

# MEASURING DISTANCES

You must have measured distances many times while playing, or seen others doing so. On the basis of your experiences or observations discuss the following in the class.

How do you measure the distance from one end of a *kabbadi* field to the other?

How do you measure the distance between the home base (*guchchak*) and the *gilli* while playing *gilli danda*?

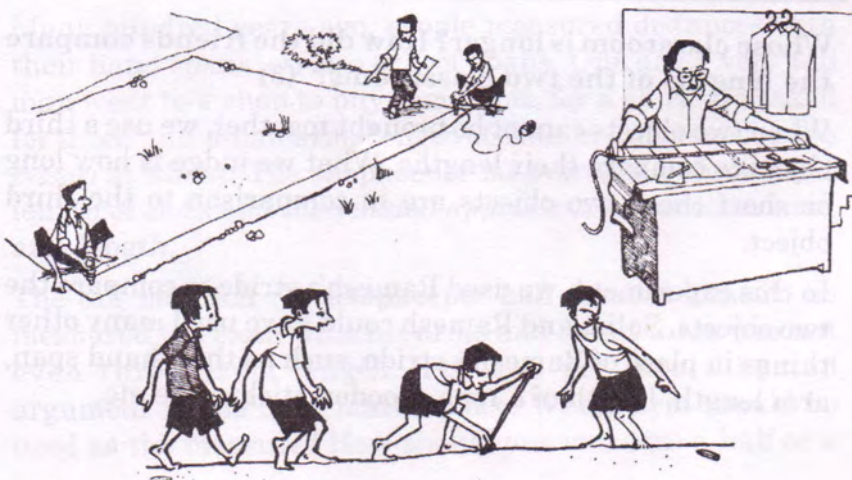
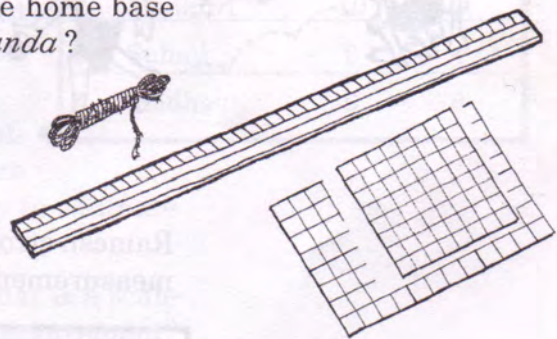
How is the depth of a well measured?

How do you measure your height?

How does the shopkeeper measure the cloth he sells?

How does the *patwari* measure the length and breadth of a field?

How would you measure the distance from your village or town to the next village or town?





## WHO IS THE TALLEST?

### EXPERIMENT 1

You can compare the height of two students by making them stand side by side.

Who is the tallest student in your class? (1)

## WHOSE ROOM IS LONGER?

Salim and Ramesh are students in different classes of the same school. They once got into an argument about whose classroom is longer.



Can Ramesh and Salim compare the lengths of their two classrooms by putting them side by side, as you did when comparing the heights of students in your class? (2)

To settle their argument the two boys decided to let Ramesh first walk across his classroom in his natural stride and then walk across Salim's classroom in the same manner. The lengths of the two rooms could then be compared to find out which is longer.

Ramesh strode across both classrooms and got the following measurements:

	Salim's classroom	Ramesh's classroom
Length of the room	23	20
(in Ramesh's strides)		

Whose classroom is longer? How did the friends compare the lengths of the two classrooms? (3)

When two objects cannot be brought together, we use a third object to compare their lengths. What we judge is how long or short these two objects are in comparison to the third object.

In this experiment, we used Ramesh's stride to compare the two objects. Salim and Ramesh could have used many other things in place of Ramesh's stride, such as their hand span, arm length, length of a rope, wooden stick, scale etc.



## HOW TALL IS LAMBU?

Sushma is the tallest girl in her class. She always boasts that she is 10 hand spans tall. One day the other girls in the class decided to check whether her claim was correct.

They made Sushma stand against a wall. Then Madhuri put a mark on the wall just above Sushma's head. The girls then measured the distance of this mark from the ground, using their hand spans and finger widths (complete hand spans and the remainder in finger widths).

