

**Topic: Triangles**

**Triangle:**

A three-sided closed figure is called triangle.

**Similarity:**

Two figures are said to be similar if they have the same shape. Any two circles, squares, rhombuses are always similar

**Congruency:**

Two figures are said to be congruent if they have same shape and same size. Any two circles of same radius, two squares of same side, two rhombuses of same side are congruent.

**Similarity in Triangles:**

Two triangles are said to be similar if:

- a) their all the three corresponding pairs of sides are equal.
- b) their corresponding angles are equal.
- c) the ratio of their corresponding sides is same.
- d) Any two angles of one triangle are equal to the corresponding angles of another triangle.

## Objectives

- Q.1. Two triangles are said to be similar if:
- a) only one corresponding angle is equal
  - b) Two corresponding sides are equal
  - c) Two corresponding angles are equal
  - d) None of these
- Q.2. A diagonal in a square divide it into two ..... triangles:
- a) Similar
  - b) Congruent
  - c) Similar as well as congruent
  - d) None of these
- Q.3. The diagonals of a square divide it into ..... Similar triangles.
- a) Two
  - b) Three
  - c) One
  - d) Four

Q.4. The perpendicular bisector in an isosceles right-angled triangle divides it into.....

- a) Two obtuse angled triangles
- b) Two isosceles right-angled triangles but not similar
- c) Two isosceles right-angled triangles which are not similar
- d) Two isosceles right-angled congruent triangles

Q.5. Which one of the following is not true?

- a) Two circles are always similar
- b) Two squares are always similar
- c) Two rectangles are always similar
- d) Two right-angled isosceles triangles are always similar.

Q.6. Two squares are always .....  
(Similar/Congruent)

Q.7. Two circles are always .....  
(Similar/Congruent)

Q.8. If  $\triangle ABC \simeq \triangle DEF$  and  $\triangle DEF \simeq \triangle GHI$ , then  $\triangle ABC$  and  $\triangle GHI$  are also similar triangles. (True/False)

- Q.9. If two squares are similar, then their sides are always equal. (True/False)
- Q.10. If the radii of two circles are 5cm and 7cm respectively. The circles are similar. (true/false)
- Q.11. The median in an equilateral triangle divides it into two triangles which are .....  
Similar but not right-angled/ Similar and right-angled
- Q.12. The areas of two similar triangles are in the ratio 4:9, then the ratio of their any two corresponding sides is:  
a) 4:9  
b) 2:3  
c) 16:81  
d) 1:2
- Q.13. The area of two similar triangles is  $100\text{cm}^2$  and  $200\text{cm}^2$ . If one side of triangle having area  $100\text{cm}^2$  is 10cm, then the corresponding side in second triangle is:  
a) 10cm  
b) 15cm  
c) 20cm  
d) Cannot be found

- Q.14. Two triangles of equal area will always be similar.  
(true/False)
- Q.15 Two triangles of equal area will always be congruent.  
(true/false)
- Q.16. Two similar triangles are always equal in area.  
(true/false)
- Q.17. Two congruent triangles are always equal in area.  
(true/false)
- Q.18. Two rectangles having one corresponding side same  
are always similar. (True/False)
- Q.19. Two right-angled triangles are always similar.  
(true/False)
- Q.20. If the ratio of corresponding sides of two triangles is  
equal, then the triangles are .....  
(Similar/Congruent)
- Q.21. Sides of  $\Delta ABC$  are 3cm, 4cm and 5cm. Sides of  $\Delta PQR$   
are 6cm, 8cm and 10cm. Then  $\Delta ABC$  and  $\Delta PQR$  are:  
(Similar/Congruent)

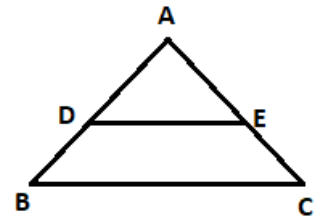
### Very Short Answer Type Questions

- Q.1. Draw a triangle ABC and draw another line segment DE  $\parallel$  BC
- Q.2. The ratio of the areas of two similar triangles .....  
(complete the statement of the theorem)
- Q.3. Find the hypotenus of a right-angled triangle which has other two sides are 3cm and 4cm.
- Q.4. Draw a triangle PQR in which ST is a line segment joining the mid points of the sides PQ and PR. Observe of the line segment ST is parallel to QR
- Q.5. If the ratio of the areas of two similar triangles is 4:9, show that the ratio of their any two corresponding pairs of sides is 2:3.
- Q.6. Take a rectangular paper. Fold it along any of the diagonal. Check if the folded parts superimpose each other.
- Q.7. Draw a rhombus and its two diagonals. Observe if the diagonals are perpendicular to each other.

