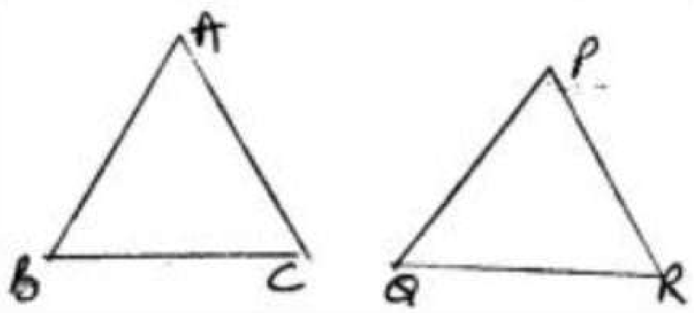
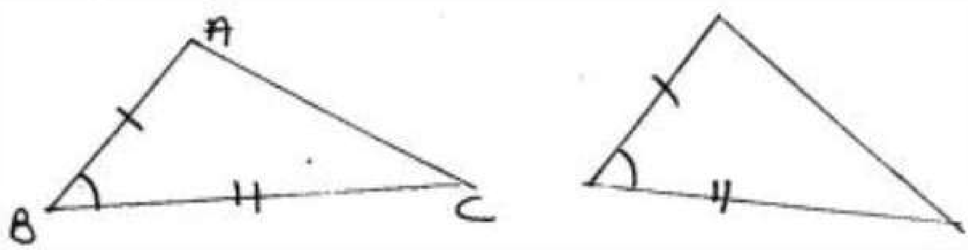
- **Triangle** – A closed figure formed by three intersecting lines is called a triangle. A triangle has three sides, three angles and three vertices.
- **Congruent figures** – Congruent means equal in all respects or figures whose shapes and sizes both are same. For example, two circles of the same radii are congruent. Also two squares of the same sides are congruent.
- **Congruent Triangles** – Two triangles are congruent if and only if one of them can be made to superimpose on the other, so as to cover it completely
- If two triangles ABC and PQR are congruent under the correspondence then symbolically, it is expressed as



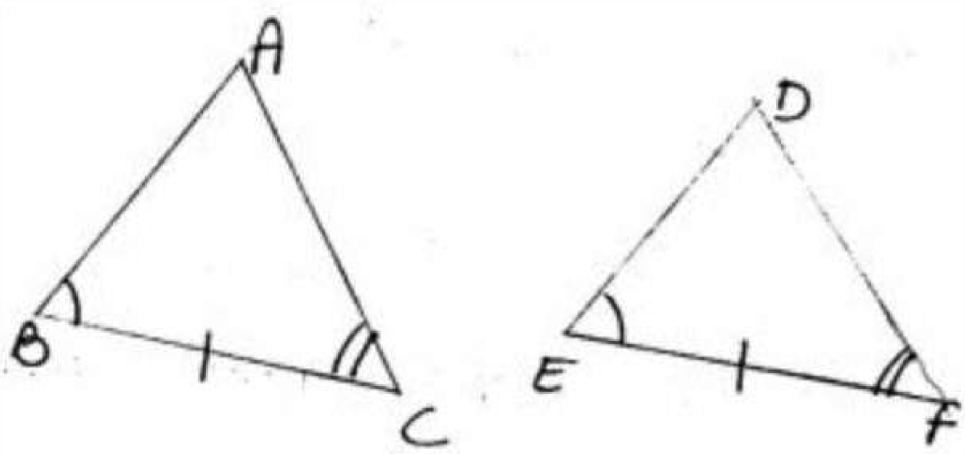
- In congruent triangles, corresponding parts are equal and we write 'CPCT' for corresponding parts of congruent triangles.

- **SAS congruency rule** – Two triangles are congruent if two sides and the included angle between two sides of one triangle are equal to the two sides and the included angle between two sides of the other triangle. For example and as shown in the figure satisfy SAS congruence criterion.

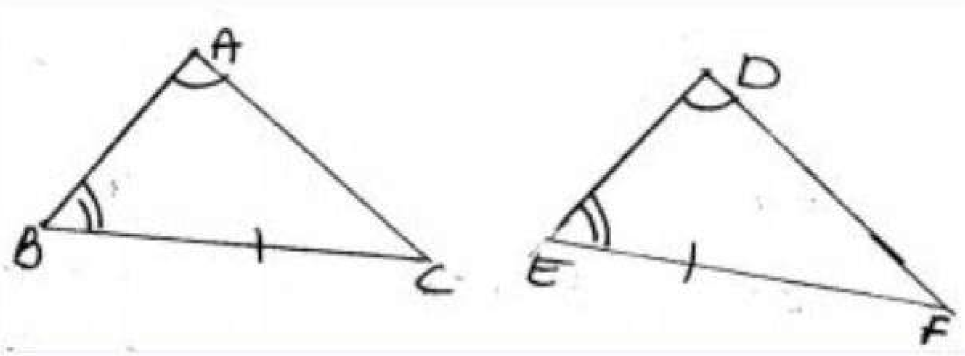


- **ASA Congruence Rule** – Two triangles are congruent if two angles and the included side of one triangle are equal to two angles and the included side of other triangle. For examples shown below satisfy ASA congruence criterion.

