3 Force and Pressure

'Force' and 'pressure' are two words we use often without quite knowing what they mean to a scientist. To a scientist, they are clearly defined physical quantities that can be measured.

FORCE

When we look around us, we see objects in different conditions. Some, like a desk or a parked car, are stationary. They are said to be in a state of rest. Others, like the vehicles moving on a road, are in a state of motion. A body's state of rest or motion cannot change on its own. For example, a chair does not move unless you pull or push it. Similarly, to stop a cart rolling down a slope, you need to pull or push it.

We use the word force to describe a push or a pull. We say that we are 'applying a force' when we push or pull something. When a force acts on a body, it can change the state of rest or of motion of the body. It can also do other things. Let us study the effects of force in greater detail.

Effects of Force

Force can cause motion

A body at rest may start moving when a force is applied. You see this happening when you push a chair, pull open a drawer, or pick up a box. Quite often, when we apply a force on a body, it moves in the direction of the force. For example, in Figure 3.1, a child is pushing a toy engine to the left, and the engine is moving in that direction. In diagrams, we show a force by an arrow. The arrowhead points in the direction of the force.

Fig. 3.1 The engine moves in the direction of the force.

Force can increase speed

The speed of a body increases when a force acts on it in the direction in which it is moving. For example, if you are on a swing and your friend pushes the swing in the direction in which it is moving, the swing will move faster. If you are cycling, and the wind pushes you from behind, your speed will increase. Similarly, if you kick a ball in the direction in which it is rolling, its speed will increase.

Force can decrease speed

Suppose a body is moving in a particular direction, and you apply a force on it in the opposite direction, the speed of the body will decrease. Thus, if you are on a swing and your friend pulls it in a direction opposite to its motion, the swing will slow down. It may even stop moving altogether. We often apply a force to stop a moving body. Fielders and goalkeepers, for example, apply force to stop the ball. Brakes push against wheels to stop their motion.

Force can change the direction of motion

Sometimes a force acting on a moving body changes its direction of motion. For example, when a ball bounces back from the floor, and you hit it with your hand, the force you apply changes the direction of its motion from 'upward' to 'downward'. And the direction in which a kite is flying changes because of the force exerted on it by the wind.

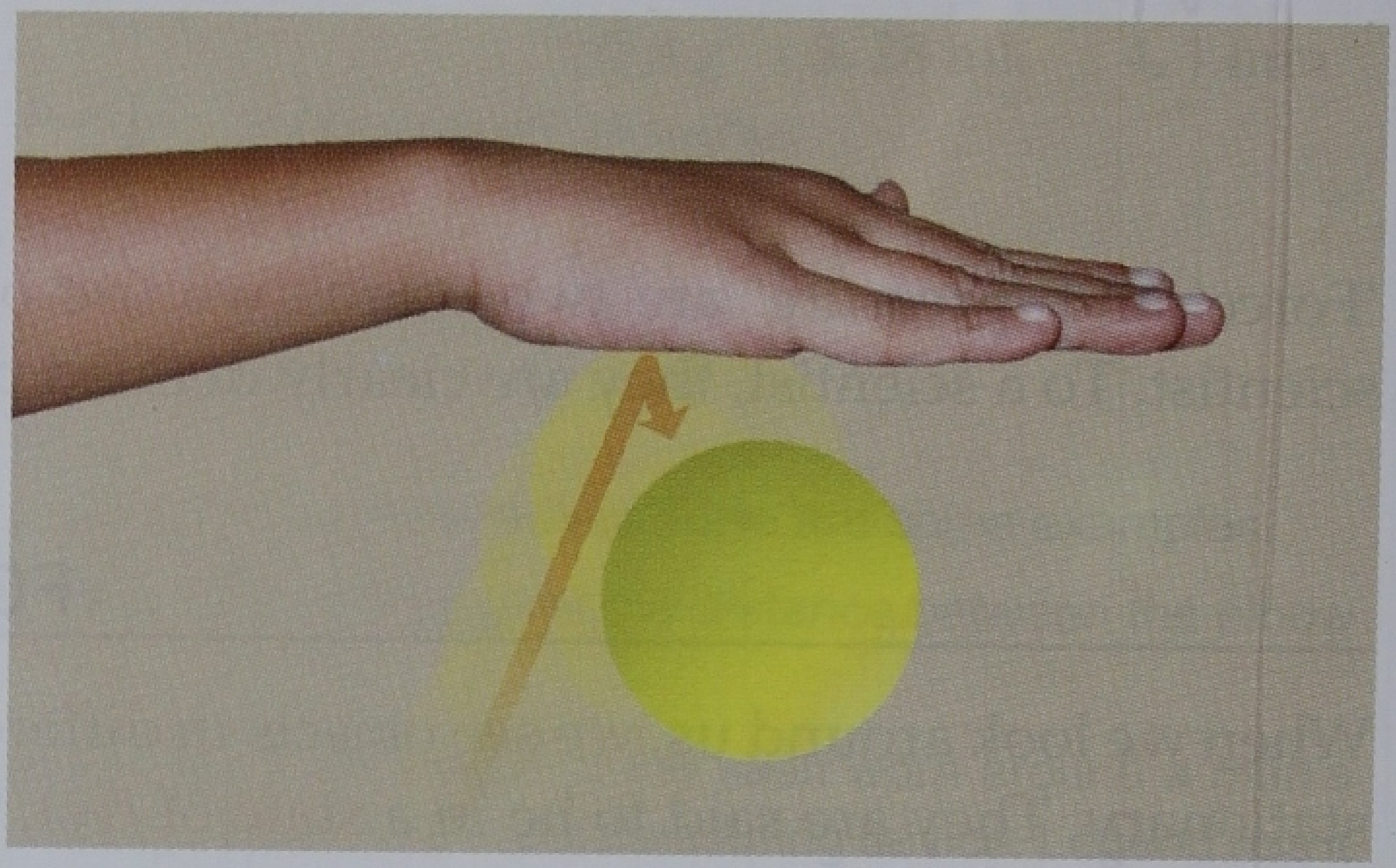


Fig. 3.2 The force exerted by the hand changes the direction of motion of the ball.

Force can change shape and size

When your head pushes down on a soft pillow, the shape of the pillow changes. When you press or pull dough, its shape and size change. When you pull a rubber band, its length increases. When an archer pulls the string of a bow, the shapes of its wooden frame and string change. Thus, a force can change the shape or size of a body.

We have discussed the kinds of changes that a force can produce when it acts on a body. Looking at it in another way, these changes occur because a force is acting on a body. We can now define force. Force is something that can bring about a change in the state of rest or of motion of a body or a change in its shape or size.

