NCERT Solutions Class 10 Maths
Chapter 6: Triangles
Exercise 6.3

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Quick Summary: In NCERT Solutions Class 10 Maths Chapter 6 Exercise 6.3, students learn the fundamental criteria for triangle similarity through comprehensive problem-solving practice. This exercise covers the Basic Proportionality Theorem (Thales' Theorem), angle-based similarity criteria, and applications in trapeziums and complex geometric figures, which are essential topics frequently tested in CBSE Class 10 board exams and form the foundation for advanced geometry concepts.

Key Takeaways:

- Master the Basic Proportionality Theorem: If a line is parallel to one side of a triangle, it divides the other two sides proportionally, expressed as (AD)/(DB) = (AE)/(EC)
- Apply AA (Angle-Angle) similarity criterion to prove triangles are similar when two corresponding angles are equal
- Solve complex problems involving trapeziums with parallel sides and their diagonal intersections using similarity principles
- Use the converse of Basic Proportionality Theorem to establish parallel lines and solve geometric proofs effectively

Complete Solutions

Question 1

QUESTION

State which pairs of triangles in Fig. 6.34 are similar. Write the similarity criterion used by you for answering the question and also write the pairs of similar triangles in symbolic form:

(i)

(ii)

(iii)

(iv)

(v)

(vi)

SOLUTION

(I)

In , the angles are . In , the angles are also . Since all three corresponding angles are equal,

(II)

In , the sides are .

In , the sides are .

The ratios of corresponding sides are

All three ratios are equal, so

(III)

has sides .

has sides .

The side ratios are not all equal (e.g.), so no constant scale factor exists for all three sides. Thus the triangles are **not similar**.

(IV)

In , sides around angle are and , with included angle .

In , sides around angle are and , with included angle .

The side ratios are

and the included angles are equal: . So

(V)

In the first triangle, two sides and the included angle are .

In the second triangle, two sides and included angle are .

The ratios of the corresponding sides around the equal angle are

which are not equal, so the SAS condition is not satisfied. The three side ratios are also not all equal, so SSS fails too. Hence the triangles are **not similar**.

(VI)

In , two angles are and .

In , two angles are and .

So,

Two pairs of corresponding angles are equal, therefore

ANSWER

(i) Yes. AAA, \triangle ABC \sim \triangle PQR

(ii) Yes. SSS, \triangle ABC \sim \triangle QRP

(iii) No

(iv) Yes. SAS, \triangle MNL \sim \triangle QPR

(v) No

(vi) Yes. AA, \triangle DEF \sim \triangle PQR

Question 2

QUESTION

In Fig. 6.35, \triangle ODC \sim \triangle OBA, \angle BOC = 125^\circ and \angle CDO = 70^\circ. Find \angle DOC, \angle DCO and \angle OAB.

SOLUTION

Step 1: Find .

Points are collinear and points are collinear. So and form a linear pair.

Given :

So,

Step 2: Find .

In :

Given and :

Step 3: Find .

The lines through and are parallel to the lines through and (top and bottom horizontal lines are parallel). Also, are collinear and lies on the line parallel to .

Thus, angle (between and) equals angle between and :

Conclusion:

ANSWER

55^\circ,\ 55^\circ,\ 55^\circ

Question 3

QUESTION

Diagonals AC and BD of a trapezium ABCD with AB \parallel DC intersect each other at the point O. Using a similarity criterion for two triangles, show that

(OA)/(OC) = (OB)/(OD).

SOLUTION

Given: ABCD is a trapezium with , and diagonals AC and BD intersect at O.

To prove: .

STEP 1: CONSIDER TRIANGLES AND

Look at triangles formed by the diagonals across the parallel sides:

- has vertices on A, O, B.
- has vertices on C, O, D.

Angle 1: Since and BD is a transversal,

Angle 2: At the intersection of diagonals,

Thus, we have two pairs of equal angles:

So,

STEP 2: USE SIMILARITY TO RELATE CORRESPONDING SIDES

From similarity , the ratios of corresponding sides are equal. With the correspondence , , , we get

Hence, in particular,

Therefore, using triangle similarity, the required relation is proved.

Question 4

QUESTION

In Fig. 6.36, (QR)/(QS) = (QT)/(PR) and \angle 1 = \angle 2. Show that \triangle PQS \sim \triangle TQR.

SOLUTION

Given: In Fig. 6.36,

-
-

To prove: .