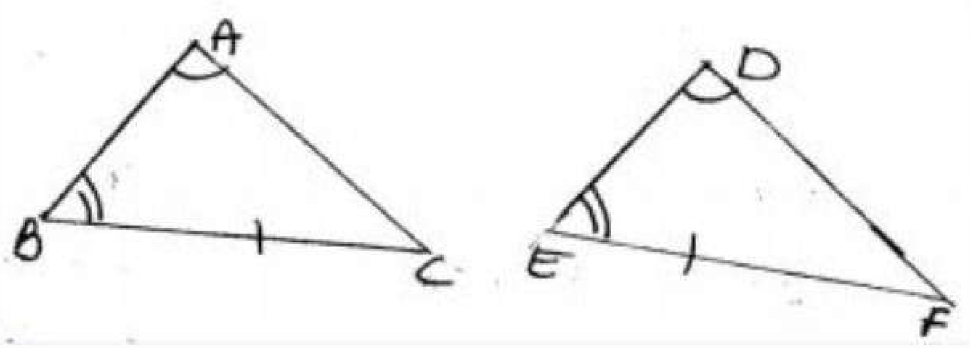
- **ASA Congruence Rule** – Two triangles are congruent if two angles and the included side of one triangle are equal to two angles and the included side of other triangle. For examples shown below satisfy ASA congruence criterion.



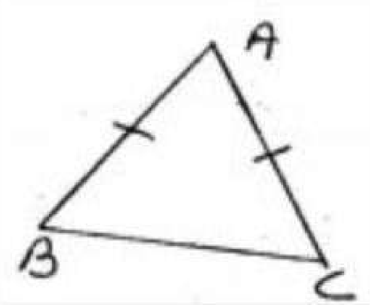
- **AAS Congruence Rule** – Two triangle are congruent if any two pairs of angles and one pair of corresponding sides are equal.For example shown below satisfy AAS congruence criterion.



- **AAS Congruence Rule** – Two triangle are congruent if any two pairs of angles and one pair of corresponding sides are equal.For example shown below satisfy AAS congruence criterion.

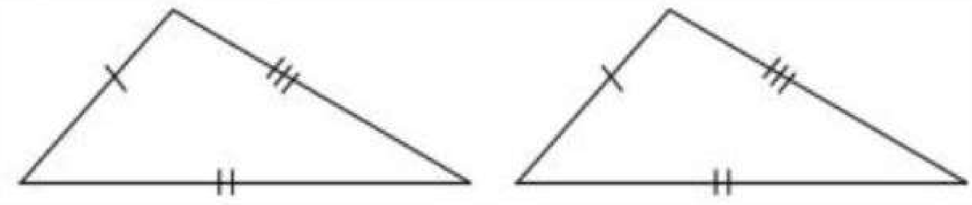


- **AAS criteri**on for congruence of triangles is a particular case of ASA criterion.
- **Isosceles Triangle** – A triangle in which two sides are equal is called an isosceles triangle. For example shown below is an isosceles triangle with AB=AC.

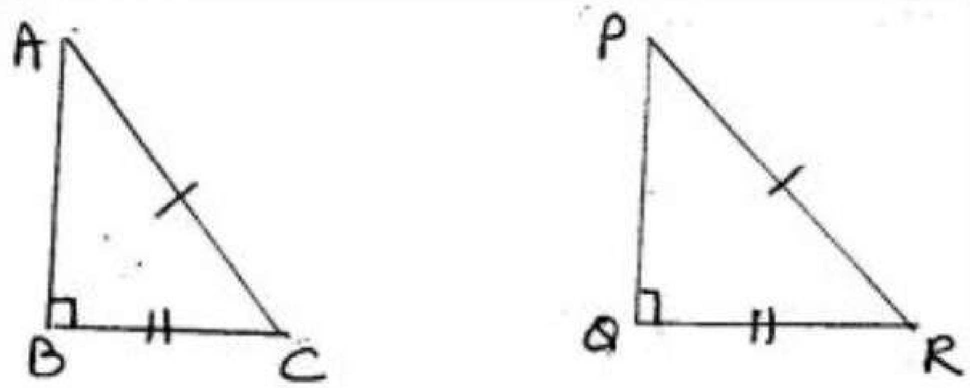


- **Scalene Triangle** – A triangle, no two of whose sides are equal, is called scalene triangle.
- **Equilateral Triangle** – A triangle whose all sides are equal, is calle an equilateral triangle.
- **Right angled triangle** – A triangle with one right angle is called a right angled triangle.
- The sum of all the angles of a triangle is 180^{o}.
- If a side of a triangle is produced, the exterior angle so formed is equal to the sum of two interior opposite angles.
- Angle opposite to equal sides of a triangle are equal.
- Sides opposite to equal angles of a triangle are equal.
- Each angle of an equilateral triangle is .
- If the altitude from one vertex of a triangle bisects the base, then the triangle is isosceles triangle.

