CHAPTER 12

UNDERSTANDING ELEMENTARY SHAPES

1. What is the disadvantage in comparing line segments by mere observation?

Solutions:

By mere observation we can't compare the line segments with slight difference in their length. We can't say which line segment is of greater length. Hence, the chances of errors due to improper viewing are higher.

2. Why is it better to use a divider than a ruler, while measuring the length of a line segment?

Solutions:

While using a ruler, chances of error occur due to thickness of the ruler and angular viewing. Hence, using divider accurate measurement is possible.

3. Draw any line segment, say $\overline{AB}$. Take any point C lying in between A and B. Measure the lengths of AB, BC and AC. Is AB = AC + CB?

Solutions:

Since given that point C lie in between A and B. Hence, all points are lying on same line segment
$\overline{AB}$. Therefore for every situation in which point C is lying in between A and B we may say that

AB = AC + CB

For example:

AB is a line segment of length 7 cm and C is a point between A and B such that AC = 3 cm and CB = 4 cm.

Hence, AC + CB = 7 cm

Since, AB = 7 cm

∴ AB = AC + CB is verified.

4. If A, B, C are three points on a line such that AB = 5 cm, BC = 3 cm and AC = 8 cm, which one of them lies between the other two?

Solutions:

Given AB = 5 cm

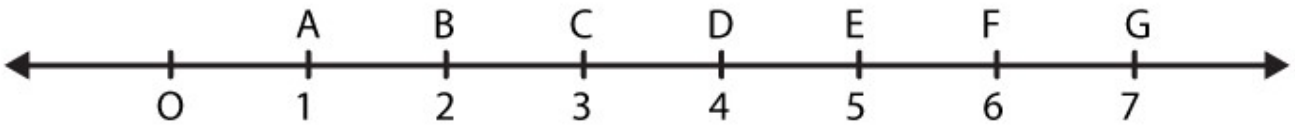
BC = 3 cm

AC = 8 cm

Now, it is clear that AC = AB + BC

Hence, point B lies between A and C.

5. Verify whether D is the mid point of $\overline{AG}$.



Solutions:

Since, it is clear from the figure that AD = DG = 3 units. Hence, D is the midpoint of $\overline{AG}$

6. If B is the mid point of $\overline{AC}$ and C is the mid point of $\overline{BD}$, where A, B, C, D lie on a straight line, say why AB = CD?

Solutions:

Given

B is the midpoint of AC. Hence, AB = BC (1)

C is the midpoint of BD. Hence, BC = CD (2)

From (1) and (2)

AB = CD is verified

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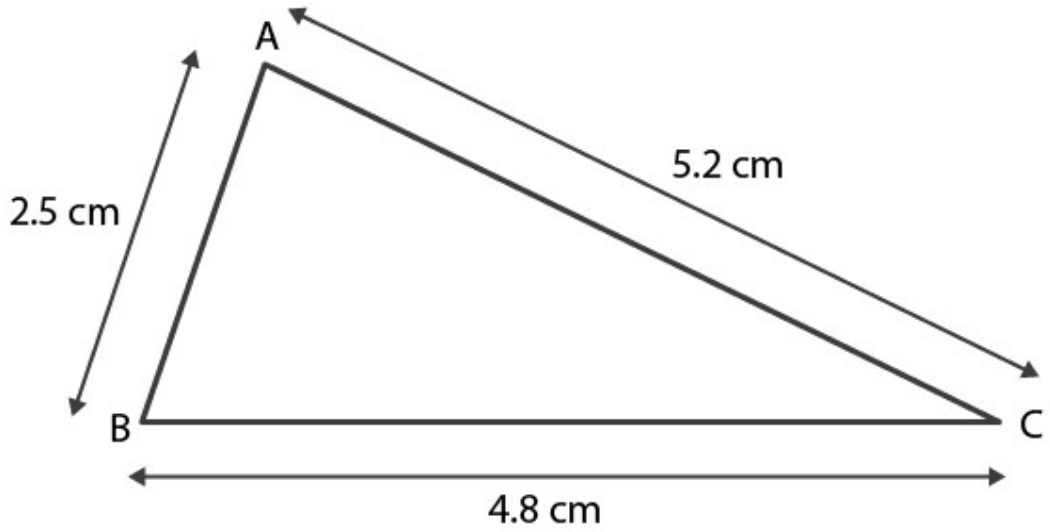
7. Draw five triangles and measure their sides. Check in each case, if the sum of the lengths of any two sides is always less than the third side.

