Chapter 1

Force

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We can observe many changes around us. For example changes in seasons, change during sun rise and sun set, changes in tides of sea etc. Have you ever thought about the cause behind these changes? In ancient days, people thought that an invisible force was responsible for the changes occurring in nature. Even now many people believe that an invisible force exists that causes whatever is happening in the world.

Later, the concept of force was developed, but it was limited to explaining our efforts and actions. The words force, effort, strength and power had almost the same meaning at that time. Have you ever wondered what forces are? What are the different types of forces and how do they act? Let's find out the answers to such questions in this chapter.

For instance, when you ride a bicycle, most of the time your legs are pushing down on the pedals. To push you have to make an effort. When you pick up your school bag you have to make an effort in order to lift or pull the bag upwards and off the ground. When you open a door you make an effort on the door knob with your hands either to push the door forward or pull it backward.

1.1 What is force?

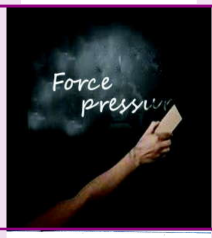
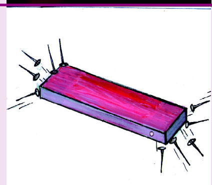
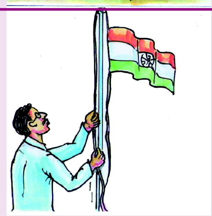
Have you ever picked a heavy stone? How does a paper boy throw a newspaper? Have you ever wondered about this action? Actions like stretching a rubber band, pulling a rickshaw, rowing a boat etc., are some more examples where our efforts help to change the positoin or shape of the object. Such actions like picking, squeezing, twisting, stretching, lowering and lifting etc., cause a change in the state of an object. Now let us try to group these tasks as a pull or a push.

Activity-1

Identifying push or pull

Table-1 gives some examples involving the actions like digging, sucking, erasing, falling, attracting, raising etc. Classify these actions in terms of a push or a pull or both. Write pull or push in the blank boxes. If you feel that the action involves both push and pull, write "both" in the box.

Table 1: Identify tasks as Push or Pull or Both

S.No.	Action	Diagram	Push/Pull/Both
1	Digging bore well		
2	Sipping Juice with a straw		
3	Erasing letters on blackboard with duster		
4	A magnet attracting nails		
5	Fruits falling from tree		
6	Hoisting a flag		

- List three more activities where we exert force which appears as a push.
- List three more activities where we exert a force as a pull.
- State three actions which involve both push and pull.

Based on this activity, can you explain what is a force?

Shall we call the effort done on an object by means of pushing or pulling as a force exerted on the object?

We cannot directly see the forces acting on a body, but we can see the effects caused due to the forces.

When an object slips off your hand, why does it always fall down? If you roll a ball on a level ground, it slows down and after sometime it will come to a stop. What makes the ball stop? What forces acting on objects, change their state or position of motion?

1.2 Types of forces

Contact forces and forces at a distance (Field Forces)

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Observe the following figures.

Fig-1 (a)
Pressing tube to come out of the toothpaste.

Fig-1(b)
Change in direction of the needle of the compass due to bar magnet.

Why does the toothpaste come out when we press the tube? Why does the needle of a magnetic compass move when we place a bar magnet near it? Have you observed the difference between the force you applied on the tube and the force applied by a magnet on the needle of a compass?

In Fig.1 (a) you observe that there is direct physical contact (or interaction) between your hand and the tube. Force, which results when there is a direct physical contact between two interacting objects, is known as **contact force**.

In Fig.1 (b) the needle of the compass changes its direction without any physical contact with the bar magnet. But a force must be acting on the needle. The force which occurs without any physical contact between two objects is known as a **force at a distance** or **field force.**

1.3 Forces acting at a distance (field forces)

1.3.1 Magnetic force

You must have done some experiments with magnets in class VI. Let us recall some of your experiences.

Activity-2

Observing the magnetic force.

Take a sewing needle. Rub it with a bar magnet several times always moving the magnet in the same direction. Does the needle get magnetised ? You may find that the needle acts like a magnet. With the help of a magnetic compass you can identify the north and south poles of the needle. Pin a red coloured cork ball to South Pole and white ball to North Pole of the needle; then drop it in a bowl of water, it floats. (Fig-2)

Make another needle in the same way. Float both the needles such that same colour balls face each other (either red or white balls).

- What happens to the needles? How do they move?

Similarly, float both the needles in such a way that different colour balls face each other.

- What happens this time?

How do the needles attract each other? How do they repel?

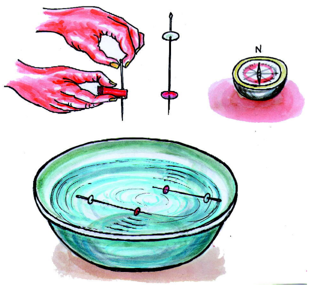


Fig-2: Making needle magnets and floating them in a bowl of water.