Their measurements are given in Table 1.

Are all the measurements alike? (4)

Why are all the measurements not the same?

(5)

Is Sushma actually 10 hand spans tall? (6)

Is your hand span equal to your friend's hand span? (7)

If everyone were to use their hand spans and finger widths to measure lengths what problems would it create? (8)

The hand & spans, foot sizes and strides of different people are not the same. They vary from person to person. Hence, we can use them only to estimate distances, not to measure distances accurately.

For correct measurements we need a scale. What is a scale and how did people begin using scales for measurement? Let us try and imagine what might have happened in the past.

## THE STORY OF THE SCALE

Many hundred years ago, people measured distances with their hand spans, strides or foot spans. One day a very tall man went to a shop to buy some cloth for a shirt. He asked for three-and-a-half arms length of cloth in exchange for two *paseri* of wheat. The shopkeeper measured out three arms length of cloth and then added approximately another half-arm length.

The tall man felt the shopkeeper had cheated him. So he measured the cloth with his arms and found there was not even three arms length. The two got into a heated argument in the busy marketplace. Whose arm should be used as the measure? How should one measure a half or a

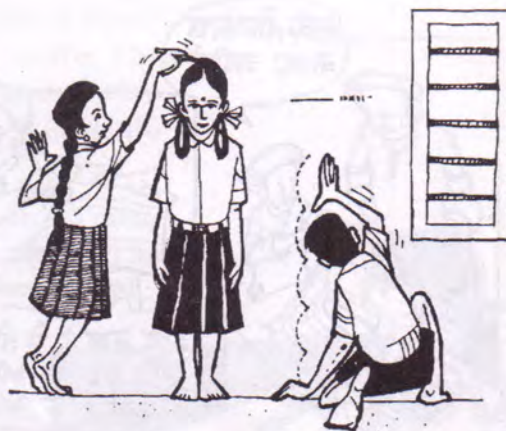


TABLE 1

No.	Name of the students	Hand spans	Finger width
1.	Sushma	9	0
2.	Suresh	9	2
3.	Madhuri	10	0
4.	Suhail	9	4
5.	Madhav	9	8





quarter arm length?

This must have been a familiar scene in those days - people getting into arguments over measuring the length of fields, or a rope or a hundred other things.

Finally, some sensible people got together and decided to have a scale of a fixed length to measure various things. They marked this scale with several smaller but equal divisions. They then decided that everyone would measure lengths with this scale. They used wood and metal to make scales of the same length.



**Why did they make their scales with wood and metal? Why didn't they use cloth or rubber? Discuss among yourselves and answer. (9)**

In one particular country, people decided to use the distance between the nose and the tip of the middle finger of their king as a measure. They called this distance one yard. This yard was divided into three equal parts and each part was called a foot. They then divided each foot into twelve equal parts called inches. They even further divided each inch into smaller segments.

For longer distances, they decided that 220 yards would make a furlong and eight furlongs would make a mile.

Other countries in the world also made their own scales. These made measurements simpler. But because each country had its own scale, which was different from that of other countries, this led to a lot of problems in trade and commerce. There was always a chance of quarrels breaking out.



Finally, in France it was decided that a certain rod of a special metal kept in a museum would be called a metre. The metre was divided into 100 equal parts and these parts were called centimetres. Each centimetre was further divided into ten equal parts called millimetres.

While there are still different scales and units used to measure length in different places, the metre is now accepted as the standard international unit of measurement of length.

### SCALE IN YOUR KIT

Carefully examine the scale in your kit. It has markings on it to measure distances.

The numbers on this scale denote centimetres (cm). Each centimetre has ten equal divisions. Each such division is a millimetre (mm).

