NCERT Solutions for Class 10 Maths Chapter 6 Exercise 6.6: Chapter 6 of Class 10 Maths, "Triangles," explores the properties and theorems related to triangles. Exercise 6.6 focuses on applying the concept of similar triangles and the Pythagoras theorem in various scenarios.

This exercise emphasizes problem-solving skills by requiring students to prove results or calculate specific values using triangle similarity criteria. Students will tackle questions involving perpendiculars, medians, and proportionality relationships. The problems are designed to enhance analytical reasoning and a clear understanding of geometric principles. Mastery of this exercise is crucial for building a solid foundation for geometry-related problems in advanced studies.

NCERT Solutions for Class 10 Maths Chapter 6 Exercise 6.6 Overview

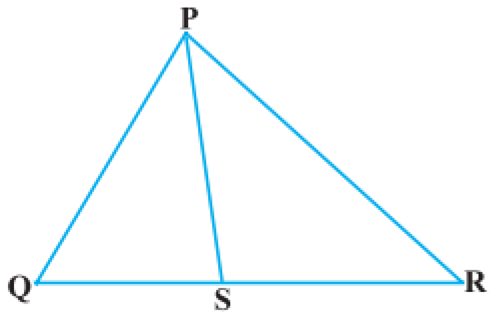
NCERT Solutions for Class 10 Maths Chapter 6, Exercise 6.6, emphasize the importance of understanding the Pythagoras theorem and its applications in proving geometric relationships. This exercise helps students strengthen their grasp of triangle similarity concepts and proportionality rules, essential for solving real-life problems and advanced geometry topics.

By practicing these problems, students develop logical reasoning and problem-solving skills, laying a strong foundation for competitive exams. Mastering this exercise enhances spatial understanding and mathematical rigor, making it a critical step in comprehending geometric theorems and their practical relevance in engineering, architecture, and higher-level mathematics.

NCERT Solutions for Class 10 Maths Chapter 6 Exercise 6.6 Triangles

Below is the NCERT Solutions for Class 10 Maths Chapter 6 Exercise 6.6 -

1. In Figure, PS is the bisector of ∠ QPR of Δ PQR. Prove that QS/PQ = SR/PR



Solution:

Let us draw a line segment RT parallel to SP which intersects extended line segment QP at point T.

Given, PS is the angle bisector of ∠QPR. Therefore,

∠QPS = ∠SPR……………………………..(i)

As per the constructed figure,

∠SPR=∠PRT(Since, PS||TR)……………(ii)

∠QPS = ∠QRT(Since, PS||TR) …………..(iii)

From the above equations, we get,

∠PRT=∠QTR

Therefore,

PT=PR

In △QTR, by basic proportionality theorem,

QS/SR = QP/PT

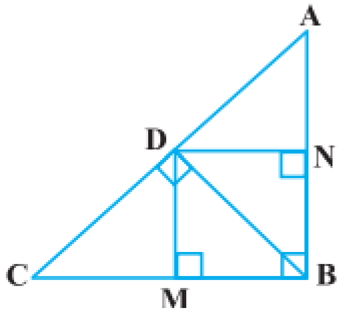
Since, PT=TR

Therefore,

QS/SR = PQ/PR

Hence, proved.

2. In Fig. 6.57, D is a point on hypotenuse AC of ∆ABC, such that BD ⊥AC, DM ⊥ BC and DN ⊥ AB. Prove that: (i) DM^2 = DN . MC (ii) DN^2 = DM . AN.



Solution:

1. Let us join Point D and B.

Given,

BD ⊥AC, DM ⊥ BC and DN ⊥ AB

Now from the figure we have,

DN || CB, DM || AB and ∠B = 90 °

Therefore, DMBN is a rectangle.

So, DN = MB and DM = NB

The given condition which we have to prove, is when D is the foot of the perpendicular drawn from B to AC.