You have learnt in class VI that like poles of two magnets repel each other and unlike poles attract each other. You can observe the red end of one needle and white end of another needle attract each other, and ends with same colour repel.

Now, you know that like poles repel or push each other away and unlike poles attract or pull each other. This action of pull or push arises due to a **magnetic force**. A magnet can attract or repel another magnet without contact. So magnetic force is a field force.

1.3.2 Electrostatic force

Activity-3

Observing electrostatic forces

Take a balloon. Inflate it and tie up the open end. Now cut a paper into small pieces and place them on the floor. Rub the balloon with a paper and bring the balloon near the pieces of papers. What happens now? Are the bits of paper pulled towards the balloon? (Fig-3) Why does the balloon pull or attract the pieces of paper? Try to use pepper and salt in the place of pieces of paper. What do you observe?

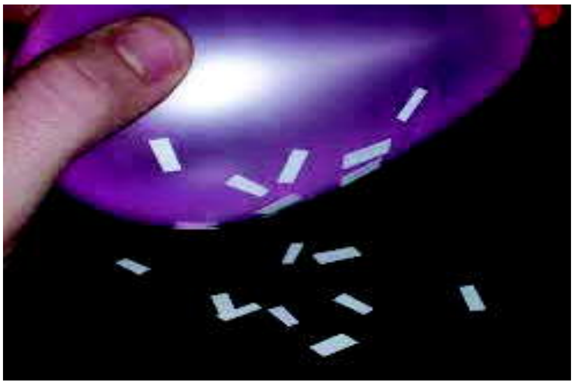


Fig-3: Charged balloon attracting bits of paper

We can say that when the balloon is rubbed with a paper, it acquires an electrostatic charge on its surface. The balloon is now said to be a charged body. When it is brought near the bits of paper, the pieces acquire opposite charge and will rise and cling to the balloon.

The force exerted by a charged body on another charged body is known as **electrostatic force**.

This force comes into play even when the bodies are not in contact. It is an example of a force at a distance.

1.3.3 Gravitational force

It is our common experience that if a pen slips off from our hands it falls down to the floor.

- Why does the pen fall down?
- What is the force which pulls the pen down?

If we keep the same pen on a table, it does not fall down. Why?

Generally our answer would be that the table supports the pen. If the table does not supports the pen it would fall down until it is supported by another object, like the floor.

- Why does a stone thrown up into the sky fall back to the earth?
- Why do rivers flow down to the sea?
- How does the earth hold the atmosphere?
- Is there any force pulling the objects towards earth?

If an object is thrown upwards, there exists a force which pulls it down towards the earth, because of this it falls down to the ground. We call this force as a **gravitational force.**

Every object on the Earth or close to Earth, will experience a gravitational pull. The force of gravity is not just due to the attraction of the Earth. It is a force of attraction that exists between any two bodies (or masses) everywhere in the universe.

As the earth is so massive and huge, all the other objects close to the earth are attracted or pulled towards it. When you sit in your class room, there will be a gravitational force between you and your teacher, and a similar force exists between you and the black board.

You cannot experience the gravitational force that exists between you and your teacher or between you and the black board because it is very small when compared to the gravitational force exerted by the earth on these objects. You will learn more about this in the lesson "Gravitation" in higher classes.

Gravitational force works even the objects are not in contact. So, this is an example of field force.

Think and discuss

A cricket ball of mass 'm' is thrown upward with some initial speed. If the air resistance is neglected, what forces are acting on the ball when it reaches

(a) half its maximum height and

(b) its maximum height?

1.3.4 Explaining of force acting at a distance: concept of field

The force which acts between two bodies, when the bodies are not directly touching each other is called force at a distance. We can explain the forces at a distance by using the concept of field.

Activity-4

Visualizing magnetic field.

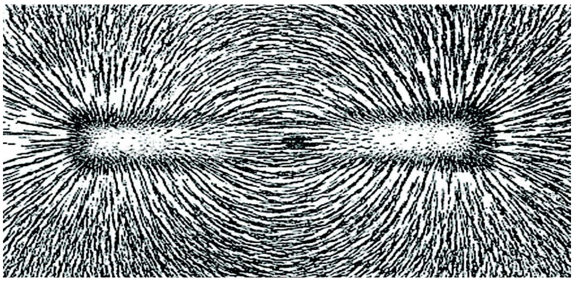


Fig-4 : Magnetic field

- Take a bar magnet and place it on a table. Place a thick white paper over it (White drawing sheet).
- On the paper, sprinkle fine powder of iron (iron filings) as shown in the fig -4.
- Tap the table or the paper gently with pen/pencil.