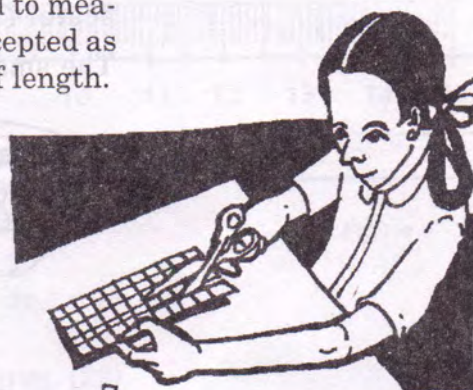


Figure 1

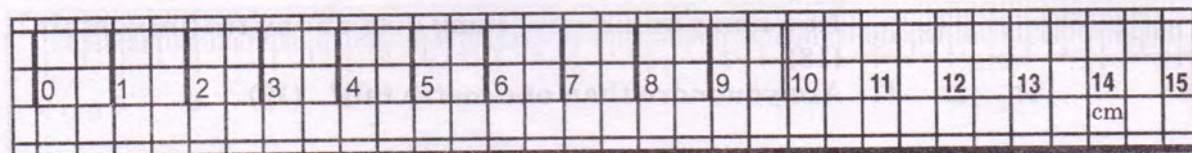
### MAKE YOUR OWN SCALE

#### EXPERIMENT 2

Cut out a long strip of graph paper along the thick lines from your kit copy. (Figure 1)

**What is the length of the side of each large square in this strip? (10)**

Count 15 such squares and mark them from 0 to 15. Your scale is ready. You can paste it along the top edge of your exercise book and use it.



**How many small divisions do each of the big squares have? (11)**

**Can you use this scale to measure wavy, zig-zag or curved lines? (12)**

### EXERCISE YOUR BRAIN

Look carefully at the 15cm long scale shown in Figure 2.

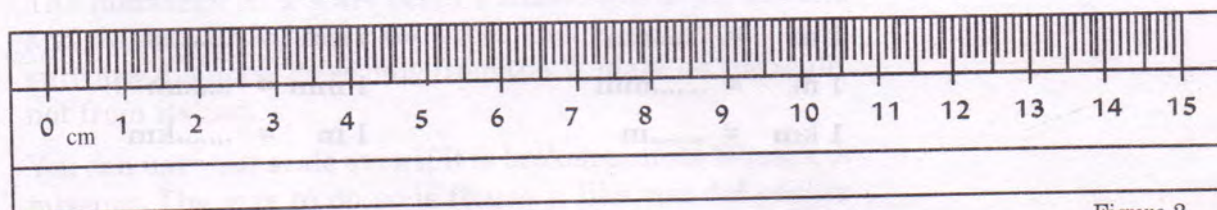


Figure 2



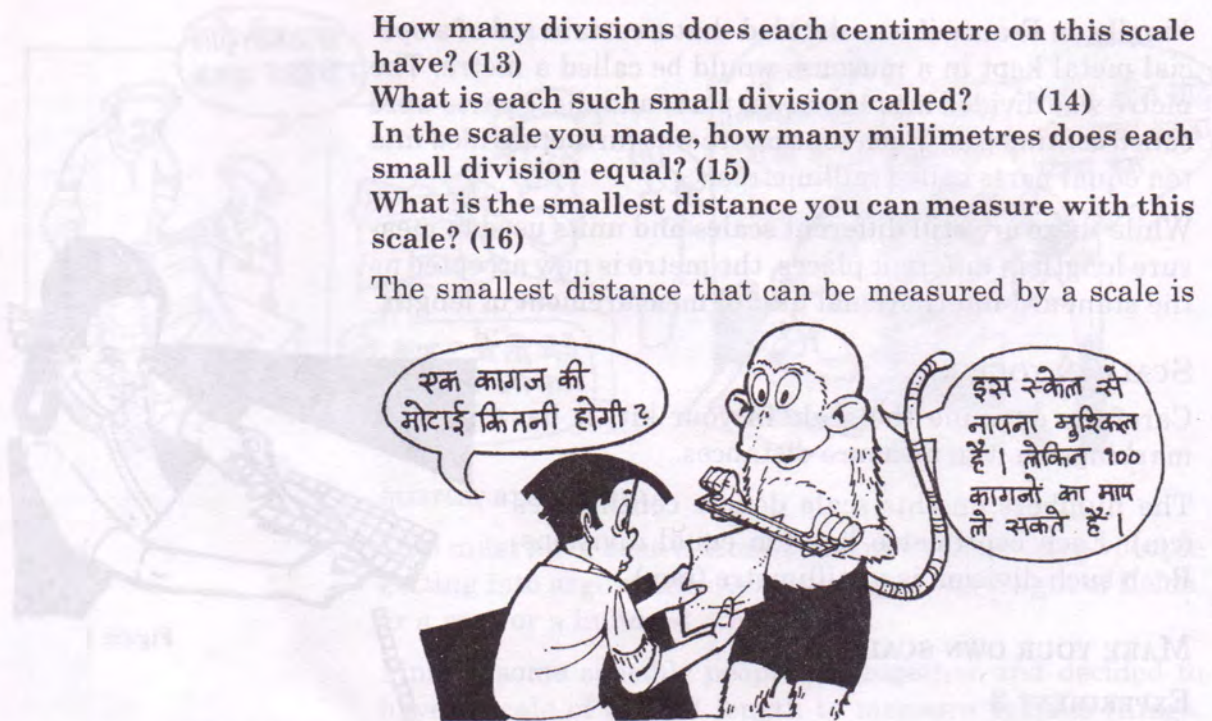
How many divisions does each centimetre on this scale have? (13)