Solutions:

Case 1. In triangle ABC



AB= 2.5 cm

BC = 4.8 cm and

AC = 5.2 cm

AB + BC = 2.5 cm + 4.8 cm

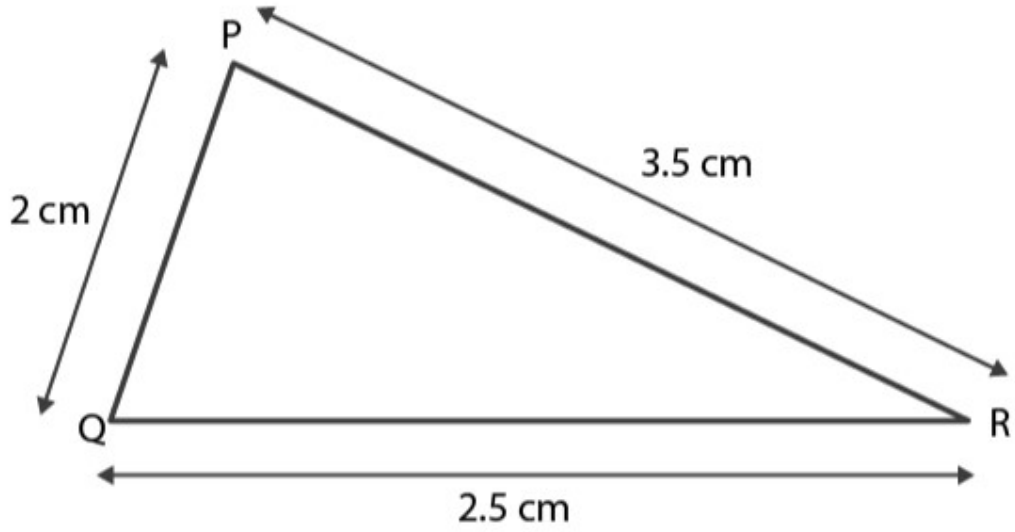
= 7.3 cm

As 7.3 > 5.2

∴ AB + BC > AC

Hence, the sum of any two sides of a triangle is greater than the third side.

Case 2. In triangle PQR



PQ = 2 cm

QR = 2.5 cm

PR = 3.5 cm

PQ + QR = 2 cm + 2.5 cm

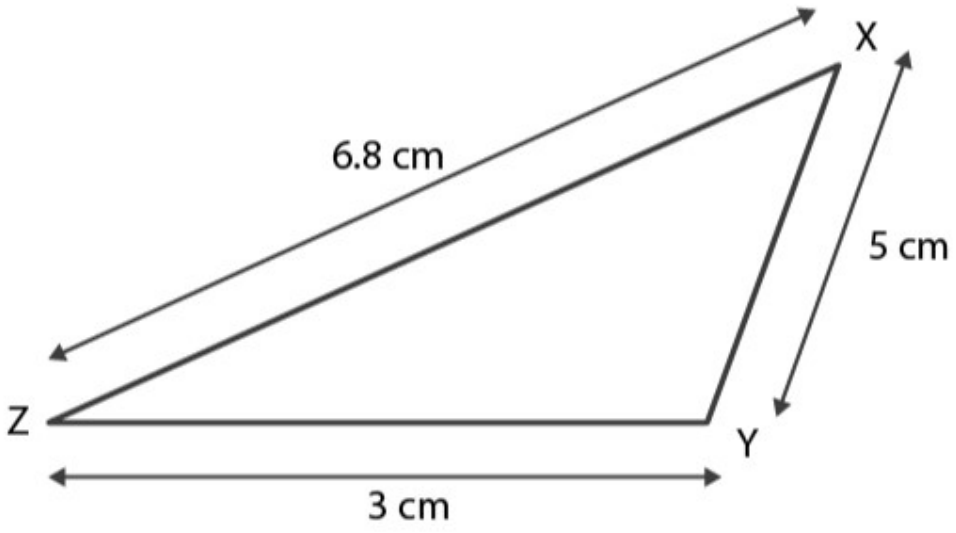
= 4.5 cm

As 4.5 > 3.5

∴ PQ + QR > PR

Hence, the sum of any two sides of a triangle is greater than the third side.