STEP 1: USE THE ANGLE CONDITION IN

Angles and are the base angles of :

Given , so

In a triangle, sides opposite equal angles are equal, therefore

STEP 2: REWRITE THE GIVEN SIDE RATIO USING (1)

Given:

Using from (1):

STEP 3: COMPARE SIDES AROUND THE COMMON ANGLE AT

Consider and .

- In , the sides including are and .
- In , the sides including are and .

From (2):

Also, and are the same angle at :

STEP 4: APPLY SAS SIMILARITY CRITERION

From (3), the pairs of corresponding sides around angle are proportional:

From (4), the included angle between these sides in both triangles is equal.

Therefore, by the **SAS similarity criterion**,

Hence proved.

Question 5

QUESTION

S and T are points on sides PR and QR of \triangle PQR such that \angle P = \angle RTS. Show that \triangle RPQ \sim \triangle RTS.

SOLUTION

Given: In , point lies on side and point lies on side . Also, .

To prove: .

STEP 1: COMPARE ANGLES AT R

Since lies on , segment is a part of line . Similarly, lies on , so segment is a part of line .

Therefore, the angle between and is the same as the angle between and :

But is angle of . Hence,

STEP 2: USE THE GIVEN ANGLE EQUALITY

We are given that

So angle at in equals angle at in .

STEP 3: CONCLUDE BY AA SIMILARITY

Thus we have two pairs of equal angles:

Therefore, by the **AA similarity criterion**,

Hence proved.

Question 6

QUESTION

In Fig. 6.37, if \triangle ABE \cong \triangle ACD, show that \triangle ADE \sim \triangle ABC.

SOLUTION

Given: . Points D and E lie on sides and respectively.

To prove: .

STEP 1: USE CONGRUENCE TO GET EQUAL SIDES

From , we have by CPCT (Corresponding Parts of Congruent Triangles):

Step 2: Form a pair of equal ratios

Using these equalities:

STEP 3: COMPARE THE INCLUDED ANGLE

The angle between and is .

The angle between and is .

Since D lies on and E lies on , rays and are the same line, and rays and are the same line. Therefore,

STEP 4: APPLY SAS SIMILARITY

From (1), the ratios of two pairs of corresponding sides are equal, and from (2), the included angle is equal. So, by the **SAS similarity criterion**:

Hence proved.

Question 7

QUESTION

In Fig. 6.38, altitudes AD and CE of \triangle ABC intersect at P. Show that:

(i) \triangle AEP \sim \triangle CDP

(ii) \triangle ABD \sim \triangle CBE

(iii) \triangle AEP \sim \triangle ADB

(iv) \triangle PDC \sim \triangle BEC

SOLUTION

Given: In , AD and CE are altitudes, so

They intersect at P.

To prove: The four pairs of triangles are similar as stated.

(I) PROVE

Since CE is an altitude, . Thus

Since AD is an altitude, . As D lies on BC and P lies on AD,

Also, AP and PD lie on the same line AD, and EP and CP lie on the same line CE, so angle between AP and EP equals angle between CP and PD:

Therefore, we have two pairs of equal angles:

Hence, by **AA similarity**,

(II) PROVE

From the altitudes:

Point D lies on BC, so BD is a part of BC; point E lies on AB, so BE is a part of AB. Therefore the angle at B in both triangles is the same angle :

Thus,

By **AA similarity**,

(III) PROVE

Again, and . So

Now compare angles at A:

In , is the angle between AP (along AD) and AE (along AB).

In , is the angle between AD and AB.

Since AP lies on AD and AE lies on AB,

Thus, two angles are equal:

Hence, by **AA similarity**,

(IV) PROVE

From the altitudes, as before:

Now consider angles at C:

In , is the angle between CP (along CE) and CD (along CB).

In , is the angle between EC and CB.

So,

Therefore,

By **AA similarity**,

Thus, all four required pairs of triangles are similar.

Question 8

QUESTION

E is a point on the side AD (produced) of a parallelogram ABCD and BE intersects CD at F. Show that \triangle ABE \sim \triangle CFB.

SOLUTION

Given: ABCD is a parallelogram. E lies on AD produced beyond D and BE meets CD at F.

To prove: .

STEP 1: USE PARALLEL SIDES OF THE PARALLELOGRAM

In a parallelogram, opposite sides are parallel:

Since E lies on AD produced, AE is a straight-line extension of AD and hence:

STEP 2: COMPARE ANGLE AND ANGLE

Angle is formed by BA and BE.

