or low pressure? How did you decide?

(a) A cook's knife blade as they cut an onion.

(b) A chopping board under the onion which protects the kitchen surface.



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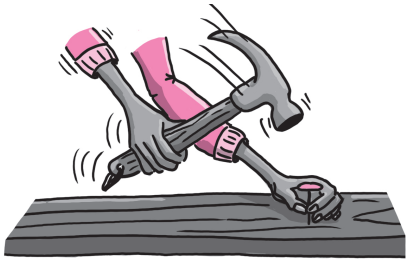
3 A carpenter is hammering a nail into a board. Complete the table to compare the force, pressure and area of the point of the nail compared to its head. Choose from the words **larger**, **smaller** and **equal**.

	On point of nail compared to head,
Area	area is
Pressure	pressure is
Force	force is



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4 The fluid in the jack used to lift vans in a garage is at a pressure of 25 N/cm^2.

(a) Complete the sentence: The force on 1 cm^2 is [ ] newtons.

(b) Work out the force on a 200 cm^2 piston using an equation.

force (N)	=	pressure (N/cm^2)	×	area (cm^2)
[ ]	=	25	×	200

(c) Work out the force on a 15 cm^2 piston.

force (N)	=	pressure (N/cm^2)	×	area (cm^2)
[ ]	=	25	×	15

(d) Work out the force for the total 100 cm^2 area of the pistons used to lift the van.

5 Calculate the force on these areas if the pressure is 100 N/cm^2.

(a) 3 cm^2

(b) 0.5 cm^2

A pressure of 30 N/m^2 $= 30$ Pa means that there is a force of 30 N on each square metre.

6 Calculate the force on these areas if the pressure is $100\,000$ Pa (atmospheric pressure).

(a) 0.02 m^2

(b) 200 m^2

(c) $0.000\,1$ m^2 (which is 1 cm^2)

(d) 300 cm^2

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7 An 80 N force is spread over a 400 cm^2 area.

(a) Force on 1 cm^2 $=$ $\square$ $\div$ $\square$ $=$ $\square$ newtons

(b) Complete the sentence: The pressure (in N/cm^2) is $\square$.

(c) A 160 N force is applied over 400 cm^2. Work out the pressure using an equation.

force (N)	$=$	pressure (N/cm^2)	$\times$	area (cm^2)
160	$=$		$\times$	400

(d) Work out the pressure if 3 kN is applied over an area of 15 cm^2. 1 kN = 1000 N

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8 Calculate the pressure (in N/cm^2) for these forces and areas.

(a) A 650 N person wearing dancing shoes. Each heel has area 1.3 cm^2.

(b) A $48\,000$ N elephant standing on four feet. Each foot has area 3000 cm^2.

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9 A thick polystyrene sheet is floating on water. It will support a weight, providing the pressure on the water is no more than 0.02 N/cm^2.

(a) At this pressure, What is the force on 1 cm^2?

(b) We want to support a 10 N weight. How many 0.02 N forces is this?

(c) What area of polystyrene is needed? Count the 0.02 N forces (each on 1 cm^2).

(d) Work out the area needed to support a 40 N chicken using an equation.

force (N)	=	pressure (N/cm^2)	×	area (cm^2)
40	=	0.02	×	

(e) Work out the area needed to support a 650 N weight.

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10 A force is 60 N. Calculate the area to make these pressures.

(a) 240 N/cm^2 (b) 12 N/cm^2

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11 Complete the word equations.

(a) force = (b) pressure =

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12 Use your understanding of pressure, or the formulae, to calculate

(a) the pressure when a 500 N teenager stands on a 200 cm^2 block.

(b) the force when a 20 N/cm^2 pressure fluid pushes a 0.5 cm^2 piston.

(c) the area if a 50 N force makes a 5000 N/cm^2 pressure.

(d) the pressure of a $270\,000$ N truck on tyres with total area 1.5 m^2. Answer in kPa.

Areas can also be measured in square millimetres. 1 mm^2 $= 0.1$ cm $\times\ 0.1$ cm $= 0.01$ cm^2.

13 A drawing pin has a flat area of 1.2 cm^2 and a point area of 1.2 mm^2. A person pushes it into a wall with a force of 30 N. Calculate or state

(a) the pressure on the flat area in N/cm^2,

(b) the force on the point in N,

(c) the pressure on the point in N/mm^2,

(d) the pressure on the point in N/cm^2.