- What do you observe? Do you find any pattern of iron filings there?
- Rotate the magnet in different directions and do the same. How has the pattern changed?

You can see that in a small space around the magnet, iron filings set themselves in a pattern because they are affected by the magnetic force of the field created by the bar magnet. The pattern represents the magnetic field. The space around the magnet where its influence can be detected is called the magnetic field. This field is three dimensional.

Thus, a field is a region in which a force can be experienced by another magnetic object placed at any point in that region.

A body creates a field and another body experiences the force by the field when it is placed in that field.

A magnetic field surrounds a magnet, an electric field surrounds electric charges and a gravitational field surrounds masses.

The strength of a field in a particular region can be represented by field lines; the greater the density of lines, the stronger the forces in that part of the field.

Think and discuss

Two identical bars, one which is steel and the other a magnet, are painted with the same colour. How can you tell which one is the magnet using only these two bars? (don't break the bars)

1.4 Contact Forces

1.4.1 Muscular Force

Fig-5

In all the actions that we perform in our daily life like brushing, bathing, eating, writing, driving and walking; we have to exert a force. Do you know from where the force comes? The force which we exert by using our body muscles is known as **muscular force**. Even when we smile our muscles exert force to bring changes in our face. Human beings and animals use muscular force to carry out their regular physical activities. Muscular forces can be exerted only through contact.

Activity-5

Preparing a list of examples for muscular force

List at least ten activities where we apply muscular force to perform various tasks, in table - 2.

Table-2

Sl.No	List of activities where we exert force
1	Lowering a basket
2	
3	
4	
5	
6	

Usually we are unaware of the muscular forces that are responsible for the various actions taking place inside our body, like blood circulation, expansion and contraction of lungs during breathing, heart beat etc.

- Do you feel your muscles get tightened while performing any physical activity? What could be the reason for it?

Activity-6

Observing the changes in any muscle while working

Take a dumbbell and lift it in different ways. Observe while doing this exercise which muscle is going to be shortened.

Ask your friends to do the same and observe the movement of their muscles.

The term muscle refers to multiple bundles of muscle cells held together. Muscles are normally arranged in such a way that as one group of muscles contract or shortens, another group relaxes or expands. For example, when you are throwing a ball, the muscles in the front of the chest and shoulder expand and pull our hand forward, while the muscles in the back of the shoulder contract and control the movement of our hand.

1.4.2 Force of Friction

When you roll a ball on a level ground it invariably stops after sometime.

- Why does the ball stop?
- Is there any hidden force which brings it to stop?

If you stop peddling your bicycle on a level road you observe that its speed decreases gradually.

- Why does the speed of the bicycle decrease gradually?
- Is there any force acting on it which tends to reduce its speed?

Does the change in speed of the ball and bicycle depend on roughness and smoothness of the surface on which they move? Let us find out.

Activity-7

Observing the motion of a ball on different surfaces

Try to roll a ball on different surfaces like carpet, rough roads, smooth floor etc. See that surfaces are plane, exerted force is same.

- On which surface does the ball roll farther?

The motion of the ball is different in each case. The force of resistance to the motion seems to be more on the rough surface than on the smooth surface. The rolling ball moves farther on a smooth marble floor than on a rough sandy surface.

Activity-8

Observing the motion of objects on an inclined plane

Take a tray. Place a small ice cube, eraser and a rupee coin on a line at one end of the tray. Now slowly lift this end of the tray as shown in the figure-6.

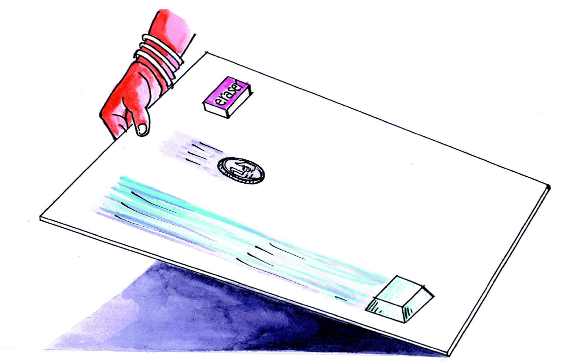


Fig-6: Motion of objects on an inclined plane.

- What do you observe?
- Which one of these three objects slides down first? Why?
- Do all the objects experience the same resistance to motion? If not why?
- Which one of the objects experiences more resistance to motion? Why?
- Why there is a change in resistance experienced by the objects though they all slide down on the same plane?

Do this activity with different objects like a book, a ball, a pen, a stone etc., and record your observations.

Friction is the resistance to the movement of a body over the surface of another body.

Fig-7

Did you ever experience slipping on a floor? What conditions caused you to slip? Did you experience slipping while you are walking on wet mud? Why do most road accidents happen during rainy days?