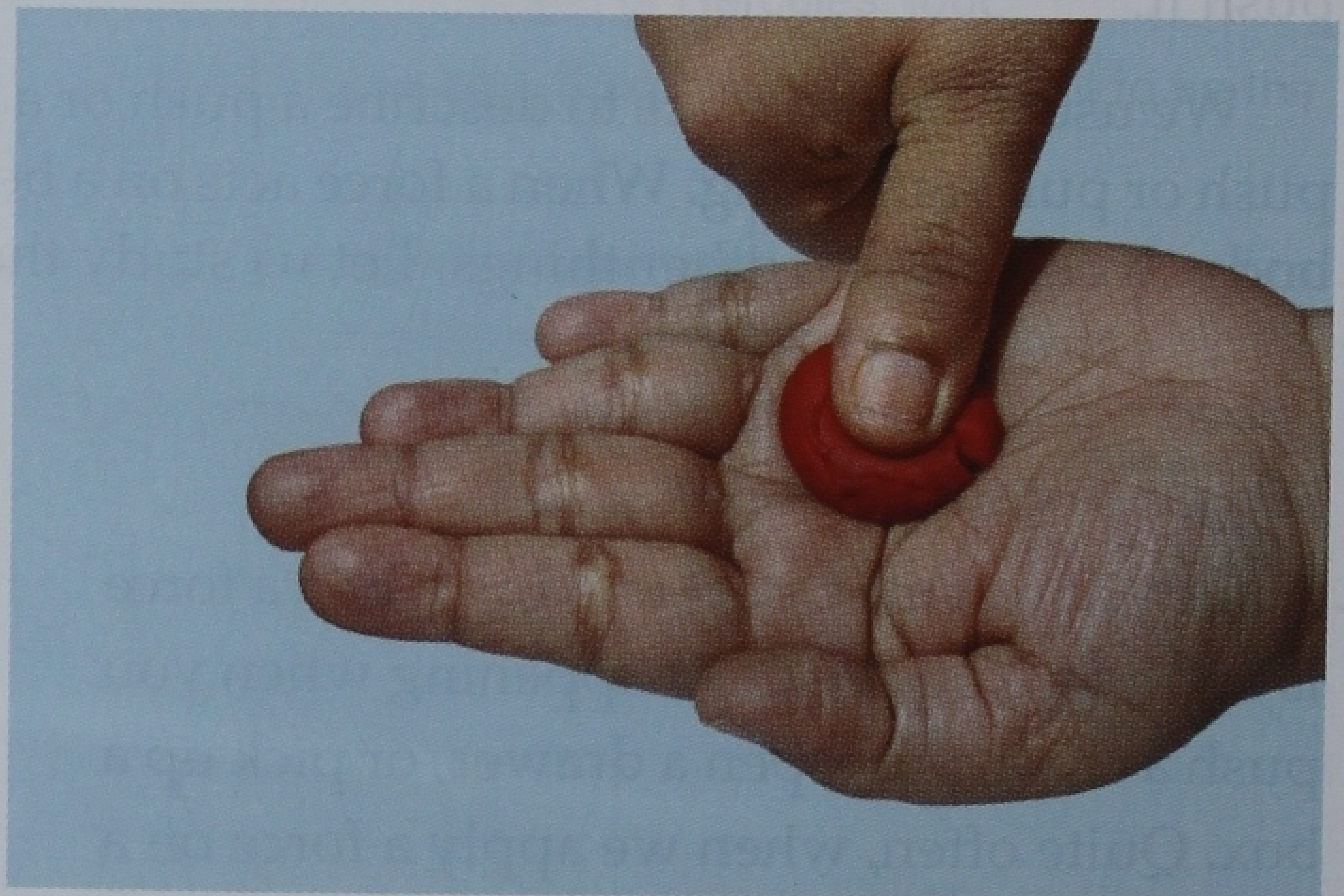


Fig. 3.3 You use force to shape modelling clay.

Unit of Force

Force is a physical quantity that can be measured. The SI unit of force is the newton, whose symbol is N. One newton is approximately the force you would apply to lift an object of mass 100 g. To lift 1 kg you would have to apply a force of about 10 N.

TYPES OF FORCES

When you push a box with your hands, you apply force on the box. In this case, your hands are in contact with the box. Now consider a leaf falling from a tree. It moves downwards because it is pulled by the earth. The earth exerts a force on the leaf though the leaf is not in contact with the earth. In general, we divide forces into two major types—contact forces and action-at-a-distance forces.

Contact Forces

Forces that two bodies in contact apply on each other are called contact forces. We apply contact forces when we push, pull or lift things around us. The forces we use when we push a switch, open a window, squeeze a lemon and kick a football are contact forces because our hands or feet are in contact with the object. Similarly, contact forces act when a bullock pulls a cart, and an elephant breaks the branch of a tree with its trunk. When we sit on a chair or lie in bed, the weight of the body presses down on the chair or bed. This too is a contact force.

Fig. 3.4 The string applies a force called tension on the car.

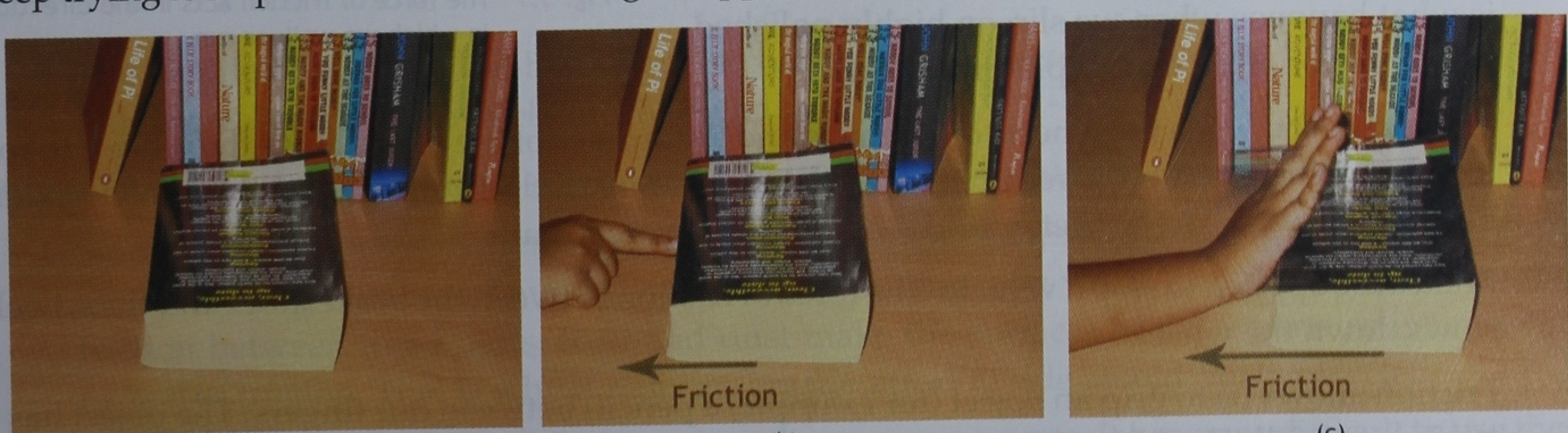
Sometimes we apply a contact force on something without touching it directly. For example, you can attach a string to a toy car and pull the string to make the car move. You apply a force on the string and the string applies a force on the car. This type of contact force applied by a string, wire or thin rod is called tension. Tension acts along the rope from which a bucket hangs in a well, or the wire from which a lamp hangs, or the rope that is pulled by two teams in a tug of war.

Friction

Flick a coin across a table. You will notice that the coin gradually slows down and stops. Since a force is necessary to change the state of motion of a body, some force must be acting on the coin while it is moving. Also, since the speed of the coin decreases, this force must be acting in a direction opposite to the motion of the coin. This force is called the force of friction, or simply, friction. It acts where the surfaces of the coin and table are in contact. It is the same force which stops a rolling ball or your bicycle once you stop pedalling.

Consider a book placed on a table (Figure 3.5a). There is no force of friction between the two as long as the book is lying at rest.

But if you push the book gently, it will have a tendency to move, and friction will act to prevent it from moving (Figure 3.5b). If you push harder, the book will begin to slide (Figure 3.5c). Friction will keep trying to stop the book from moving, or oppose its motion. If you want the book to keep moving,



(a) (b) (c)

Fig. 3.5 Friction acts only when something tends to move or is moving.

you will have to continue pushing. Friction acts only when something has a tendency to move or is actually moving. The direction of friction is opposite to that of the motion or the tendency of motion. The force that opposes the motion or tendency of motion between two surfaces in contact is called the force of friction.

Friction depends on the surfaces in contact The magnitude of the force of friction between two surfaces depends largely on the nature of the surfaces in contact.

ACTIVITY Place a book in an inclined position on the floor, as shown in Figure 3.6. Place a small ball or marble at the top and let it roll down. Note how far the ball rolls on the floor. Repeat the activity on a carpet, on the ground outside your house, and so on. Note how far the ball moves in each case. You will find that on a rough surface the ball stops after a short distance. On a smooth surface it moves much farther.