- **SSS congruence Rule** – If three sides of one triangle are equal to the three sides of another triangle then the two triangles are congruent for example as shown in the figure satisfy SSS congruence criterion.



- **RHS Congruence Rule** – If in two right triangles the hypotenuse and one side of one triangle are equal to the hypotenuse and one side of the other triangle then the two triangle are congruent. For example shown below satisfy RHS congruence criterion.



RHS stands for Right angle – Hypotenuse side.

- A point equidistant from two given points lies on the perpendicular bisector of the line segment joining the two points and vice-versa.
- A point equidistant from two intersecting lines lies on the bisectors of the angles formed by the two lines.
- In a triangle, angle opposite to the longer side is larger (greater)
- In a triangle, side opposite to the larger (greater) angle is longer.
- Sum of any two sides of a triangle is greater than the third side.

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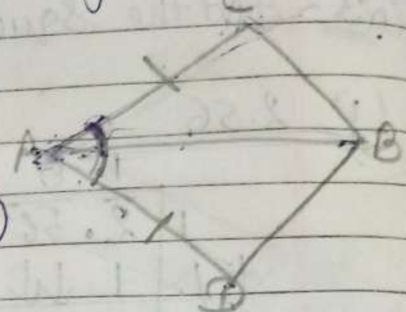
Day 4 sept 2020 Chapter - 7.

Ex - 7.1

Q1. In quadrilateral ACBD,

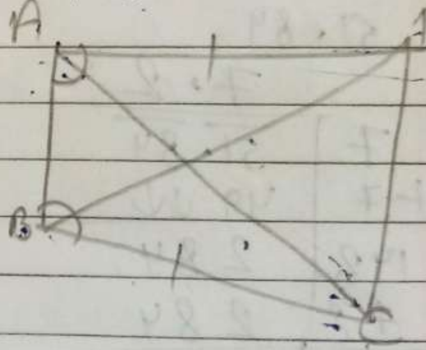
AC = AD and AB bisects ∠A (see fig. 7.6) Show that
△ ABC ≅ △ABD. What can you say about BC and BD



Ans In △ABC and △ABD

AC = AD (Given)
∠CAB = ∠DAB (AB bisect ∠A)
AB = AB (common)
△ ABC ≅ △ ABD (SAS)
BC = BD (CPCT Corresponding sides of Congruent triangle.)

Q2. ABCD is a quadrilateral in which AD = BC and ∠DAB = ∠CBA (see fig 7.17) Prove that



(i) △ABD ≅ △ BAC
(ii) BD = AC
(iii) ∠ABD = ∠BAC.

(i) In △ABD and △BAC
AD = BC (Given)
∠DAB = ∠CBA (Given)
AB = BA (common)
△ ABD ≅ △BAC (SAS)
(ii) BD = AC (CPCT)
(iii) ∠ABD = ∠BAC (CPCT).

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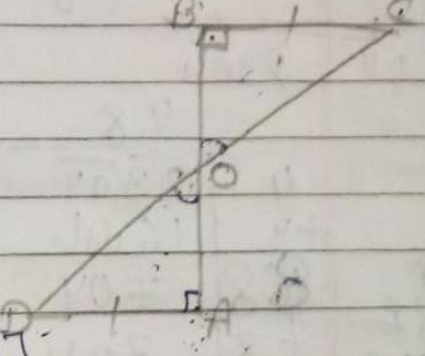
Day 5 Sept 2020

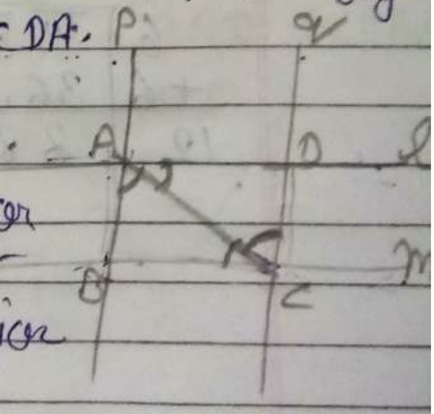
Chapter - 7
Ex 7.1

Q3. AD and BC are equal perpendiculars to a line segment AB (see fig. 7.18). Show that CD bisects AB.



Sol. Prove = AO = BO
In Δ BOC and Δ AOD
$\because \angle B = \angle A$ (Both 90°)
$\angle BOC = \angle AOD$ (Vertically opp. Angles]
BC = AD (Given)
Δ BOC $\cong$ Δ AOD [AAS]
BO = AO (CPCT)
$\therefore$ It means CD bisect AB.

