NCERT Solutions for Class 10 Maths Chapter 6 Exercise 6.4: Chapter 6 of Class 10 Maths, "Triangles," explores the concept of similarity and its applications. Exercise 6.4 focuses on problems involving the Pythagoras Theorem and its converse, highlighting their practical applications in solving geometric problems.

Students learn to prove relationships between the sides of right-angled triangles and use these relationships to calculate unknown lengths. The exercise reinforces the foundational importance of the Pythagoras Theorem, which has significant real-world applications in fields like construction, navigation, and design. By solving these problems, students enhance their analytical skills and develop a deeper understanding of the geometric principles that are essential for advanced mathematics.

NCERT Solutions for Class 10 Maths Chapter 6 Exercise 6.4 Overview

NCERT Solutions for Class 10 Maths Chapter 6 Exercise 6.4, "Triangles," focus on the Pythagoras Theorem and its converse, emphasizing their practical applications. This exercise is crucial as it builds a strong foundation in understanding right-angled triangles, which is essential for advanced topics in trigonometry, physics, and engineering.

The problems help students develop logical reasoning and problem-solving skills by applying the theorem to real-world scenarios. Mastery of these concepts is important not only for academic success but also for competitive exams. The solutions provide clarity, enabling students to approach complex problems with confidence.

NCERT Solutions for Class 10 Maths Chapter 6 Exercise 6.4 Triangles

Below is the NCERT Solutions for Class 10 Maths Chapter 6 Exercise 6.4 Triangles -

1. Let ΔABC ~ ΔDEF and their areas be, respectively, 64 cm^2 and 121 cm^2. If EF = 15.4 cm, find BC.

Solution: Given, ΔABC ~ ΔDEF,

Area of ΔABC = 64 cm^2

Area of ΔDEF = 121 cm^2

EF = 15.4 cm

$$\therefore \frac{Area\ of\ \Delta ABC}{Area\ of\ \Delta DEF} = \frac{AB^2}{DE^2}$$

As we know, if two triangles are similar, the ratio of their areas is equal to the square of the ratio of their corresponding sides.

$= AC^2/DF^2 = BC^2/EF^2$

$\therefore$ $64/121 = BC^2/EF^2$

$\Rightarrow (8/11)^2 = (BC/15.4)^2$

$\Rightarrow 8/11 = BC/15.4$

$\Rightarrow BC = 8\times15.4/11$

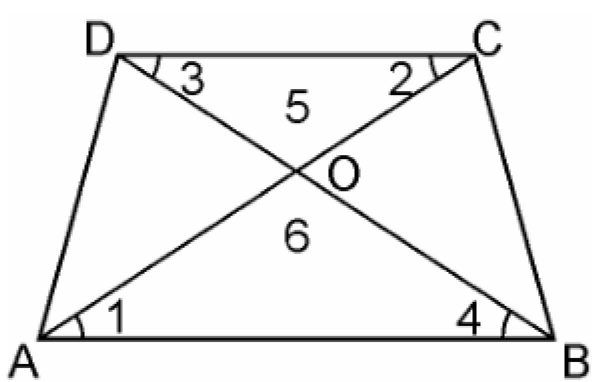
$\Rightarrow BC = 8 \times 1.4$

$\Rightarrow BC = 11.2$ cm

2. Diagonals of a trapezium ABCD with AB || DC intersect each other at the point O. If AB = 2CD, find the ratio of the areas of triangles AOB and COD.

Solution:

Given, ABCD is a trapezium with AB || DC. Diagonals AC and BD intersect each other at point O.