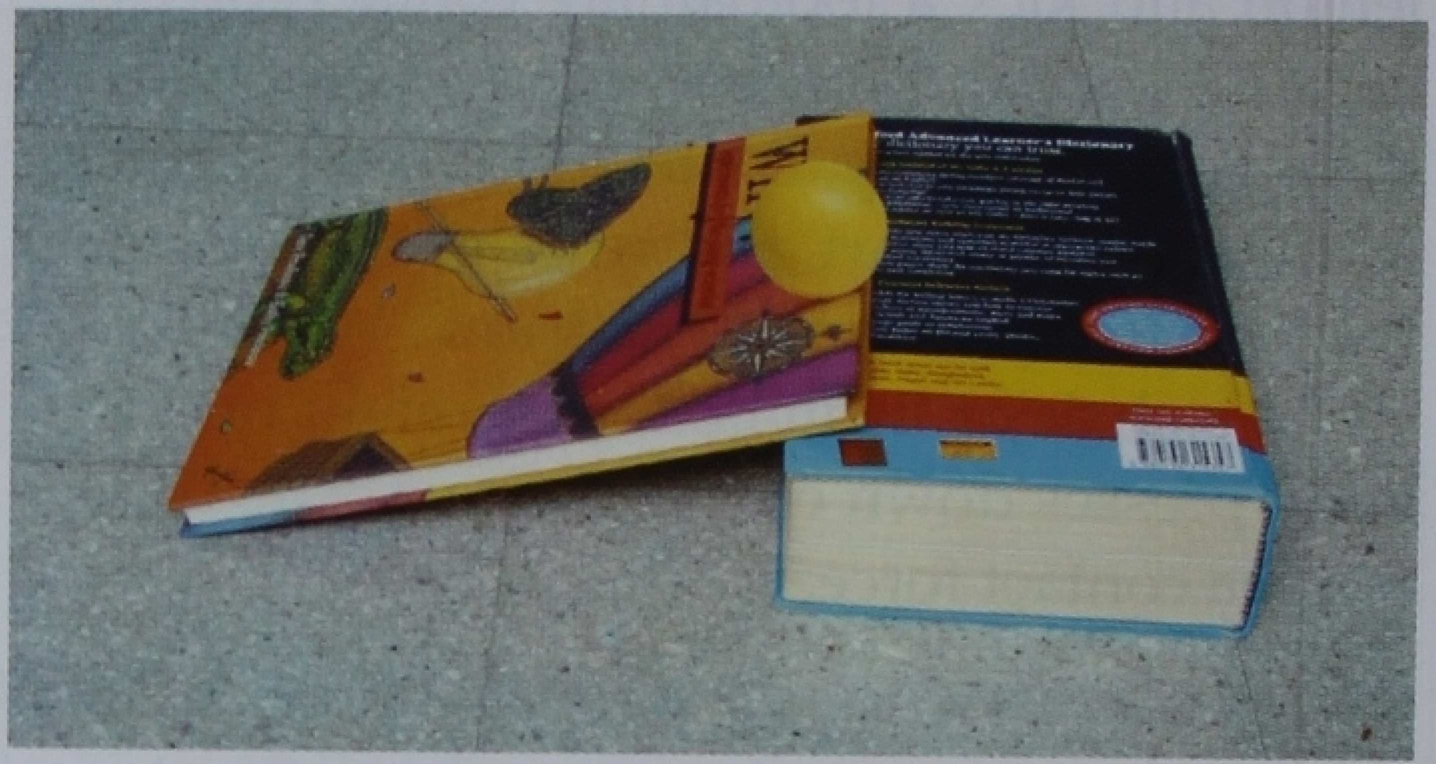


Fig. 3.6

The ball moves much farther over a smooth surface because the force of friction, which opposes its motion, is smaller for smooth surfaces than for rough surfaces. For the same reason, it is easier to move an object over a smooth surface than to move it over a rough surface.

Friction is useful Friction can be useful as well as harmful. Let us first see how friction plays a helpful role in our lives.

1. When you walk or run, you push the ground backwards with your foot. The tendency of the foot is to move in that direction. The force of friction opposes this tendency and acts in the opposite direction, i.e., in the direction in which you want to move. This helps you move forward.

   If the force of friction between your foot and the floor is small, your foot may continue to move backwards. In that case you may slip and fall. This is what happens when we slip on highly polished floors, ice, or oil or water spilt on the floor.

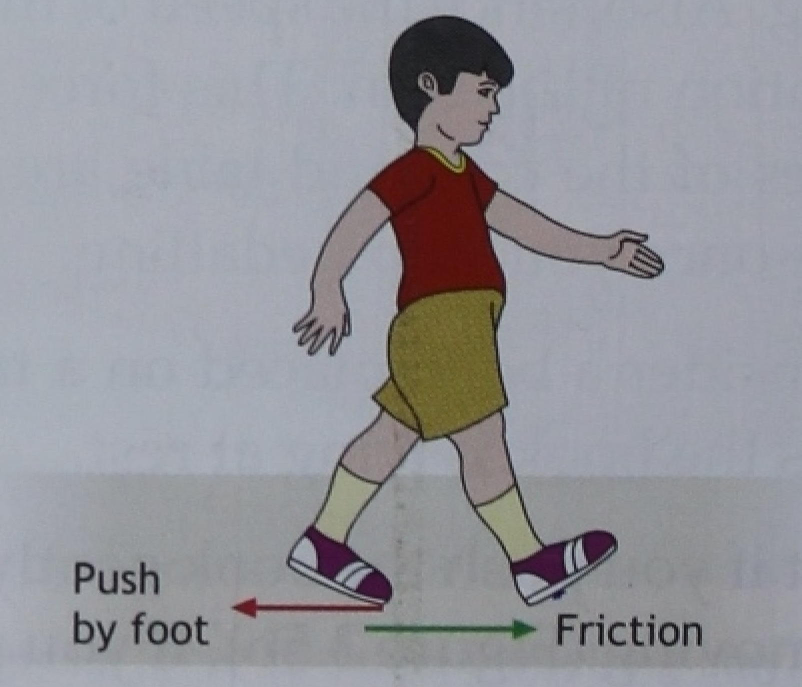


Fig. 3.7 The force of friction acts in the direction in which we walk or run.

2. The friction between the wheels of a vehicle and the surface of the road allows the wheels to roll forward. When friction is reduced, the wheels slide instead of rolling, and the vehicle skids. This is why cars skid on wet, muddy, oily or ice-covered roads.
3. Brakes are applied to stop a vehicle. The force of friction between the brakeshoes and the wheels slows down the wheels.
4. Friction allows us to grip an object (for example, a pencil) between our fingers. The object has a tendency to fall. The force of friction opposes this tendency. It is difficult to grip a smooth object, such as an ice cube, because of low friction.

5. Pencils write because of friction. The 'lead' of a pencil is made of graphite (a form of carbon). The friction between the lead of a pencil and paper causes small particles of graphite to break off and get deposited on the paper. Can you figure out why it is difficult to write on smooth surfaces, such as glass and polythene?