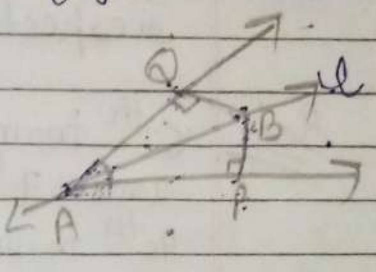
Q4. l and m are two parallel lines intersected by another pair of parallel lines p and q (see fig 7.19) Show that $\Delta ABC \cong \Delta CDA$.



Sol. In Δ ABC and Δ CDA,
$\angle DAC = \angle BCA$ (Alternate Interior Angles]
$\angle BAC = \angle DCA$ (Alternate Interior Angles]
AC = CA (common)
Δ ABC $\cong$ Δ CDA (AAS.) H.P.

PAGE NO. :

Q5. Line l is the bisector of an angle $\angle A$ and B is any point on l. BP and BQ are perpendiculars from B to the arms of $\angle A$ (see fig 7.20) Show that :-



(i) $\Delta APB \cong \Delta AQB$

(ii) $BP = BQ$ or B is equidistant from the arms of $\angle A$.

Sol. In ΔAPB and ΔAQB

$\angle AQB = \angle APB$ (Both $90°$)

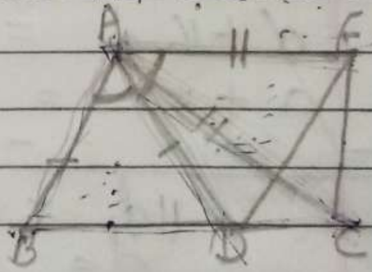
$\angle QAB = \angle PAB$ [l bisect $\angle A$]

$AB = AB$ (Common)

$\Delta APB \cong \Delta AQB$ [AAS]

(ii) $BQ = BP$ (By CPCT)

Q6. In the given fig. $AC = AE = AD$ and $\angle BAD = \angle EAC$. Show that $BC = DE$.



Sol. $\angle BAD = \angle EAC$

$\angle BAD + \angle DAC = \angle EAC + \angle DAC$

$\angle BAC = \angle EAD$ ——— (1)

In ΔABC and ΔADE

$AB = AB$ (Given]

$\angle BAC = \angle EAD$ (By eq. (1))

$AC = AE$ (Given]

$\Delta ABC \cong \Delta ADE$ (SAS]

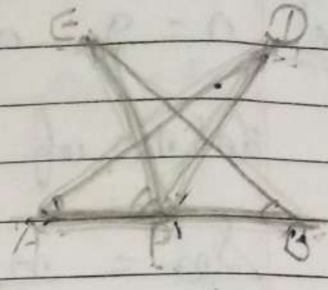
so $BC = DE$ (By CPCT.)

Day 14 Sept 2020

Chapter-7

Ex - 7.1

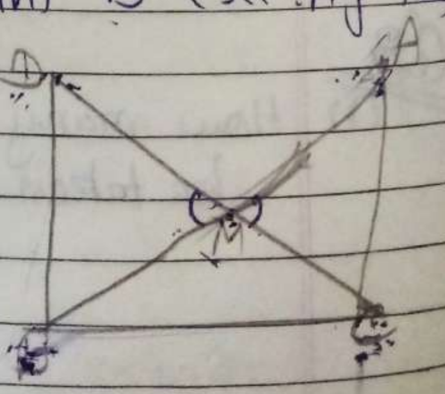
Q7. AB is a line segment and P is its mid-point. D and E are point on the same side of AB Such that ∠BAD = ∠ABE and ∠EPA = ∠DPB (See fig 7.22) Show that.



(i) △DAP ≅ △EBP
(ii) AD = BE

Sol. (i) ∠EPA = ∠DPB (given)
∠EPA + ∠EPD = ∠DPB + ∠EPD
∠APD = ∠BPE — (i)
In △DAP and △EBP
∠DAP = ∠EBD (given)
AP = BP [P is mid point of AB]
∠APD = ∠BPE — [By eq (i)]
△DAP ≅ △EBP (ASA)
(ii) AD = BE (By CPCT)

Q8. 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) △AMC ≅ △BMD
(ii) ∠DBC is a right angle
(iii) △DBC ≅ △ABC
(iv) CM = $\frac{1}{2}$ AB

Sol. Given M is mid point of AB
$DM = CM$
$\angle C = 90'$

(i) In $\triangle AMC$ and $\triangle BMD$
$DM = CM$ (given)
$\angle AMC = \angle BMD$ (Vertically opp. Angles)
$AM = BM$ (M is mid point of AB)
$\triangle AMC \cong \triangle BMD$ (SAS)

(ii) $\angle DBC$ is a right angle.
$\triangle AMC \cong \triangle BMD$ (SAS)
$\angle ACM = \angle BDM$ (CPCT)
These are also Alternate Interior angles.
$\therefore DB \parallel AC$
$\angle DBC + \angle C = 180'$ (co. interior angles)
$\angle DBC + 90' = 180'$
$\angle DBC = 180 - 90'$
$\angle DBC = 90'$
So $\angle DBC$ is a right angle.