Case 3. In triangle XYZ



XY = 5 cm

YZ = 3 cm

ZX = 6.8 cm

XY + YZ = 5 cm + 3 cm

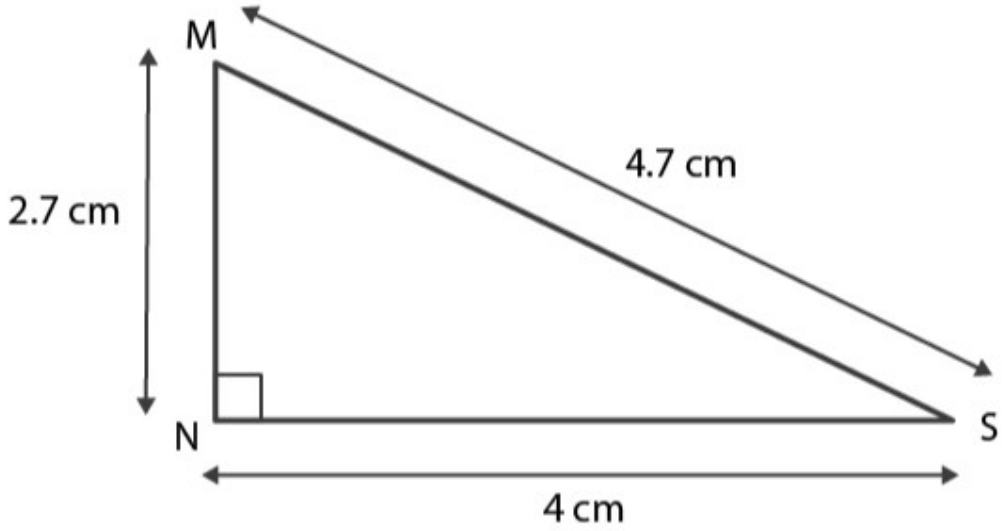
= 8 cm

As 8 > 6.8

∴ XY + YZ > ZX

Hence, the sum of any two sides of a triangle is greater than the third side.

Case 4. In triangle MNS



MN = 2.7 cm

NS = 4 cm

MS = 4.7 cm

MN + NS = 2.7 cm + 4 cm

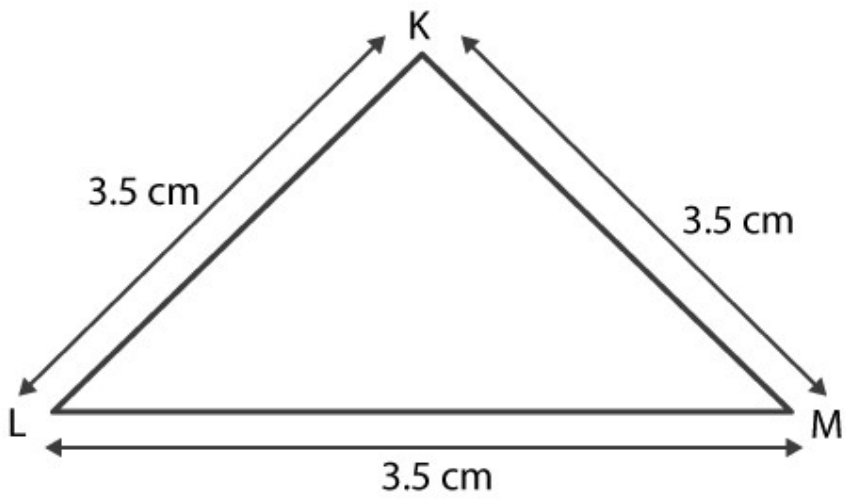
6.7 cm

As 6.7 > 4.7

∴ MN + NS > MS

Hence, the sum of any two sides of a triangle is greater than the third side.

Case 5. In triangle KLM



KL = 3.5 cm

LM = 3.5 cm

KM = 3.5 cm

KL + LM = 3.5 cm + 3.5 cm

= 7 cm

As 7 cm > 3.5 cm

∴ KL + LM > KM

Hence, the sum of any two sides of a triangle is greater than the third side.

Therefore, we conclude that the sum of any two sides of a triangle is always greater than the third side.