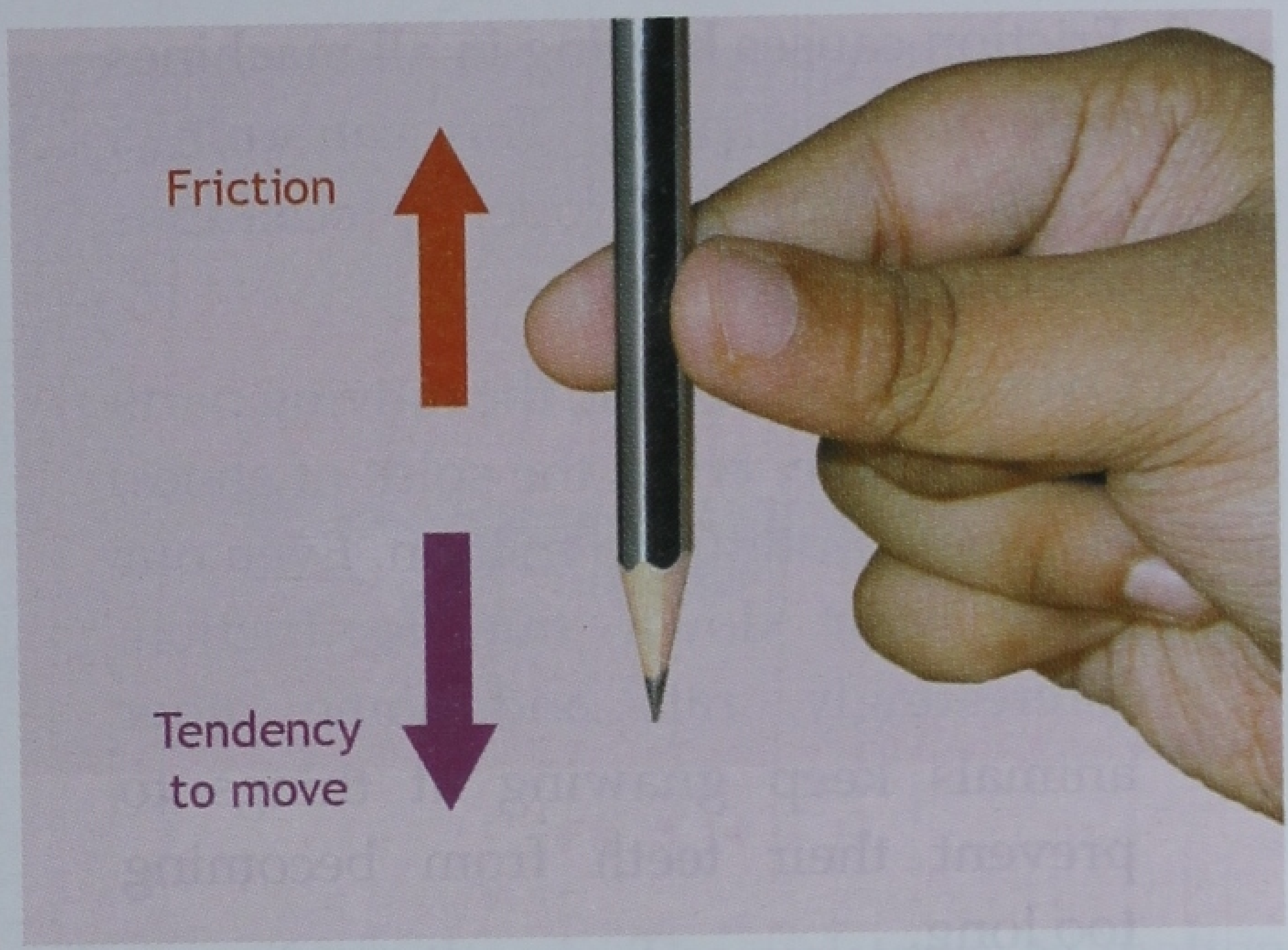


Fig. 3.8 Friction allows us to hold objects between our fingers.

6. Friction is used to polish surfaces. You might have seen a carpenter use sandpaper to polish wood. The large force of friction produced when this rough paper is rubbed on wood wears down the tiny bumps on the surface.
7. When two surfaces rub against each other, the friction between them produces heat. This has some uses. You rub your hands together when they feel cold. Primitive man lit fires by rubbing stone or wood. To ignite a match, we rub it against a rough surface. The heat produced by friction causes the chemicals on its head to catch fire.

Increasing friction Wherever friction is of help, we try to increase it to our advantage.

1. You may have noticed that the surface of a tyre has patterns on it. These are called treads. They are provided to increase friction between the road and the tyre. This reduces the tendency to slip, and improves the 'grip' of the tyre on the road. The soles of shoes have grooves for the same reason.
2. Pavements and playing areas, such as basketball courts, are made slightly rough to prevent slipping.

Fig. 3.9 Tyre treads and the sole of a shoe

3. The handle of a cricket bat has layers of coarse string, covered by a close-fitting rubber tube. This increases friction, which improves the grip.

Friction causes problems Friction is a problem in the following situations.

1. Since friction opposes motion, it is a disadvantage in machines with moving parts. For example, a bicycle has a number of moving parts. While cycling, you waste some effort in overcoming friction between these parts. Rust and dust make the surfaces of these parts rougher, which increases friction. That is why it requires greater effort to ride an old, rusty bicycle.
2. Shutters, door hinges and sliding windows have moving parts. It becomes difficult to use them when friction increases because of rusting or any other reason.

3. Friction causes heating in all machines with moving parts. This can ruin a machine unless proper precautions are taken.
4. Over a period of time, the moving parts of a machine, tyres, the soles of shoes, etc., wear out due to friction. Even our teeth wear down due to friction. Interestingly, rats and some other animals keep gnawing at things to prevent their teeth from becoming too long.

Fig. 3.10 The teeth of the gear on the right have worn out (become thinner) due to friction.

Reducing friction Wherever friction causes problems, we try to reduce it. For example, we try to reduce friction in machines to make them run smoothly and with less effort. Reducing friction also increases the life of machines.

Fig. 3.11 Common lubricants

1. The most common method of reducing friction in the moving parts of a machine is to apply machine oil, grease, etc. These materials are called lubricants. If your cycle is cleaned and oiled regularly, it will run smoothly and last long.
2. The sliding parts of machines are made as smooth as possible to reduce friction.
3. It is difficult to push a table from one end of a room to another. But if the table has wheels, the job becomes a lot easier because friction is less when something rolls over a surface than when it slides over the surface. This is why trolleys, computer and TV tables, and pieces of luggage are provided with wheels.
4. When a wheel rotates about a fixed shaft, there is a lot of friction between the two. Smooth metal balls called ball bearings are used to reduce friction in such rotating parts. These balls are

Fig. 3.12 The wheels on a 'strolley' reduce friction.