What is each such small division called? (14)

In the scale you made, how many millimetres does each small division equal? (15)

What is the smallest distance you can measure with this scale? (16)

The smallest distance that can be measured by a scale is



called its least count. You should always check the least count of a scale before using it.

### HOW LONG IS A METRE?

Carefully examine the metre scale in your kit.

How many centimetres (cm) does one metre (m) contain? (17)

How many millimetres (mm) does one metre (m) contain? (18)

Are you more than one metre tall? (19)

### HOW LONG IS A KILOMETRE?

A 'kilo' means one thousand. So a kilogram is 1,000 grams.

In the same way, a kilometre (km) is 1,000 metres.

### THINK AND ANSWER

Fill in the blanks. (20)

1 cm = .....mm

1 mm = .....cm

1 m = .....cm

1 cm = .....m

1 m = .....mm

1 mm = .....m

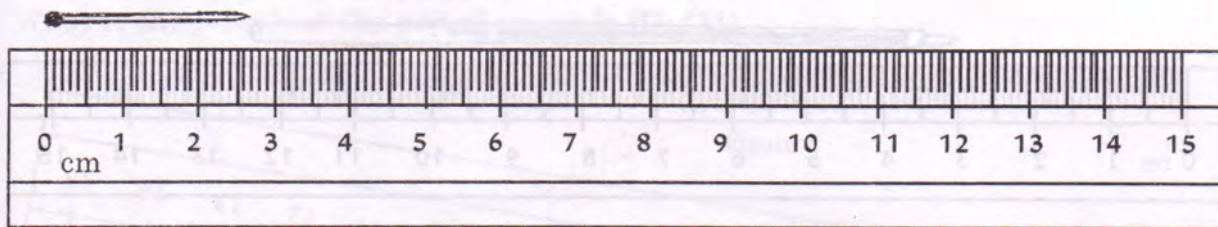
1 km = .....m

1 m = .....km



## THE CORRECT WAY TO USE A SCALE

To measure the length of a straight object, place the scale parallel to the object. Then count on the scale the number of mm between the two ends of the object.



Count the number of mm in Figure 3 and find the length of the pin in mm. (21)

Figure 3

In the same way, we can count the number of cm and mm between the two ends of the object.

The length of the pin in Figure 3 is ..... cm ..... mm. (22)  
Write down the length of the pin in cm. (23)

Don't forget to specify the units you use when writing down a measurement. If you do not write down the unit, your measurement will be considered incorrect. If you do not specify the unit, how would one know whether a distance is in cm, mm or metres?

You don't have to count the small divisions every time you measure a length. There is a simpler way.

