# NCERT Solutions Class 9 Maths
# Chapter 7: Triangles
# EXERCISE 7.2

**Document Information:**
**Class:** 9 | **Subject:** Mathematics | **Chapter:** 7 | **Exercise:** 7.2
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**Quick Summary:** NCERT Solutions Class 9 Maths Chapter 7 Exercise 7.2 focuses on the criteria for congruence of triangles, covering essential rules like SAS, ASA, SSS, RHS, and AAS congruence. Students learn to prove triangle congruence through step-by-step solutions involving isosceles triangles, angle bisectors, and perpendicular properties. These concepts form the foundation for advanced geometry and are frequently tested in CBSE Class 9 exams.

**Key Takeaways:**

- Master all five congruence criteria: SAS (Side-Angle-Side), ASA (Angle-Side-Angle), SSS (Side-Side-Side), RHS (Right-Hypotenuse-Side), and AAS (Angle-Angle-Side)
- In isosceles triangles, angles opposite to equal sides are equal: if AB = AC, then \angle B = \angle C
- Angle bisector property: If AD bisects \angle A, then \angle BAD = \angle CAD
- Applications include proving equality of sides, angles, and solving real-world geometry problems in CBSE exams

## Complete Solutions

### Question 1

**QUESTION**

In an isosceles triangle ABC, with AB = AC, the bisectors of \angle B and \angle C intersect each other at O. Join A to O. Show that: (i) OB = OC, (ii) AO bisects \angle A.

**SOLUTION**

This question tests our understanding of isosceles triangles, angle bisectors, and the properties of angles opposite equal sides in a triangle.

**(i) To prove**

**Step 1:** We are given that triangle is isosceles with . Therefore, the angles opposite to equal sides are equal, which means .

**Step 2:** Since and are bisectors of and respectively, we have:

and .

**Step 3:** Since , their halves are also equal:

, which implies .

**Step 4:** In triangle , since , the sides opposite to these equal angles are also equal. Therefore, .

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**(ii) To prove bisects**

**Step 1:** Consider triangles and . We have:

(Given)

(Proved above)

(Common side)

**Step 2:** By the SSS (Side-Side-Side) congruence rule, .

**Step 3:** Since the triangles are congruent, their corresponding parts are equal. Therefore, (by CPCT - Corresponding Parts of Congruent Triangles).

**Step 4:** Since , bisects .

**Final Answer:** (i) , (ii) bisects .

## Question 2

### QUESTION

In \triangle ABC, AD is the perpendicular bisector of BC. Show that \triangle ABC is an isosceles triangle in which AB = AC.

### SOLUTION

This question tests our understanding of triangle congruence, particularly the SAS (Side-Angle-Side) congruence rule, and the properties of perpendicular bisectors.

**Step 1: Draw the diagram and state the given information**

We have with as the perpendicular bisector of . This means:

- (since bisects )
- (since is perpendicular to )

**Step 2: Consider triangles and**

We want to prove that using the SAS congruence rule.

**Step 3: Apply the SAS congruence rule**

We have:

- (Common side)
- (Given)
- (Given that is the perpendicular bisector of )

Therefore, by the SAS congruence rule, .

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

Since , their corresponding parts are equal. Therefore:

(By CPCT)

**Step 5: Conclude that is isosceles**

In , we have shown that . By definition, a triangle with two equal sides is an isosceles triangle.

Therefore, is an isosceles triangle.

**Final Answer:** is an isosceles triangle in which .

## Question 3

### QUESTION

ABC is an isosceles triangle in which altitudes BE and CF are drawn to equal sides AC and AB respectively. Show that these altitudes are equal.

### SOLUTION

This question tests our understanding of congruent triangles, specifically using the RHS (Right-Hypotenuse-Side) or ASA (Angle-Side-Angle) congruence rule, and how corresponding parts of congruent triangles (CPCT) are equal.

**Step 1: Draw the diagram and identify given information**

Draw triangle with . Draw altitudes perpendicular to and perpendicular to . We are given that , , and . We need to prove that .

**Step 2: Choose appropriate triangles to prove congruence**

Consider triangles and . We aim to prove these triangles congruent.

**Step 3: Prove the triangles congruent using ASA**

In and :

(Common angle)

(Given)

(Since and are altitudes)

Therefore, by ASA congruence rule, .

**Step 4: Use CPCT to prove the altitudes are equal**

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

**Final Answer:** Hence, the altitudes and are equal.

**Conclusion:** By proving the congruence of triangles and using the ASA congruence rule, we were able to show that the altitudes and are equal using the CPCT property.

## Question 4

### QUESTION

ABC is a triangle in which altitudes BE and CF to sides AC and AB are equal. Show that (i) \triangle ABE \cong \triangle ACF, (ii) AB = AC, i.e., ABC is an isosceles triangle.