∴ ∠CDB = 90° ⇒ ∠2 + ∠3 = 90° ……………………. (i)

In ∆CDM, ∠1 + ∠2 + ∠DMC = 180°

⇒ ∠1 + ∠2 = 90° …………………………………….. (ii)

In ∆DMB, ∠3 + ∠DMB + ∠4 = 180°

⇒ ∠3 + ∠4 = 90° …………………………………….. (iii)

From equation (i) and (ii), we get

∠1 = ∠3

From equation (i) and (iii), we get

∠2 = ∠4

In ∆DCM and ∆BDM,

∠1 = ∠3 (Already Proved)

∠2 = ∠4 (Already Proved)

∴ ∆DCM ~ ∆BDM (AA similarity criterion)

BM/DM = DM/MC

DN/DM = DM/MC (BM = DN)

⇒ $DM^2 = DN \times MC$

Hence, proved.

(ii) In right triangle DBN,

∠5 + ∠7 = 90° ……………….. (iv)

In right triangle DAN,

∠6 + ∠8 = 90° ………………… (v)

D is the point in triangle, which is foot of the perpendicular drawn from B to AC.

∴ ∠ADB = 90° ⇒ ∠5 + ∠6 = 90° ………….. (vi)

From equation (iv) and (vi), we get,

∠6 = ∠7

From equation (v) and (vi), we get,

∠8 = ∠5

In ∆DNA and ∆BND,

∠6 = ∠7 (Already proved)

∠8 = ∠5 (Already proved)

∴ ∆DNA ~ ∆BND (AA similarity criterion)

AN/DN = DN/NB

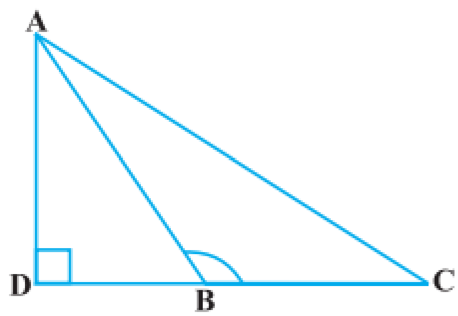
⇒ $DN^2 = AN \times NB$

⇒ $DN^2 = AN \times DM$ (Since, NB = DM)

Hence, proved.

3. In Figure, ABC is a triangle in which ∠ABC > 90° and AD ⊥ CB produced. Prove that

$AC^2 = AB^2 + BC^2 + 2\ BC.BD$.



Solution:

By applying Pythagoras Theorem in ∆ADB, we get,

$AB^2 = AD^2 + DB^2$ ……………………… (i)

Again, by applying Pythagoras Theorem in ∆ACD, we get,

$AC^2 = AD^2 + DC^2$

$AC^2 = AD^2 + (DB + BC)^2$

$AC^2 = AD^2 + DB^2 + BC^2 + 2DB \times BC$

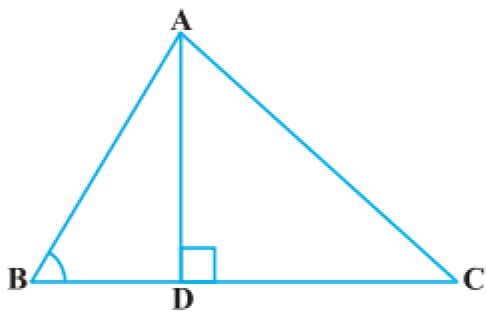
From equation (i), we can write,

$AC^2 = AB^2 + BC^2 + 2DB \times BC$

Hence, proved.

4. In Figure, ABC is a triangle in which ∠ ABC < 90° and AD ⊥ BC. Prove that

$AC^2 = AB^2 + BC^2 - 2\ BC.BD$.



Solution:

By applying Pythagoras Theorem in ∆ADB, we get,

$AB^2 = AD^2 + DB^2$

We can write it as;

$\Rightarrow AD^2 = AB^2 - DB^2$ ……………….. (i)

By applying Pythagoras Theorem in ∆ADC, we get,

$AD^2 + DC^2 = AC^2$

From equation (i),

$AB^2 - BD^2 + DC^2 = AC^2$

$AB^2 - BD^2 + (BC - BD)^2 = AC^2$

$AC^2 = AB^2 - BD^2 + BC^2 + BD^2 - 2BC \times BD$

$AC^2 = AB^2 + BC^2 - 2BC \times BD$

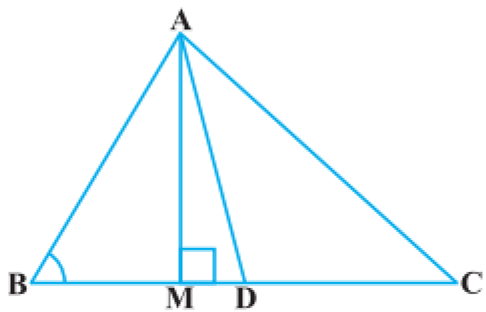
Hence, proved.

