MATHEMATICS
WORKSHEET_210925
CHAPTER 07 TRIANGLES
(ANSWERS)

SUBJECT: MATHEMATICS — **MAX. MARKS : 40**

CLASS : IX — **DURATION : $1\frac{1}{2}$ hrs**

General Instructions:

(i). **All** questions are compulsory.

(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.

(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.

(iv). There is no overall choice.

(v). **Use of Calculators is not permitted**

SECTION – A

Questions 1 to 10 carry 1 mark each.

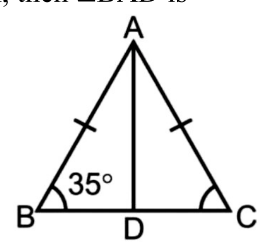
1. Given two right-angled triangles ABC and PRQ, such that $\angle A = 30°$, $\angle Q = 30°$ and AC = QP. Write the correspondence if triangles are congruent.

(a) $\Delta ABC \cong \Delta PQR$ (b) $\Delta ABC \cong \Delta PRQ$

(c) $\Delta ABC \cong \Delta RQP$ (d) $\Delta ABC \cong \Delta QRP$

Ans: (d) $\Delta ABC \cong \Delta QRP$

2. In the given figure, AD is the median, then $\angle BAD$ is



(a) 35° (b) 70° (c) 110° (d) 55°

Ans: In ΔBAD and ΔCAD, BD = DC ($\because$ AD is median, so D is mid-point of BC)

AB = AC (Given)

AD = AD (Common)

$\Rightarrow \Delta BAD \cong \Delta CAD$ (SSS congruence rule)

$\Rightarrow \angle BAD = \angle CAD$ (CPCT)

Also, $\angle ABC = \angle ACB = 35°$ ($\because$ AB = AC and $\angle B = 35°$)

Now, in ΔBAC, we have $\angle BAC + \angle ABC + \angle ACB = 180°$ ($\because$ Angle sum property of a triangle)

$\Rightarrow \angle BAC + 35° + 35° = 180° \Rightarrow \angle BAC = 110°$

$\Rightarrow 2\angle BAD = 110° \Rightarrow \angle BAD = 55°$

$\therefore$ Correct option is (d).

3. It is given that $\Delta ABC \cong \Delta FDE$ and AB = 5 cm, $\angle B = 40°$ and $\angle A = 80°$. Then which of the following is true?

(a) DF = 5 cm, $\angle F = 60°$ (b) DF = 5 cm, $\angle E = 60°$

(c) DE = 5 cm, $\angle E = 60°$ (d) DE = 5 cm, $\angle D = 40°$

Ans. (b) DF = 5 cm, $\angle E = 60°$

4. If $\Delta ACB \cong \Delta EDF$, then which of the following equations is/are true?

(I) AC = ED

(II) $\angle C = \angle F$

(III) AB = EF

(a) Only (I) (b) (I) and (III) (c) (II) and (III) (d) All of these

Ans. (b) (I) and (III)

Since, $\Delta ACB \cong \Delta EDF$.

$\therefore$ AC = ED, CB = DF and AB = EF

And $\angle A = \angle E$, $\angle C = \angle D$ and $\angle B = \angle F$

Therefore, equations (I) and (III) are true.

5. If AB = QR, BC = PR and CA = PQ in ΔABC and ΔPQR, then:

(a) $\Delta ABC \cong \Delta PQR$ (b) $\Delta CBA \cong \Delta PRQ$ (c) $\Delta BAC \cong \Delta RPQ$ (d) $\Delta BCA \cong \Delta PQR$

Ans. (b) $\Delta CBA \cong \Delta PRQ$

According to the question, AB = QR, BC = PR and CA = PQ

Since, AB = QR, BC = PR and CA = PQ

We can say that, A corresponds to Q, B corresponds to R, C corresponds to P.

Hence, $\Delta CBA \cong \Delta PRQ$

6. If in ΔACB and ΔPQR, AC = PQ and BC = RQ, then to show $\Delta ACB \cong \Delta PQR$ by SAS congruence rule which one of the following is needed?