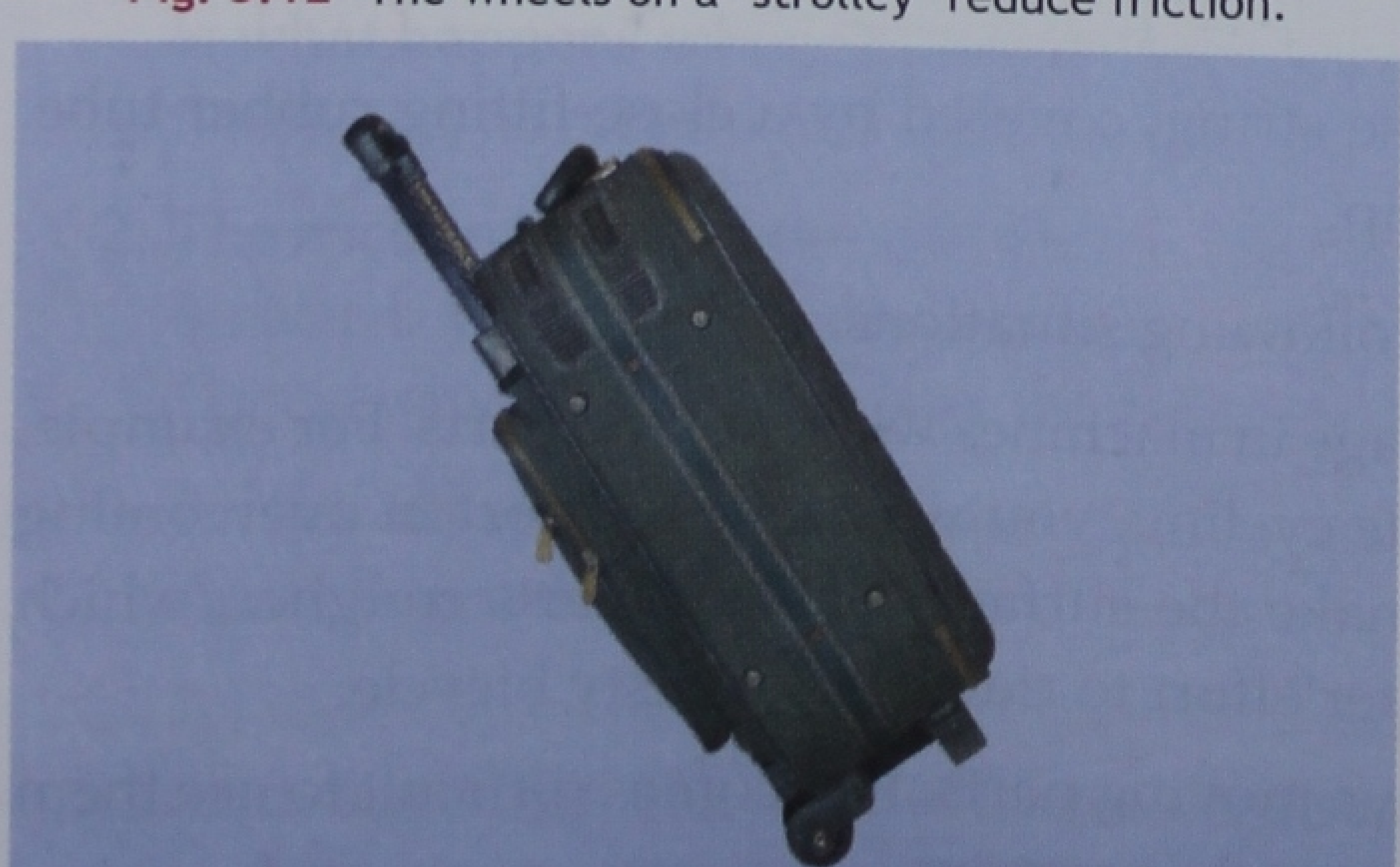


Fig. 3.13 Ball bearings

usually arranged between two metal rings. The rings rotate with very little friction because the balls between them roll. Ball bearings are used in cycles (Figure 3.13), fans, cars and machines.

Fig. 3.14

ACTIVITY Place the metal cap of a pickle or jam bottle on a flat surface and try to make it spin. Then place some marbles below the cap and make it spin again. This time it will spin more easily and for much longer. This is how ball bearings work.

5. When an object moves through air, it faces resistance from the air. The resistance to motion offered by air is very similar to friction, and is commonly referred to as air resistance. Liquids too offer such resistance. To reduce the resistance offered by air and water, aeroplanes, cars and boats are shaped in a particular way. This is called streamlining. Nature streamlines the bodies of birds and fish.

Fig. 3.15 Aeroplanes and boats have streamlined shapes to reduce the resistance offered by air and water.

Action-at-a-Distance Forces

Forces that can act between two bodies even when they are not in contact with each other are called action-at-a-distance forces. The force of gravity, for example, can act on a body even when it is not in contact with the earth. Magnetic and electrostatic forces are two other forces that can act between two bodies that are separated by a distance. We shall now learn about these forces.

Gravitational force

If you let go of a pen, it falls to the ground. If you throw a ball straight up, it slows down gradually before stopping for a moment (Figure 3.16). Then it moves downwards. There must be a force acting downwards on the pen and the ball. Sir Isaac Newton was

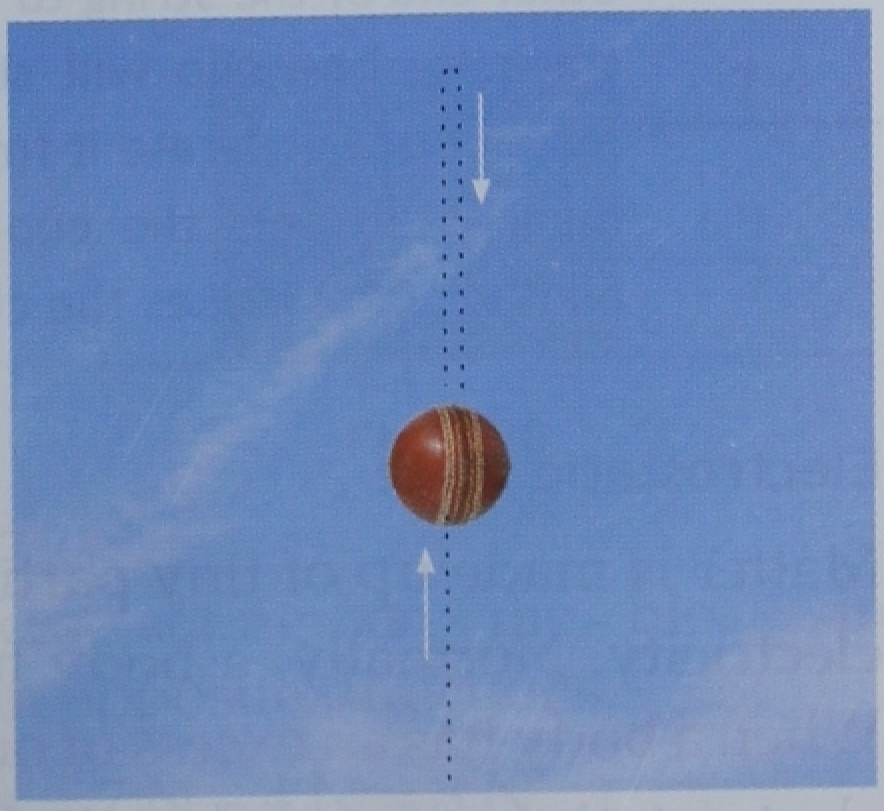


Fig. 3.16 A ball moving upwards slows down and then falls back to the earth because of gravity.

the first to identify this force as the attraction between an object and the earth. As a matter of fact, such a force acts between any two bodies because of their masses. This is called gravitational force, and it depends on the masses of the two bodies. It is large when the mass of at least one of the bodies is large.

We can now define gravitational force. The mutual force of attraction between two bodies because of their masses is called gravitational force. The earth's gravitational force, or gravity, pulls things on or near it and prevents them from flying away. For example, it pulls back a ball thrown into the air and keeps the air surrounding the earth from escaping. Gravitational force also holds the moon in an orbit around the earth, and the planets in their orbits around the sun.

Weight The force with which the earth attracts a body is called the body's weight. This force acts downwards. When you lift something, you have to exert an upward force to overcome the force of gravity acting on the body. The force of gravity acting on a mass of 1 kg is about 10 N. This is why we had said earlier (while defining the unit of force) that 'to lift 1 kg, you would have to apply a force of about 10 N'. Remember though that in ordinary conversation we often say that a body weighs 1 kg when we mean that its mass is 1 kg.

Fig. 3.17 The force of gravity acting on a mass of 1 kg is about 10 N. This force is the body's weight. We have to apply an upward force to overcome this force.

Magnetic force

You must have seen a magnet attract objects made of iron. The force exerted by a magnet is called magnetic force. This force acts even when a magnet is at a distance from the object it attracts. The following activity will make this clear.

ACTIVITY Tie a paper clip or pin to a short length of string. Tape the other end of the string to the floor. Bring a magnet close to the clip. The clip will stick to the magnet. Pull up the magnet and separate it from the clip. You will find that the magnet attracts the clip even when the two are not in contact. This makes the clip float in air.