(iii) $\triangle DBC \cong \triangle ABC$
In $\triangle DBC$ and $\triangle ABC$.
$DB = AC$ (CPCT)
$\angle DBC = \angle ACB$ (Both 90')
$BC = CB$ (common)
$\triangle DBC \cong \triangle ABC$ (SAS)

(iv) $CM = \frac{1}{2} AB$

$\triangle DBC \cong \triangle ACB$ (SAS)

$DC = AB$ (CPCT)

$CM + DM = AB$

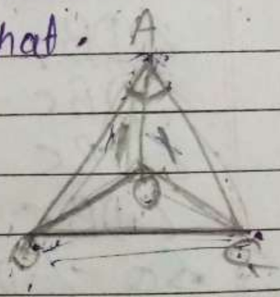
$CM + CM = AB$

$2CM = AB$

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

Ex - 7.2

Q1. 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 $\angle A$.

Sol. $AB = AC$ (Given)

$\angle ACB = \angle ABC$ (Angle opp. to equal sides in $\triangle$ are equal)

$\frac{1}{2} \angle ACB = \frac{1}{2} \angle ABC$

$\angle OCB = \angle OBC$

In $\triangle OBC$

$OB = OC$ (Side opp. to eq. angles in $\triangle$ are equal.

(ii) AO bisects $\angle A$.

In $\triangle OAB$ and $\triangle OAC$

$AB = AC$ (Given)

$OA = OA$ (common)

$OB = OC$ (Proved above)

$\triangle OAB \cong \triangle OAC$ (SSS)

$\angle OAB = \angle OAC$ (CPCT)

$\therefore$ OA bisects $\angle A$.

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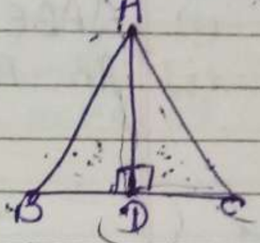
Chapter - 7

Ex - 7.2

Q2. In $\triangle ABC$, AD is the perpendicular bisector of BC. Show that $\triangle ABC$ is an isosceles triangle in which AB = AC.



Sol. In $\triangle ABD$ and $\triangle ADC$

AD = AD (Common)

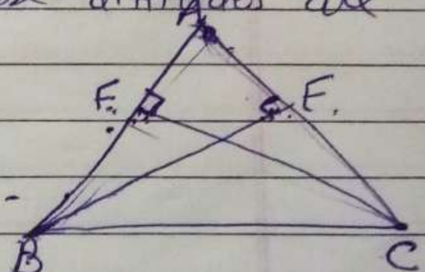
$\angle ADB = \angle ADC$ (AD $\perp$ BC, Both 90°)

BD = CD (D is mid point of BC)

$\triangle ADB \cong \triangle ADC$ (SAS)

AB = AC (By CPCT)

Q3. ABC is an isosceles $\triangle$ in which altitudes BE and CF are drawn to equal sides AC and AB respectively. Show that these altitudes are equal.



Sol. In $\triangle AEB$ and $\triangle AFC$

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

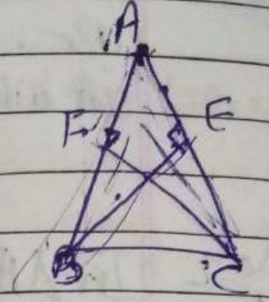
AB = AC (Given)

$\angle AEB = \angle AFC$ (Both 90°)

$\triangle AEB \cong \triangle AFC$ (ASA)

BE = CF (By CPCT).

Q4. ABC is a Δ in which altitudes BE and CF to sides AC and AB are equal. Show that.



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

(ii) $AB = AC$, ABC is an isosceles Δ.

Sol. (i) In ΔABE and ΔACF

$\angle A = \angle A$ (common)

$\angle AEB = \angle AFC$ (Both $90°$)

$BE = CF$ (Given)

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

(ii) $AB = AC$ (By CPCT)

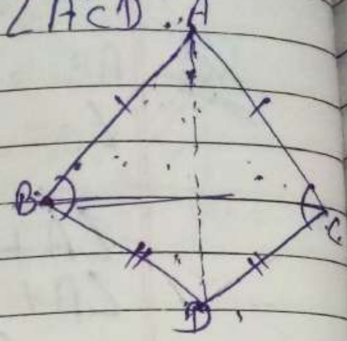
ABC is an isosceles Δ.

Day 16 sept 2020

Chapter-7

Exe -7.2

Q5. ABC and DBC are two isosceles triangles on the same base BC. Show that ∠ABD = ∠ACD.



Sol. Const. = Join AD

In ΔABD and ΔACD

AB = AC (Given)

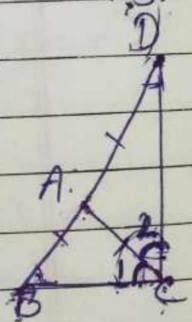
DB = DC (Given)

AD = AD (common)

ΔABD ≅ ΔACD (SSS)

∠ABD = ∠ACD (By CPCT).