(a) $\angle A = \angle P$ (b) $\angle A = \angle Q$ (c) $\angle B = \angle R$ (d) $\angle C = \angle Q$

Ans. (d) $\angle C = \angle Q$

7. In ΔABC, BC = AB and $\angle B = 80°$, then $\angle A$ is equal to:

(a) 80° (b) 40° (c) 50° (d) 100°

Ans. (c) 50°

BC = AB and $\angle B = 80°$

$\Rightarrow \angle A = \angle C$ [Angles opposite to equal sides are equal]

Let $\angle A = \angle C = x$

In ΔABC, $x + 80° + x = 180°$ [Angle sum property of Δ]

$\Rightarrow 2x + 80° = 180°$

$\Rightarrow 2x = 180° - 80°$

$\Rightarrow 2x = 100°$

$\Rightarrow x = 50°$

8. If $\Delta ABC \cong \Delta PQR$ and ΔABC is not congruent to ΔRPQ, then which of the following is not true?

(a) BC= PQ (b) AC = PR (c) QR= BC (d) AB = PQ

Ans. (a) BC = PQ

Given, $\Delta ABC \cong \Delta PQR$

Thus, the corresponding sides are equal

Hence, AB = PQ, BC = QR and AC = PR

Therefore, BC = PQ is not true for the triangles.

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

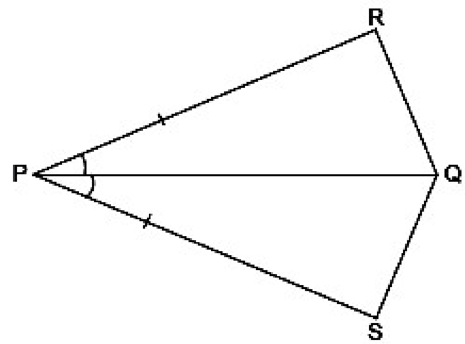
(d) A is false but R is true.

9. **Assertion (A):** If we draw two triangles with angles 30° 70°, and 80° and the length of the sides of one triangle be different than that of the corresponding sides of the other triangle then two triangles are not congruent.

Reason (R): If two triangles are constructed which have all corresponding angles equal but have unequal corresponding sides, then two triangles cannot be congruent to each other.

Ans. (a) Both A and R are true and R is the correct explanation of A.

10. Assertion (A): In a quadrilateral PQRS, PR = PS and PQ bisect ∠P by SAS congruency criteria.



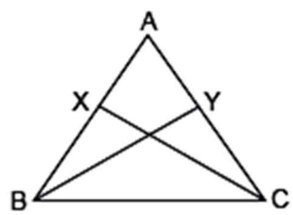
Reason (R): SAS congruency axiom state that if two sides and their including angle of one triangle is equal to the corresponding two sides and including angle of other triangle, then Both the triangles are congruent.

Ans. (a) Both A and R are true and R is the correct explanation of A.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. In the figure below, ABC is a triangle in which AB = AC. X and Y are points on AB and AC such that AX = AY. Prove that ΔABY ≅ ΔACX.



Ans: In ΔABY and ΔACX,

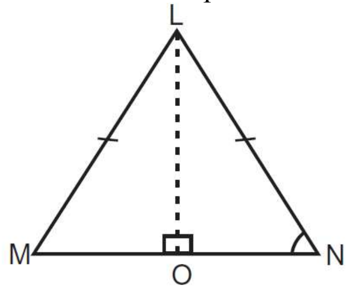
AB = AC (Given)

∠A = ∠A (Common)

AX = AY (Given)

⇒ ΔABY ≅ ΔACX (SAS congruence rule)

12. In the below left figure, ΔLMN is an isosceles triangle, where LM = LN and LO, is an angle bisector of ∠MLN, Prove that point 'O' is the mid-point of side MN.



Ans. Given: LM = LN and ∠MLO = ∠NLO

Since ΔLMN is an isosceles triangle and LM = LN

∴ ∠M = ∠N ...(i)

LO is an angle bisector of ∠MLN

∠MLO = ∠NLO ...(ii)

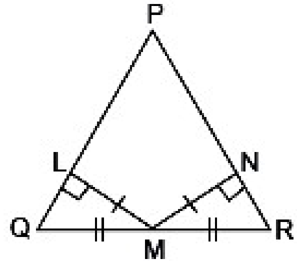
In ΔMLO and ΔNLO, ∠M = ∠N

i.e., ∠OML = ∠ONL

LM = LN

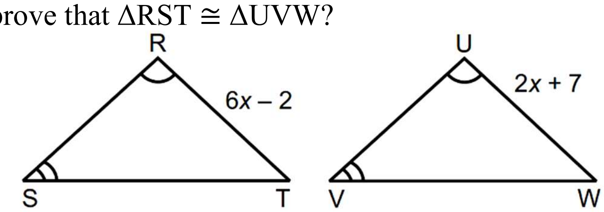
$\angle MLO = \angle NLO$
$\therefore \Delta MLO \cong \Delta NLO$ [By ASA congruence rule]
$\therefore OM = ON$ [By CPCT]