8. What fraction of a clockwise revolution does the hour hand of a clock turn through, when it goes from

(a) 3 to 9

(b) 4 to 7

(c) 7 to 10

(d) 12 to 9

(e) 1 to 10

(f) 6 to 3

Solutions:

We know that in one complete clockwise revolution, hour hand will rotate by 360^0

(a) When hour hand goes from 3 to 9 clockwise, it will rotate by 2 right angles or 180^0

∴ Fraction = $180^0 / 360^0$

= 1 / 2

(b) When hour hand goes from 4 to 7 clockwise, it will rotate by 1 right angle or 90^0

∴ Fraction = $90^0 / 360^0$

= 1 / 4

(c) When hour hand goes from 7 to 10 clockwise, it will rotate by 1 right angle or 90^0

∴ Fraction = 90^0 / 360^0

= 1 / 4

(d) When hour hand goes from 12 to 9 clockwise, it will rotate by 3 right angles or 270^0

∴ Fraction = 270^0 / 360^0

= 3 / 4

(e) When hour hand of a clock goes from 1 to 10 clockwise, it will rotate by 3 right angles or 270^0

∴ Fraction = $270^0 / 360^0$

= 3 / 4

(f) When hour hand goes from 6 to 3 clockwise, it will rotate by 3 right angles or 270^0

∴ Fraction = $270^0 / 360^0$

= 3 / 4

9. Where will the hand of a clock stop if it

(a) starts at 12 and makes 1 / 2 of a revolution, clockwise?

(b) starts at 2 and makes 1 / 2 of a revolution, clockwise?

(c) starts at 5 and makes 1 / 4 of a revolution, clockwise?

(d) starts at 5 and makes 3 / 4 of a revolution, clockwise?

Solutions:

We know that one complete clockwise revolution, hour hand will rotate by 360^0

(a) When hour hand of a clock starts at 12 and makes 1 / 2 revolution clockwise, it will rotate by 180^0.

Hence, the hour hand of a clock will stop at 6.

(b) When hour hand of a clock starts at 2 and makes 1 / 2 revolution clockwise, it will rotate by 180^0

Hence, the hour hand of a clock will stop at 8.

(c) When hour hand of a clock starts at 5 and makes 1 / 4 revolution clockwise, it will rotate by 90^0

Hence, hour hand of a clock will stop at 8.

(d) When hour hand of a clock starts at 5 and makes 3 / 4 revolution clockwise, it will rotate by 270^0

Hence, hour hand of a clock will stop at 2

10. Which direction will you face if you start facing

(a) east and make 1 / 2 of a revolution clockwise?

(b) east and make 1 ½ of a revolution clockwise?

(c) west and make 3 / 4 of a revolution anti – clockwise?

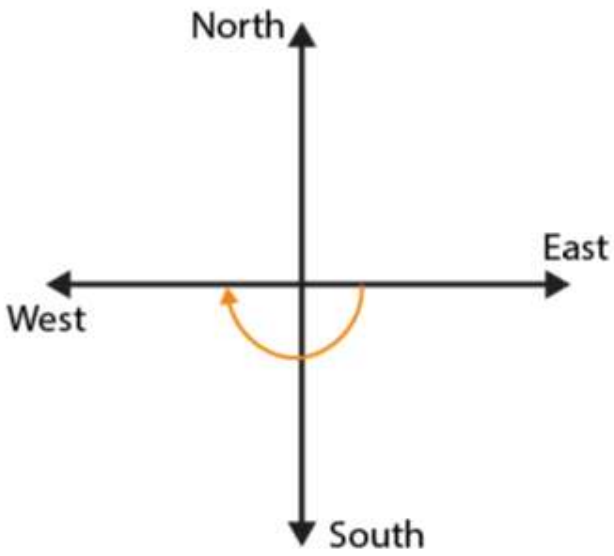
(d) south and make one full revolution?

(should we specify clockwise or anti – clockwise for this last question? Why not?)

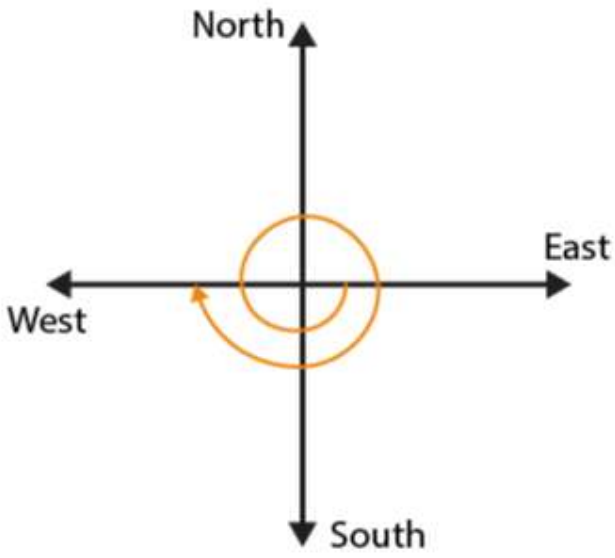
Solutions:

Revolving one complete round in clockwise or in anti – clockwise direction we will revolve by 360^0 and two adjacent directions are at 90^0 or 1 / 4 of a complete revolution away from each other.