Angle is formed by FC and FB.

But FC lies on CD and . Also, FB is common to both angles as a side.

Therefore, corresponding angles are equal (alternate interior angles with transversal BF):

STEP 3: COMPARE ANGLE AND ANGLE

Angle is formed by AE and EB.

Angle is formed by CB and BF.

We have and is the same as along line B–E–F.

Thus, these two angles are also equal (corresponding/alternate interior angles):

STEP 4: CONCLUDE SIMILARITY

We have two pairs of equal angles:

Therefore, by the **AA similarity criterion**:

Hence proved.

Question 9

QUESTION

In Fig. 6.39, ABC and AMP are two right triangles right-angled at B and M respectively. Prove that:

(i) \triangle ABC \sim \triangle AMP

(ii) (CA)/(PA) = (BC)/(MP)

SOLUTION

Given: and are right-angled at B and M respectively.

To prove: (i) ; (ii) .

(I) PROVE

In ,

In ,

So one angle of each triangle is a right angle.

Also, both triangles share angle at A:

Thus we have two pairs of equal angles:

Therefore, by **AA similarity**,

(II) PROVE

From the similarity , corresponding vertices are:

So the corresponding sides are:

- (hypotenuses)
- (sides opposite the equal acute angles at A)

Hence, the ratio of corresponding sides is equal:

Thus: (i) and (ii) are proved.

Question 10

QUESTION

CD and GH are respectively the bisectors of \angle ACB and \angle EGF such that D and H lie on sides AB and FE of \triangle ABC and \triangle EFG respectively. If \triangle ABC \sim \triangle FEG, show that:

(i) (CD)/(GH) = (AC)/(FG)

(ii) \triangle DCB \sim \triangle HGE

(iii) \triangle DCA \sim \triangle HGF

SOLUTION

Given: . CD and GH are internal bisectors of and respectively, with D on AB and H on FE.

From the similarity , we have the correspondence:

and so

(i) Prove

Because similarity is a rigid "shape-preserving" scaling, the angle bisector at vertex C of corresponds to the angle bisector at vertex G of . Thus segment CD in the first triangle corresponds to segment GH in the second triangle, just as side AC corresponds to side FG.

Therefore, the ratio of corresponding bisectors equals the ratio of any pair of corresponding sides:

(ii) Prove

Since CD and GH are angle bisectors,

But (from similarity of the big triangles). Hence,

Also, D lies on AB and H lies on FE. Using , we have

Angles at B and E made with the same sides give

From (1) and (2), two angles of equal two angles of . Therefore, by **AA similarity**,

---

(iii) Prove

Again using the angle bisectors,

As before, , so

From the similarity of the big triangles,

D lies on AB and H lies on FE, so angle at A in equals angle at F in :

Using (3) and (4), two angles of equal two angles of . Thus, by **AA similarity**,

Hence all three statements (i), (ii) and (iii) are proved.

Question 11

QUESTION

In Fig. 6.40, E is a point on side CB of an isosceles triangle ABC with AB = AC. If AD ⊥ BC and EF ⊥ AC, prove that \triangle ABD \sim \triangle ECF.

SOLUTION

Given: is isosceles with . E lies on side CB. AD is perpendicular to BC and EF is perpendicular to AC.

To prove: .

STEP 1: MARK THE RIGHT ANGLES

Since AD ⊥ BC, angle at D in is a right angle:

Since EF ⊥ AC, angle at F in is a right angle:

Thus,

STEP 2: USE THE ISOSCELES PROPERTY

In an isosceles triangle ABC with , the base angles at B and C are equal:

STEP 3: RELATE ANGLES IN THE TWO SMALLER TRIANGLES

In , angle at B is

because BD lies along BC.

In , angle at C is

because CE lies along CB and CF lies along CA.

Using (2):

STEP 4: CONCLUDE SIMILARITY

From (1) and (3), we have two pairs of equal angles:

Therefore, by the **AA similarity criterion**,

Hence proved.

Question 12

QUESTION

Sides AB and BC and median AD of a triangle ABC are respectively proportional to sides PQ and QR and median PM of \triangle PQR (see Fig. 6.41). Show that \triangle ABC \sim \triangle PQR.

SOLUTION

Given: In , AD is a median, so D is the midpoint of BC. In , PM is a median, so M is the midpoint of QR. Also, the three lengths are proportional:

To prove: .

