Self Assessment Model Paper - 3 (2024-25)

IX MATHEMATICS SOLUTIONS

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I. Answer all the questions in one word or one phrase.

1. If in △ABC and △PQR, AB = PQ, BC = QR and CA = RP then write the pair of congruent triangles in symbolic form

Sol: $\Delta ABC \cong \Delta PQR$

2. If △PQR ≅ △EFD; then ∠E= [A]

A) ∠P B) ∠Q C) ∠R D) None of these

3. Given which of the following is false [C]

A) The sides opposite to equal angles of a triangle are equal.

B) Two squares of the same sides are congruent

C) Each angle of an isosceles triangle is 60smgse

D) Angles opposite to equal sides of a triangle are equal.

4. Each angle of a square is _______

Sol: 90^0

5. Statement - I: The diagonals of parallelogram bisect each other. [A]

Statement - II: Two figures are congruent if they are of the same shape and of the same size

Now choose the correct option.

A) Both statements are true

B) Statement I is true and statement II is false

C) Statement I is False and statement II is true

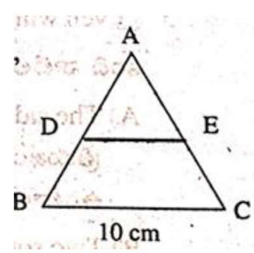
D) Both statements are false

6. In a Parallelogram ABCD, If ∠A = 75° then ∠C=

Sol: $\angle C = \angle A (In\ a\ parallelogram\ opposite\ angles\ are\ equal)$

$\angle C = 75^0$

7. In the adjacent figure, D and E are the mid points of the sides AB and AC of △ABC and BC = 10 cm, then find DE...



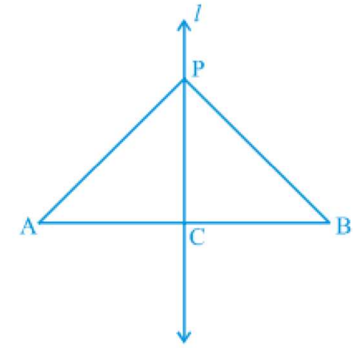
Sol: $From\ mid\ point\ theorem.$

$$DE = \frac{1}{2}BC = \frac{1}{2} \times 10\ cm = 5\ cm.$$

II. Solve the following problems. . 6 x 2 = 12

8. AB is a line segment and line "l" is its perpendicular bisector. If a point P lies on line "l", show that P is equidistant from A and B.

Sol: l is perpendicular bisector of AB



Δ PCA and Δ PCB.

AC = BC (C is midpoint of AB)

$\angle$ PCA = $\angle$ PCB = 90° ($l \perp$ AB)

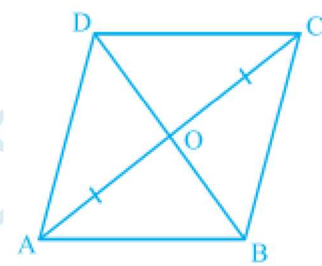
PC = PC (Common)

$So, \Delta\ PCA \cong \Delta\ PCB\ (SAS\ congruence\ rule)$

$PA = PB\ (CPCT)$

9. Show that the diagonals of a rhombus are perpendicular to each other.

Sol: Let ABCD is a rhombus.



AB = BC = CD = DA (All sides are equal in rhombus)

In Δ AOD and Δ COD

OA = OC (Diagonals of a parallelogram bisect each other)

OD = OD (Common)

AD = CD (given)

Δ AOD $\cong$ Δ COD (SSS congruence rule)

$\angle$AOD = $\angle$COD (CPCT)

But, $\angle$AOD + $\angle$COD = 180° (Linear pair)

2$\angle$AOD = 180°

$\angle$AOD = 90°

So, the diagonals of a rhombus are perpendicular to each other.