- Would it be possible to drive a car if there was no friction between the tyres and the road?

The direction of friction is always opposite to the direction of motion relative to the surface. Let’s imagine a world without friction. Without friction, would it be possible to write with a pen on a paper or with a piece of chalk on the black board? Can we atleast walk on a road without friction? You will learn more about friction in the next chapter.

Think and discuss

A book placed on a table is at rest. Is the force of friction acting on it or not? Explain.

1.4.3 Normal force

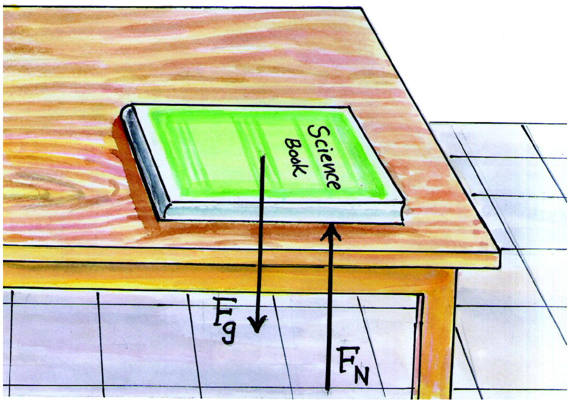


Fig-8: Force of gravitation and normal force acting on the book.

Place your science book on the table. Is it in a state of rest? Is there any force acting on that book? Imagine that the table has disappeared suddenly by magic. What will happen then? The book will fall down due to the gravitational pull of the Earth. Even when a book is lying on the table, the gravity pulls the book down all the time but it does not fall down because it is supported by the table. Therefore, there exists a force which supports the book against gravity by pushing it upward.

- What do we call this force?

Look at the fig.8 A direction which is perpendicular to the plane of a surface is said to be **normal**. The force that a solid surface exerts on any object in the normal direction is called the **normal force.**

In the above example the downward gravitational force is balanced by the upward normal force. Since these two forces are of equal magnitude and acting in opposite directions, we say that the net force acting on the book is zero and the book is in equilibrium.

1.4.4 Tension

As shown in the figure-9 a wooden block is suspended with the help of a string and its free end is tied to the ceiling

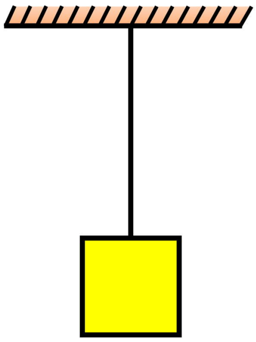


Fig-9

- What is the state of the wooden block?
- What forces are acting on it?
- What will happen if the string is broken?

We know that the wooden block would fall down due to gravitational pull (weight) of the earth if the string is broken.

For a wooden block tied to the string, gravity pulls down the wooden blockall the time but it does not fall down because it is supported by the string. Thus, there exists a force which supports the wooden block against gravity by pulling it upward.

- What do we call this force?

When you try to stretch a rope or a string the tightness of rope or string is called **tension**. Tension is a contact force.

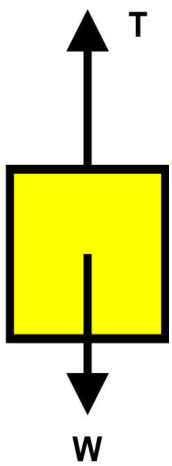


Fig-10

In the above example, as shown in fig-10, the upward tension force in the string is equal to download gravitational force but in opposite direction. Hence, the two force balance each other.

Lab Activity

Aim: To find the limiting force that can be borne by a string.

Material used: Spring balance, weights, light strings are of 10 cm length and of equal thickness, weight hanger.

Procedure:

1. Arrange the system as shown in figure-11. Put some small weights like 50 gm on the weight hanger and note the readings of the spring balance. Now, add some more weights to the hanger and note the readings of spring balance. Do the same till the string is broken. Note the reading of the balance in the following table when the string is broken.

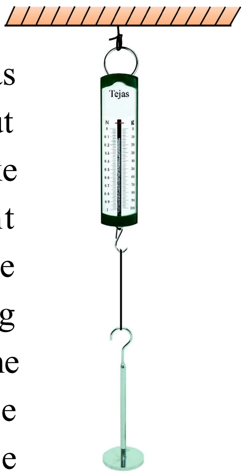


Fig-11

Find out the limiting force of different types of strings and mention the values in the given table.

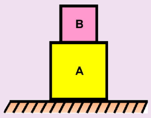
Sl.No.	Type of String	Limiting Force

2. Separate the whole system from the ceiling, and tie the string to weight hanger and now slowly pull up the whole system with your hand when there is a small weight on the hanger. While pulling up, note the readings of spring balance. Similarly, while slowly moving down, note the readings of spring balance.

