

The formula for pressure is:

$$\text{Pressure} = \frac{\text{force (in newtons)}}{\text{area (in cm}^2 \text{ or m}^2)}$$

If the area is in  $\text{cm}^2$ , then the unit of pressure is newtons per square centimetre ( $\text{N/cm}^2$ ).

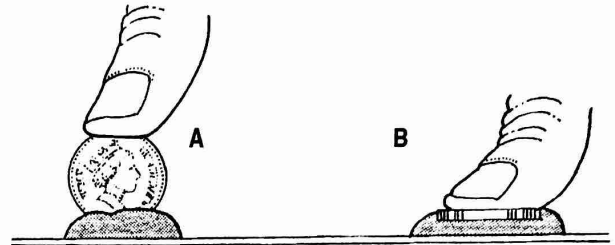
If the area is in  $\text{m}^2$ , then the unit of pressure is newtons per square metre ( $\text{N/m}^2$ ).

This unit is also called a **pascal (Pa)**.  $1 \text{ Pa} = 1 \text{ N/m}^2$ .

- 1 A coin is being pushed into plasticine, in 2 ways, as shown:
- Explain why it is easier in diagram A.
  - In diagram B, the area of the face of the coin is  $2 \text{ cm}^2$ . The finger is pushing with a force of  $10 \text{ N}$ .

What pressure is exerted on the plasticine?

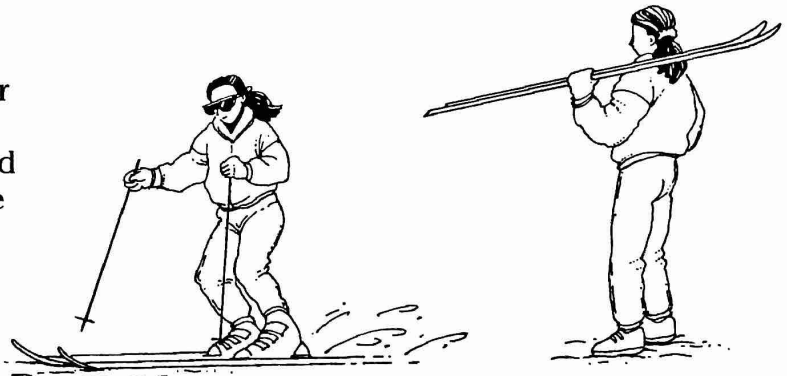
Give the correct unit.



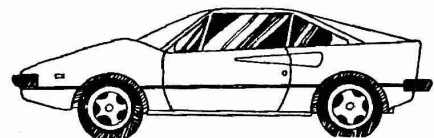
- 2 A man weighs  $800 \text{ N}$ . Each shoe has an area of  $200 \text{ cm}^2$ . What is the pressure exerted on the ground when he stands on:
- one shoe?
  - both shoes?



- 3 The girl and her skis weigh a total of  $500 \text{ N}$ . The area of contact between her skis and the snow is  $2500 \text{ cm}^2$ .
- Calculate the pressure exerted by the skis on the snow. Give the correct unit.
  - In the second picture, the pressure exerted by her feet is 5 times as much as when she is skiing. Explain this.

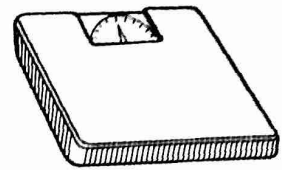


- 4 A car weighs  $8000 \text{ N}$ . It has 4 wheels. Each tyre has a pressure of  $20 \text{ N/cm}^2$ .
- If the weight is spread evenly, what is the weight supported by each tyre?
  - Calculate the area of each tyre in contact with the road.
  - When some people get in the car, the area of contact for each tyre increases to  $125 \text{ cm}^2$ . If the pressure of each tyre is still  $20 \text{ N/cm}^2$ , what is the total weight of the car now?



Name \_\_\_\_\_ Class \_\_\_\_\_

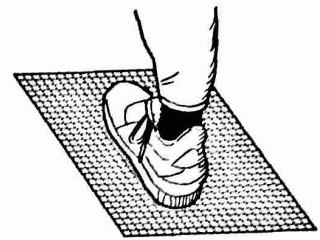
- Look at steps 1–4 below.  
This is a way to work out the pressure that you exert on the ground.