10. ABC is a right-angled triangle in which $\angle$ A = 90° and AB = AC, Find $\angle$B and $\angle$C.

Sol: In ΔABC, AB = AC

$\Rightarrow \angle C = \angle B = x\ (Equal\ sides\ opposite\ angles\ are\ equal)$

$\angle A + \angle B + \angle C = 180^0\ (Angle\ sum\ property\ of\ a\ triangle)$

$90^0 + x + x = 180^0$

$2x = 90^0$

$x = \dfrac{90^0}{2} = 45^0$

$\angle B = \angle C = 45^0$

11. AD is an altitude of an isosceles triangle ABC in which AB = AC. Show that AD bisects BC.

Sol: In ΔADB and ΔADC

$AB = AC$ (Given)

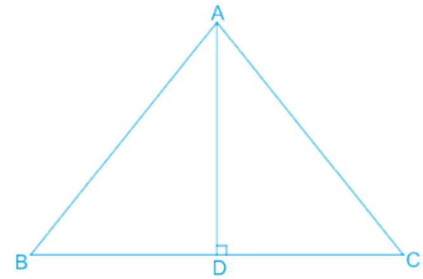
$\angle ADB = \angle ADC = 90^0$ ($AD \perp BC$)

$AD = AD$ (Common)

$\Delta ADB \cong \Delta ADC$ (RHS Congruence rule)

BD=CD (CPCT)

Hence , AD bisects BC



12. Show that each angle of a rectangle is a right angle.

Sol: Rectangle is a parallelogram in which one angle is a right angle.

ABCD is a rectangle. Let one angle is $\angle A = 90^0$

We have, AD || BC and AB is a transversal.

$\angle A + \angle B = 180°$ (Interior angles on the same side of the transversal)

$90^0 + \angle B = 180°$

$\angle B = 180° - 90^0 = 90^0$

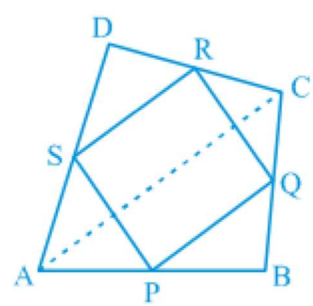
$\angle C = \angle A$ and $\angle D = \angle B$ (Opposite angles of the parallelogram)

$\angle C = 90^0$ and $\angle D = 90^0$

Therefore, each of the angles of a rectangle is a right angle

13. ABCD is a quadrilateral in which P, Q, R and S are mid-points of the sides AB, BC, CD and DA. AC is a diagonal. Show that :

(i) SR || AC and SR $= \frac{1}{2}$ AC



Sol: We know that the line segment joining the mid-points of two sides of a triangle is parallel to the third side and also half of it.

(i) In ΔADC , S and R are midpoints of DA and DC.

SR || AC and SR $= \frac{1}{2}$ AC

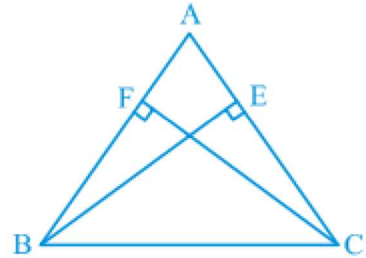
III. Solve the following problems. . **2x4=8**

14. In the given figure, ABC is a triangle in BC is a triangle in which altitudes BE and CF to sides AC and AB are equal. Show that

(i) $\Delta ABE \cong \Delta ACF$

(ii) AB = AC

Sol: In Δ ABE and Δ ACF



$\angle A = \angle A$ (Common angle)

$\angle AEB = \angle AFC = 90^0$ ($BE \perp AC$ and $CF \perp AB$)

BE = CF(Given)

Δ ABE $\cong$ Δ ACF (AAS Congruence rule)

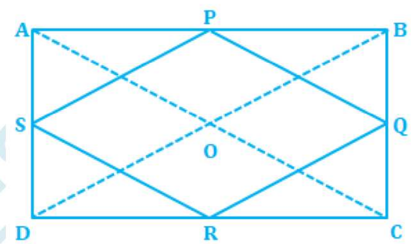
(ii) Δ ABE $\cong$ Δ ACF

$\Rightarrow$ AB = AC (CPCT)

ΔABC is an isosceles triangle.

15. ABCD is a rectangle and P, Q, R and S are mid-points of the sides AB, BC, CD and DA respectively. Show that the quadrilateral PQRS is a rhombus..

