To Make a Paper Scale of Given Least Count, e.g., 0.2 cm, 0.5 cm.

Aim
To make a paper scale of given least count, e.g., 0.2 cm, 0.5 cm.

Apparatus
A thick white paper sheet, pencil, scale with sharp edge marked in cm and mm, fevicol, a pair of scissors, a paper cutter, thick ivory sheet used by engineering students.

Theory
Least count. The minimum observation that can be measured by the instrument accurately is called the least count of instrument.
Range of an instrument. The maximum observation that can be measured by instrument is called its range.

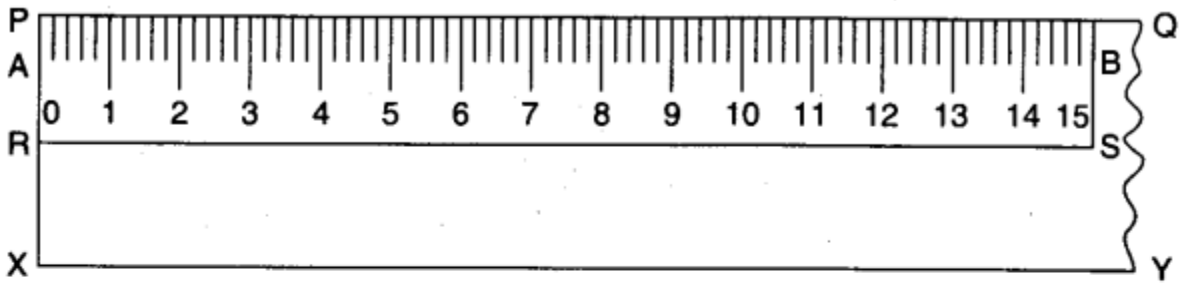
Diagram


Fig. A. Scale of least count 0.2 cm.

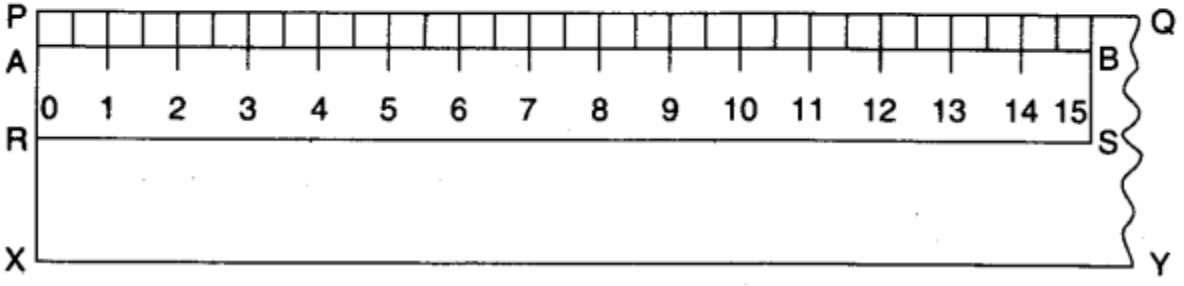


Fig. B. Scale of least count 0.5 cm.

Procedure
(A) Paper scale of least count 0.2 cm

1. Fold a white paper sheet in the middle along lengthwise.

2. Mark in the upper half along the length a line PQ 15 cm long by a sharp pencil (Fig. A).
3. Take P as zero mark points on PQ at a distance of 1.0 cm and write as 0,1, 2,……up to 15.
4. Mark the vertical lines to line PQ at the position of each mark 0, 1, 2,……up to 15.
5. Draw another sharp line RS which is parallel to PQ at a distance of 8 mm.
6. Draw another line XY parallel to PQ at a distance of about 25 mm. And complete the rectangle ABXY.
7. Now divide each 1.0 cm interval into five equal divisions on PQ by marking points at every interval of 2 mm. Mark these points up to 15 cm mark.
8. Now draw sharp small lines about 3 mm long perpendicular to PQ on each of the point which is separated by 2 mm.
9. Draw another line AB parallel to PQ at a gap of 3 mm.
10. Darken each line and division by the sharp black pen, and write 1,2,……15 at each cm mark.
11. Cut the rectangular scale by a sharp paper cutter and paste it on a thick ivory sheet and cut the sheet along the boundary of the rectangle with the help of scissors.
12. Paper scale of least count 0.2 mm and of the range of 15 cm is ready.

(B) Paper scale of least count 0.5 cm

1. Repeat steps 1 to 6 as in part A of the above activity.
2. Divide each 1.0 cm interval into two equal divisions on PQ by marking points at every interval of 5 mm and mark these points up to 15 cm mark (Fig. B).
3. Draw sharp small lines about 3 mm long perpendicular to PQ on each of the point which is separated by 5 mm.
4. Draw another line AB parallel to PQ at a gap of 3 mm.
5. Darken each line and division by the sharp black pen and write 1,2,…….15 at each cm mark.
6. Repeat the step 11 as in part A of the Activity 1.
7. Paper scale of least count 0.5 cm and of the range of 15 cm is ready.

(C) Measure the length of pencil with the paper scale

1. Place one end A of the pencil along the scale (A) in such a way so that A lies at full mark say 1 cm and read the position of the other end. Repeat the observation by placing the one end A of the pencil at 2 cm mark and take the reading of the other end.
2. Use the second scale (B) of least count 0.5 cm in the similar manner as explained in step 1 and record the observations.

Observations

Least count of the scale (A) = ……..0.2 cm.
Table for length of the pencil using scale (A)

S. No.	Reading at one end A of the pencil a_1 (cm)	Reading at other end B a_2 (cm)	Length of the pencil = $a_2 - a_1$ (cm)
1.	1.0		
2.	2.0		

Mean length of the pencil =……..cm.

Table for length of the pencil using scale (B)

S. No.	Reading at one end A of the pencil a_1 (cm)	Reading at other end B a_2 (cm)	Length of the pencil = $a_2 - a_1$ (cm)
1.	1.0		
2.	2.0		

Mean length of the pencil =……cm.

Result

1. The scales of the least count 0.2 cm and 0.5 cm have been made.
2. The length of the pencil, using scale (A) = …….cm.
   The length of the pencil, using scale (B) = …….cm.

Precautions

1. The cm markings should be longer than 0.2 cm and 0.5 cm markings.
2. Final lines and marking should be drawn by using fine tipped black ink pen.
3. Paper scale should be pasted on the thick ivory paper.
4. Use very sharp pencil for the graduation marks.

Sources of error

1. Graduation marks may not be equally separated.
2. The lines showing graduations may not be sharp as required.