Q6. ΔABC is an isosceles Δ in which AB = AC. Side BA is produced to D such that AD = AB. Show that ∠BCD is a right angle.



Sol. Given. = AB = AC, AD = AB

To prove = ∠BCD = 90°

proof → In ΔABC

AB = AC (Given)

∠1 = ∠B (i) (Angle opp. to eq. sides in Δ are equal.)

In ΔACD

AD = AC

∠2 = ∠D — (ii) (Angle opp. to eq. sides in Δ are equal.)

Adding eq. (i) and (ii)

∠1 = ∠B

∠2 = ∠D

∠BCD = ∠B + ∠D — (iii)

In $\triangle BCD$

$\angle B + \angle D + \angle BCD = 180°$ (Angle sum property of $\triangle$)

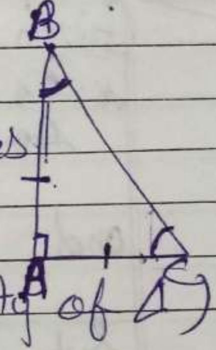
$\angle BCD + \angle BCD = 180°$

$2\angle BCD = 180°$

$\angle BCD = \frac{180}{2} = 90°$

$\angle BCD = 90°$ (H.P).

Q7. ABC is a right angled $\triangle$ in which $\angle A = 90°$ and $AB = AC$. find $\angle B$ and $\angle C$.



Sol. $AB = AC$ (Given)

$\angle C = \angle B$ [Angle opp. to equal sides of $\triangle$ are equal]

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

$90° + \angle B + \angle B = 180°$

$90 + 2\angle B = 180°$

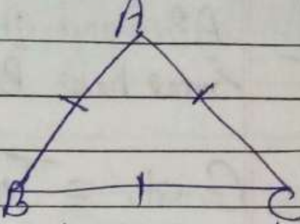
$2\angle B = 180 - 90°$

$2\angle B = 90°$

$\angle B = \frac{90}{2} = 45°$

$\angle C = 45°$.

Q8. Show that the angles of an equilateral Δ are 60° each.



Sol. $AB = AC = BC$

$\angle C = \angle B = \angle A$ (Angle opp. to equal sides is Δ are equal)

$\angle A + \angle B + \angle C = 180^\circ$ (ASP)

$\angle A + \angle A + \angle A = 180^\circ$

$3\angle A = 180^\circ$

$\angle A = \frac{180^\circ}{3} = 60^\circ$

$\angle A = 60^\circ$

$\angle B = 60^\circ$

$\angle C = 60^\circ$ H.P.

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Chapter - 7

Ex - 7.3

Q1. ΔABC & ΔDBC are two isosceles Δ on the same base BC and vertices A and D are on the same side of BC. If AD is extended to intersect BC at P, show that

(i) $\Delta ABD \cong \Delta ACD$

(ii) $\Delta ABP \cong \Delta ACP$

(iii) AP bisects $\angle A$ as well as $\angle D$.

(iv) AP is the perpendicular bisector of BC.

As (i) In ΔABD and ΔACD

$AB = AC$ (Given)

$DB = DC$ (Given)

$AD = AD$ (common)

$\Delta ABD \cong \Delta ACD$ (By SSS Rule)

$\angle BAP = \angle CAP$ (By CPCT) — (i)

(ii) In ΔABP and ΔACP

$AB = AC$ (Given)

$\angle BAP = \angle CAP$ (By eq. (i))

$AP = AP$

$\Delta ABP \cong \Delta ACP$ (By SAS Rule)

(iii) $\angle BAP = \angle CAD$ (By eq. (i))

AP bisect $\angle A$

In ΔBDP and ΔCDP

$BD = CD$ (Given)

$DP = DP$ (common)

$BP = CP$ (P is mid point of BC)

$\Delta BDP \cong \Delta CDP$ (By SSS Rule)

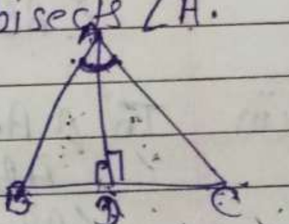
$\angle BDP = \angle CDP$ (By CPCT)
AP bisect $\angle D$.

(iv) $\triangle ABP \cong \triangle ACP$
$\angle BPD = \angle CPD$ (By CPCT)

$\angle BPD + \angle CPD = 180°$ (linear pair)
$\angle CPD + \angle CPD = 180°$
$2\angle CPD = 180°$
$\angle CPD = \frac{\cancel{180}}{\cancel{2}} = 90°$

$\angle BPD = 90°$ (AP is the perpendicular bisector of BC.)

Q2. AD is an altitude of an isosceles $\triangle$ ABC in which AB = AC. Show that
(i) AD bisects BC (ii) AD bisects $\angle A$.