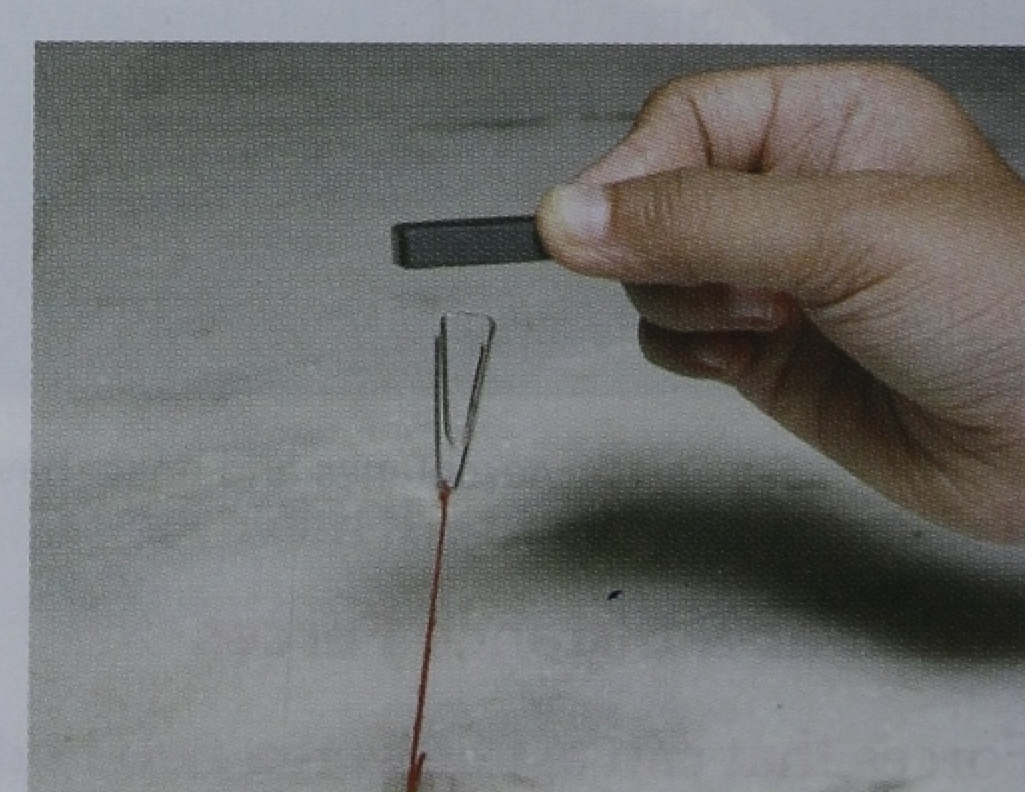


Fig. 3.18 The magnet attracts the clip even though they are not in contact.

Electrostatic force

Matter is made up of tiny particles that carry something called charge. Charge is what gives rise to electricity. Normally, a body has equal amounts of two types of charges—positive and negative. When a body has an excess of one kind of charge, it is said to be charged. It then applies a force, called electrostatic force, on other charged bodies near it. This force, like magnetic force, can act at a distance, as the following activity will show you.

ACTIVITY Run a comb through your hair a few times. (Your hair must be dry.) Bring the comb close to bits of paper, without touching them. The bits of paper will jump up and stick to the comb. When you run the comb through your hair, the balance of positive and negative charges in it gets disturbed. It gets an excess of one kind of charge, or becomes charged. Then it attracts the bits of paper, which stick to it. (This activity works best in winter, when the air is dry.)

Fig. 3.19 The charged comb attracts the bits of paper from a distance.

RESULTANT OF FORCES

So far we have considered what happens to a body when only one force acts on it. In most situations, however, more than one force acts on a body. What happens to a body in such a case depends on the resultant of all the forces acting on the body. The resultant of the forces acting on a body is the single force that would produce the same effect as is produced by the actual forces acting on it.

Let us put this in a different way. Suppose three boys together lift a heavy box. Let the forces applied by the boys be denoted by F_1, F_2 and F_3. Now suppose a man wants to lift the box alone. He will have to apply a force equal to the forces applied by the boys. Suppose he has to apply a force F. We then say that the resultant of the forces F_1, F_2 and F_3 is the force F.

When the forces acting on a body act along the same line, we find the magnitude of their resultant as follows.

- The resultant of the forces acting in the same direction is the sum of the forces.
- The resultant of the forces acting in opposite directions is the difference between the forces acting in each direction.

Consider the forces acting on the block in Figure 3.20. Both the forces are acting towards the left.

The resultant of the forces = 7 N + 4 N = 11 N.

The resultant force will also act to the left.

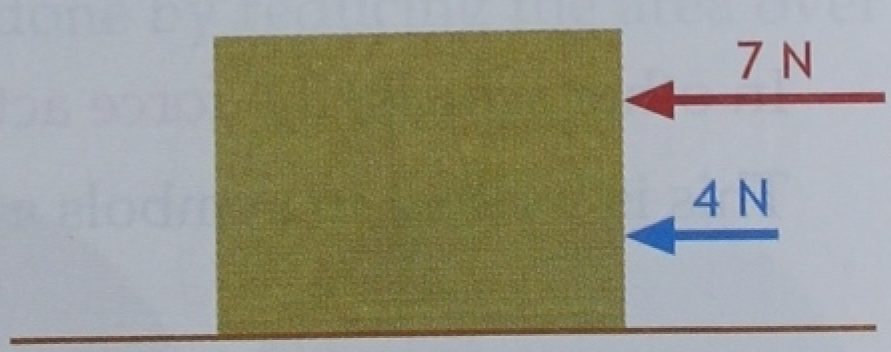


Fig. 3.20

Fig. 3.21

Now consider the forces acting on the block in Figure 3.21. They are acting in opposite directions.

The resultant of the forces = 7 N – 4 N = 3 N.

The resultant force will act to the right, that is, in the direction of the greater force.

Figure 3.22 shows four forces acting on a ball.

The sum of the forces acting to the left = 4 N + 3 N = 7 N.

The sum of the forces acting to the right = 3 N + 1 N = 4 N.

The resultant of the forces = 7 N – 4 N = 3 N.

The resultant force will act to the left.

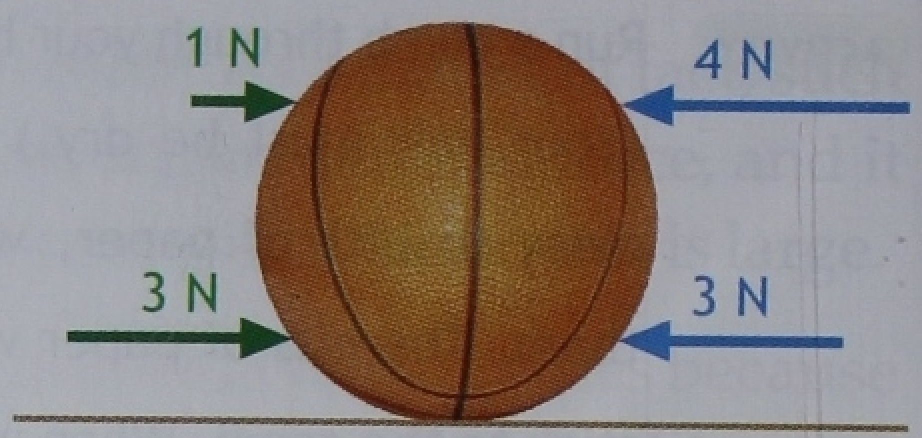


Fig. 3.22

EXAMPLE 1. A body is moving upwards. Forces of 15 N and 25 N act on it upwards, while forces of 10 N, 20 N and 30 N act on it downwards. Will its speed increase or decrease?

The sum of the forces acting upwards

= 15 N + 25 N = 40 N.

The sum of the forces acting downwards

= 10 N + 20 N + 30 N = 60 N.

The resultant of all the forces acting on the body

= 60 N – 40 N = 20 N, downwards.

Since the direction of the resultant force is opposite to the direction of motion, the speed will decrease.

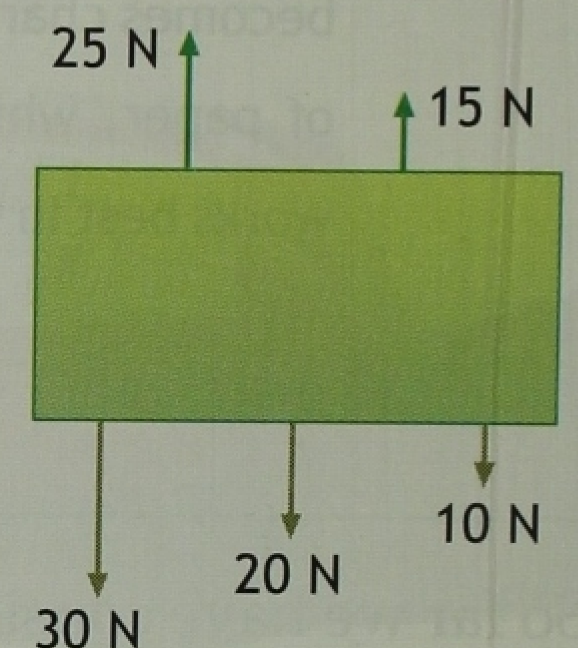


Fig. 3.23

PRESSURE

ACTIVITY Drop a pencil vertically on your palm with its sharpened lead pointing downwards. Repeat with the back of the pencil pointing down. The sharp point will hurt more than the blunt end. This is because in the first case the force acts over a very small area, which is equal to that of the tip of the lead. In the second case the force acts on a larger area.

