

CHAPTER 3

- 1 A piece of elastic cord is 80 cm long. When it is stretched, its length increases to 102 cm. What is its extension?
- 2 Table 5.2 shows the results of an experiment to stretch an elastic cord. Copy and complete the table, and draw a graph to represent this data.

Load / N	Length / mm	Extension / mm
0.0	50	0
1.0	54	
2.0	58	
3.0	62	
4.0	66	
5.0	70	
6.0	73	
7.0	75	
8.0	76	

- 3 A spring requires a load of 2.5 N to increase its length by 4 cm. The spring obeys Hooke's law. What load will give it an extension of 12 cm?
- 4 A spring has an unstretched length of 12.0 cm. Its stiffness k is 8 N/cm. What load is needed to stretch the spring to a length of 15.0 cm?
- 5 Table 5.3 shows the results of an experiment to stretch a spring. Use the results to plot an extension against load graph. On your graph, mark the limit of proportionality and state the value of the load at this point.

Load / N	Length / m
0.0	0.800
2.0	0.815
4.0	0.830
6.0	0.845
8.0	0.860
10.0	0.880
12.0	0.905

- 6 Use the idea of pressure to explain the following.
 - a Sharks and crocodiles have sharp teeth.
 - b Camels have wide, flat feet.
 - c If you walk on a wooden floor wearing stilettos (shoes with very narrow heels), you may damage the floor.

- 7 Write down an equation that defines pressure.
- 8 What are the SI units of pressure?
- 9 Which exerts a greater pressure, a force of 100 N acting on 1 cm², or the same force acting on 2 cm²?
- 10 What pressure is exerted by a force of 40 000 N acting on 2 m²?
- 11 A swimming pool has a level, horizontal, bottom of area 10.0 m by 4.0 m. If the pressure of the water on the bottom is 15 000 Pa, what total force does the water exert on the bottom of the pool?
- 12 Name an instrument used to measure:
 - a atmospheric pressure
 - b differences in pressure.
- 13 Figure 5.15 shows two tanks, A and B. Each tank contains gas and is fitted with a manometer to show how the pressure compares with atmospheric pressure outside the tank.

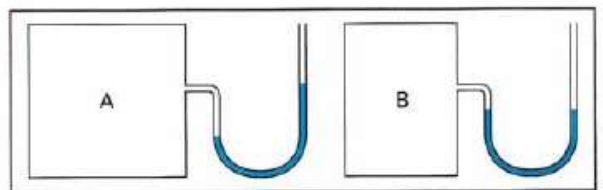


Figure 5.15 For Question 13.

- a In which tank is the gas pressure greater than atmospheric pressure? Explain how you can tell.
 - b What can you say about the pressure of the gas in the other tank?
- 14 A water tank holds water to a depth of 80 cm. What is the pressure on the bottom of the tank? (Density of water = 1000 kg/m³.)
 - 15 Figure 5.16 shows a tank that is filled with oil. The density of the oil is 920 kg/m³.
 - a Calculate the volume of the tank from the dimensions shown in the diagram.
 - b Calculate the weight of the oil in the tank.

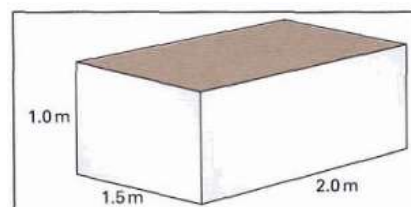


Figure 5.16 For Question 15.

- c The pressure on the bottom of the tank is caused by the weight of the oil. Calculate the pressure using

$$p = \frac{F}{A}$$

- d Now calculate the pressure using

$$p = h\rho g$$

Do you find the same answer?

- 1 Figure 4.5 shows a heavy trapdoor. Three different forces are shown pulling on the trapdoor. Which force will have the biggest turning effect? Explain your answer.

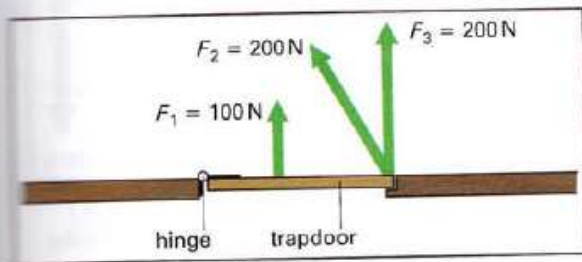


Figure 4.5 For Question 1.