In ΔAOB and ΔCOD, we have

$\angle 1 = \angle 2$ (Alternate angles)

$\angle 3 = \angle 4$ (Alternate angles)

$\angle 5 = \angle 6$ (Vertically opposite angle)

∴ ΔAOB ~ ΔCOD [AAA similarity criterion]

As we know, if two triangles are similar, then the ratio of their areas is equal to the square of the ratio of their corresponding sides. Therefore,

Area of (ΔAOB)/Area of (ΔCOD) = AB^2/CD^2

= $(2CD)^2/CD^2$ [∴ AB = 2CD]

∴ Area of (ΔAOB)/Area of (ΔCOD)

= $4CD^2/CD^2$ = 4/1

Hence, the required ratio of the area of ΔAOB and ΔCOD = 4:1

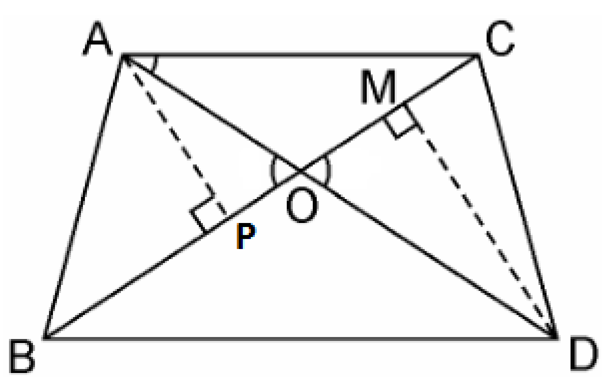
3. In the figure, ABC and DBC are two triangles on the same base BC. If AD intersects BC at O, show that area (ΔABC)/area (ΔDBC) = AO/DO.

Solution:

Given, ABC and DBC are two triangles on the same base BC. AD intersects BC at O.

We have to prove: Area (ΔABC)/Area (ΔDBC) = AO/DO

Let us draw two perpendiculars, AP and DM, on line BC.



We know that area of a triangle = 1/2 × Base × Height

$$\therefore \frac{ar(\Delta ABC)}{ar(\Delta DEF)} = \frac{\frac{1}{2} BC \times AP}{\frac{1}{2} BC \times DM} = \frac{AP}{DM}$$

In ΔAPO and ΔDMO,

∠APO = ∠DMO (Each 90°)

∠AOP = ∠DOM (Vertically opposite angles)

∴ ΔAPO ~ ΔDMO (AA similarity criterion)

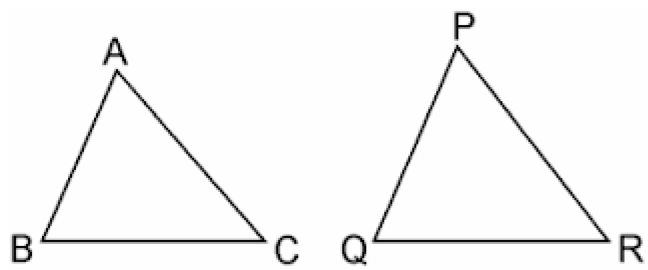
∴ AP/DM = AO/DO

⇒ Area (ΔABC)/Area (ΔDBC) = AO/DO

4. If the areas of two similar triangles are equal, prove that they are congruent.

Solution:

Say, ΔABC and ΔPQR are two similar triangles and equal in area.



Now, let us prove ΔABC ≅ ΔPQR

ΔABC ~ ΔPQR

∴ Area of (ΔABC)/Area of (ΔPQR) = BC^2/QR^2

⇒ BC^2/QR^2 =1 [Since, Area(ΔABC) = (ΔPQR)

⇒ BC^2/QR^2

⇒ BC = QR

Similarly, we can prove that

AB = PQ and AC = PR

Thus, ΔABC ≅ ΔPQR [SSS criterion of congruence]

5. D, E and F are, respectively, the mid-points of sides AB, BC and CA of ΔABC. Find the ratio of the area of ΔDEF and ΔABC.

Solution:

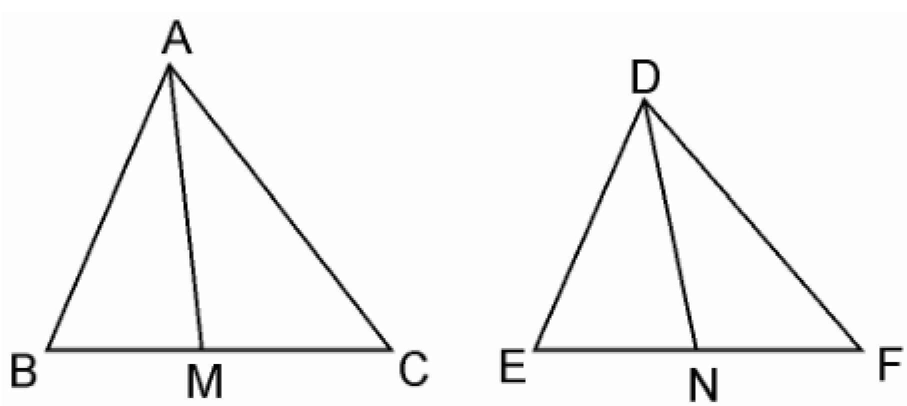
D, E, and F are the mid-points of ΔABC.