5. In Figure, AD is a median of a triangle ABC and AM ⊥ BC. Prove that :

(i) $AC^2 = AD^2 + BC.DM + 2(BC/2)^2$

(ii) $AB^2 = AD^2 - BC.DM + 2(BC/2)^2$

(iii) $AC^2 + AB^2 = 2AD^2 + ½BC^2$



Solution:

(i) By applying Pythagoras Theorem in ∆AMD, we get,

$AM^2 + MD^2 = AD^2$ ………………. (i)

Again, by applying Pythagoras Theorem in ∆AMC, we get,

$AM^2 + MC^2 = AC^2$

$AM^2 + (MD + DC)^2 = AC^2$

$(AM^2 + MD^2) + DC^2 + 2MD.DC = AC^2$

From equation(i), we get,

$AD^2 + DC^2 + 2MD.DC = AC^2$

Since, DC=BC/2, thus, we get,

$AD^2 + (BC/2)^2 + 2MD.(BC/2)^2 = AC^2$

$AD^2 + (BC/2)^2 + 2MD \times BC = AC^2$

Hence, proved.

(ii) By applying Pythagoras Theorem in ∆ABM, we get;

$AB^2 = AM^2 + MB^2$

$= (AD^2 - DM^2) + MB^2$

$= (AD^2 - DM^2) + (BD - MD)^2$

$= AD^2 - DM^2 + BD^2 + MD^2 - 2BD \times MD$

$= AD^2 + BD^2 - 2BD \times MD$

$= AD^2 + (BC/2)^2 – 2(BC/2)\ MD$

$= AD^2 + (BC/2)^2 – BC\ MD$

Hence, proved.

(iii) By applying Pythagoras Theorem in ∆ABM, we get,

$AM^2 + MB^2 = AB^2$ ……………………. (i)

By applying Pythagoras Theorem in ∆AMC, we get,

$AM^2 + MC^2 = AC^2$ …………………..… (ii)

Adding both the equations (i) and (ii), we get,

$2AM^2 + MB^2 + MC^2 = AB^2 + AC^2$

$2AM^2 + (BD − DM)^2 + (MD + DC)^2 = AB^2 + AC^2$

$2AM^2+BD^2 + DM^2 − 2BD.DM + MD^2 + DC^2 + 2MD.DC = AB^2 + AC^2$

$2AM^2 + 2MD^2 + BD^2 + DC^2 + 2MD (− BD + DC) = AB^2 + AC^2$

$2(AM^2+ MD^2) + (BC/2)^2 + (BC/2)^2 + 2MD (-BC/2 + BC/2)^2 = AB^2 + AC^2$

$2AD^2 + BC^2/2 = AB^2 + AC^2$

6. Prove that the sum of the squares of the diagonals of parallelogram is equal to the sum of the squares of its sides.

Solution:

Let us consider, ABCD be a parallelogram. Now, draw perpendicular DE on extended side of AB, and draw a perpendicular AF meeting DC at point F.

By applying Pythagoras Theorem in ∆DEA, we get,

$DE^2 + EA^2 = DA^2$ …………………. (i)

By applying Pythagoras Theorem in ∆DEB, we get,

$DE^2 + EB^2 = DB^2$

$DE^2 + (EA + AB)^2 = DB^2$

$(DE^2 + EA^2) + AB^2 + 2EA × AB = DB^2$

$DA^2 + AB^2 + 2EA \times AB = DB^2$ ……………. (ii)