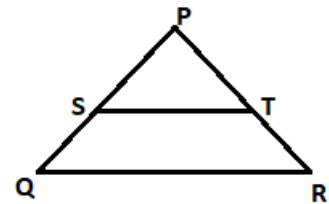
- Q.8. Give the names of any three pairs of objects available in your home which are similar but not congruent.
- Q.9. Give the names of any three pairs of objects available in your home which are similar as well as congruent.
- Q.10. Give the names of any three pairs of objects available in your home which are neither similar nor congruent.
- Q.11. categorise the given objects as similar or congruent or else:
- (a) A pair of spoons of same size and same shape
  - (b) A pair of papers from the same book
  - (c) A pair of shoes
  - (d) A pair of cylindrical mugs of different size
- Q.12. Draw two triangles which are similar but not congruent.
- Q.13. Draw two circles which are congruent as well as similar
- Q.14. Draw two circles which similar but not congruent.
- Q.15. Are all rhombuses similar? If so, draw a pair of rhombuses which are congruent as well similar.

## Short Answer Type Questions

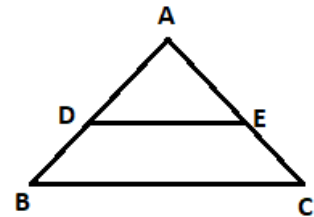
- Q.1. In the given figure,  $DE \parallel BC$ ,  $AD=2$ ,  $BD=2.5$  and  $AE=3$ , find  $EC$



- Q.2. If  $PQ = 4\text{cm}$ ,  $PT = 6\text{cm}$ ,  $QS = 4\text{cm}$  and  $TR = 6\text{cm}$ , Prove that  $ST \parallel QR$

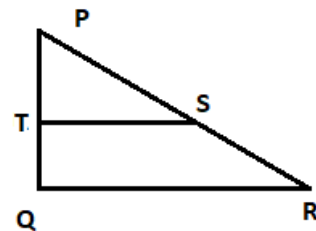


- Q.3.  $\triangle ABC$  is isosceles with  $AD = 5\text{cm}$ ,  $BD = 4\text{cm}$ . Find  $AE$  and  $EC$  when  $DE \parallel BC$



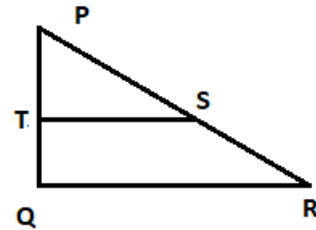
- Q.4. Prove that the line segment from the common vertex of equal sides of a triangle divides the triangle into congruent triangles.

- Q.5. In  $\triangle PQR$ ,  $ST \parallel QR$ ,  $PT = TQ = 3\text{cm}$ ,  $PS = 6\text{cm}$ , Find  $TR$ .



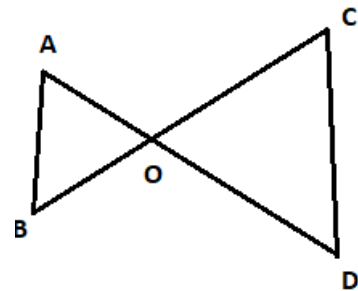


- Q.6. In the given figure, if  $PT=TQ=4\text{cm}$ ,  
 $PS = SR= 8\text{cm}$ , prove that  $TS \parallel QR$



- Q.7. The angles of  $\triangle ABC$ ,  $\angle A=60^\circ$ ,  $\angle B=90^\circ$  and  $\angle C=30^\circ$ . In  $\triangle PQR$ ,  $\angle P=30^\circ$ ,  $\angle Q=90^\circ$ ,  $\angle R= 30^\circ$ . Show that:  $\frac{AC}{RP} = \frac{BC}{PQ} = \frac{AB}{RQ}$

- Q.8. In the given figure, if  $AB \parallel CD$ ,  
 prove that  $\triangle ABO \simeq \triangle DOC$

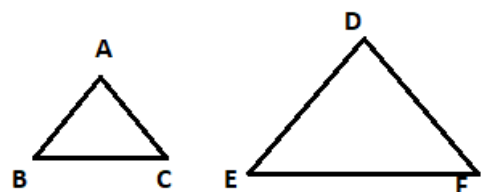


- Q.9. In the figure given in Q.8, if  $\angle B=\angle C$ , prove that  $\triangle ABO \simeq \triangle DOC$

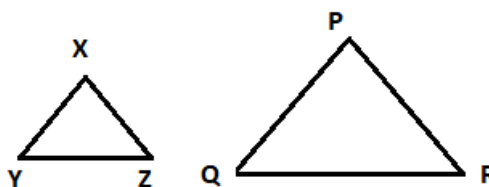
- Q.10. Prove that the median in an isosceles triangle divide it into two similar triangles.

