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Mathematics

GANITA PRAKASH

PART-2

For the Student of Class 7

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Contents

CHAPTER 1

GEOMETRIC TWINS

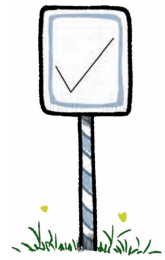
1.1 GEOMETRIC TWINS

FACTS

- This section explores how to check if two shapes are exactly the same in size and shape.
- It explains that matching only the lengths is not enough; we often need to check the angles too.

Intext Questions **Page 1**

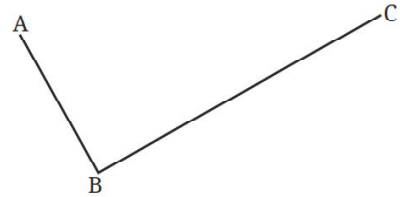
Q. 1. The symbol on this signboard needs to be recreated on another board. How do we do it? One way is to trace the outline of this symbol on tracing paper to reconstruct the figure. But this is difficult for big symbols. What else can we do?



Solution : Instead of tracing the symbol which becomes difficult for large figures, we can recreate it by measuring the lengths of the arms and the angle between them, then we can accurately redraw the same shape on another board. These measurements allow us to construct an exact copy without tracing it.

Q. 2. Can we take some measurements that would allow us to exactly recreate this figure? If yes, what measurements should we take?

Solution : Let us name the corner points of this symbol as shown.



Yes, we can recreate it by measuring the lengths of the arms and the angle between them, then we can accurately redraw the same shape. Two arm lengths alone (AB and BC) are not enough, because the angle between them can vary. To recreate the symbol exactly we must measure the following :

1. AB = length of the first arm.
2. BC = length of the second arm.
3. ∠ABC = the angle formed at the intersection point B between the two arms.

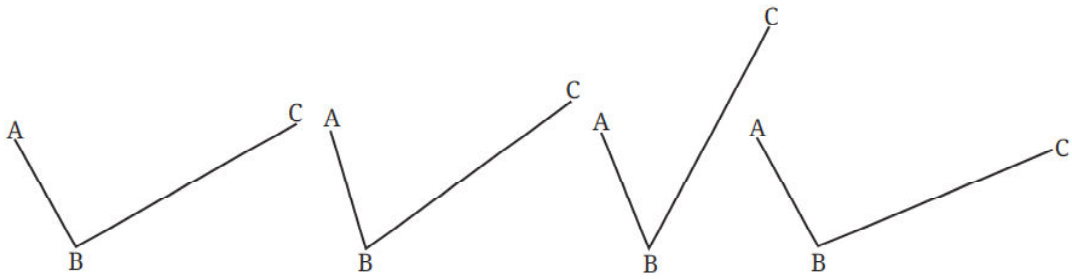
These three pieces of information (two sides and the included angle) fix both the shape and size of the symbol, so they let you reconstruct an exact copy.

Q. 3. Are the arm lengths AB and BC sufficient to exactly recreate this figure?

Solution : No, two arm lengths alone (AB and BC) are not enough, because the angle between them can vary. So, to recreate an exact copy, we need an angle formed at the intersection point B between the two arms along with the arm lengths AB and BC.

Intext Question Page 2

Q. 1. (i) Suppose these lengths are AB = 4 cm, BC = 8 cm. We observe that several such symbols can be constructed with the same lengths.



To get the exact replica, would it help to take any other measurement?

(ii) Can you draw the symbol if it is known that AB = 4 cm, BC = 8 cm, and ∠ABC = 80°?

Solution : (i) Yes, the measure of ∠ABC, along with the two arm lengths AB and BC, would help to get the exact replica.

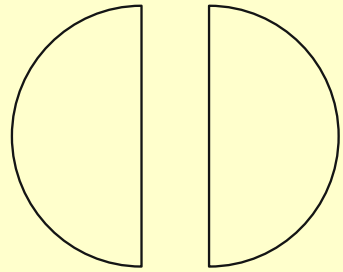
(ii) Yes, we can draw the symbol using these measurements because they give us two sides and the included angle (SAS), which is enough to fix the exact shape.