### SOLUTION

This question tests the concept of congruent triangles, specifically using the AAS (Angle-Angle-Side) congruence rule, and the properties of isosceles triangles.

**(i) Proving**

**Step 1: Identify the given information**

We are given that and are altitudes to sides and respectively, and that .

This means and .

**Step 2: Identify common angles and sides**

In and :

(Common angle)

(Since and are altitudes)

(Given)

**Step 3: Apply the AAS congruence rule**

By the Angle-Angle-Side (AAS) congruence rule, if two angles and a non-included side of one triangle are equal to the corresponding two angles and side of another triangle, then the two triangles are congruent.

Therefore, by AAS congruence.

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**(ii) Proving**

**Step 1: Use the result from part (i)**

Since , their corresponding parts are equal by CPCT (Corresponding Parts of Congruent Triangles).

**Step 2: Apply CPCT**

Therefore, (CPCT)

**Step 3: Conclude that is an isosceles triangle**

Since , triangle is an isosceles triangle (A triangle with two equal sides is an isosceles triangle).

**Final Answer:** (i) , (ii) , i.e., is an isosceles triangle.

## Question 5

### QUESTION

ABC and DBC are two isosceles triangles on the same base BC. Show that \angle ABD = \angle ACD.

### SOLUTION

This question tests our understanding of isosceles triangles and angle properties. We need to prove that given that triangles and are isosceles on the same base .

**Step 1: Identify the given information**

We are given that and are isosceles triangles on the same base . This means:

(since is isosceles)

(since is isosceles)

**Step 2: Use the property of angles opposite to equal sides**

In triangle , since , we have:

---(1)

Similarly, in triangle , since , we have:

---(2)

**Step 3: Subtract equation (2) from equation (1)**

Subtracting equation (2) from equation (1), we get:

**Step 4: Simplify the equation**

From the figure, we can see that:

and

Therefore, we have:

**Final Answer:**

**Conclusion:**

By using the properties of isosceles triangles (equal sides imply equal opposite angles) and subtracting the relevant angles, we have successfully shown that .

## Question 6

### QUESTION

\triangle ABC is an isosceles triangle in which AB = AC. Side BA is produced to D such that AD = AB. Show that \angle BCD is a right angle.

### SOLUTION

This question tests our understanding of isosceles triangles and angle sum property of triangles. We need to prove that .

**Step 1: Draw the diagram and mark equal sides**

Draw triangle with . Extend to such that . This means .

**Step 2: Identify equal angles in isosceles triangles**

In , since , we have . Let's denote .

In , since , we have . Let's denote .

**Step 3: Apply angle sum property in**

In , we have .

Substituting the angles we defined:

**Step 4: Express in terms of and**

We know that .

**Step 5: Relate the angles using the straight line**

Since is a straight line, . However, we are interested in the angles of . We know and . Also, .

**Step 6: Use the angle sum property of**

In , . Therefore, , which means .

**Step 7: Relate to**

Since is a straight line, . So, .

**Step 8: Apply angle sum property in**

In , . Substituting the known values, we get , which simplifies to .

**Step 9: Find**

Dividing the equation by 2, we get .

**Step 10: Conclude that is a right angle**

Since and , we conclude that .

Therefore, is a right angle.

**ANSWER**

\angle BCD = \angle BCA + \angle DCA = \angle B + \angle D

## Question 7

**QUESTION**

ABC is a right-angled triangle in which \angle A = 90^\circ and AB = AC. Find \angle B and \angle C.

**SOLUTION**

This question tests our understanding of the properties of right-angled triangles and isosceles triangles.

**Step 1: Identify the given information**

We are given that triangle is right-angled at , which means . We are also given that , which means that triangle is an isosceles triangle.

**Step 2: Recall properties of isosceles triangles**

In an isosceles triangle, the angles opposite to equal sides are equal. Since , we have .

**Step 3: Apply the angle sum property of triangles**

The sum of all angles in a triangle is . Therefore, in triangle , we have:

**Step 4: Substitute known values**

We know and . Let's denote as . Then is also . Substituting these values into the equation from Step 3, we get:

**Step 5: Solve for x**

Combining like terms, we have:

Subtracting from both sides:

Dividing both sides by 2:

**Step 6: State the final answer**

Since , we have and .

Therefore, each angle is of 45°.

**ANSWER**

each is of 45°

## Question 8

QUESTION

Show that the angles of an equilateral triangle are 60^\circ each.

SOLUTION

We need to prove that each angle in an equilateral triangle measures .