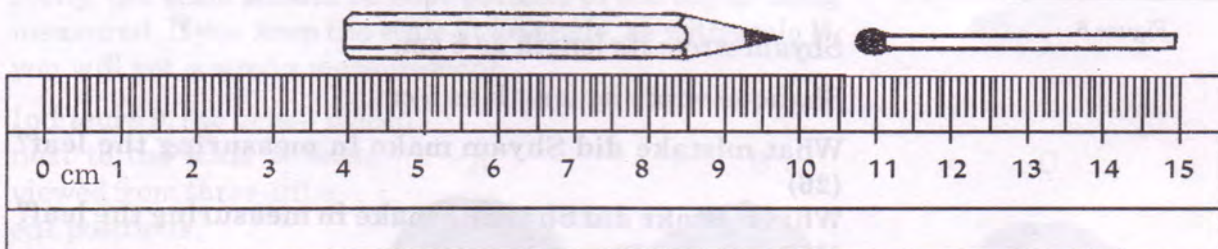


Figure 4

In Figure 4, one end of the pencil is at the 4.0 cm mark, while its other end, the tip, is at the 9.8 cm mark. So the length of the pencil is  $(9.8 - 4.0) \text{ cm} = 5.8 \text{ cm}$ . You could check this answer by counting the small divisions on the scale from one end of the pencil to the other.

The markings on a scale begin a little away from one end and finish a little before the other end. So when you measure any distance, do so only from the '0' mark on the scale, not from its end.

You can use your scale even if it is broken or if its '0' mark is missing. The way to do so is to use it like you did earlier when measuring the pencil.



### AN EXERCISE

What is the length of the matchstick in Figure 4? (24)  
Note the length of the refill in Figure 5 and write it in your exercise book. (25)

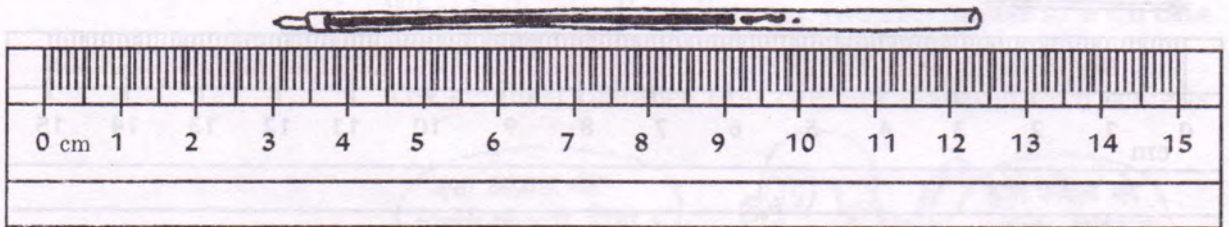


Figure 5

### SPOT THE MISTAKES

Shyam and Shafique measured the length of the leaf shown in Figure 6.

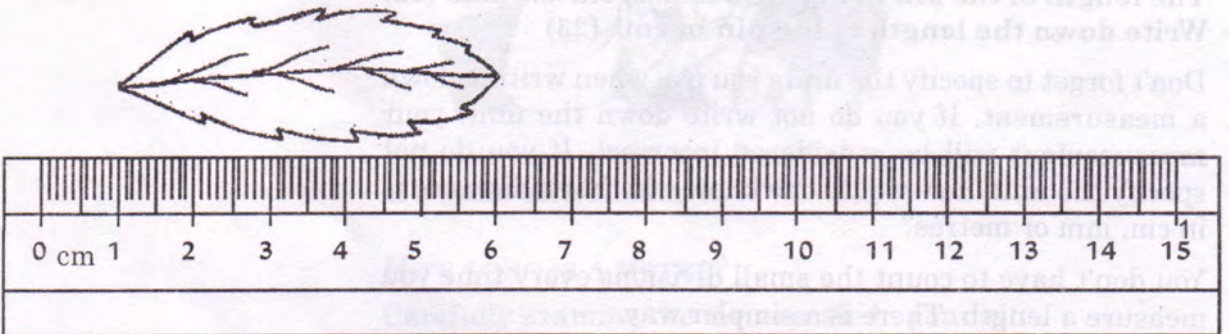


Figure 6

Shyam wrote its length as 6 cm.