By applying Pythagoras Theorem in $\triangle ADF$, we get,

$AD^2 = AF^2 + FD^2$

Again, applying Pythagoras theorem in $\triangle AFC$, we get,

$AC^2 = AF^2 + FC^2 = AF^2 + (DC - FD)^2$

$= AF^2 + DC^2 + FD^2 - 2DC \times FD$

$= (AF^2 + FD^2) + DC^2 - 2DC \times FD\ AC^2$

$AC^2 = AD^2 + DC^2 - 2DC \times FD$ ………………… (iii)

Since ABCD is a parallelogram,

AB = CD ………………..….(iv)

And BC = AD ………………. (v)

In $\triangle DEA$ and $\triangle ADF$,

$\angle DEA = \angle AFD$ (Each 90°)

$\angle EAD = \angle ADF$ (EA || DF)

AD = AD (Common Angles)

$\therefore \triangle EAD \cong \triangle FDA$ (AAS congruence criterion)

$\Rightarrow$ EA = DF ……………… (vi)

Adding equations (i) and (iii), we get,

$DA^2 + AB^2 + 2EA \times AB + AD^2 + DC^2 - 2DC \times FD = DB^2 + AC^2$

$DA^2 + AB^2 + AD^2 + DC^2 + 2EA \times AB - 2DC \times FD = DB^2 + AC^2$

From equation (iv) and (vi),

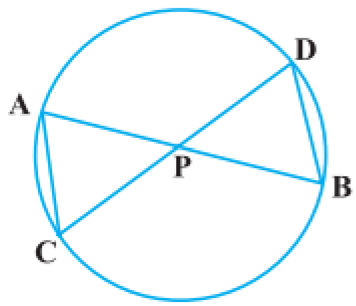
$BC^2 + AB^2 + AD^2 + DC^2 + 2EA \times AB - 2AB \times EA = DB^2 + AC^2$

$AB^2 + BC^2 + CD^2 + DA^2 = AC^2 + BD^2$

7. In Figure, two chords AB and CD intersect each other at the point P. Prove that :

(i) ΔAPC ~ Δ DPB

(ii) AP . PB = CP . DP



Solution:

Firstly, let us join CB, in the given figure.

(i) In ΔAPC and ΔDPB,

$\angle$APC = $\angle$DPB (Vertically opposite angles)

$\angle$CAP = $\angle$BDP (Angles in the same segment for chord CB)

Therefore,

ΔAPC ~ ΔDPB (AA similarity criterion)

(ii) In the above, we have proved that ΔAPC ~ ΔDPB

We know that the corresponding sides of similar triangles are proportional.

$\therefore$ AP/DP = PC/PB = CA/BD

$\Rightarrow$AP/DP = PC/PB

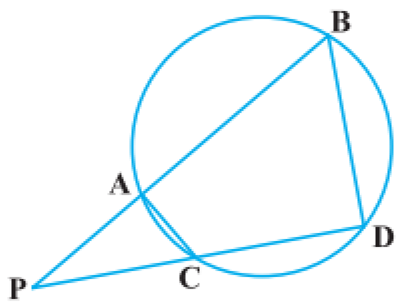
$\therefore$AP. PB = PC. DP

Hence, proved.

8. In Fig. 6.62, two chords AB and CD of a circle intersect each other at the point P (when produced) outside the circle. Prove that:

(i) Δ PAC ~ Δ PDB

(ii) PA . PB = PC . PD.



Solution:

(i) In ∆PAC and ∆PDB,

∠P = ∠P (Common Angles)

As we know, exterior angle of a cyclic quadrilateral is ∠PCA and ∠PBD is opposite interior angle, which are both equal.

∠PAC = ∠PDB

Thus, ∆PAC ~ ∆PDB(AA similarity criterion)

(ii) We have already proved above,

∆APC ~ ∆DPB

We know that the corresponding sides of similar triangles are proportional.

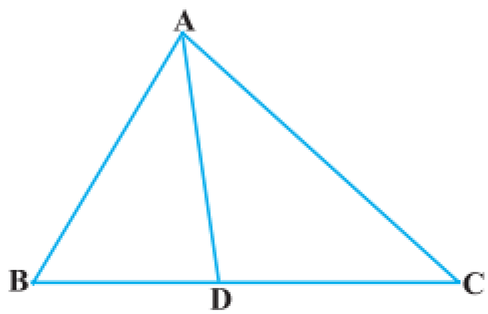
Therefore,

AP/DP = PC/PB = CA/BD

AP/DP = PC/PB

∴ AP. PB = PC. DP

9. In Figure, D is a point on side BC of ∆ ABC such that BD/CD = AB/AC. Prove that AD is the bisector of ∠ BAC.



Solution:

In the given figure, let us extend BA to P such that;

AP = AC.