- What do you observe from the readings when it is pulled up and released to move down?
- Is the string broken when the whole system is pulled quickly up?

Think and discuss

- A system of two bodies A and B are placed as shown in figure. How many forces are acting on A and B respectively?



- Why is it necessary to separate contact force into a normal force and frictional force? Give at least two reasons.

1.5 Net force

In reality, many forces can act simultaneously on a body. For example, there exists two forces on an object at rest placed on a horizontal floor. One is gravitational force (vertically down) and other is normal force (vertically up).

Do you observe any change in the state of rest of that object because of these forces? Obviously your answer is 'No'.

In this case two forces acting on the object are equal and opposite in direction. Hence, the object remains in the state of rest.

Technically, we say that the net force on this object is zero.

Imagine that the same object is kept in a lift which is accelerating.

- How many forces are acting on this object?
- Is the net force acting on the object zero? Why?

Note: When an object is in non uniform motion, it is said to be in acceleration.

The net force acting on an object kept in a lift which is accelerating is not zero, as the object is in non-uniform motion.

When two forces act on a body, as in the above case, one of the forces should be greater than the other to set the body in motion.

The strength of a force is usually represented by its magnitude. The direction of a force is as important as its magnitude. We represent the direction of force, magnitude using 'arrows' (→).

Activity-9

Effects of net force acting on a table

- Try to push a heavy wooden table. (Fig-12a). Is it hard to push ?

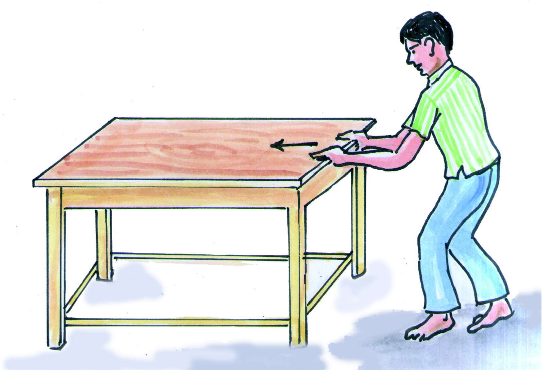


Fig - 12(a)

- Ask your friend to help you in pushing the table in the same direction, as shown in the fig.12 (b). Do you find it easier to move the table now? Why?

Fig - 12 (b)

You may notice that it is easier to push the table when you take the help of your friend. The force applied by your friend added to the force exerted by you, results in both forces being applied on the table in the same direction. The total force applied by both of you made it easy to move the table.

Now ask your friend to push the table from the opposite side as shown in fig.12(c). Does it move? If it moves, then in which direction does it move?

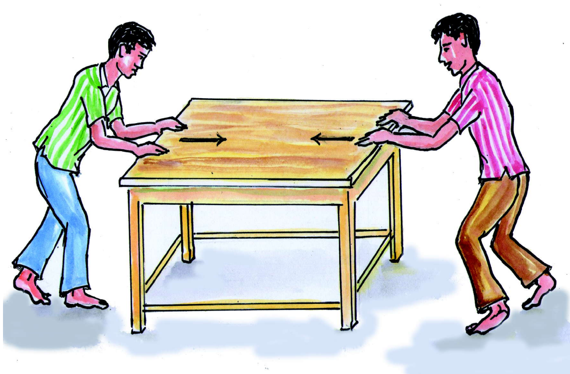


Fig-12(c)

When you and your friend push the table from opposite sides, the table doesn't move if both of you apply force with equal magnitude. Let us assume that one of you exerts a larger force, what will happen? Why?

All forces have both magnitude and direction. While adding forces, the directions of forces have to be taken into account. When forces act on a body along a straight line and they are in the same direction the net force is taken as the sum of all forces acting on the body. To add forces, sign convention must be used.

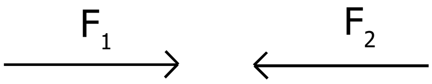


Fig - 13

As shown in the above figure the force F_1 directed towards right could be taken as positive and the force F_2 acting towards left could be taken as negative. Let the forces F_1 and F_2 act on the table in opposite directions as shown in the figure and $F_1 > F_2$,

Then $F_{net} = F_1 + (-F_2) = F_1 - F_2$

When the forces on a body in a straight line are in opposite directions, the net force is equal to difference between the two forces. The object at rest moves in the direction of the net force acting on it.

Activity-10

Effects of stretched rubber bands on fingers

Take a rubber band, stretch it using your fingers. When you stretch the rubber band it exerts force on your fingers and you feel the force of pull on your fingers. What happens if you add one more similar rubber band around your fingers and stretch both together to the same length? Do you feel the combination of two bands exerts a larger force than that of one? Increase the number of rubber bands around your fingers and observe the force exerted on your fingers by the rubber bands.

