

TRIANGLES

Important Concepts

- Two figures are congruent if they are of the same shape and of the same size.
- Two circles of the same radii are congruent.
- Two squares of the same sides are congruent.
- Two triangles are congruent if their corresponding parts are congruent.
- If two triangles ABC and PQR are congruent under the correspondence $A \leftrightarrow P$, $B \leftrightarrow Q$ and $C \leftrightarrow R$, then symbolically, it is expressed as $\Delta ABC \cong \Delta PQR$.

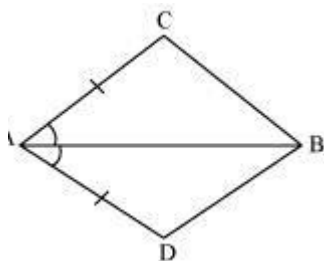
Some congruence rules are SAS(Side-Angle-Side)

Congruence Rule: Two triangles are congruent if two sides and the included angle of one triangle are equal to the sides and the included angle of the other triangle. ASA(Angle-Side-Side) Congruence Rule: Two triangles are congruent if two angles and the included side of one triangle are equal to two angles and the included side of the other triangle. AAS Congruence Rule: Two triangles are congruent if any two pairs of angles and one pair of corresponding sides are equal.

NCERT SOLUTIONS

Question 1

In quadrilateral ACBD, $AC = AD$ and AB bisects $\angle A$ (See the given figure). Show that $\Delta ABC \cong \Delta ABD$. What can you say about BC and BD ?



ANSWER:

In ΔABC and ΔABD ,

$AC = AD$ (Given)

$\angle CAB = \angle DAB$ (AB bisects $\angle A$)

$AB = AB$ (Common)

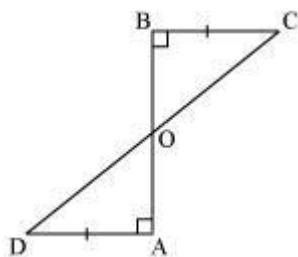
$\therefore \Delta ABC \cong \Delta ABD$ (By SAS congruence rule)

$\therefore BC = BD$ (By CPCT)

Therefore, BC and BD are of equal lengths.

Question 2:

AD and BC are equal perpendiculars to a line segment AB (See the given figure). Show that CD bisects AB



ANSWER:

In $\triangle BOC$ and $\triangle AOD$,

$\angle BOC = \angle AOD$ (Vertically opposite angles)

$\angle CBO = \angle DAO$ (Each 90°)

$BC = AD$ (Given)

$\therefore \triangle BOC \cong \triangle AOD$ (AAS congruence rule)

$\therefore BO = AO$ (By CPCT)

$\Rightarrow CD$ bisects AB .

MCQ

Q1. The exterior angle of a triangle is equal to the

- (a) sum of the two interior opposite angles.
- (b) sum of the three interior angles.
- (c) difference of two interior angles.
- (d) opposite of the interior angle.

Q2. In two right-angled triangle ABC and triangle DEF , the measurement of hypotenuse and one side is given. Check if they are congruent or not? If yes, by which rule.



- a) SAS b) ASA c) SSS d) RHS

Q3. The angles of a triangle are in the ratio $3 : 4 : 2$. Find all the angles of the triangle.

- (a) $110^\circ, 40^\circ, 30^\circ$ b) $60^\circ, 80^\circ, 40^\circ$ c) $60^\circ, 50^\circ, 70^\circ$ d) $110^\circ, 50^\circ, 20^\circ$

Q4. In SAS congruence rule

- a) The angle should be included
- b) The angle should not be included
- c) Any two sides and one angle
- d) None of the above

Q5. Assertion: In $\triangle ABC$, $BC = AB$ and $B = 80^\circ$, Then, $A = 50^\circ$

Reason: In a triangle, angles opposite to two equal sides are equal

- a) Both Assertion and Reason are correct and Reason is correct explanation for Assertion.
- b) Both Assertion and Reason are correct and Reason is not correct explanation for Assertion.
- c) Both Assertion is true but and Reason is false.
- d) Both Assertion and Reason are false.

SECTION B SHORT ANSWERS TYPE

Q1. The angles of triangle are $(x + 10^\circ)$, $(2x - 30^\circ)$ and x° . Find the value of x .

Q2. $\triangle ABC$ is a right triangle such that $AB = AC$ and bisector of angle C intersects the side AB at D . Prove that $AC + AD = CD$.

Q3. D, E, F are the midpoints of the sides BC, CA and AB respectively of $\triangle ABC$, then $\triangle DEF$ is congruent to triangle $\triangle AEF$

Q4. 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 $\angle A$

Q5. ABC is a right angled triangle in which $\angle A = 90^\circ$ and $AB = AC$. Find $\angle B$ and $\angle C$.