Shafique wrote its length as 5 cm.

What mistake did Shyam make in measuring the leaf? (26)

What mistake did Shafique make in measuring the leaf? (27)

What is the correct length of the leaf? (28)

Kallu measured the length of the blade as 4.2 cm and the nail as 3.2 cm. (Figure 7)

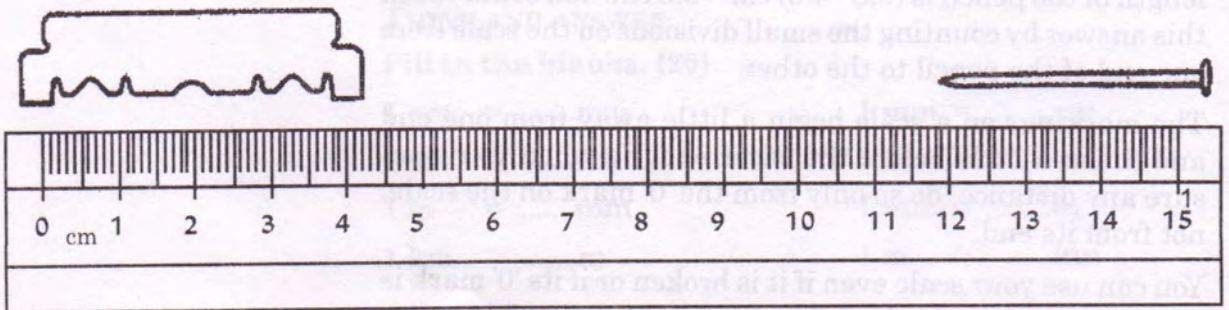


Figure 7



What mistake did he make in his measurements? (29)

Figure 8 shows a pencil being measured with two scales A and B.

What is the length of the pencil on scale A? (30)

What is the length of the pencil on scale B? (31)

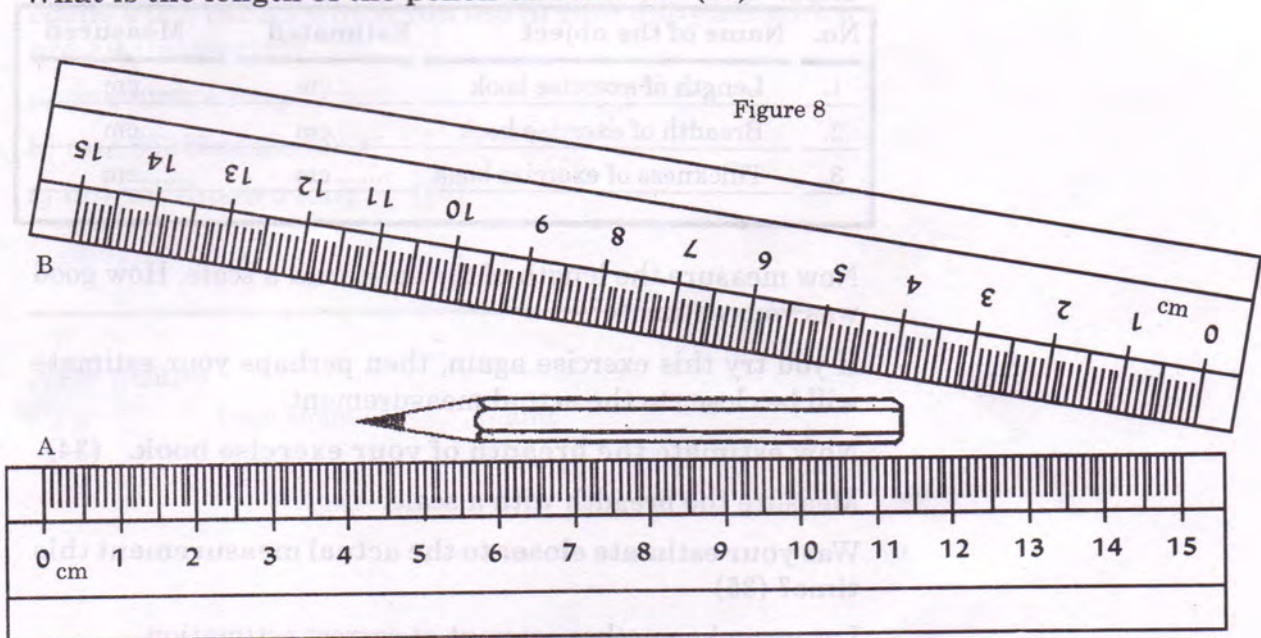


Figure 8 shows that if you wish to measure a length correctly, the scale should be kept parallel to the object being measured. If you keep the scale at an angle, as with scale B, you will get a wrong measurement.