Now join PC.

Given, BD/CD = AB/AC

⇒ BD/CD = AP/AC

By using the converse of basic proportionality theorem, we get,

AD || PC

∠BAD = ∠APC (Corresponding angles) ……………….. (i)

And, ∠DAC = ∠ACP (Alternate interior angles) ………. (ii)

By the new figure, we have;

AP = AC

⇒ ∠APC = ∠ACP …………………….. (iii)

On comparing equations (i), (ii), and (iii), we get,

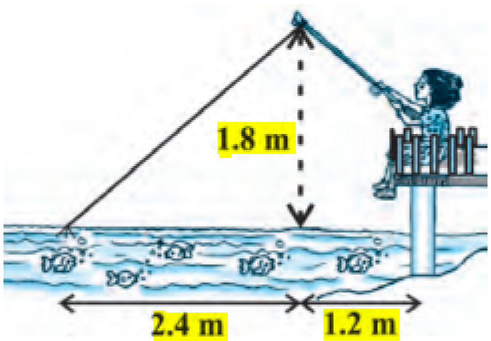
∠BAD = ∠APC

Therefore, AD is the bisector of the angle BAC.

Hence, proved.

10. Nazima is fly fishing in a stream. The tip of her fishing rod is 1.8 m above the surface of the water and the fly at the end of the string rests on the water 3.6 m away and 2.4 m from a point directly under the tip of the rod. Assuming that her string (from the tip of her rod to the fly) is taut, how much string does she have out (see Figure)? If she pulls in the

string at the rate of 5 cm per second, what will be the horizontal distance of the fly from her after 12 seconds?



Solution:

Let us consider, AB is the height of the tip of the fishing rod from the water surface and BC is the

horizontal distance of the fly from the tip of the fishing rod. Therefore, AC is now the length of the string.

To find AC, we have to use Pythagoras theorem in $\triangle ABC$, is such way;

$AC^2 = AB^2 + BC^2$

$AB^2 = (1.8\ m)^2 + (2.4\ m)^2$

$AB^2 = (3.24 + 5.76)\ m^2$

$AB^2 = 9.00\ m^2$

$\Rightarrow AB = \sqrt{9}\ m = 3m$

Thus, the length of the string out is 3 m.

As its given, she pulls the string at the rate of 5 cm per second.

Therefore, string pulled in 12 seconds = 12 × 5 = 60 cm = 0.6 m

Let us say now, the fly is at point D after 12 seconds.

Length of string out after 12 seconds is AD.

AD = AC − String pulled by Nazima in 12 seconds

= (3.00 − 0.6) m

= 2.4 m

In ∆ADB, by Pythagoras Theorem,

$AB^2 + BD^2 = AD^2$

$(1.8 \text{ m})^2 + BD^2 = (2.4 \text{ m})^2$

$BD^2 = (5.76 - 3.24) \text{ m}^2 = 2.52 \text{ m}^2$

BD = 1.587 m

Horizontal distance of the fly = BD + 1.2 m

= (1.587 + 1.2) m = 2.787 m

= 2.79 m

Benefits of Using NCERT Solutions for Class 10 Maths Chapter 6 Exercise 6.6

Clarity in Concepts: Step-by-step explanations simplify complex problems, enhancing understanding of triangle similarity and the Pythagoras theorem.

Time Management: Practicing with structured solutions helps students solve problems efficiently during exams.

Exam Preparedness: NCERT solutions align with the CBSE curriculum, covering essential questions often asked in exams.

Logical Reasoning: Solutions improve analytical skills by emphasizing the reasoning behind geometric proofs.

Self-Paced Learning: Students can practice at their own pace, revisiting tricky concepts as needed.

Competitive Exam Readiness: Builds a foundation for geometry questions in exams.