13. In the given figure, $LM = MN$, $QM = MR$, $ML \perp PQ$ and $MN \perp PR$. Prove that $PQ = PR$.



Ans. Given: $LM = MN$, $QM = MR$
$ML \perp PQ$ and $MN \perp PR$
To prove: $PQ = PR$
Proof: In ΔQML and ΔRMN, $LM = MN$ (Given)
$\angle L = \angle N$ (Each 90°)
$QM = MR$ (Given)
$\Rightarrow \Delta QML \cong \Delta RMN$ (RHS congruence rule)
$\Rightarrow \angle LQM = \angle NRM$ (CPCT)
$\Rightarrow PQ = PR$ (Sides opposite to equal angles are equal).

14. In ΔRST, $RT = 6x - 2$. In ΔUVW, $UW = 2x + 7$, $\angle R = \angle U$, and $\angle S = \angle V$. What must be the value of x in order to prove that $\Delta RST \cong \Delta UVW$?

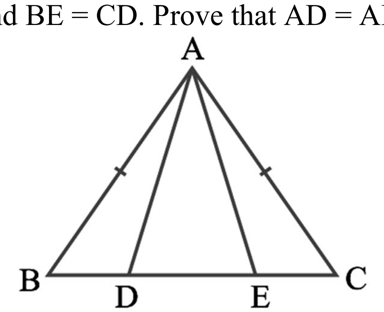


Ans. Given that $\angle S = \angle V$ and $\angle R = \angle U$
$\angle T = \angle W$ (by Angle sum property of triangle)
For $\Delta RST \cong \Delta UVW$, $RT = UW$ using either ASA or AAS congruence rule
$\Rightarrow 6x - 2 = 2x + 7$
$\Rightarrow 6x - 2x = 9$
$\Rightarrow 4x = 9 \Rightarrow x = 9/4 \Rightarrow x = 2.25$

SECTION – C

Questions 15 to 17 carry 3 marks each.

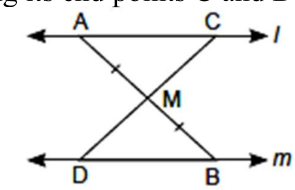
15. In the given figure, $AB = AC$ and $BE = CD$. Prove that $AD = AE$.



Ans: In ΔABC, $AB = AC$
$\Rightarrow \angle ACB = \angle ABC$ (Angles opposite to equal sides are equal)
Now, in ΔABE and ΔACD,
$AB = AC$ (Given)
$\angle ABE = \angle ACD$ (Proved above)

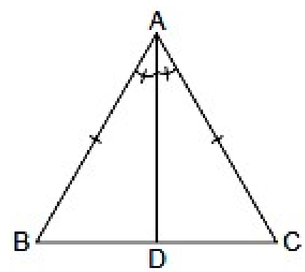
BE = CD (Given)
⇒ ΔABE ≅ ΔACD (SAS congruence rule)
⇒ AE = AD (CPCT)
or AD = AE

16. In the given figure, $l \parallel m$ and M is the mid-point of line segment AB. Prove that M is also the mid-point of any line segment CD having its end points C and D on l and m respectively.



Ans: Given $l \parallel m$ and AB is transversal
⇒ ∠CAM = ∠DBM (Alternate interior angles)
Now, in ΔAMC and ΔBMD,
∠CAM = ∠DBM (As proved above)
AM = BM (M is mid-point of AB)
∠AMC = ∠BMD (Vertically opposite angles)
⇒ ΔAMC ≅ ΔBMD (ASA congruence rule)
⇒ CM = DM (CPCT)
⇒ M is mid-point of CD.