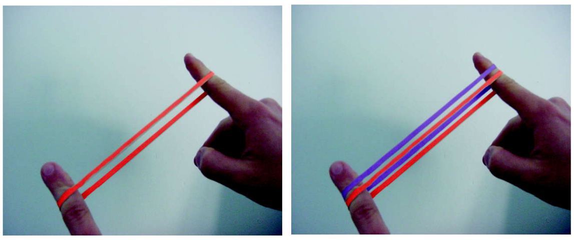


Fig-14 Stretching rubber bands

Let us say the force exerted by one rubber band is F units and the force exerted by the second rubber band is also F units. Then what will be the net force of two rubber bands? We can express it as:

$F_{net} = F + F = 2F$ units

The unit of force in SI system is newton(N).

What is the net force acting on your finger when three, four etc. rubber bands are used?

1.6 How to calculate net force from free body diagrams

The diagram showing all the forces acting on an object at a particular instant is called Free Body Diagram. It is denoted as FBD.

Example:

Let a car be moving with a non uniform speed along a road. What are the forces acting on the car? What is the net force acting along the vertical direction? What is the net force acting on the car along horizontal direction?

Draw all the relevant forces acting on the car. We call it a free body diagram (FBD).

Choose a coordinate system with X-axis and Y-axis as shown in figure-15. Add forces algebraically with sign conventions along X and Y axes separately. Then those values give net forces along X and Y directions respectively.

Solution:

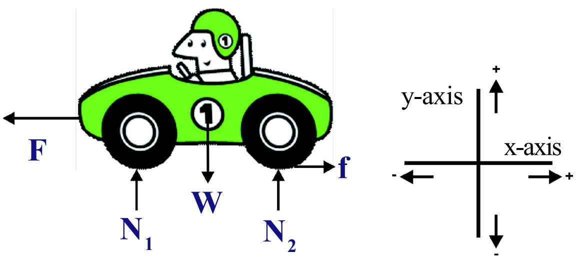


Fig-15: Free Body Diagram(FBD)

The forces acting on the car are shown in the fig-15. They are:

Force applied by the engine = F

Friction applied by road = f

Normal forces = N_1 and N_2

Gravitational force (F_g) = W

Net force along X-axis:

$$F_{net,\,x} = f - F$$

Net force along y-axis:

$$F_{net,\,y} = N_1 + N_2 - W$$

Think and discuss

- Play arm wrestling with your friend. Explain the winning of the game by using the concept of net force. Name forces acting on arm and their direction while playing the game. Try to draw FBD for this situation.

1.7 What Forces can do?

Activity-11

Effect of force on state of motion of an object and it's direction.

Place a football on the ground. The ball will remain in a state of rest unless someone kicks the ball. Now kick the ball (Fig-16a). What happens? Does the ball start moving? Kick the moving ball again in the same direction (Fig-16b). What will be the result? Place your hand or leg against the ball. Does the ball stop? Or does it change its direction? Note your observations.

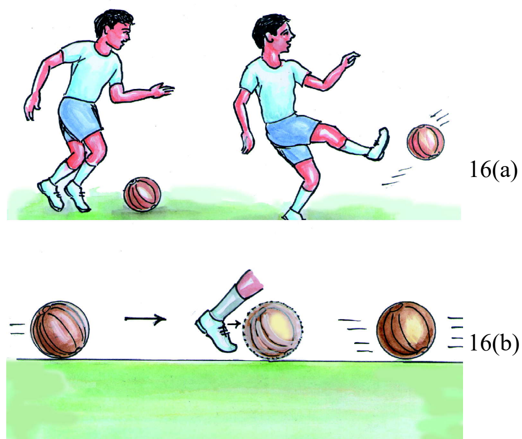


Fig-16: (a) Force applied on a ball at rest.
Fig-16: (b) Force applied on a moving ball in the direction of motion.

We can move the ball from its position of rest by applying a force on it. We can stop the moving ball and bring it back to rest by catching it. Give few more examples where the state of motion of an object changes due to the application of force.

You might have seen children playing with a rubber tyre by pushing it with a stick. They push the tyre again and again with the stick to increase its speed. Do you understand why the speed of the tyre increases whenever it is pushed by the stick?

With every push they are applying a little more force on the moving tyre in the direction of motion. Hence the speed of the tyre increases continuously.

If the net force acts in the direction of motion, the speed of an object moving with constant speed also increases. If the net force acts in a direction opposite to the motion, then it either slows down the object or brings it to a rest or it may change the direction of motion.

Give some more examples where the object speeds up or slows down or a change may occur in its direction of motion when we exert a force on it.

Activity-12

Effect of net force on direction of moving object

Hit a carrom coin with the striker. Ask your friends to do the same. Does the coin move in the same direction in each case? If not, why?