So, there must be a relation between force and the area on which it acts. This relation is expressed by a physical quantity called pressure.

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

In other words, the force acting per unit area is called pressure.

This is written in symbols as

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

When the same force acts over two different areas, the pressure is greater on the smaller area. Also, when a force acts over a very small area, the pressure may be quite large, even when the force is not very large.

ACTIVITY Press hard against the surface of an inflated balloon with your thumb. Only a slight depression will form on its surface. If, however, you push lightly against the surface with a pin, the balloon will burst. The sharp point of the pin has a very small area. Even a small force acting over this area causes a large pressure, which breaks the wall of the balloon.

Unit of Pressure

You know that the unit of force is the newton, while that of area is metre^2. It follows from the definition of pressure that its unit is newton ÷ metre^2, i.e., N/m^2. This unit is given the name pascal, whose symbol is Pa.

EXAMPLE 2. The weight of a cube placed on a table is 20 N. The area of a face of the cube is 25 cm^2. How much pressure does the cube exert on the table?

The force exerted by the cube on the table is equal to its weight. So, $F = 20\ N$, $A = 25\ cm^2$.

$$1\ m^2 = 100\ cm \times 100\ cm = 10000\ cm^2.$$

$$\therefore\ 25\ cm^2 = \frac{25}{10000}\ m^2.$$

$$\text{Now,}\quad p = \frac{F}{A} = 20\ N \div \left(\frac{25}{10000}\ m^2\right) = \left(20 \times \frac{10000}{25}\right) N/m^2$$

$$= 8000\ N/m^2 = 8000\ Pa.$$

EXAMPLE 3. A rectangular carton filled with books weighs 300 N. The largest face of the carton has an area of 0.25 m^2, while its smallest face has an area of 0.1 m^2. Find the maximum and minimum pressures which it can exert when placed on the floor.

The pressure exerted by the carton will be maximum when the smallest face is on the floor, and minimum when the largest face is on the floor.

The force exerted on the floor = the weight of the carton = 300 N.

The area of the smallest face = 0.1 m^2.

$\therefore$ the maximum pressure exerted by the carton $= \frac{F}{A} = \frac{300\ N}{0.1\ m^2} = 3000\ N/m^2 = 3000\ Pa.$

The area of the largest face = 0.25 m^2.

$\therefore$ the minimum pressure exerted by the carton $= \frac{F}{A} = \frac{300\ N}{0.25\ m^2} = 1200\ N/m^2 = 1200\ Pa.$

Increasing Pressure

We need to apply a large pressure to cut or pierce an object. This is done by reducing the area over which the force acts. Here are some examples.

1. The tip of a nail, pin or needle has a very small area. When we push these against a surface, the pressure acting at the tip is very high. This allows the tip to pierce the surface.
2. A vegetable knife has a sharp edge. So when we apply a small force on its handle, it applies a large pressure on the object being cut. The edge of a butter knife, on the other hand, is not sharp. That is why we cannot chop vegetables with it.

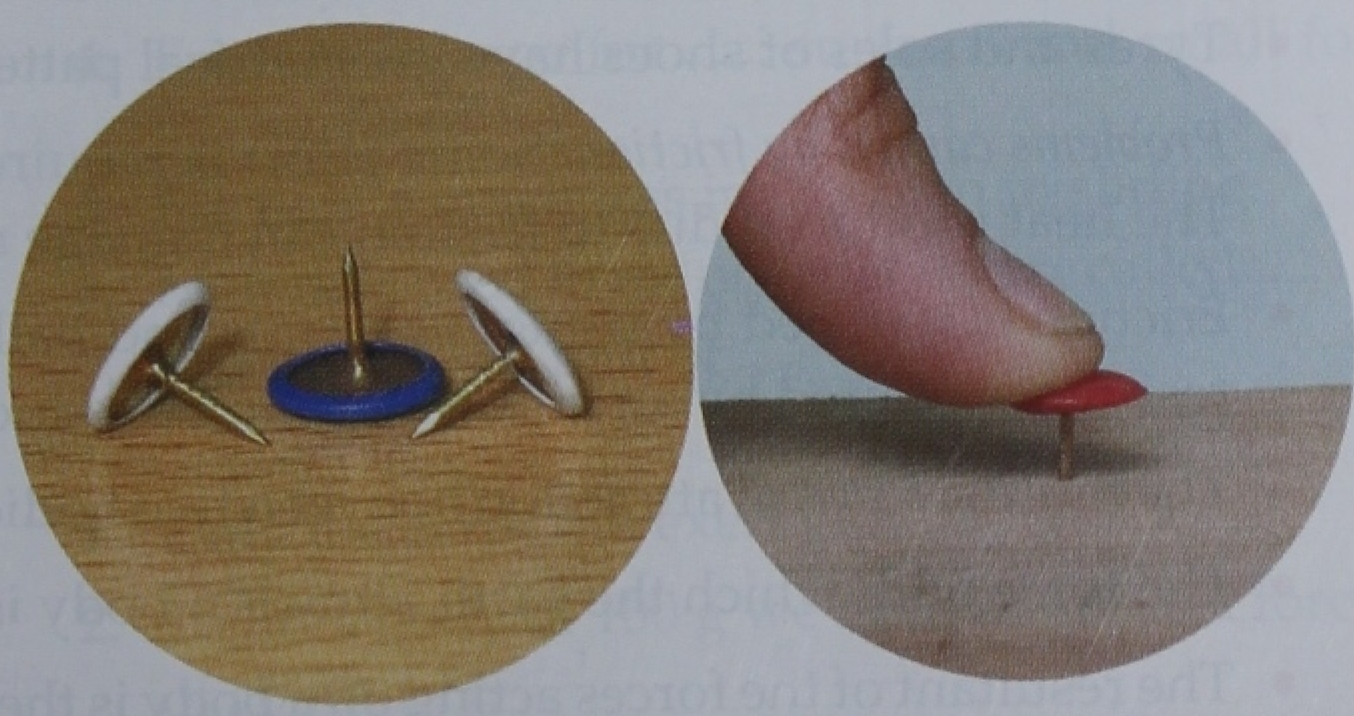


Fig. 3.24 The sharp point of a drawing pin enters wood by exerting a large pressure.

3. Weapons such as spears, swords and daggers have a sharp point, a sharp edge, or both so that they can pierce or cut.

Fig. 3.25

Reducing Pressure

To decrease the pressure due to a given force, we increase the area over which it acts. Here are some examples.

1. To move through snow, long metal skis or wide snowshoes are used to increase the area of contact. This decreases the pressure due to the weight of the person and prevents the feet from sinking into the snow.
2. Birds which walk on leaves floating on the surface of water have very wide feet. Camels too have wide feet. In both cases, the weight gets distributed over a wide area, preventing the legs from sinking into water or sand.
3. The straps of the shoulder bags in which we carry luggage are purposely made broad. This decreases the pressure on the shoulder by increasing the area of contact.

POINTS TO REMEMBER

- Force is something that can bring about a change in the state of rest or of motion of a body, or a change in its shape or size. The SI unit of force is the newton (N).
- Forces that two bodies in contact apply on each other are called contact forces. Friction, tension and pushes and pulls are examples of contact force.
- Forces that can act between two bodies even when they are not in contact with each other are called action-at-a-distance forces. Examples: gravitational, magnetic and electrostatic forces.
- The force that opposes or prevents the motion between two surfaces in contact is called the force of friction. Friction is large for rough surfaces and small for smooth surfaces. It produces heat.
- *Uses of friction:* Friction allows us to walk, run and grip objects. The rolling of wheels, the braking of vehicles, and polishing and writing are possible because of friction. The heat produced in friction is used to light matches.
- Tyres and soles of shoes have geometrical patterns to increase friction.
- *Problems caused by friction:* Some effort is required to overcome friction. Friction causes wear and tear. The heat produced due to friction can damage machine parts.
- Friction is reduced by using lubricants and ball bearings, and by making machine parts smooth. The resistance offered by air and water can be reduced by streamlining.
- The mutual force of attraction between two bodies because of their masses is called gravitational force.
- The force with which the earth attracts a body is called the body's weight.
- The resultant of the forces acting on a body is the single force which would produce the same effect as is produced by the actual forces acting on it.

