Class-7 / Chapter-21 / Congruence

Exercise-21

1. (i) Since $AB = QP = 2.5cm$

$BC = QR = 4cm$

$AC = PR = 3.5cm$

$\therefore$ By SSS, $\triangle ABC \cong PQR$.

(ii) Since, $AC = PR$ (hypotenuse)

$AB = PQ$ (side

$\angle B = \angle Q = 90^\circ$

$\therefore$ By RHS, $\triangle ABC \cong \triangle PQR$.

1. (iii) Since, $\angle B = \angle Q = 90°$

$BA = QP$

$\angle A = \angle P = 35°$

$\therefore$ By ASA $\triangle ABC \cong \triangle PQR$

(iv) Since, $AC = PR$

$\angle C = \angle R = 90°$

$CB = RQ$.

$\therefore$ By SAS, $\triangle ABC \cong \triangle PQR$,

2. (i) Since, $\angle C = \angle E = 50°$

$\angle B = \angle D = 60°$

$BA = DF$

$\therefore$ By AAS, $\triangle ABC \cong \triangle FDE$.

(ii) Since, $AB = PR$

$\angle B = \angle R = 35°$

$BC = RQ$.

$\therefore \triangle ABC \cong \triangle PRQ$. (by SAS)

(iii) Since, $DH = RP$.

$\angle H = \angle P = 90°$

$HE = PQ$.

$\therefore$ By SAS, $\triangle DHE \cong \triangle RPQ$.

(iv) Since, $AB = RQ$
$\angle B = \angle Q = 90^\circ$
$BC = QP$

$\therefore$ By SAS, $\triangle ABC \cong \triangle RQP$.

(v) ~~Since, $\angle$~~.

In $\triangle XYZ$, $\angle X + \angle Y + \angle Z = 180^\circ$ (Sum of 3 $\angle$es of a $\triangle$le)

$\Rightarrow \angle X + 30^\circ + 80^\circ = 180^\circ$

$\Rightarrow \angle X = 180^\circ - 110 = 70^\circ$

Now, In $\triangle LMN$ & $\triangle XYZ$,

since, $LM = ZX$
$\angle M = \angle X = 70^\circ$
$MN = XY$

$\therefore$ By SAS, $\triangle LMN \cong \triangle ZXY$.

Q.3. (i) Given:

In $\triangle ABC$, $\angle A = 50^\circ$
$\angle B = 60^\circ$
$BC = 4.5 cm$

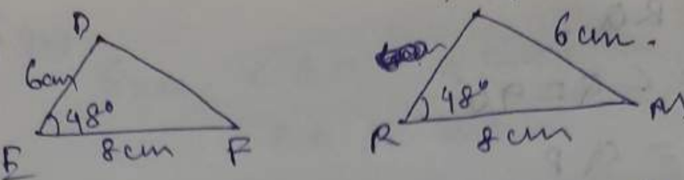
In $\triangle DEF$,
$\angle E = 60^\circ$
$\angle F = 70^\circ$
$EF = 4.5 cm$.

$\therefore \angle C = 180^\circ - (\angle A + \angle B)$
$= 180^\circ - (50 + 60^\circ)$
$= 180^\circ - 110^\circ = 70^\circ$

Now, since, $\angle B = \angle E = 60^\circ$
$BC = EF = 4.5 cm$.
$\angle C = \angle F = 70^\circ$

$\therefore$ By ASA, $\triangle ABC \cong \triangle DEF$

(ii)

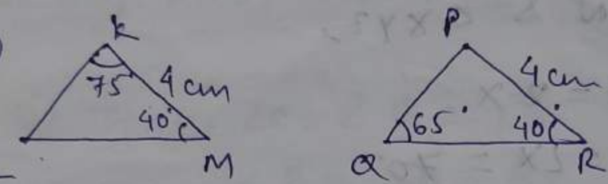


Since, in $\triangle DEF$, $\angle E$ is the included $\angle$le of the sides DE & EF

But in $\triangle MNR$, $\angle R = 48°$ is not the included angle of NR & RM.

$\therefore$ $\triangle DEF$ and $\triangle MNR$ are not congruent.

(iii)



Now, in $\triangle KLM$,

$\angle L = 180° - (\angle K + \angle M)$

$= 180° - (75° + 40°)$

$= 180 - 115$

$= 65°$

Now, in $\triangle KLM$ & $\triangle PQR$,

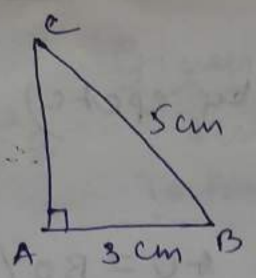
since, $\angle L = \angle Q = 65°$

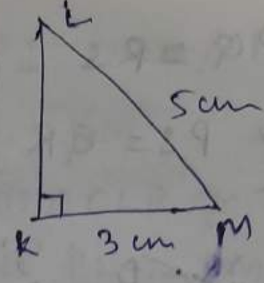
$\angle M = \angle R = 40°$

$MK = RP = 4cm$.