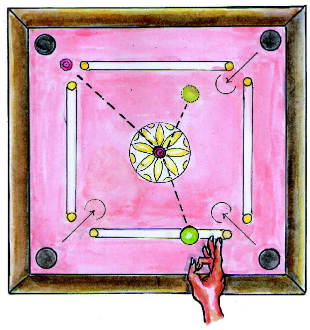


Fig.17

You can observe that in each case the direction of the coin changes.

When you hit the coin with the striker, not only does the coin change its direction, but the striker changes its direction too. What might be the cause for that?

From these observations, we can say that a net force stops a moving object or makes a stationary object move and also changes the speed and direction of a moving object.

Does the force change only the state of motion? Are there any other effects of force?

1.8 Other effects of force

Activity-13

Effects of force on the shape of an object

D7WLE1

In table-3 some situations are given in the first column showing how the force is applied on an object. Observe the shape of the objects carefully before and after applying the force. In the above situations, observe if there is permanent or temporary change in shape of the object and fill the table.

Mark 'T' for temporary change and mark 'P' for permanent change in the second column.

Table 3

Action of force	Change in shape [temporary (T)/ permanent(P)]
Stretching rubber band	
Squeezing sponge	
Tearing paper	
Breaking piece of chalk	
Making chapathi	
Breaking glass	

Give some more examples where force can change the shape of an object.

From the above table we can understand that a force not only changes the state of motion of an object but can also change the shape of an object. It may change the shape temporarily or permanently, based on the nature of the object and the force applied on it.

1.9 Pressure

Activity-14

Change in effect of force with area of contact

Take a pencil. Just push its rounded end on your palm. Now push from the other side of the pencil gently so that the sharp end is on your palm. What difference did you experience? Why?

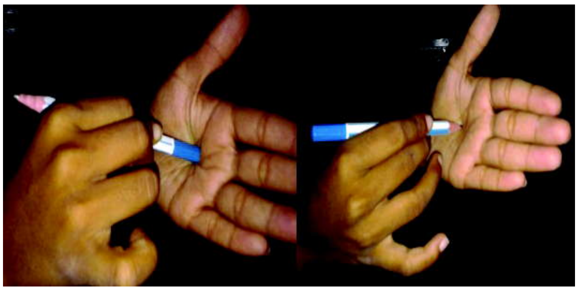


Fig-18

Why do people who carry weights on their heads wear a turban?

Why school bags and shopping bags have wide belts?

Did you ever think why trucks that carry more weight have broader tyres?

In these examples you might have noticed that the effect of force depends on the area of contact on which the force is acting. When there is a decrease in the area of contact of the force or load then the effect of force increases and vice versa.

The force acting perpendicularly on unit area of a surface is called pressure.

Pressure = Force/Area

The unit of pressure in S.I. system is Newton/meter^2 or N/m^2.

Activity 15

Identifying effects of force

Take two trays. Fill both the trays with lime powder or fine sand. Now take two rectangular bricks of equal mass and similar shape.

As shown in Fig.-19, drop one brick vertically in one tray and the other brick horizontally in the second tray from certain height. What do you notice?

Do both bricks sink to the same depth in lime powder? If not why?

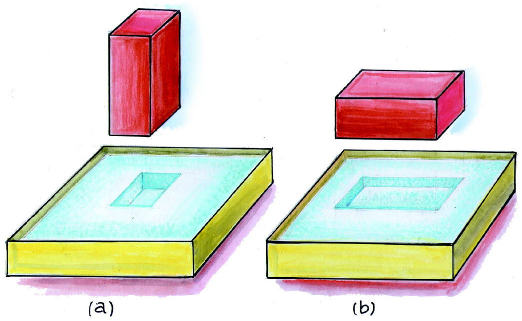


Fig-19

You may notice that the brick standing vertically sinks deeper in lime powder than the brick standing horizontally.

Since the masses of both bricks are similar, the force applied on lime powder by them is the same on both the trays. The difference lies in the surface area of the brick in contact with the lime powder and this is responsible for the change in the extent to which the brick sinks in the lime powder.

In above activity, the contact area on which force is acting is different in each case. The depth to which the brick sinks in the first tray (Fig 19 a) is deeper than that in the second tray (Fig 19 b).This is because in Fig 19(a), the contact area or the surface area on which force is acting is smaller and hence, the pressure exerted by the brick is more. In Fig 19(b), the contact area or the surface area on which force acting is larger. Hence the pressure exerted by the brick is less.

Why does the sharper side of a knife cuts more easily than the blunt side of it? A sharp side of knife has a smaller contact area. Therefore, for the same amount of force applied on it, the sharp side of knife exerts more pressure than the blunt side and hence cuts more easily.