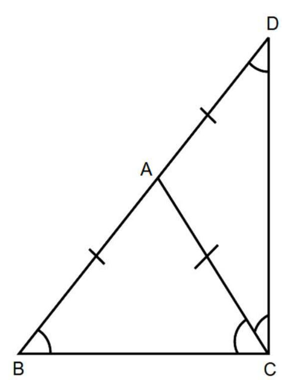
17. Prove that angles opposite to equal sides of an isosceles triangle are equal.
Ans. Given: ΔABC is an isosceles triangle with AB = AC
To prove: ∠B = ∠C



Construction: Draw AD bisector of ∠A which intersects BC at D.
Proof: In ΔBAD and ΔCAD, AB = AC (Given)
∠BAD = ∠CAD (By construction)
AD = AD (Common)
So, ΔBAD ≅ ΔCAD (SAS congruence rule)
⇒ ∠ABD = ∠ACD (CPCT)
So, ∠B = ∠C

OR

ΔABC is an isosceles triangle in which AB = AC. Side BA is produced to D such that AD = AB. Show that ∠BCD is a right angle.
Ans. In ΔABC, AB = AC

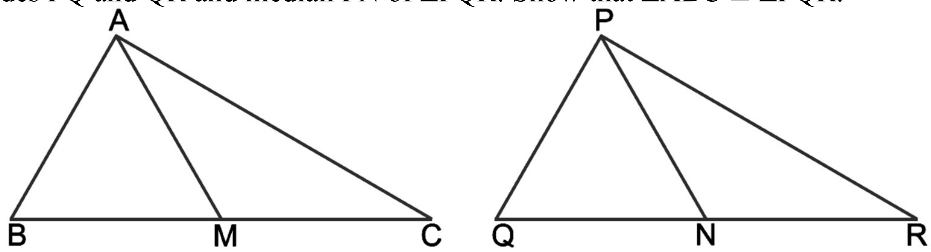


Also, AD = AB
i.e., AC = AB = AD
In ΔABC, AB = AC
⇒ ∠ACB = ∠ABC = ∠1 … (i) [Angles opposite to equal sides are equal]
In ΔACD, AC = AD [As AC = AB]
∠ADC = ∠ACD = ∠2 … (ii) [Angle opposite to equal sides are equal]
In ΔBCD, ∠DBC + ∠BCD + ∠BDC = 180º ...(iii) [Angle sum property of triangle]
⇒ ∠1 + ∠1 + ∠2 + ∠2 = 180º
⇒ 2(∠1 + ∠2) = 180º
⇒ ∠1 + ∠2 = 90º ⇒ ∠BCD = 90º

SECTION – D

Questions 18 carry 5 marks.

18. In the below figure, two sides AB and BC and median AM of one triangle ABC are respectively equal to sides PQ and QR and median PN of ΔPQR. Show that ΔABC ≅ ΔPQR.

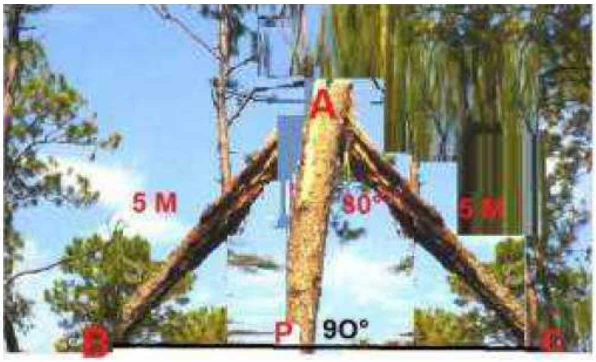


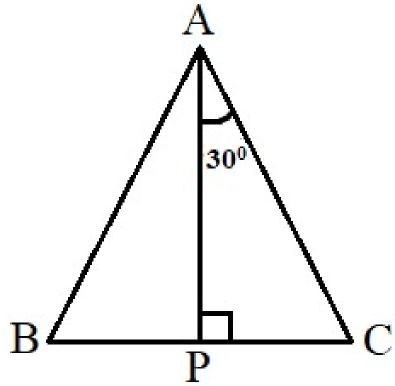
Ans. In ΔABC and ΔPQR,
BC = QR (Given)
⇒ ½ BC = ½ QR
⇒ BM = QN
In triangles ABM and PQN, we have
AB = PQ (Given)
BM = QN (Proved above)
AM = PN (Given)
∴ ΔABM ≅ ΔPQN (By SSS congruence criterion)
⇒ ∠B = ∠Q (By CPCT)
Now, in triangles ABC and PQR, we have
AB = PQ (Given)
∠B = ∠Q (Proved above)
BC = QR (Given)
∴ ΔABC ≅ ΔPQR (By SAS congruence criterion)

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. Aditya and his friends went to a forest, they saw a big tree got broken due to heavy rain and wind. Due to this rain the big branches AB and AC with lengths 5m fell down on the ground. Branch AC makes an angle of 30° with the main tree AP. The distance of Point B from P is 4 m. You can observe that ΔABP is congruent to ΔACP.