STEP 1: EXPRESS THE SMALLER SIDES BD AND QM

Since AD and PM are medians,

Using the second ratio in (1):

So,

STEP 2: PROVE (SSS)

From (1) and (3), we have

Thus the three pairs of corresponding sides of and are proportional. Hence, by the **SSS similarity criterion**,

This gives equality of corresponding angles:

STEP 3: TRANSFER THESE ANGLES TO THE BIG TRIANGLES

Since D lies on BC and M lies on QR, we have

and from (4),

Similarly, at the vertices A and P,

so from (4),

STEP 4: CONCLUDE SIMILARITY OF AND

From (5) and (6), we have two pairs of equal angles:

Therefore, by the **AA similarity criterion**,

Hence proved.

Question 13

QUESTION

D is a point on side BC of a triangle ABC such that \angle ADC = \angle BAC. Show that CA^2 = CB · CD.

SOLUTION

Given: In , point D lies on BC such that .

To prove: .

STEP 1: CONSIDER TRIANGLES AND

We know:

- (given)
- (common angle at C)

So we have two pairs of equal angles, hence

STEP 2: WRITE THE RATIO OF CORRESPONDING SIDES

From the similarity, match the vertices:

Thus the corresponding sides are:

So we get the proportionality:

STEP 3: REARRANGE TO GET THE REQUIRED RELATION

Cross-multiplying,

That is,

Hence proved.

Question 14

QUESTION

Sides AB and AC and median AD of a triangle ABC are respectively proportional to sides PQ and PR and median PM of another triangle PQR. Show that \triangle ABC \sim \triangle PQR.

SOLUTION

Given: In and , AD and PM are medians and

To prove: .

STEP 1: CONSTRUCTION

Produce AD to a point E such that . Produce PM to a point N such that . Join BE, CE, QN and RN.

STEP 2: SHOW ABEC AND PQNR ARE PARALLELOGRAMS

In and :

(construction), (AD is a median), and (vertically opposite).

So (SAS), hence and D is the midpoint of both BC and AE. Thus, diagonals BC and AE bisect each other, so quadrilateral ABEC is a parallelogram. Therefore,

Similarly, in and :

(construction), (PM is a median), and (vertically opposite),

so . Hence and M is the midpoint of both QR and PN, so PQNR is a parallelogram and

STEP 3: BUILD A PAIR OF SIMILAR TRIANGLES AND

From the given proportionality,

Using and (from the congruent triangles above), we get

Also, and , so

Hence,

Thus, all three pairs of corresponding sides in and are proportional, so

STEP 4: RELATE ANGLES AT A AND P

From , we have

Since ABEC and PQNR are parallelograms, and . Therefore, angle between BA and AE equals angle between CE and EN (or RN and NP):

Now, angle at A of can be split as

and angle at P of as

Using and , we get

so

STEP 5: CONCLUDE

We already know

and we have just proved . Thus, by the **SAS similarity criterion**,

Hence proved.

ANSWER

Produce AD to a point E such that AD = DE and produce PM to a point N such that PM = MN. Join EC and NR.

Question 15

QUESTION

A vertical pole of length 6 m casts a shadow 4 m long on the ground and at the same time a tower casts a shadow 28 m long. Find the height of the tower.

SOLUTION

Idea: At the same time of day, the Sun's rays make the same angle with the ground for all objects. So the pole and the tower form two right triangles that are similar (same angle of elevation of the Sun).

STEP 1: FORM THE TWO RIGHT TRIANGLES

For the pole: height = 6 m, shadow = 4 m.
For the tower: height = m (unknown), shadow = 28 m.

Each pair "object + shadow" forms a right triangle with the ground.

Because the angle of elevation of the Sun is the same,

STEP 2: WRITE THE RATIO OF CORRESPONDING SIDES

Heights correspond to heights, shadows to shadows:

STEP 3: SOLVE FOR

Cross-multiply:

Conclusion: The height of the tower is **42 m**.

ANSWER

42 m

Question 16

QUESTION

If AD and PM are medians of triangles ABC and PQR, respectively, where \triangle ABC \sim \triangle PQR, prove that

(AB)/(PQ) = (AD)/(PM).

SOLUTION

Given: , and AD, PM are medians so that D is the midpoint of BC and M is the midpoint of QR.

To prove: .

STEP 1: USE SIMILARITY OF THE BIG TRIANGLES

Since , corresponding sides are proportional:

Also, the correspondence of vertices is .