- The magnitude of the resultant of the forces acting along the same line is found by adding the forces acting in the same direction and finding the difference of the forces acting in opposite directions.
- Pressure = force ÷ area, i.e., it is the force acting per unit area. Its unit is N/m^2, or pascal (Pa).
- The pressure exerted by a force can be increased by reducing the area over which it acts, as in knives, pins, etc. Pressure can be reduced by increasing the area over which a force acts, as in skis, snowshoes, etc.

EXERCISE

Short-Answer Questions

1. What is force? Write the SI unit of force.
2. Name two types of forces and give two examples of each.
3. What is friction? On what does friction depend?
4. Why is it difficult to write on glass with a pencil?
5. Mention three methods of reducing friction in a machine.
6. How will you show that a magnet applies a force on a pin even when it is not in contact with the pin?
7. When does a body exert electrostatic force?
8. Define pressure. Write the SI unit of pressure.
9. Forces of 1 N act on the smallest and the largest sides of a rectangular box. Which side experiences greater pressure?
10. Why is a nail able to pierce the surface of wood?

Long-Answer Questions

1. Explain the effects produced by force. Give one example of each effect.
2. Give two examples in which friction is of advantage to us. Explain the advantage clearly.
3. (a) What are the disadvantages of friction?
   (b) Why does a knife become blunt with use?
4. Mention two cases in which it is useful to decrease the pressure exerted by a force and two cases in which it is useful to increase the pressure exerted by a force.

Objective Questions

Choose the correct option.

1. Which of the following increases friction?
   (a) Lubricant (b) Treads on a tyre
   (c) Streamlining (d) Polishing
2. One pascal is equal to
   (a) $1\ N/m^2$ (b) $1\ Nm^2$
   (c) $1\ N/m$ (d) $1\ Nm$
3. In which of the following cases is friction a disadvantage to us?
   (a) Running
   (b) Braking
   (c) Writing with a pencil
   (d) Parts of a machine rubbing against each other
4. A charged comb picks up bits of paper because of
   (a) magnetic force
   (b) gravitational force
   (c) contact force
   (d) electrostatic force
5. Which of the following is a contact force?
   (a) Gravitational force (d) Friction
   (c) Electrostatic force (d) Magnetic force

Fill in the blanks.

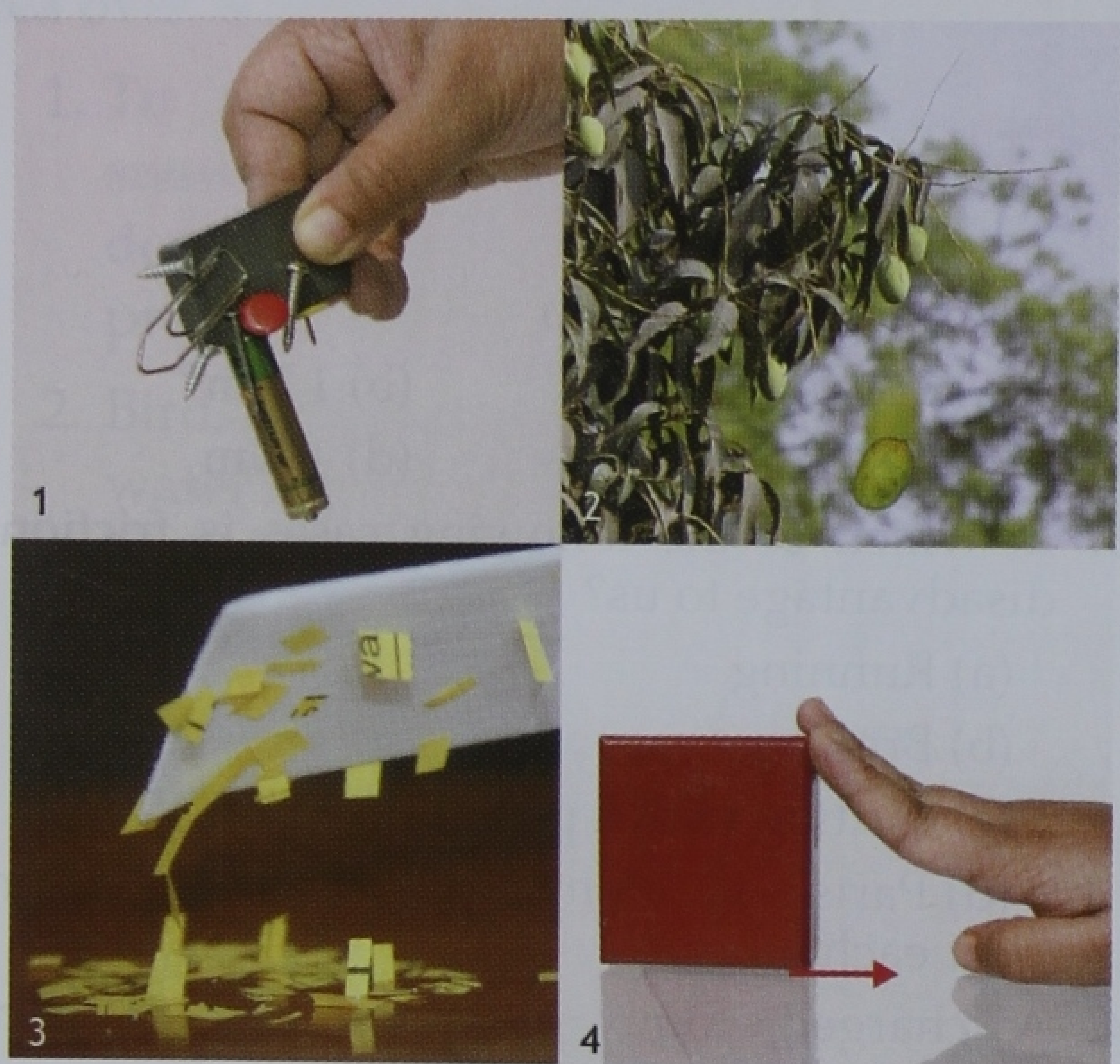
1. The tension in a string is an example of ...... force.
2. The force with which the earth attracts a body is called the body's ....
3. When you walk or run, you push your foot ....
4. Friction is large for ...... surfaces and small for ...... surfaces.
5. Friction is much less in ...... than in sliding.
6. Materials used to reduce friction are called ....
7. The pascal is a unit of ....

Write true or false.

1. Only the earth can exert gravitational force.
2. To lift a body of 100 g we need to apply a force of about 1 N.
3. No contact force acts on a bucket when it is being pulled out of a well using a rope.

4. The force of friction always opposes motion or the tendency of motion.
5. The force applied on a body depends on the area over which it acts.
6. A boat is streamlined to reduce the resistance to motion offered by water.

Name the forces.



Numericals

1. A force of 10 N acts on a body in the upward direction, and a force of 12 N acts on it in the downward direction. Find the resultant of the forces acting on the body.
2. Two forces of 9 N and 7 N act on a body to the right, while another force of 16 N acts on it to the left. Find the resultant of the forces.
3. A body is moving downwards. Forces of 10 N and 20 N act on it upwards, while forces of 15 N and 25 N act on it downwards. Will its speed increase or decrease?
4. The weight of a man is 750 N. The total area of the soles of his shoes is 250 cm^2. Find the pressure he applies on the floor.
5. When an eraser presses on a paper with a force of 1 N, the paper experiences a pressure of 10,000 Pa. Find the area of contact between the eraser and the paper.

Answers

1. 2 N, downwards **2.** 0 **3.** increase
4. 30,000 Pa **5.** 1 cm^2

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