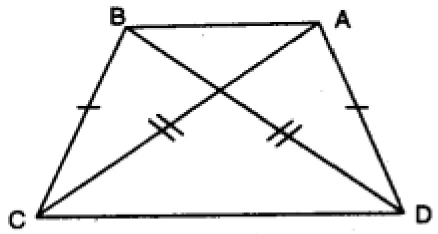
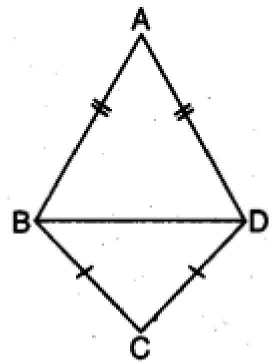
Chapter 7 Triangles Class 9 Important Questions NCERT Maths

Question 1.
In the given figure, AD = BC and BD = AC, prove that ∠DAB = ∠CBA.
Solution:



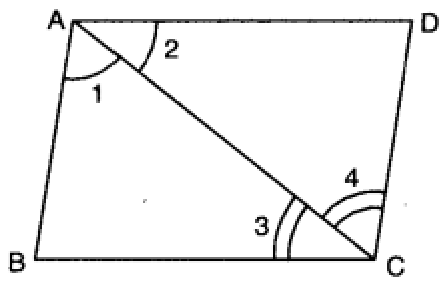
In ΔDAB and ΔCBA, we have
AD = BC [given]
BD = AC [given]
AB = AB [common]
∴ ΔDAB ≅ ΔCBA [by SSS congruence axiom]
Thus, ∠DAB =∠CBA [c.p.c.t.]

Question 2.
In the given figure, ΔABD and ABCD are isosceles triangles on the same base BD. Prove that ∠ABC = ∠ADC.
Solution:



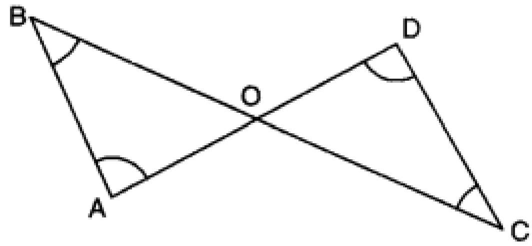
In ΔABD, we have
AB = AD (given)
∠ABD = ∠ADB [angles opposite to equal sides are equal] ...(i)
In ΔBCD, we have
CB = CD
⇒ ∠CBD = ∠CDB [angles opposite to equal sides are equal] ... (ii)
Adding (i) and (ii), we have
∠ABD + ∠CBD = ∠ADB + ∠CDB
⇒ ∠ABC = ∠ADC

Question 3.
In the given figure, if ∠1 = ∠2 and ∠3 = ∠4, then prove that BC = CD.
Solution:



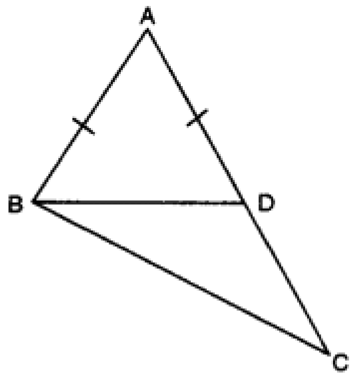
In ΔABC and ACDA, we have
∠1 = ∠2 (given)
AC = AC [common]
∠3 = ∠4 [given]
So, by using ASA congruence axiom
ΔABC ≅ ΔCDA
Since corresponding parts of congruent triangles are equal
∴ BC = CD

Question 4.
In the given figure, ∠B < ∠A and ∠C < ∠D. Show that AD < BC.



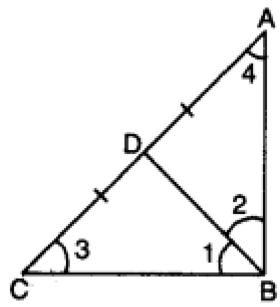
Solution:
Here, ∠B < ∠A
⇒ AO < BO …..(i)
and ∠C < ∠D
⇒ OD < CO …..(ii)
[∴ side opposite to greater angle is longer]
Adding (i) and (ii), we obtain
AO + OD < BO + CO
AD < BC

Question 5.
In the given figure, AC > AB and D is a point on AC such that AB = AD. Show that BC > CD.
Solution:



Here, in ΔABD, AB = AD
∠ABD = ∠ADB
[∠s opp. to equal sides of a Δ]
In ΔBAD
ext. ∠BDC = ∠BAD + ∠ABD
⇒ ∠BDC > ∠ABD ….(ii)
Also, in ΔBDC .
ext. ∠ADB > ∠CBD …(iii)
From (ii) and (iii), we have
∠BDC > CD [∵ sides opp. to greater angle is larger]

Question 6.
In a triangle ABC, D is the mid-point of side AC such that BD = 12 AC. Show that ∠ABC is a right angle.
Solution:



Here, in ΔABC, D is the mid-point of AC.
⇒ AD = CD = 12AC …(i)
Also, BD = 12AC… (ii) [given]
From (i) and (ii), we obtain
AD = BD and CD = BD
⇒ ∠2 = ∠4 and ∠1 = ∠3 …..(iii)
In ΔABC, we have
∠ABC + ∠ACB + ∠CAB = 180°
⇒ ∠1 + ∠2 + ∠3 + ∠4 = 180°
⇒ ∠1 + ∠2 + ∠1 + ∠2 = 180° [using (iii)]

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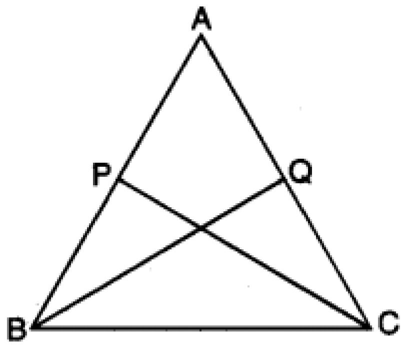
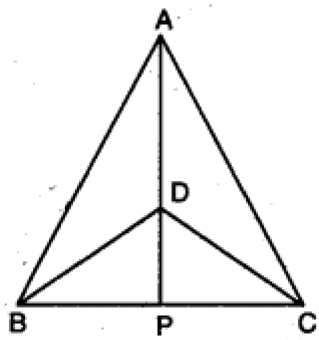
$\Rightarrow 2(\angle 1 + \angle 2) = 180°$
$\Rightarrow \angle 1 + \angle 2 = 90°$
Hence, $\angle ABC = 90°$

Question 7.
ABC is an isosceles triangle with AB = AC. P and Q are points on AB and AC respectively such that AP = AQ. Prove that CP = BQ.
Solution:



In ΔABQ and ΔACP, we have
AB = AC (given)
$\angle BAQ = \angle CAP$ [common]
AQ = AP (given)
$\therefore$ By SAS congruence criteria, we have
$\Delta ABQ \cong \Delta ACP$
CP = BQ

Question 8.
In the given figure, ΔABC and ΔDBC are two isosceles triangles on the same base BC and vertices A and D are on the same side of BC, AD is extended to intersect BC at P. Show that : (i) $\Delta ABD \cong \Delta ACD$ (ii) $\Delta ABP \cong \Delta ACP$



Solution:
(i) In ΔABD and ΔACD
AB = AC [given]
BD = CD [given]
AD = AD [common)]
$\therefore$ By SSS congruence axiom, we have
$\Delta ABD \cong \Delta ACD$
(ii) In ΔABP and ΔACP
AB = AC [given]
$\angle BAP = \angle CAP$ [c.p.cit. as $\Delta ABD \cong \Delta ACD$]
AP = AP [common]
$\therefore$ By SAS congruence axiom, we have
$\Delta ABP \cong \Delta ACP$

Question 9.
In the given figure, it is given that AE = AD and BD = CE. Prove that $\Delta AEB \cong \Delta ADC$.

Solution:
We have AE = AD … (i)
and CE = BD … (ii)
On adding (i) and (ii),
we have AE + CE = AD + BD

⇒ AC = AB

Now, in ΔAEB and ΔADC,

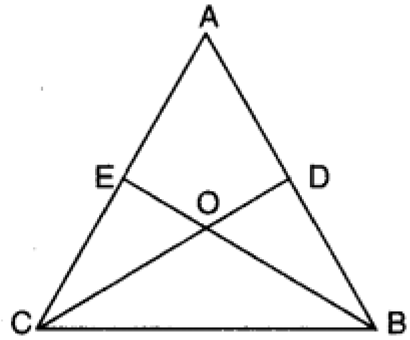
we have AE = AD [given]

AB = AC [proved above]

∠A = ∠A [common]

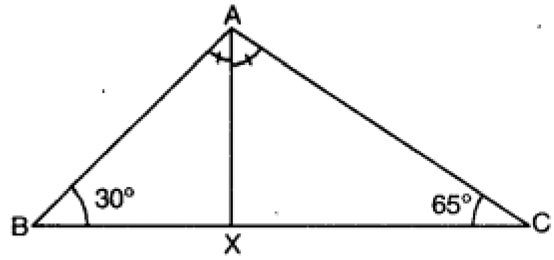
∴ By SAS congruence axiom, we have

ΔAEB = ΔADC



Question 10

In the given figure, in ΔABC, ∠B = 30°, ∠C = 65° and the bisector of ∠A meets BC in X. Arrange AX, BX and CX in ascending order of magnitude.



Solution:

Here, AX bisects ∠BAC.

∴ ∠BAX = ∠CAX = x (say)

Now, ∠A + ∠B + C = 180° [angle sum property of a triangle]

⇒ 2x + 30° + 65° = 180°

⇒ 2x + 95 = 180°

⇒ 2x = 180° – 95°

⇒ 2x = 85°

⇒ x = 85∘2 = 42.59

In ΔABX, we have x > 30°

BAX > ∠ABX

⇒ BX > AX (side opp. to larger angle is greater)

⇒ AX < BX

Also, in ΔACX, we have 65° > x

⇒ ∠ACX > ∠CAX

⇒ AX > CX [side opp. to larger angle is greater]

⇒ CX > AX … (ii)

Hence, from (i) and (ii), we have

CX < AX < BX

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