- Q.11. If perpendicular in a triangle bisects the side of the triangle, prove that the triangle is isosceles.

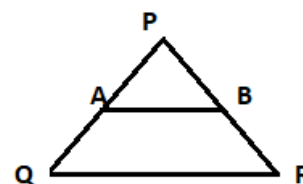
- Q.12. In the given figure,  $\triangle ABC \simeq \triangle DEF$ . If  $ar\triangle ABC = 81\text{cm}^2$   
 and  $ar\triangle DEF = 256\text{cm}^2$ .  
 Find DE when  $AB=9\text{cm}$



- Q.13.  $\Delta XYZ$  and  $\Delta PQR$  are two equilateral triangles. If  $ar\Delta XYZ = 4\sqrt{3}cm^2$  and side of the  $\Delta PQR$  is 6cm, find the side of  $\Delta XYZ$  and  $ar\Delta PQR$



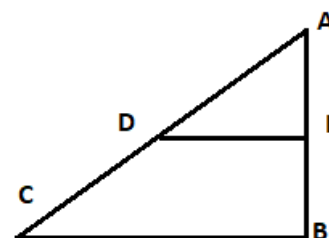
- Q.14. In the given triangle  $AB \parallel QR$ . If  $ar\Delta PAB = ar(ABRQ)$  and  $AP = 5cm$ , find  $AQ$



- Q.15. The hypotenus and one of the other two sides of a right-angled triangle are 15cm and 9cm, find the third side.

- Q.16.  $\Delta ABC$  is right-angled at  $\angle B$ . If  $DE \parallel BC$ , prove that:

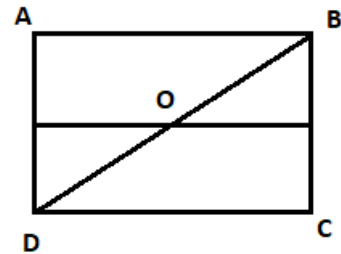
$$DE^2 + AE^2 = BC^2 + AC^2$$



- Q.17. Two trees (A) and (B) are of height 21m and 12m respectively. Shows that:  $\frac{\text{Shadow of tree (A)}}{\text{Shadow of tree (B)}} = \frac{7}{4}$
- Q.18. If the areas of two similar right-angled triangles are  $81\text{cm}^2$  and  $225\text{cm}^2$ , show that ratio of their hypotenus is 3:5

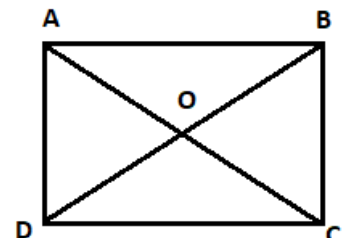
### Long Answer Type Questions

- Q.1. ABCD is a rectangle. If  $EF \parallel DC$ , prove that  $EO=OF$  and  $DO=OB$

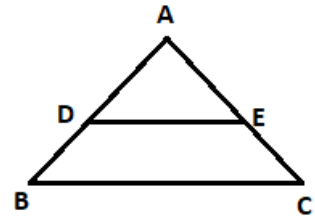


- Q.2. Prove that the diagonal of a parallelogram divides it into two triangles which are similar as well congruent.
- Q.3. Prove that a square is divided into congruent as well similar triangles by any of the diagonal.

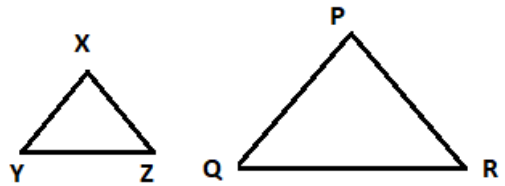
- Q.4. ABCD is a rectangle. AC and BD are the diagonals which intersect each other at point O. Prove that:
- I)  $\triangle AOB \simeq \triangle DOC$
- II)  $\triangle AOD \simeq \triangle BOC$



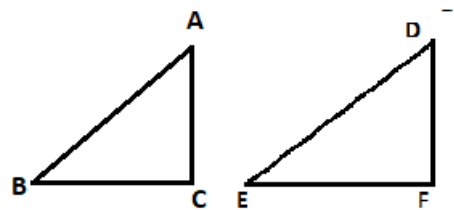
- Q.5. In the given figure,  $DE \parallel BC$ , find  $\angle ADE$ ,  $\angle AED$  and  $\angle A$  if  $\angle B=60$  and  $\angle C=65$



- Q.6. The area of  $\Delta XYZ = 25\text{cm}^2$  and  $\Delta PQR = 36\text{cm}^2$ . If  $XY=5\text{cm}$ ,  $YZ=10\text{cm}$  and  $XZ=2.5\text{cm}$ , find  $PQ$ ,  $QR$  and  $PR$