**Step 1: Define an equilateral triangle**

An equilateral triangle is a triangle in which all three sides are equal in length. Let's consider an equilateral triangle where .

**Step 2: Recall the property of angles opposite to equal sides**

In any triangle, angles opposite to equal sides are equal. This is a fundamental theorem in geometry.

**Step 3: Apply the property to triangle ABC**

Since , the angles opposite to these sides are equal. Therefore, .

Similarly, since , the angles opposite to these sides are equal. Therefore, .

From these two relations, we can conclude that .

**Step 4: Use the angle sum property of a triangle**

The sum of all angles in a triangle is . Therefore, in triangle :

**Step 5: Substitute and solve for the angles**

Since , we can replace and with :

Since , we have .

**Final Answer:** Each angle of an equilateral triangle is .



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## 📐 Key Formulas

### Important Formulas for Exercise 7.2

| Formula / Concept | Description |
|---|---|
| Congruent Figures | Two geometric figures are congruent if they have the exact same shape and size. When superimposed, they cover each other perfectly. |
| Congruence of Triangles | Two triangles are congruent if their corresponding sides and angles are equal. It is denoted by the symbol \cong. |
| SSS (Side-Side-Side) Congruence Rule | If three sides of one triangle are equal to the three corresponding sides of another triangle, then the two triangles are congruent. |
| SAS (Side-Angle-Side) Congruence Rule | Two triangles are congruent if two sides and the included angle of one triangle are equal to the corresponding two sides and included angle of the other triangle. |
| ASA (Angle-Side-Angle) Congruence Rule | Two triangles are congruent if two angles and the included side of one triangle are equal to the corresponding two angles and included side of the other triangle. |
| AAS (Angle-Angle-Side) Congruence Rule | Two triangles are congruent if any two pairs of angles and one pair of corresponding non-included sides are equal. |
| 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 one corresponding side of the other triangle, then the two triangles are congruent. |
| Isosceles Triangle | A triangle in which two sides are of equal length. |
| Theorem 7.2: Angles opposite to equal sides | Angles opposite to equal sides of an isosceles triangle are equal. |
| Theorem 7.3: Sides opposite to equal angles | The sides opposite to equal angles of a triangle are equal. |
| Angle-Side Inequality Theorem | If two sides of a triangle are unequal, the angle opposite to the longer side is larger (greater). |
| Side-Angle Inequality Theorem | In any triangle, the side opposite to the larger (greater) angle is longer. |

| Formula / Concept | Description |
| --- | --- |
| CPCT | Corresponding Parts of Congruent Triangles. It means that if two triangles are congruent, then their corresponding parts (sides and angles) are equal. |

## Top FAQs

### Q1. How many questions are in NCERT Solutions Class 9 Maths Chapter 7 Triangles Exercise 7.2?

Exercise 7.2 of NCERT Solutions for Class 9 Maths Chapter 7 Triangles contains exactly 8 questions. These questions focus on criteria for congruence of triangles including SAS, ASA, SSS, and RHS rules, which are essential for CBSE board exam 2025-26 preparation.

### Q2. Where can I download free PDF of NCERT Solutions for Class 9 Maths Chapter 7 Triangles Exercise 7.2?

You can download the free PDF of NCERT Solutions for Class 9 Maths Chapter 7 Triangles Exercise 7.2 from the official NCERT website or various educational platforms offering step by step solutions. These PDFs are updated as per the latest CBSE syllabus 2025-26 and include detailed explanations for all 8 questions covering congruence criteria.

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

Chapter 7 Triangles carries 6 marks in the CBSE Class 9 Maths board exam 2025-26 as part of Unit IV - Geometry. Exercise 7.2 questions on congruence of triangles using SAS, ASA, SSS, and RHS criteria are crucial for scoring well in this unit.

### Q4. Which is the most difficult question in Exercise 7.2 of NCERT Solutions Class 9 Maths Chapter 7 Triangles?

Questions 6 and 8 in Exercise 7.2 of NCERT Solutions Class 9 Maths Chapter 7 Triangles are considered most challenging as they require applying multiple congruence criteria and proving angle-side relationships. Step by step solutions help students understand the logical approach needed for CBSE board exam 2025-26 preparation.

### Q5. What is Congruence of Triangles (SAS, ASA, SSS, RHS) in NCERT Class 9 Maths Chapter 7 Exercise 7.2?

Congruence of Triangles in NCERT Class 9 Maths Chapter 7 Exercise 7.2 refers to four criteria: SAS (Side-Angle-Side), ASA (Angle-Side-Angle), SSS (Side-Side-Side), and RHS (Right angle-Hypotenuse-Side). These rules determine when two triangles are congruent, meaning they have identical shape and size, which is a key concept for CBSE board exam 2025-26.

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