STEP 2: EXPRESS THE MID-SEGMENTS USING MEDIANS

Because AD is a median, D is the midpoint of BC:

Because PM is a median, M is the midpoint of QR:

From (1),

Hence,

STEP 3: SHOW

Now consider and :

- From (1) and (2) we have

Also from (1), taking the first and third ratios,

But AD and PM join corresponding vertices A–C and P–R at their midpoints, so by similarity of the big triangles, the segment joining a vertex to the midpoint of the opposite side scales in the same ratio; this gives

More formally, since triangles and are similar with scale factor , every corresponding length (including medians) is multiplied by the same factor. Thus,

so

STEP 4: CONCLUDE THE REQUIRED RESULT

Therefore,

Hence proved.

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Key Formulas

Important Formulas for Exercise 6.3

Formula / Concept	Description
Similarity of Triangles	Two triangles are similar if their corresponding angles are equal and their corresponding sides are in the same ratio.
AAA (Angle-Angle-Angle) Similarity Criterion	If in two triangles, corresponding angles are equal, then their corresponding sides are in the same ratio (or proportion) and hence the two triangles are similar. This is also often referred to as the AA (Angle-Angle) criterion since if two corresponding angles are equal, the third will also be equal.
SSS (Side-Side-Side) Similarity Criterion	If in two triangles, the sides of one triangle are proportional to the sides of the other triangle, then their corresponding angles are equal and hence the two triangles are similar.
SAS (Side-Angle-Side) Similarity Criterion	If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are proportional, then the two triangles are similar.
Basic Proportionality Theorem (Thales Theorem)	If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio. For a triangle ABC, if a line DE is parallel to BC and intersects AB at D and AC at E, then: (AD)/(DB) = (AE)/(EC)
Converse of Basic Proportionality Theorem	If a line divides any two sides of a triangle in the same ratio, then the line is parallel to the third side.
Pythagoras Theorem	In a right-angled triangle, the square of the hypotenuse (the side opposite the right angle) is equal to the sum of the squares of the other two sides. If a, b, and

Formula / Concept	Description
	c are the lengths of the sides of a right-angled triangle, where c is the hypotenuse, then: a^2 + b^2 = c^2
Converse of Pythagoras Theorem	In a triangle, if the square of one side is equal to the sum of the squares of the other two sides, then the angle opposite the first side is a right angle.

❓ Top FAQs

Q1. How many questions are in NCERT Solutions Class 10 Maths Chapter 6 Triangles Exercise 6.3?

NCERT Solutions for Class 10 Maths Chapter 6 Triangles Exercise 6.3 contains exactly 16 questions. These questions focus on criteria for similarity of triangles including Basic Proportionality Theorem (Thales Theorem) and are crucial for CBSE board exam 2025-26 preparation.

Q2. Where can I download free PDF of NCERT Solutions for Class 10 Maths Chapter 6 Triangles Exercise 6.3 with step by step solutions?

You can download the free PDF of NCERT Solutions for Class 10 Maths Chapter 6 Triangles Exercise 6.3 from the official NCERT website or trusted educational platforms. These PDFs contain detailed step by step solutions for all 16 questions, updated as per CBSE syllabus 2025-26.

Q3. How many marks does Chapter 6 Triangles carry in CBSE Class 10 Maths board exam 2025-26?

Chapter 6 Triangles carries 6 marks in CBSE Class 10 board exam 2025-26 as part of Unit V - Geometry. Exercise 6.3 focusing on similarity criteria is particularly important for scoring these marks in the examination.

Q4. Which is the most difficult question in Exercise 6.3 of NCERT Solutions Class 10 Maths Chapter 6 Triangles?

Questions 14, 15, and 16 in Exercise 6.3 of Class 10 Maths Chapter 6 Triangles are considered the most difficult as they require application of Basic Proportionality Theorem combined with other similarity criteria. These questions demand step by step analytical approach and thorough conceptual understanding for CBSE board exam 2025-26.

Q5. What is Basic Proportionality Theorem (Thales Theorem) explained in NCERT Class 10 Maths Chapter 6 Triangles Exercise 6.3?

Basic Proportionality Theorem (Thales Theorem) in NCERT Class 10 Maths Chapter 6 states that if a line is drawn parallel to one side of a triangle, it divides the other two sides proportionally. Exercise 6.3 contains multiple questions applying this theorem, which is essential for CBSE board exam 2025-26 and carries significant weightage in the Geometry unit.

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