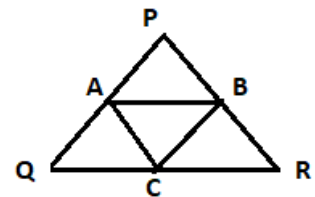


- Q.7.  $\Delta ABC \sim \Delta DEF$ ,  $\Delta ABC$  and  $\Delta DEF$  are right angled triangles right angled at  $\angle C$  and  $\angle F$  respectively. If  $ar\Delta ABC = ar\Delta DEF$  and  $BC = 3\text{cm}$ ,  $AC=4\text{cm}$ , find  $EF$ ,  $DF$ ,  $DE$



- Q.8. If the area of two similar triangles is equal, prove that they are congruent.

- Q.9. A, B, C are the mid points of the sides PQ, QR and PR of  $\Delta PQR$  respectively. Prove the  $ar\Delta ABC = \frac{1}{4}ar\Delta PQR$

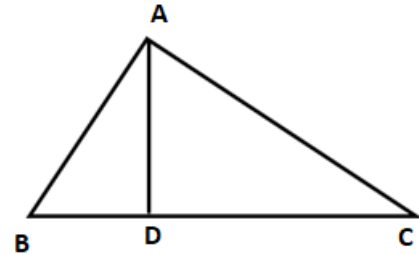


Q.10. Which one of the following triplets as the sides of triangle represent it as right-angled triangle?

(a) 5cm, 6cm, 7cm    (b) 6cm, 8cm, 10cm

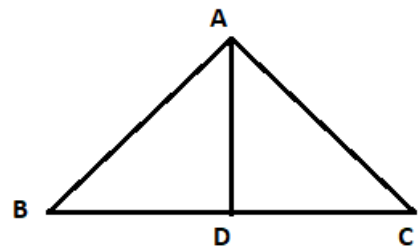
Q.11.  $\triangle ABC$  is right-angled at  $\angle A$ . If  $AD \perp BC$ , prove that

$$AD^2 = BD \cdot DC$$



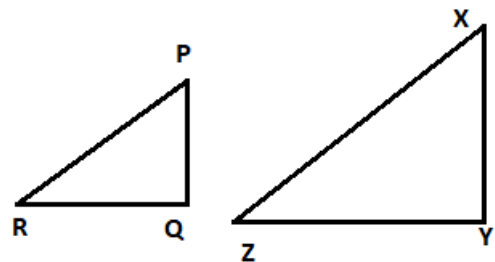
Q.12. In the given figure,  $\triangle ABC$  is right-angled at  $\angle A$ . If  $AD \perp BC$ , if  $BD=DC$ , prove that

$$AD = DC$$



Q.13. A 10m ladder is placed 6m away from the foot of a tree. If the top of the ladder touches at the one-third of the height of the tree. Find the height of the tree.

Q.14.  $\triangle PQR$  and  $\triangle XYZ$  are two right-angled similar triangles at  $\angle Q$  and  $\angle Y$  respectively. If the ratio of the areas of  $\triangle PQR$  to  $\triangle XYZ$  is  $\frac{1}{2}$ , Prove that  $2PR \cdot RQ = XZ \cdot YZ$



Q.15. A 20m high tree makes 15m shadow on the ground at a particular time. If another tree makes 12m shadow on the ground at the same time, find the height of the tree.

## **Answers**

### **Objective:**

Q1	(c)
Q2	(c)
Q3	(d)
Q4	(d)
Q5	(c)
Q6	Similar
Q7	Similar
Q8	True
Q9	false
Q10	True
Q11	Similar and right-angled
Q12	(b)
Q13	(c)
Q14	false
Q15	False
Q16	False
Q17	True
Q18	False
Q19	False
Q20	Similar
Q21	Similar

### Very Short Answer Type

- Q3            5cm
- Q4            Yes ST  $\parallel$  QR
- Q6            Yes, Superimpose each other
- Q7            Yes Perpendicular to each
- Q11           a) Congruent  
              b) Congruent  
              c) Not similar  
              d) May or may not be similar
- Q15           Yes

### Short Answer Type

- Q1            EC=3.7cm
- Q3            AE=5cm,    EC=4cm
- Q5            TR=6cm
- Q12           DE =14cm
- Q13           4cm and  $9\sqrt{3}cm^2$
- Q14           AQ=  $5(\sqrt{2} - 1)cm$
- Q15           12cm

### Long Answer Type

- Q5             $\angle AED = 60$   
               $\angle AFE = 65$   
               $\angle A = 55$
- Q6            PQ=6cm, QR = 12cm, PR = 3cm
- Q7.           EF = 3cm. DF =4cm, DE = 5cm
- Q10           (b)
- Q13           24cm
- Q15           16cm