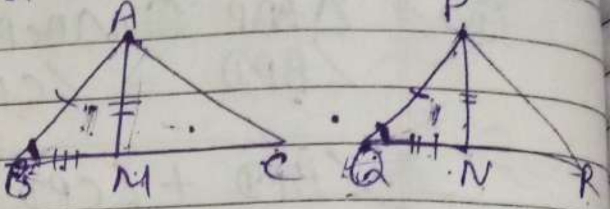
Sol. (i) AD bisects BC
In $\triangle ABD$ and $\triangle ACD$
$\angle ADB = \angle ADC$ (Both are 90°)
$AB = AC$ (Given)
$AD = AD$ (common)
$\triangle ABD \cong \triangle ACD$ (By RHS Rule)
$BD = CD$ (CPCT)
So, AD Bisects BC.

(ii) $\angle BAD = \angle CAD$ (By CPCT)
So AD bisect $\angle A$.

Q3. Two sides AB and BC and median AM of one Δ ABC are respectively equal to sides PQ and QR and median PN of ΔPQR. Show that :-

(i) $\Delta ABM \cong \Delta PQN$

(ii) $\Delta ABC \cong \Delta PQR$



Sol. (i) ΔABM and ΔPQN

$\frac{1}{2} BC = \frac{1}{2} QR$

$BM = QN$ (AM and PN are median of BC and QR)

$AB = PQ$ (Given)

$AM = PN$ (Given)

$\Delta ABM \cong \Delta PQN$ (By SSS Rule)

$\angle ABM = \angle PQN$,

$\angle ABC = \angle PQR$ (By eq (i)) [By CPCT]

(ii) In ΔABC and ΔPQR

$AB = QP$ (Given)

$\angle ABC = \angle PQR$ (By eq(i))

$BC = QR$ (Given)

$\Delta ABC \cong \Delta PQR$ (By SAS Rule)

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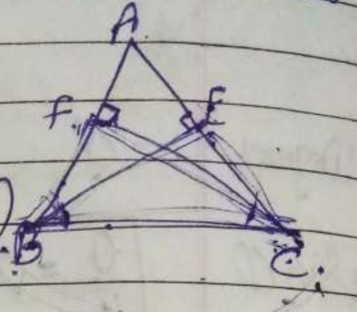
Q4. BE and CF are two equal altitudes of ΔABC, Using RHS congruence rule, prove that the ΔABC is isosceles.



Sol. In ΔBEC and ΔCFB

R $\angle CFB = \angle BEC$ (Both are 90°)

H $BC = CB$ (common side)

S $BF = CE$ (Given)

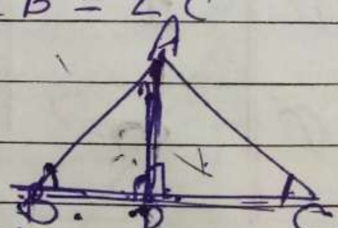
$\Delta BEC \cong \Delta CFB$ (RHS Rule)

$\angle BCE = \angle CBF$ (By CPCT)

$AB = AC$ (Side opp. to equal $\angle$ of a Δ are equal)

So ΔABC is isosceles Δ. (H.P)

Q5. ΔABC is an isosceles Δ with. $AB = AC$. Draw $AP \perp BC$ to show that $\angle B = \angle C$



Sol. In ΔABP and ΔACP

$AB = AC$ (Given)

$\angle APB = \angle APC$ (Both are 90°)

$AP = AP$ (common)

$\Delta ABP \cong \Delta ACP$ (By RHS Rule)

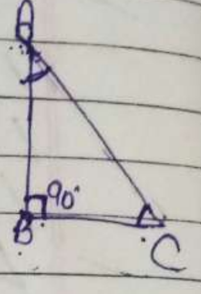
$\angle B = \angle C$ (By CPCT).

Day 18 Sept 2020 Chapter - 7

Ex - 7.4

Q1. Show that in a right angled Δ, the hypotenuse is the largest side.

Sol. Let us draw ΔABC in which Right angle at B.



$\angle A + \angle B + \angle C = 180°$ (ASP)

$\angle A + 90 + \angle C = 180°$

$\angle A + \angle C = 180 - 90$

$\angle A + \angle C = 90°$

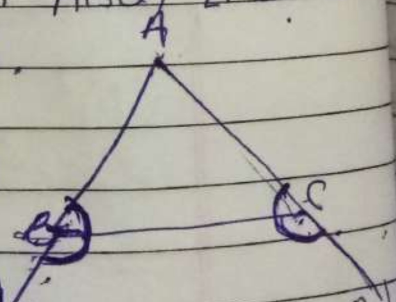
$\angle B$ = Largest angle.

$\angle A$ or $\angle C$ = Acute angles.

AC is longest side. (In any Δ the side opp. to largest angle is longer)

(AC = hypotenuse side)

Q2. In fig. 7.48, Sides AB and AC of ΔABC are extended to points P and Q respectively. Also, $\angle PBC < \angle QCB$. Show that $AC > AB$.