- Measure your weight.

My weight is \_\_\_\_\_ N

- Take a piece of squared paper and stand on it.  
Draw around one foot.  
Count the number of squares inside your footprint.  
Some squares around the edge may not be completely inside your footprint.  
Count a square only if more than half of it is inside.

Area of one foot = \_\_\_\_\_  $\text{cm}^2$ 

- Multiply this by 2, because you have 2 feet.

Area of two feet = \_\_\_\_\_  $\text{cm}^2$ 

- Now you can calculate the pressure.

Pressure = your weight  $\div$  area of your two feetPressure = \_\_\_\_\_ N  $\div$  \_\_\_\_\_  $\text{cm}^2$ Pressure = \_\_\_\_\_  $\text{N/cm}^2$ 

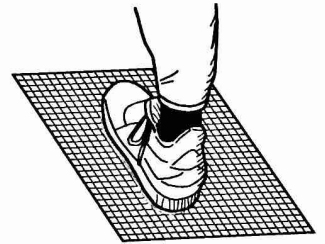
- Who exerts the biggest and the smallest pressures in your class?

\_\_\_\_\_

Name \_\_\_\_\_ Class \_\_\_\_\_

Some pupils were investigating the pressure that they exert on the ground.

They wanted to find out how the pressure is affected by different shoes. They also wanted to find out the pressure exerted on the floor by their bare feet and when they were sitting on a stool.



Here is a set of results for one of the pupils:

|                                      | Total weight<br>(N) | Surface area<br>(cm <sup>2</sup> ) | Pressure<br>(N/cm <sup>2</sup> ) |
|--------------------------------------|---------------------|------------------------------------|----------------------------------|
| Standing in school shoes             | 550                 | 320                                |                                  |
| Standing in bare feet, holding shoes | 550                 | 275                                |                                  |
| Standing in stiletto-heel shoes      | 550                 | 80                                 |                                  |
| Standing in trainers                 | 550                 | 415                                |                                  |
| Sitting on a stool                   | 600                 | 12                                 |                                  |

1 Calculate the pressure, and fill in the last column of the table, using:

$$\text{Pressure} = \frac{\text{force}}{\text{area}}$$

2 Which of them is most likely to mark the floor? \_\_\_\_\_

3 What is the weight of the stool? \_\_\_\_\_

The stool has 4 feet.

What is the area of each foot of the stool? \_\_\_\_\_

4 Ignoring the stool, draw a graph showing the last two columns in the table (with area along the bottom and pressure up the side).  
(You can add more points by imagining more shoes, with different areas.)

5 In each of the examples in the table, apart from the stool, there was a constant force. Describe the relationship between pressure and surface area, given a constant force.

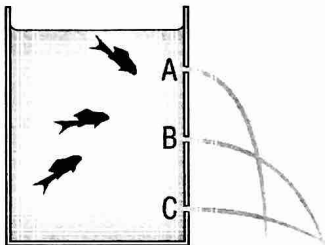
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Name \_\_\_\_\_ Class \_\_\_\_\_

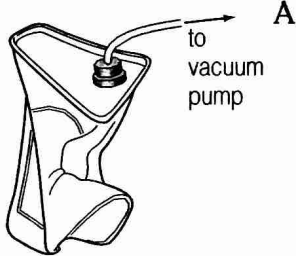
- 1 Read the information on pages 152 and 153 in Book 9.
- 2 Look at each of the pictures. In box A describe and explain what is happening using scientific knowledge. In box B state why this knowledge is useful.



A This picture shows

This happens because

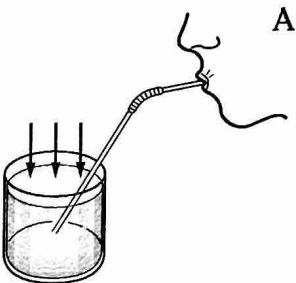
B This is useful to know because



A This picture shows

This happens because

B This is useful to know because



A This picture shows

This happens because

B This is useful to know because

- 3 Describe 2 more experiments that show pressure, and for each one explain what is happening. In each case, explain why this scientific knowledge is useful.