(a) Show that ΔABP is congruent to ΔACP (1)
(b) Find the value of ∠ACP? (2)

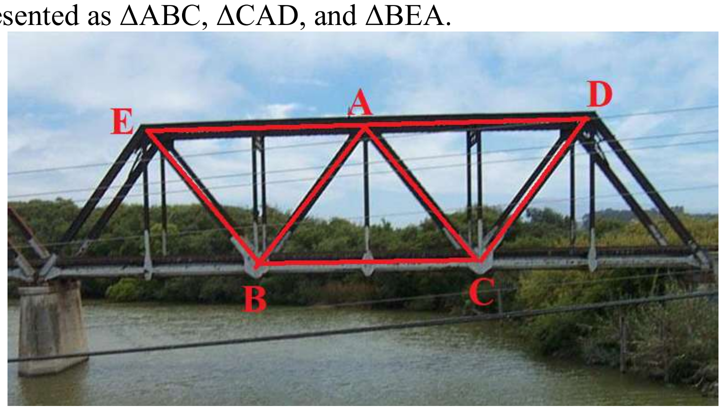
OR

What is the total height of the tree? (2)
(c) Find the value of ∠BAP? (1)
Ans: (a) In ΔACP and ΔABP
AB = AC (Given)
AP = AP (common)
∠APB = ∠APC =90°
By RHS criteria ΔACP ≅ ΔABP
(b) In ΔACP, ∠APC + ∠PAC + ∠ACP = 180°
⇒ 90° + 30° + ∠ACP = 180° (angle sum property of triangle)
⇒ ∠ACP =180° - 120° = 60°
∠ACP = 60°

OR

In ΔACP, by Pythagoras theorem,
$AC^2 = AP^2 + PC^2$
⇒ $25 = AP^2 + 16$
⇒ $AP^2 = 25 – 16 = 9$
⇒ AP = 3 m
Total height of the tree = AP + 5 = 3 + 5 = 8m
(c) ΔACP ≅ ΔABP
Corresponding part of congruent triangle
∠BAP = ∠CAP
∠BAP = 30° (given ∠CAP = 30°)

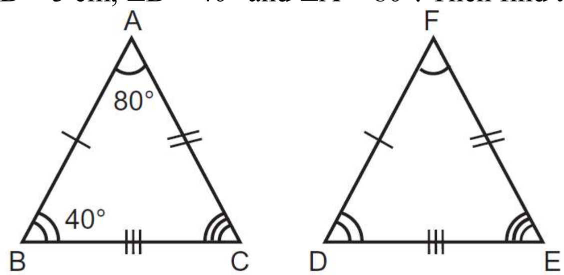
20. Truss bridges are formed with a structure of connected elements that form triangular structures to make up the bridge. Trusses are the triangles that connect to the top and bottom cord and two end posts. You can see that there are some triangular shapes are shown in the picture given alongside and these are represented as ΔABC, ΔCAD, and ΔBEA.



(a) If AB = CD and AD = CB, then prove ΔABC ≅ ΔCDA

(b) If AB = 7.5 m, AC = 4.5 m and BC = 5 m. Find the perimeter of ΔACD, if ΔABC ≅ ΔCDA by SSS congruence rule.

(c) If ΔABC ≅ ΔFDE, AB = 5 cm, ∠B = 40° and ∠A = 80°. Then find the length of DF and ∠E.



Ans. Ans. (a) In ΔABC and ΔCDA,
AB = CD [Given]
AD = CB [Given]
AC = CA [common]
So by SSS congruence rule, ΔABC ≅ ΔCDA
(b) Given that ΔABC ≅ ΔCDA [By SSS congruence rule]
So, Perimeter of ΔABC = Perimeter of ΔCDA
(7.5 m + 4.5 m + 5 m) = Perimeter of ΔCDA
The required perimeter of ΔCDA = 17 m.
(c) Given, ΔABC ≅ ΔFDE and AB = 5cm,
∠B = 40°
∠A = 80°
Since, ΔFDE ≅ ΔABC
DF = AB [By CPCT]
DF = 5cm
and ∠E = ∠C
⇒ ∠E = ∠C = 180°– (∠A + ∠B) [By Angle Sum Property of a DABC]
⇒ ∠E = 180°– (80° + 40°) ⇒ ∠E = 60°
Hence, DF = 5cm, ∠E = 60°