In Figure 9, the pencil placed next to the scale is being viewed from three different positions.

Which is the correct position - A, B or C? (32)

You can now understand the importance of the position of the scale, the object and the eye in measuring correctly.

Let us now practise measuring distances.

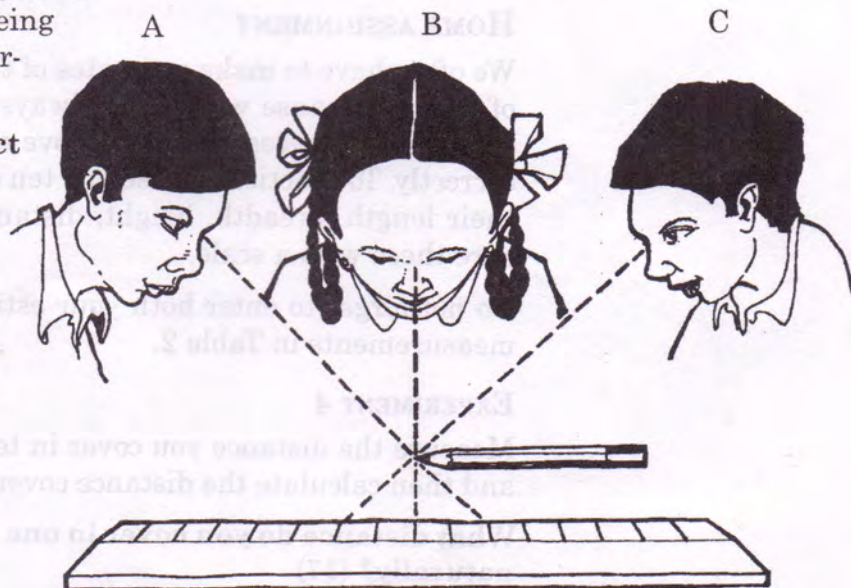


Figure 9



### EXPERIMENT 3

Guess the length of your exercise book. Copy the table given below in your exercise book and write down your estimate. (33)

TABLE 2

No.	Name of the object	Estimated	Measured
1.	Length of exercise book	.....cm	.....cm
2.	Breadth of exercise book	.....cm	.....cm
3.	Thickness of exercise book	.....cm	.....cm

Now measure the length of the book with a scale. How good was your estimate?

If you try this exercise again, then perhaps your estimate will be closer to the actual measurement.

Now estimate the breadth of your exercise book. (34)

Measure the breadth with a scale.

Was your estimate closer to the actual measurement this time? (35)

Let us make another attempt at correct estimation.

This time estimate the thickness of your exercise book.

Now measure the thickness with a scale.

Does your estimate improve as you repeat the exercise several times? (36)

### HOME ASSIGNMENT

We often have to make estimates of the length and breadth of objects because we do not always have a scale to measure. So it is necessary to improve our ability to estimate correctly. To practise, choose any ten objects. First estimate their length, breadth, height, distance etc and then measure these with a scale.

Do not forget to enter both your estimates and the actual measurements in Table 2.

### EXPERIMENT 4

Measure the distance you cover in ten strides with a scale and then calculate the distance covered in one stride.

What distance do you cover in one stride when walking naturally? (37)



While returning home, count the number of strides you take while going from your school to your home and then estimate this distance in metres.

### THINK AND ESTIMATE

Name a few things which you use in your daily life which are approximately

- a) one metre long
- b) one centimetre long
- c) one millimetre long (38)

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### NEW WORDS

scale      least count      unit