∴ DE || AC and
DE = (1/2) AC (Mid-point theorem) …. (1)
In ΔBED and ΔBCA,
∠BED = ∠BCA (Corresponding angles)
∠BDE = ∠BAC (Corresponding angles)
∠EBD = ∠CBA (Common angles)
∴ΔBED~ΔBCA (AAA similarity criterion)
ar (ΔBED) / ar (ΔBCA)=$(DE/AC)^2$
⇒ar (ΔBED) / ar (ΔBCA) = (1/4) [From (1)]
⇒ar (ΔBED) = (1/4) ar (ΔBCA)
Similarly,
ar (ΔCFE) = (1/4) ar (CBA) and ar (ΔADF) = (1/4) ar (ΔADF) = (1/4) ar (ΔABC)
Also,
ar (ΔDEF) = ar (ΔABC) − [ar (ΔBED) + ar (ΔCFE) + ar (ΔADF)]
⇒ar (ΔDEF) = ar (ΔABC) − (3/4) ar (ΔABC) = (1/4) ar (ΔABC)
⇒ar (ΔDEF) / ar (ΔABC) = (1/4)

6. Prove that the ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding medians.

Solution:

Given: AM and DN are the medians of triangles ABC and DEF, respectively and ΔABC ~ ΔDEF.



We have to prove: Area(ΔABC)/Area(ΔDEF) = AM^2/DN^2

Since, ΔABC ~ ΔDEF (Given)

∴ Area(ΔABC)/Area(ΔDEF) = (AB^2/DE^2) ……………………………**(i)**

and, AB/DE = BC/EF = CA/FD ………………………………………**(ii)**

$$\Rightarrow \frac{AB}{DE} = \frac{\frac{1}{2}BC}{\frac{1}{2}EF} = \frac{CD}{FD}$$

In ΔABM and ΔDEN,

Since ΔABC ~ ΔDEF

∴ ∠B = ∠E

AB/DE = BM/EN [Already proved in equation **(i)**]

∴ ΔABC ~ ΔDEF [SAS similarity criterion]

⇒ AB/DE = AM/DN …………………………………………………..**(iii)**

∴ ΔABM ~ ΔDEN

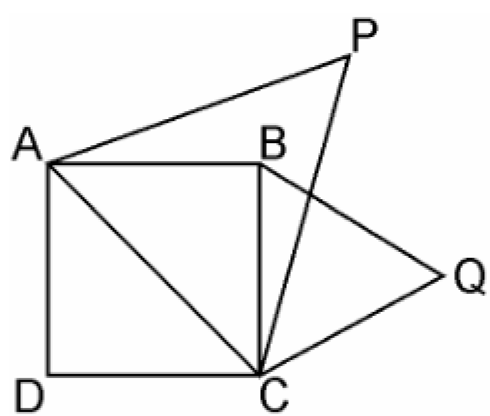
The areas of two similar triangles are proportional to the squares of the corresponding sides.

∴ area(ΔABC)/area(ΔDEF) = $AB^2/DE^2 = AM^2/DN^2$

Hence, proved.

7. Prove that the area of an equilateral triangle described on one side of a square is equal to half the area of the equilateral triangle described on one of its diagonals.

Solution:



Given, ABCD is a square whose one diagonal is AC. ΔAPC and ΔBQC are two equilateral triangles described on the diagonals AC and side BC of the square ABCD.