Steps of constructing the symbol

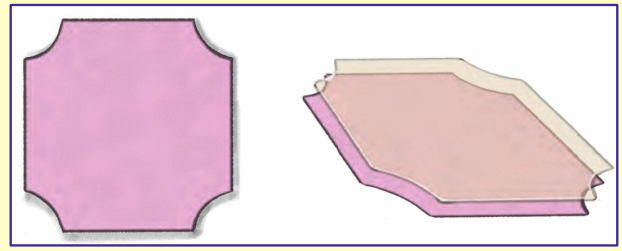
1. Draw AB = 4 cm.
2. Construct ∠ABC = 80°. Place the protractor at point B and draw a ray making an 80° angle with BA.
3. Mark BC = 8 cm. On the ray forming the 80° angle, measure 8 cm from B and mark that point as C.
4. Join the endpoints if needed to complete the shape exactly as shown in the original symbol.

FACTS

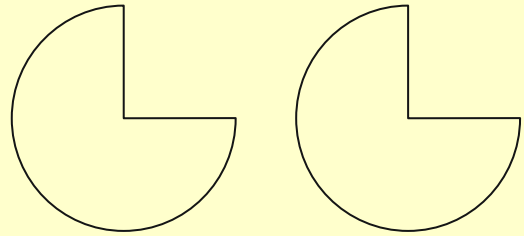
- Three measurements can help us to create an exact replica of the symbol on the signboard.
- When a shape can be placed exactly on another without gaps or overlaps, they are congruent.



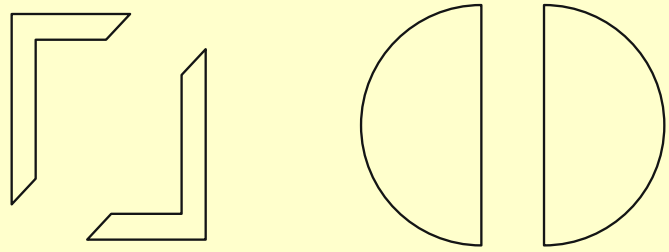
- Congruent figures can be superimposed exactly, one over the other.



- We can use a tracing paper to trace the first figure and superimpose it on the second one. We find that they fit exactly, one over the other.



- For checking the congruence, a figure can be rotated or flipped before superimposing it on the other figure.
- The figures below are congruent.



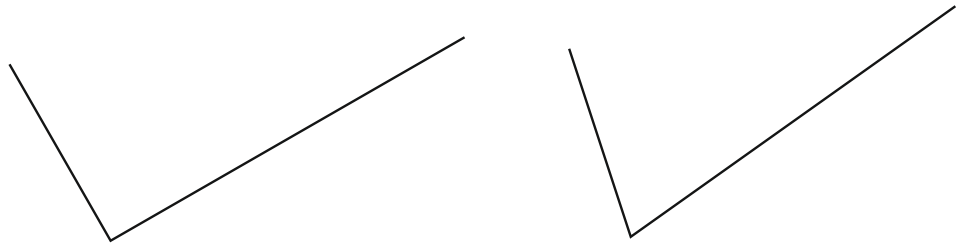
Intext Question Page 3

Q. 1. If it is known that both symbols have the same arm lengths, can it be concluded that the two symbols are congruent?

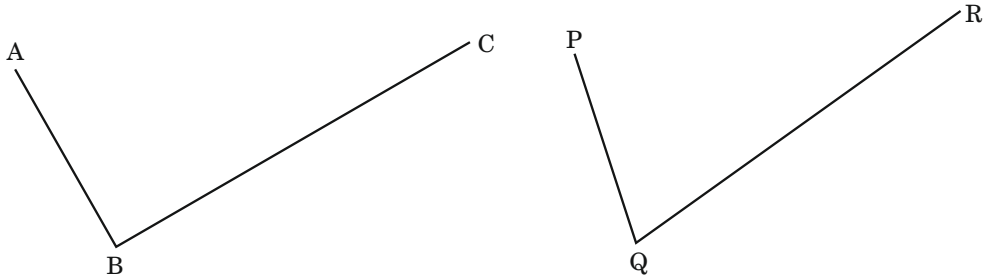
Solution : We have seen that there can exist several such non-congruent figures with different angles between the given arm lengths. Thus, if both symbols have the same arm lengths, we cannot be sure that the figures are congruent. As two arm lengths are not enough, because the angle between them can vary.

Figure it Out Pages 3-4

Q. 1. Check if the two figures are congruent.



Solution : For the sake of our convenience, we give name to these figures.



Here, AB and PQ are equal. Also, BC and QR are equal. But the angle between their arms that is ∠ABC and ∠PQR are not equal.

or ∠ABC > ∠PQR.

So, the given two figures are not congruent.

Q. 2. Circle the pairs that appear congruent.