- 2 A tall tree can survive a gentle breeze but it may be blown over by a high wind. Explain why a tall tree is more likely to blow over than a short tree.

- 3 Figure 4.10 shows a balanced beam. Calculate the unknown forces X and Y .

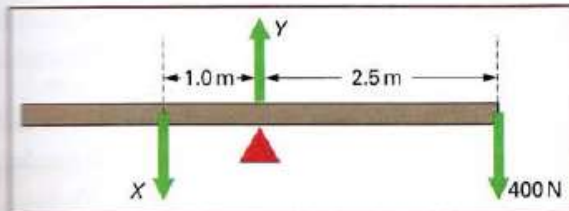


Figure 4.10 For Question 3.

- 4 Figure 4.11 shows a beam, balanced at its midpoint. The weight of the beam is 40 N . Calculate the unknown force Z , and the length of the beam.

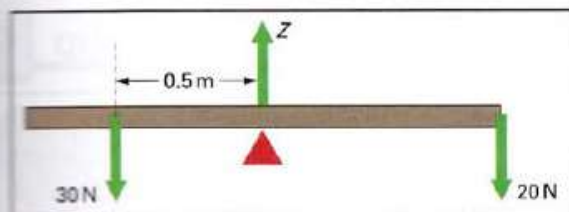
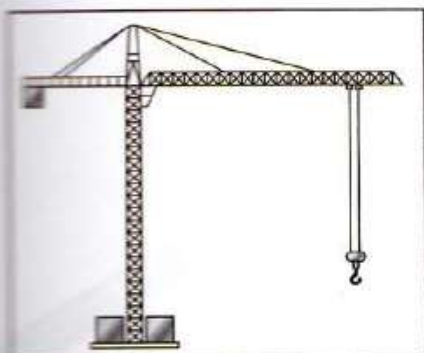
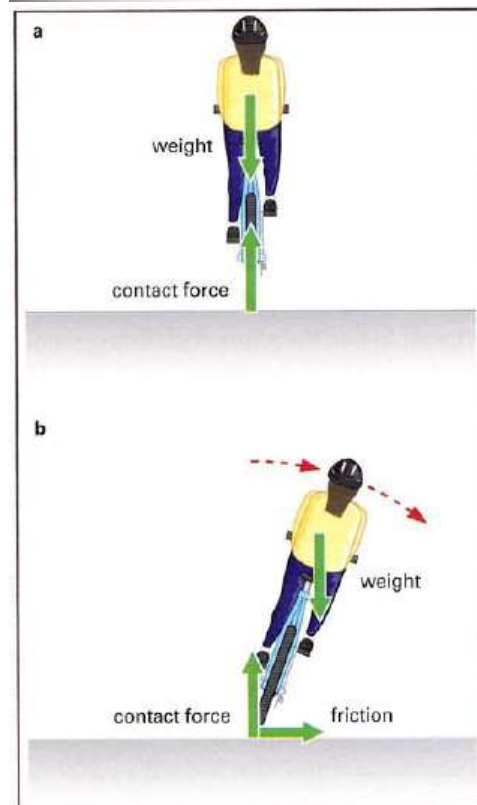


Figure 4.11 For Question 4.

- 5 Use the ideas of **stability** and **centre of mass** to explain the following.
- Double-decker buses have heavy weights attached to their undersides.
 - The crane shown in Figure 4.16 has a heavy concrete block attached to one end of its arm, and others placed around its base.



- 6 Figure 4.17 shows the forces acting on a cyclist. Look at part a of the diagram.
- Explain how you can tell that the cyclist shown in part a is in equilibrium.
 - Now look at part b of the diagram.
 - Are the forces on the cyclist balanced now? How can you tell?
 - Would you describe the cyclist as **stable** or **unstable**? Explain your answer.



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A container holds 20 m^3 of air at a pressure of $120\,000\text{ Pa}$. If the pressure is increased to $160\,000\text{ Pa}$, what will the volume of the gas become? Assume that its temperature remains constant.