Sol. $\angle ABC + \angle PBC = 180°$ (linear pair)

$\angle ABC = 180 - \angle PBC$ ___ (i)

$\angle ACB + \angle QCB = 180°$ (linear pair)

$\angle ACB = 180 - \angle QCB$ ___ (ii)

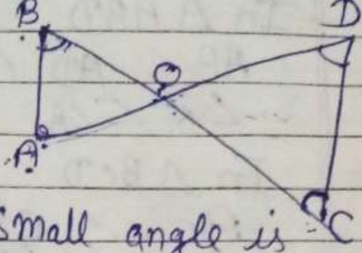
$\angle PBC < \angle QCB$ (Given)

$180 - \angle PBC > 180° - \angle QCB$

$\angle ABC > \angle ACB$

$AC > AB$.

Q3. In fig. 7.49, $\angle B < \angle A$ and $\angle C < \angle D$. Show that $AD < BC$.



Sol. In $\triangle AOB$

$\angle B < \angle A$ (i)

$OA < OB$ (Side opp. to small angle is smaller)

In $\triangle COD$

$\angle C < \angle D$

$OD < OC$ (ii) (Side opp. to small angle is smaller)

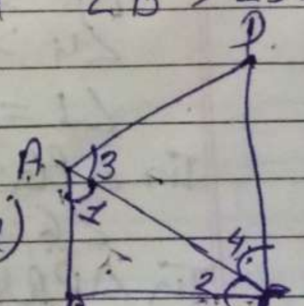
Add eq (i) and (ii)

$OA < OB$

$OD < OC$

$AD < BC$ (H.P).

Q4. AB and CD are respectively the smallest and longest sides of a Quadrilateral ABCD. Show that $\angle A > \angle C$ and $\angle B > \angle D$.



Sol. Letus join AC

In $\triangle ABC$

$AB < BC$ (AB is smallest side)

$\angle 2 < \angle 1$ — (i)

In $\triangle ACD$

$AD < CD$ (CD is largest side)

$\angle 4 < \angle 3$ — (ii)

Ad eq (i) & (ii)

$\angle 2 + \angle 4 < \angle 1 + \angle 3$

$\angle C < A$ / $\angle A > \angle C$

(iii) Join BD

In ΔABD

$AB < AD$ (AB is smallest side)

$\angle 5 < \angle 8$ —— (i)

In ΔBCD

$BC < CD$ (CD is longest side)

$\angle 6 < \angle 7$ —— (ii)

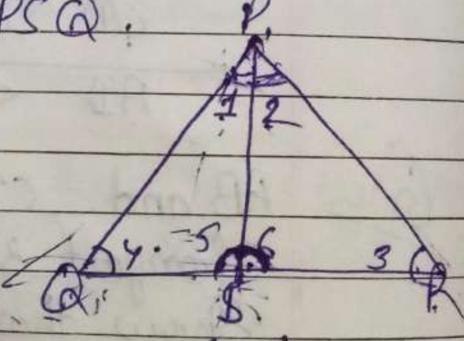
Add (i) & (ii)

$\angle 5 + \angle 6 < \angle 8 + \angle 7$

$\angle D < \angle B$

$\angle B > \angle D$ (H.P).

Q5. In fig 7.51, $PR > PQ$ and PS bisects $\angle QPR$. Prove that $\angle PSR > \angle PSQ$.



Sol. Prove $= \angle PSR > \angle PSQ$

$\angle 6 > \angle 5$.

In ΔPQR

$PR > PQ$

$\angle 4 > \angle 3$ (Angle opp. to larger side is greater)

$\angle 1 = \angle 2$ (PS bisect $\angle QPR$)

In ΔPQS

$\angle 6 = \angle 1 + \angle 4$ —— (i)

In ΔPRS

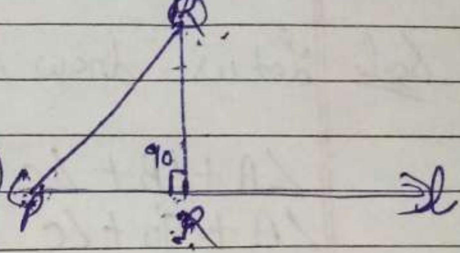
$\angle 5 = \angle 2 + \angle 3$ —— (ii)

$\angle 1 + \angle 4 > \angle 2 + \angle 3$

$\angle 6 > \angle 5$

$\angle PSR > \angle PSQ$ (H.P).

Q6. Show that of all line segments drawn from a given point not on it, the perpendicular line segment is the shortest.



Sol: To Prove. $QR < PQ$

$\angle P + \angle Q + \angle R = 180°$ (ASP)

$\angle P + \angle Q + 90 = 180°$

$\angle P + \angle Q = 180 - 90°$

$\angle P + \angle Q = 90°$

$\angle P$ will be an acute angle.

$QR < PQ$ (side opp. to greater angle is larger).

Perependicular QR will the shorter line.