Sol: We know that the line segment joining the mid-points of two sides of a triangle is parallel to the third side and also half of it.



In ΔABC , P and Q are midpoints of AB and BC.

$PQ \parallel AC$ and $PQ = \frac{1}{2}$ AC → (1)

In ΔADC , S and R are midpoints of AD and DC.

SR $\parallel$ AC *and* SR $= \frac{1}{2}$ AC → (2)

From (1)*and* (2) : $PQ \parallel SR$ *and* $PQ = SR = \frac{1}{2}$AC

Similarly : PS $\parallel$ QR and PS = QR $= \frac{1}{2}$ BD

Also, AC = BD (*Diagonals of a rectangle AC, BD are equal*)

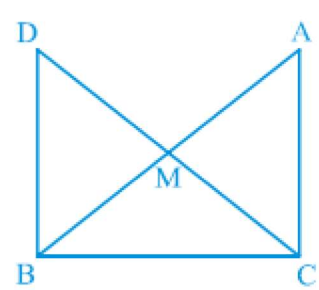
$\therefore$ PQ=QR=RS=SP

So, PQRS is a rhombus.

IV. Solve the following problem. 1 x8 = **8**

16. a) In right triangle ABC, right angled at C, M is the mid-point of hypotenuse AB. C is joined to M and produced to a point D such that DM = CM. Point D is joined to point B (see Fig. 7.23). Show that: (i) Δ AMC $\cong$ Δ BMD (ii) $\angle$ DBC is a right angle. (iii) Δ DBC $\cong$ Δ ACB (iv) CM $= \frac{1}{2}$AB

Sol: (i) In Δ AMC and Δ BMD



AM=BM (M is midpoint of AB)

$\angle$ AMC=$\angle$ BMD (Vertically opposite angles)

DM = CM (Given)

$\therefore$ Δ AMC $\cong$ Δ BMD (By SAS congruence rule)

(ii) Δ AMC $\cong$ Δ BMD

∠ACM=∠BDM (By CPCT)

Alternate interior angles are equal

∴ DB || AC

∠DBC +∠ACB=180^0 (co-interior angles are supplementary)

∠DBC+90^0 =180^0(Given ∠ACB=90^0)

∴∠DBC=90^0

(iii) $In\ \Delta\ DBC\ and\ \Delta\ ACB$

DB=AC (Δ AMC ≅ Δ BMD)

∠DBC=∠ACB = 90^0

BC=CB(common)

$\Delta\ DBC\ \cong\ \Delta\ ACB\ (By\ SAS\ congruence\ rule)$

(iv) $\Delta\ DBC\ \cong\ \Delta\ ACB$

AB=DC (by CPCT)

AB=2 CM (CM=DM)

$\text{CM} = \frac{1}{2}\text{AB}$

b) **In ΔABC, D, E and F are respectively the mid-points of sides AB, BC and CA (see Fig. 8.18). Show that Δ ABC is divided into four congruent triangles by joining D, E and F.**

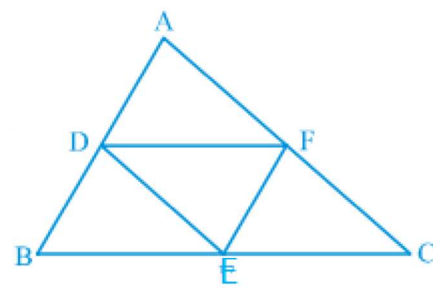
Solution: We know that the line segment joining the mid-points of two sides of a triangle is parallel to the third side.

DE || AC , DF || BC and EF || AB

Therefore ADEF, BDFE and DFCE are all parallelograms.

Now DE is a diagonal of the parallelogram BDFE,

We know that diagonal of a parallelogram divides it into two congruent triangles.



Therefore, ΔBDE ≅ Δ FED

Similarly ΔDAF ≅ ΔFED and ΔEFC ≅ ΔFED

∴ ΔBDE ≅ Δ FED≅ΔDAF ≅ΔEFC

So, all the four triangles are congruent

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