$\therefore$ $\triangle KLM \cong \triangle PQR$. (by AAS)

(iv)





In $\triangle ABC$ and $\triangle KML$,

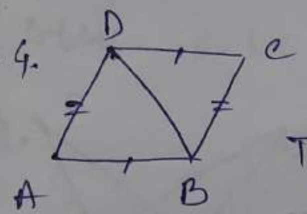
since, $\angle A = \angle K = 90^\circ$

$BC = ML$ (hypotenuse)

$AB = KM$ (side)

$\therefore$ By RHS, $\triangle ABC \cong \triangle KML$.

Q.4.



given: $AB = CD$ / $AD = CB$

To Prove: $\triangle ABD \cong \triangle CDB$.

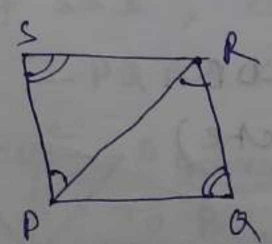
Proof:- In $\triangle ABD$ & $\triangle CDB$

since, $\left.\begin{array}{l} AD = BC \\ AB\,C = CD \end{array}\right\}$ given.

$BD = BD$ (common side)

$\therefore$ By SSS, $\triangle ABD \cong \triangle CDB$.

Q.5.



given: $\angle S = \angle Q$ / ~~GD~~

$\angle SPR = \angle QRP$

To Prove: (i) ~~$\triangle ABD$~~ $PQ = RS$

(ii) $PS = QR$.

Proof:- In $\triangle SPR$ & $\triangle QRP$,

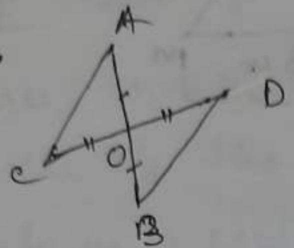
$\left.\begin{array}{l} \angle PSR = \angle PQR \\ \angle SPR = \angle QRP \end{array}\right\}$ (given)

$PR = PR$ (common)

$\therefore \triangle SPR \cong \triangle QRP$ (by SSS)

(i) $\Rightarrow PQ = RS$
(ii) Also $PS = QR$ } (by cpct)

Q.6.



Given: $AO = BO$ / $CO = DO$

To Prove: (i) $\triangle AOC \cong \triangle BOD$

(ii) $AC = BD$

Proof :- In $\triangle AOC$ and $\triangle BOD$,

$CO = OD$ (given)

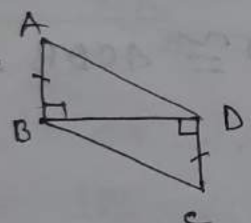
$\angle AOC = \angle BOD$ (V.O.A)

$AO = BO$ (given)

$\therefore$ By SAS, $\triangle AOC \cong \triangle BOD$

$\therefore AC = BD$ (by cpct)

Q.7.



Given: $AB \perp BD$ and $CD \perp BD$ / $AB = CD$

To Prove: (i) $\triangle ABD \cong \triangle CDB$

(ii) $AD = CB$

Proof :- In $\triangle ABD$ & $\triangle CDB$,

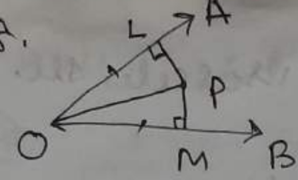
$AB = CD$ (given)

$\angle ABD = \angle BDC = 90°$

$BD = BD$ (common)

$\therefore$ By SAS, $\triangle ABD \cong \triangle CDB$.

Also, $AD = CB$ (by cpct)

Q.8. 

Given :- $PL \perp OA$ / $PM \perp OB$

Also, $OL = OM$

To Prove :- (i) $\triangle OLP \cong \triangle OMP$

(ii) $PL = PM$

(iii) $\angle LOP = \angle MOP$

Proof :-

In $\triangle OLP$ & $\triangle OMP$,

$\angle OLP = \angle OMP = 90°$

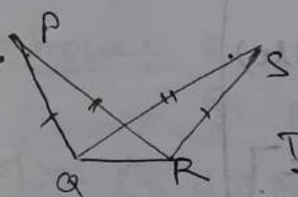
$OL = OM$ (hypotenuse)

$OP = OP$ (common side)

(i). By RHS, $\triangle OLP \cong \triangle OMP$.