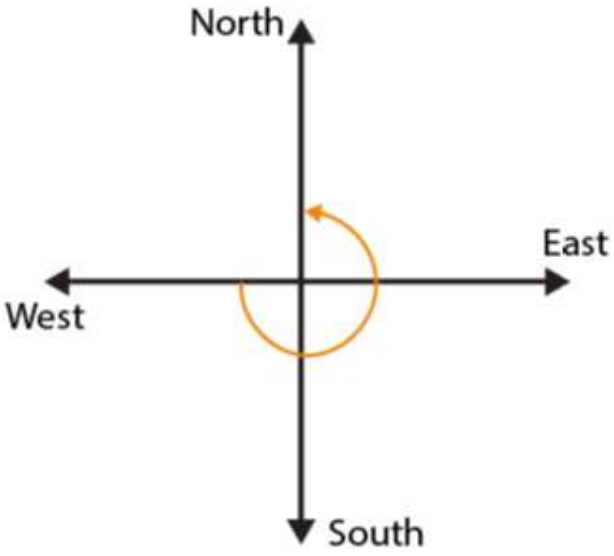
(a) If we start facing towards East and make 1 / 2 of a revolution clockwise, we will face towards West direction.



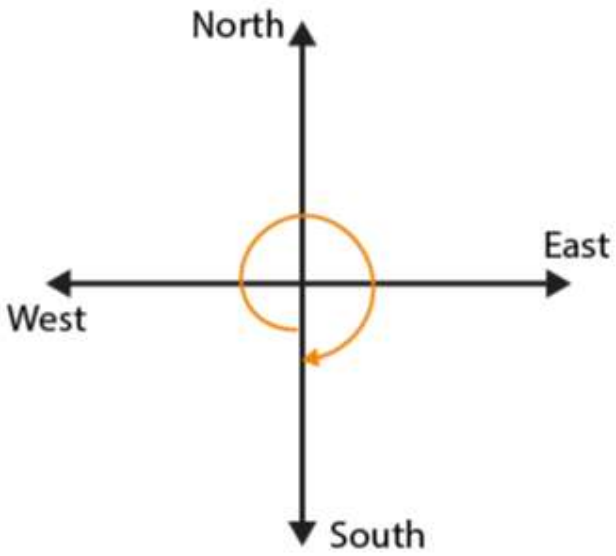
(b) If we start facing towards East and make 1 ½ of a revolution clockwise, we will face towards West direction

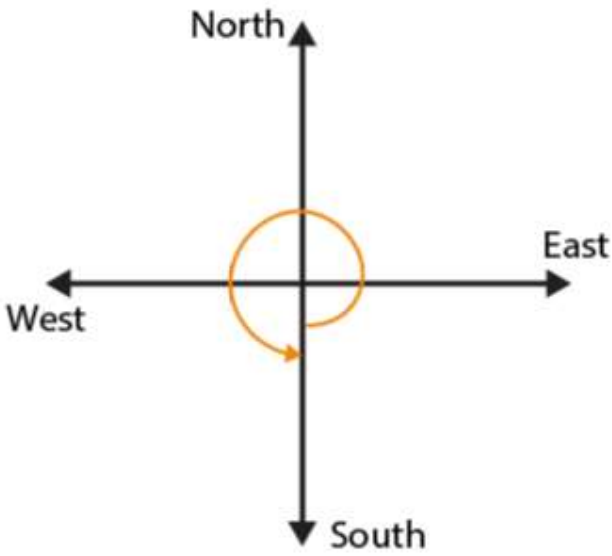


(c) If we start facing towards West and make 3 / 4 of a revolution anti – clockwise, we will face towards North direction



(d) If we start facing South and make one full revolution, again we will face the South direction.





In case of revolving 1 complete revolution, either clockwise or anti-clockwise we will be back at the original position.