Area(ΔBQC) = ½ Area(ΔAPC)

ΔAPC and ΔBQC are both equilateral triangles,

∴ ΔAPC ~ ΔBQC [AAA similarity criterion]

∴ area(ΔAPC)/area(ΔBQC) = $(AC^2/BC^2) = AC^2/BC^2$

Since, Diagonal = √2 side = √2 BC = AC

$$\left(\frac{\sqrt{2}BC}{BC}\right)^2 = 2$$

⇒ area(ΔAPC) = 2 × area(ΔBQC)

⇒ area(ΔBQC) = 1/2area(ΔAPC)

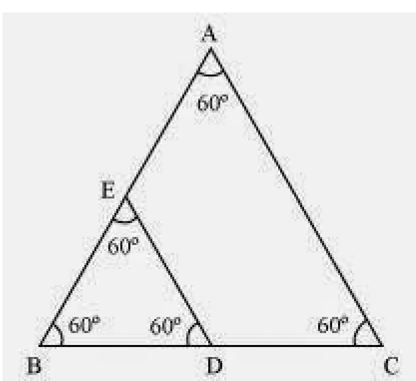
Hence, proved.

Tick the correct answer and justify.

8. ABC and BDE are two equilateral triangles, such that D is the mid-point of BC. The ratio of the area of triangles ABC and BDE is
(A) 2:1
(B) 1:2
(C) 4:1
(D) 1:4

Solution:

Given**,** ΔABC and ΔBDE are two equilateral triangles. D is the midpoint of BC.



∴ BD = DC = 1/2BC

Let each side of the triangle be 2*a*.

ΔABC ~ ΔBDE

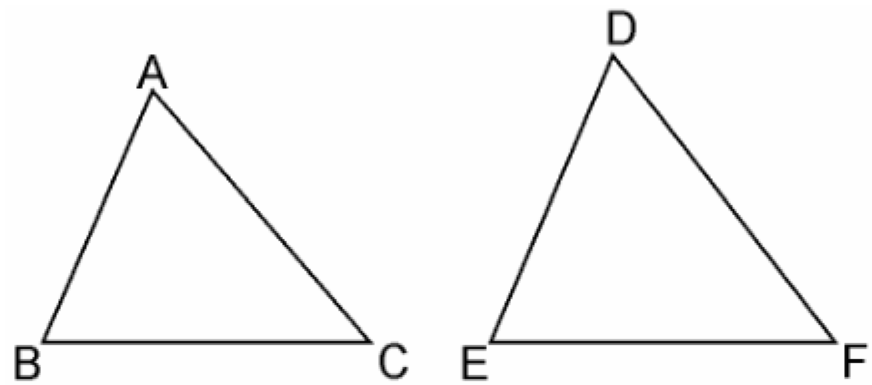
∴ Area(ΔABC)/Area(ΔBDE) = $AB^2/BD^2 = (2a)^2/(a)^2 = 4a^2/a^2$ = 4/1 = 4:1

Hence, the correct answer is (C).

9. Sides of two similar triangles are in the ratio 4:9. Areas of these triangles are in the ratio
(A) 2:3
(B) 4:9
(C) 81:16
(D) 16:81

Solution:

Given, the sides of two similar triangles are in the ratio 4:9.



Let ABC and DEF be two similar triangles, such that,

ΔABC ~ ΔDEF

And AB/DE = AC/DF = BC/EF = 4/9

The ratio of the areas of these triangles will be equal to the square of the ratio of the corresponding sides.

∴ Area(ΔABC)/Area(ΔDEF) = AB^2/DE^2

∴ Area(ΔABC)/Area(ΔDEF) = $(4/9)^2$ = 16/81 = 16:81

Hence, the correct answer is (D).

Benefits of Using NCERT Solutions for Class 10 Maths Chapter 6 Exercise 6.4 Triangles

Concept Clarity: Provides clear explanations of the Pythagoras Theorem and its converse, enhancing understanding.

Step-by-Step Guidance: Offers detailed, step-by-step solutions, making it easier for students to follow and learn.

Practical Application: Helps students solve real-world problems involving right-angled triangles, building practical knowledge.

Exam Preparedness: Focuses on key concepts frequently tested in board exams, improving performance.

Competitive Edge: Strengthens foundational knowledge useful for competitive exams.

Confidence Building: Simplifies complex problems, boosting confidence and problem-solving abilities.