- Can you give some more examples of pressure?

From the above examples, you can say that for a given force, if the surface area is smaller, the pressure will be greater. If you use a larger area, you are spreading out the force, and the pressure becomes smaller.

Think and discuss

Does pressure have direction? Explain.

Key words

Force, Push, Pull, Contact force, Force at a distance, Field, Friction, Muscular force, Gravitational force, Magnetic force, Electrostatic force, Net force, Magnitude, Equilibrium, Normal force, Tension, State of motion, Pressure, Freebody diagram

What we have learnt?

- Force is a push or a pull.
- A force can act on an object with or without being in contact with it. A force acting on a body is either a contact force or force acting at a distance.
- Field is a three dimensional region. If an object is kept at any point in the field, it will experience the force.
- Friction is the force that opposes relative motion of surfaces in contact.
- The force which we exert by using our body muscles is known as muscular force.
- The attractive force between any two massive objects is called gravitational force.
- The magnetic force attracts a magnetic material such as iron. But it either attracts or repels another magnet.
- The force exerted by a charged body on other charged body is known as electrostatic force.
- Force has magnitude as well as direction.
- The algebraic sum of all the forces acting on a body is known as net force, and is denoted by F_{net}.
- A force can change the state of motion of an object.
- Force may cause a change in the shape of an object.
- The force acting perpendecularly on a unit area of a surface is called pressure.

Improve your learning

G6SXIC

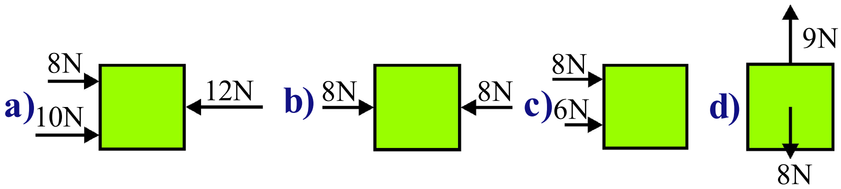
I. Reflections on concepts

1. What is a force? What changes can be produced by a Force? (AS_1)
2. Give two examples each for a contact force and a force at a distance. (AS_1)
3. Explain Gravitational Force by giving a suitable example. (AS_1)
4. Draw and explain a free body diagram (FBD) to show all the forces acting on a car? (AS_5)
5. Why do tools meant for cutting always have sharp edges? (AS_1)

II. Application of concepts

1. Explain the differences between a contact force and a force at a distance with examples? (AS_1)

2. Find the net forces from the following diagrams. (AS_1)

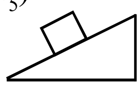


3. A man stand still on a level floor. What forces act on him? Draw a free body diagram (FBD) to show all forces acting on him? (AS_5)

4. The surface area of an object is 20 m^2 and a force of 10 N is applied on it, then what is the pressure? (AS_7)

5. How do you appreciate the role of friction in facilitating our various activities in our daily life? (AS_6)

6. Identify and draw all forces acting on the body shown in the diagram. (AS_5)



III. Higher Order Thinking Questions

1. If you push a heavy box which is at rest, you must exert some force to start its motion. However once the box is sliding you apply a lesser force to maintain that motion. Why? (AS_1)

2. How do you increase the pressure by keeping (AS_1)

   a) area unchanged

   b) force unchanged

3. Imagine that friction disappeared from the earth. Explain what would happen? (AS_2)

Multiple Choice Questions

1. Hoisting a flag is related to ( )

   a) push b) pull

   c) Push and pull both d) pressure

2. A person is pulling water from well. Which type of force it is ( )

   a) Muscular force b) Magnetic force

   c) Friction force d) Electrostatic force

3. The force that a solid surface exerts on any object in the normal direction is called ( )

a) Muscular force b) Normal Force

c) Tension force d) Magnetic force

4. Let the forces F_1 and F_2 act on the table in opposite directions, $F_1>F_2$, the F_{net} = ( )

a) F_1-F_2 b) F_1+F_2 c) 0 d) $2F_2-F_1$

5. A situation for effect of force leads to a permanent change in shape of object is ( )

a) Stretching Rubber band b) Squeezing sponge

c) Pressing the Spring d) Breaking glass

Experiments

1. Conduct an experiment to find the limiting forces that can be borne by different strings and prepare a report.
2. Design and conduct experiment to test few ways how friction may be reduced.
3. Conduct an experiment to determine the change in effect of force with an area of contact.

Project Works

1. Collect pictures to illustrate contact forces, forces at a distance and prepare a report.
2. Classify the actions in your daily life into
   (i) actions where we exert force which appears as a push
   (ii) actions where we exert force which appears as a pull
   (iii) actions which involve both push and pull
3. Observe the situations of electrostatic forces in your daily life and prepare a report.