(ii) $\Rightarrow$ $PL = PM$ (by cpct)

(iii) Also, $\angle LOP = \angle MOP$ (by cpct)

Q.9. 

Given: $PQ = SR$ / $PR = SQ$.

To Prove :- (i) $\triangle PQR \cong \triangle SRQ$.

(ii) $\angle PQR = \angle SRQ$.

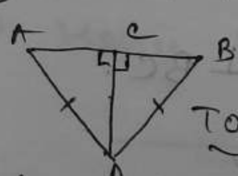
Proof :- In $\triangle PQR$ and $\triangle SRQ$,

$PQ = SR$ }
$PR = SQ$ } given.

$QR = QR$ (common side)

(i) By SSS, $\triangle PQR \cong \triangle SRQ$.

(ii) $\therefore$ $\angle PQR = \angle SRQ$ (by cpct)

10. 

given :- $AC \perp CD$ / $BC \perp CD$ / $DA = DB$

To Prove: $CA = CB$

Proof :- In $\triangle ACD$ & $\triangle BCD$,

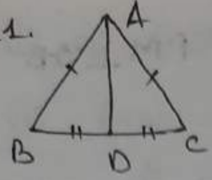
$\angle ACD = \angle BCD = 90°$.

$AD = BD$ (hypotenuse)

$CD = CD$ (common side)

$\therefore$ By RHS, $\triangle ACD \cong \triangle BCD$

$\Rightarrow$ $CA = CB$ (by cpct)

11. 

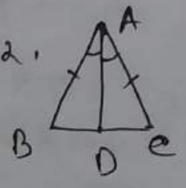
given: $\triangle ABC$ is an isosceles $\triangle$le.
$\Rightarrow AB = AC$
Also, AD is the median
$\Rightarrow BD = DC$

To prove: (i) $\triangle ADB \cong \triangle ADC$
(ii) $\angle BAD = \angle CAD$

Proof:- In $\triangle ABD$ and $\triangle ACD$,
$AB = AC$ } given
$BD = DC$ }
$AD = AD$ (common side.
$\therefore$ By SSS, $\triangle ABD \cong \triangle ACD$.

[OR $AB = AC$ given.
$\angle B = \angle C$ ($\because$ isoscles $\triangle$le).
$BD = DC$.
$\therefore$ By SAS, $\triangle ABD \cong \triangle ADC$]

$\Rightarrow \angle BAD = \angle CAD$ (by cpctc).

Q.12. 

given: $\triangle ABC$ is an isosceles $\triangle$le.
$\Rightarrow AB = AC$.
AD is the bisector of $\angle A$
$\Rightarrow \angle BAD = \angle CAD$.

To prove:- (i) $\triangle ADB \cong \triangle ADC$
(ii) $\angle B = \angle C$
(iii) $BD = DC$ (iv) $AD \perp BC$.

Proof:- In $\triangle ADB$ and $\triangle ADC$,
$AB = AC$ (given)
$\angle BAD = \angle DAC$ (given)
$AD = AD$ (common)
(i) $\therefore$ By SAS, $\triangle ADB \cong \triangle ADC$.

(ii) Hence, $\angle B = \angle C$ (by cpct)

(iii) Also, $BD = CD$ (by cpct).

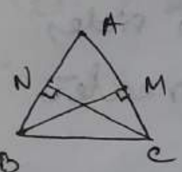
(iv) Also, $\angle ADB = \angle ADC$ —— (1)

Now, $\angle ADB + \angle ADC = 180°$ ($\because$ straight angle)

$\Rightarrow 2\angle ADB = 180°$ (from (1))

$\Rightarrow \angle ADB = 90° = \angle ADC$.

$\Rightarrow AD \perp BC$.

13. 

Given: $\triangle ABC$ is an isosceles $\triangle$.

$AB = AC$

Also, $BM \perp AC$ / $CN \perp AB$

To Prove:- (i) $\triangle BMC \cong \triangle CNB$

(ii) $BM = CN$

Proof:- In $\triangle BMC$ and $\triangle CNB$

$\angle BNC = \angle CMB = 90°$

$\angle NBC = \angle MCB$ ($\because AB = AC$
$\Rightarrow \angle ABC = \angle ACB$)
$\Rightarrow \angle NBC = \angle MCB$)

$BC = BC$ (common)

(i) $\therefore$ By AAS, $\triangle BMC \cong \triangle CNB$

(ii) Hence, $BM = CN$ (by cpct).

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