Q6. ABC is an isosceles triangle with $AB = AC$. Drawn $AP \perp BC$ to show that $\angle B = \angle C$.

Q7. BE and CF are two equal altitude of a triangle ABC. Using RHS congruence rule, Prove that the triangle ABC is isosceles

Q8. Prove that the Perimeter of a triangle is greater than the sum of three median

Q9. BE and CF are two equal altitudes of a triangle ABC. Using RHS congruence rule, prove that the triangle ABC is isosceles.

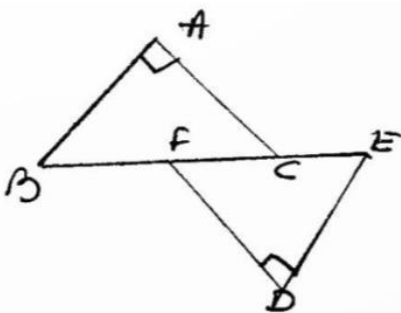
Q10. In the given figure $\angle CPD = \angle BPD$ and AD is the bisector of $\angle BAC$.

Prove that $\triangle BAP \cong \triangle CAP$ and hence $BP = CP$.

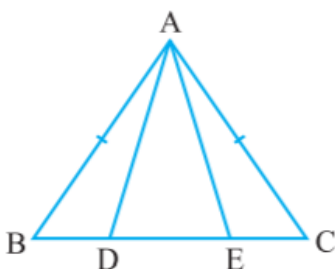
LONG ANSWER TYPE

Q1. In the given figure BA is perpendicular to AC, DE is perpendicular to DF such that

$BA = DE$ and $BF = EC$. Show that $\triangle ABC \cong \triangle DEF$.

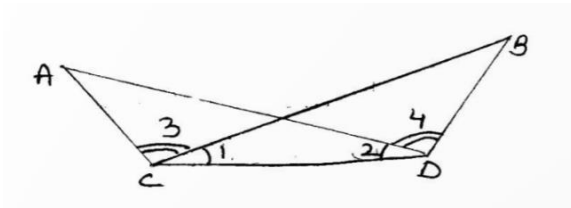


Q2. In an isosceles triangle ABC with $AB = AC$, D and E are points on BC such that $BE = CD$. Show that $AD = AE$



Q3. In the given figure $\angle BCD = \angle ACD$ and $\angle ACB = \angle BDA$.

Prove that $AD = DB$ and $\angle A = \angle B$.



Q4. Prove that if two angles of a triangle are equal then sides opposite to them are also equal.

Q5. PQR is a triangle in which $PQ = PR$ and S is any point on the side PQ. Through S, a line is drawn parallel to QR and intersecting PR at T. Prove that $PS = PT$.

ANSWERS (MCQ) Q1 (a) , Q2(d), Q3(b), Q4(a) ,Q5(a)

TEST 1

(20Marks : Q1– 2Marks, Q2 TO Q7 are of 3 Marks each)

Q1. ABC is an isosceles triangle with $AB = AC$. Draw $AP \perp BC$ to show that $\angle B = \angle C$.

Q2. ABCD is a quadrilateral such that $AB = AD$ and $CB = CD$. Prove that AC is the perpendicular bisector of BD.

Q3. ABC is an isosceles triangle with $AB = AC$ and BD and CE are two medians.

Show that $BD = CE$.

Q4. BE and CF are two equal altitudes of a triangle ABC. Using RHS congruence rule,

Prove that the triangle ABC is isosceles.

Q5. If two isosceles triangles have a common base, prove that the line joining the vertex bisects the base at right angle.

Q6. ABC is a right-angled triangle in which $\angle A = 90^\circ$ and $AB = AC$. Find $\angle B$ and $\angle C$.

Q7. Prove that the Perimeter of a triangle is greater than the sum of the three medians.

TEST 2

(30 Marks: Each Question is of 5 Marks each)

Q1. Prove that the medians of an equilateral triangle are equal.

Q2. Prove that "angle opposite to equal sides of a triangle are equal."

Q3. Prove that, "A triangle is isosceles if and only if any two altitudes are equal."

Q4. AD is an altitude of an isosceles triangle ABC in which $AC = AB$.

Show that (i) AD bisects BC (ii) AD bisects $\angle A$.

Q5. $\triangle ABC$ is an isosceles triangle in which $AB = AC$. Side BA is produced to D such that $AD = AB$. Show that $\angle BCD$ is right angle.

Q5. ABC and DBC are triangles on the same base BC such that A and D lie on the opposite side of BC, $AB = AC$ and $DB = DC$. Show that AD is the perpendicular bisector of BC.

OR

.Line segment joining the mid-points. M and N of parallel sides. AB and DC, respectively of a trapezium ABCD is perpendicular to both the sides AD and BC. Prove that $AM = MC$

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