NCERT Solutions Class 9 Maths
Chapter 7: Triangles
EXERCISE 7.3

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Quick Summary: In NCERT Solutions Class 9 Maths Chapter 7 Exercise 7.3, students learn advanced properties of triangles through congruence proofs and isosceles triangle theorems. This exercise covers triangle congruence criteria (SAS, ASA, SSS, RHS) and angle-side relationships which are essential for building strong geometry foundations required in CBSE board exams and competitive tests.

Key Takeaways:

- Master all four congruence criteria: SSS (Side-Side-Side), SAS (Side-Angle-Side), ASA (Angle-Side-Angle), and RHS (Right angle-Hypotenuse-Side)
- In isosceles triangles, if AB = AC, then base angles are equal: \angle B = \angle C
- Learn to prove triangle congruence using given conditions about sides, angles, and medians step-by-step
- Apply angle-side inequalities and properties of equal triangles to solve complex geometry problems for CBSE exams

Complete Solutions

Question 1

QUESTION

\triangle ABC and \triangle DBC are two isosceles triangles on the same base BC and vertices A and D are on the same side of BC. If AD is extended to intersect BC at P, show that (i) \triangle ABD \cong \triangle ACD, (ii) \triangle ABP \cong \triangle ACP, (iii) AP bisects \angle A as well as \angle D, (iv) AP is the perpendicular bisector of BC.

SOLUTION

This question involves proving congruence of triangles and properties of isosceles triangles to show that bisects angles and , and is the perpendicular bisector of .

(i)

Step 1: Identify the given information

Since and are isosceles triangles on the same base , we have:

(Sides of isosceles)

(Sides of isosceles)

(Common side)

Step 2: Apply SSS congruence rule

By the SSS (Side-Side-Side) congruence rule, if three sides of one triangle are equal to the three sides of another triangle, then the two triangles are congruent.

Therefore, .

(ii)

Step 1: Use the result from part (i)

Since , we have (CPCT - Corresponding Parts of Congruent Triangles). This means bisects .

So, .

Step 2: Identify other equal parts

(Given, as is isosceles)

(Common side)

Step 3: Apply SAS congruence rule

By the SAS (Side-Angle-Side) congruence rule, if two sides and the included angle of one triangle are equal to the two sides and the included angle of another triangle, then the two triangles are congruent.

Therefore, .

(iii) bisects as well as

Step 1: bisection

As shown in part (ii), . Therefore, bisects .

Step 2: bisection

Since , we have (CPCT). This means bisects , and since is extended to , also bisects .

(iv) is the perpendicular bisector of

Step 1: Use the result from part (ii)

Since , we have (CPCT). This means is the midpoint of , and bisects .

Step 2: Show is perpendicular to

Also, since , we have (CPCT).

Since (Linear pair), we have , which implies .

Therefore, .

Step 3: Conclude

Since bisects and , is the perpendicular bisector of .

Question 2

QUESTION

AD is an altitude of an isosceles triangle ABC in which AB = AC. Show that (i) AD bisects BC, (ii) AD bisects \angle A.

SOLUTION

We are given an isosceles triangle with , and is an altitude. We need to prove that bisects and .

(i) Proving that bisects

Step 1: Identify the triangles to consider

Consider triangles and .

Step 2: State the given information

We know that (given), and (since is an altitude).

Step 3: Identify the common side

(common side).

Step 4: Apply the RHS congruence rule

By the RHS (Right-Hypotenuse-Side) congruence rule, .

Step 5: Use CPCT to prove bisection

Since the triangles are congruent, their corresponding parts are equal. Therefore, (by CPCT - Corresponding Parts of Congruent Triangles).

Step 6: Conclude

Since , bisects .

(ii) Proving that bisects

Step 1: Recall the congruent triangles

From part (i), we know that .

Step 2: Use CPCT to prove angle bisection

Since the triangles are congruent, their corresponding parts are equal. Therefore, (by CPCT).

Step 3: Conclude

Since , bisects .

Question 3

QUESTION

Two sides AB and BC and median AM of one triangle ABC are respectively equal to sides PQ and QR and median PN of \triangle PQR. Show that (i) \triangle ABM \cong \triangle PQN, (ii) \triangle ABC \cong \triangle PQR.

SOLUTION

This question involves proving the congruence of two triangles using the given information about their sides and medians. We'll use the Side-Side-Side (SSS) congruence rule and the Side-Angle-Side (SAS) congruence rule.

(i) Proving

Step 1: State the given information

We are given that , , and .

Step 2: Use the median property

Since is the median of , . Similarly, since is the median of , .

Step 3: Relate and

Since , we have . Therefore, .

Step 4: Apply SSS congruence rule

In and , we have:

(Given)

(Proved above)

(Given)

Therefore, by the SSS congruence rule, .

(ii) Proving

Step 1: Use the result from part (i)

Since , their corresponding angles are equal. Therefore, .

Step 2: Rewrite the angles

is the same as , and is the same as . So, .

Step 3: Apply SAS congruence rule

In and , we have:

(Given)

(Proved above)

(Given)

Therefore, by the SAS congruence rule, .

From (i),

ANSWER

From (i), \angle ABM = \angle PQN

Question 4

QUESTION

BE and CF are two equal altitudes of a triangle ABC. Using RHS congruence rule, prove that the triangle ABC is isosceles.

SOLUTION

This question requires us to prove that triangle is isosceles given that two of its altitudes, and , are equal. We will use the RHS (Right-Hypotenuse-Side) congruence rule to prove this.

Step 1: Draw the diagram and state the given information

Draw triangle with altitudes and , where and . We are given that .

Step 2: Identify the right-angled triangles

Consider triangles and . Both are right-angled triangles: .

Step 3: Apply the RHS congruence rule

We have:

- **Right angle:**
- **Hypotenuse:** (Common side)
- **Side:** (Given)

Therefore, by the RHS congruence rule, .

Step 4: Use CPCT (Corresponding Parts of Congruent Triangles)

Since , their corresponding parts are equal. Therefore, (CPCT).

Step 5: Relate the angles to the sides of the triangle

In triangle , is the same as and is the same as . So, we have , which means .

Step 6: Conclude that the triangle is isosceles

Since in triangle , the sides opposite to these angles are equal. Therefore, . A triangle with two equal sides is an isosceles triangle. Hence, triangle is isosceles.

Final Answer: Triangle is isosceles.

Question 5

QUESTION

ABC is an isosceles triangle with AB = AC. Draw AP \perp BC to show that \angle B = \angle C.

SOLUTION

We are given an isosceles triangle with , and we need to prove that by drawing .

Step 1: Draw the diagram and state the given information

Draw triangle such that . Draw a perpendicular from vertex to the base . This means , so and .

Step 2: Consider the two triangles formed

The perpendicular divides triangle into two right-angled triangles: and .

Step 3: Prove the congruence of the two triangles

We will use the RHS (Right-angle-Hypotenuse-Side) congruence rule to prove that .

In and :

(i) (Given, as)

(ii) (Given, as is an isosceles triangle)

(iii) (Common side)

Therefore, by the RHS congruence rule, .

Step 4: Use CPCT to prove the required equality

Since , their corresponding parts must be equal. This is known as CPCT (Corresponding Parts of Congruent Triangles).

Therefore, (by CPCT).

Final Answer:

Conclusion: By drawing a perpendicular from the vertex to the base of an isosceles triangle and proving the congruence of the two resulting triangles, we have shown that the angles opposite the equal sides are equal.

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📌 Key Formulas

Important Formulas for Exercise 7.3

Formula / Concept	Description
SSS (Side-Side-Side) Congruence Rule	If three sides of one triangle are equal to the corresponding three sides of another triangle, then the two triangles are congruent.
SAS (Side-Angle-Side) Congruence Rule	If two sides and the included angle of one triangle are equal to the corresponding two sides and included angle of another triangle, then the two triangles are congruent.
ASA (Angle-Side-Angle) Congruence Rule	If two angles and the included side of one triangle are equal to the corresponding two angles and included side of another triangle, then the two triangles are congruent.
RHS (Right Angle-Hypotenuse-Side) Congruence Rule	If in two right-angled triangles, the hypotenuse and one side of one triangle are equal to the hypotenuse and the corresponding side of the other triangle, then the two triangles are congruent.
Properties of Isosceles Triangles	In an isosceles triangle, angles opposite to equal sides are equal. Conversely, sides opposite to equal angles are equal.
Angle-Side Inequality in a Triangle	If two sides of a triangle are unequal, the angle opposite to the longer side is larger.
Side-Angle Inequality in a Triangle	If two angles of a triangle are unequal, the side opposite to the larger angle is longer.
CPCTC (Corresponding Parts of Congruent Triangles are Congruent)	If two triangles are congruent, then their corresponding sides and angles are equal.

❓ Top FAQs

Q1. How many questions are in NCERT Solutions Class 9 Maths Chapter 7 Triangles Exercise 7.3?

Exercise 7.3 of NCERT Solutions for Class 9 Maths Chapter 7 Triangles contains exactly 5 questions. These questions focus on properties of triangles including inequalities and relationships between sides and angles, which carry significant weightage in CBSE board exam 2025-26.

Q2. Where can I download free PDF of NCERT Solutions for Class 9 Maths Chapter 7 Triangles Exercise 7.3?

You can download the free PDF of NCERT Solutions for Class 9 Maths Chapter 7 Triangles Exercise 7.3 from the official NCERT website or various educational portals offering CBSE study materials. These step by step solutions are updated for the 2025-26 academic session and include detailed explanations for all 5 questions covering congruence criteria and triangle inequalities.

Q3. How many marks does Triangles Chapter 7 carry in CBSE Class 9 board exam 2025-26?

Triangles Chapter 7 is part of Unit IV Geometry which carries approximately 6 marks in CBSE Class 9 Maths board exam 2025-26. The marks are shared across different geometry topics, with Exercise 7.3 focusing on important concepts like congruence of triangles (SAS, ASA, SSS, RHS) and angle-side inequalities that frequently appear in examinations.

Q4. Which is the most difficult question in Exercise 7.3 of NCERT Solutions Class 9 Maths Chapter 7 Triangles?

Question 5 in Exercise 7.3 of NCERT Solutions for Class 9 Maths Chapter 7 Triangles is generally considered the most challenging as it involves proving complex inequalities using angle-side relationships. Students preparing for CBSE board exam 2025-26 should practice this question with step by step solutions to understand the application of triangle inequality theorems thoroughly.

Q5. What is Congruence of Triangles SAS ASA SSS RHS in NCERT Class 9 Maths Chapter 7 Exercise 7.3?

Congruence of Triangles in NCERT Solutions for Class 9 Maths Chapter 7 refers to four criteria: SAS (Side-Angle-Side), ASA (Angle-Side-Angle), SSS (Side-Side-Side), and RHS (Right angle-Hypotenuse-Side). Exercise 7.3 specifically deals with inequalities in triangles and relationships between sides and angles, which are fundamental concepts for CBSE board exam 2025-26 preparation.

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