Chapter 12

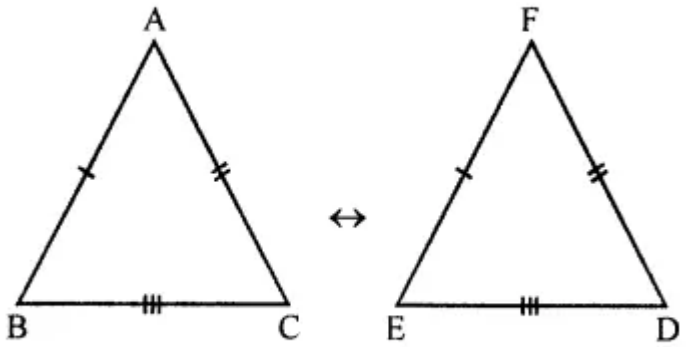
Congruence of Triangles

Exercise 12.1

Question 1.
If ΔABC and ΔDEF are congruent under the correspondence ABC ↔ FED, write all the corresponding congruent parts of the triangles.
Solution:

ΔABC and ΔDEF are congruent

under the correspondence, ABC ↔ FED

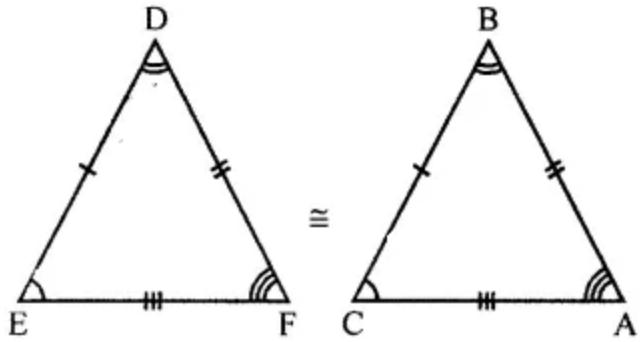


∠A ↔ ∠F, ∠B ↔ ∠E, ∠C ↔ ∠D

AB ↔ FE, BC ↔ ED and AC ↔ FD

Question 2.
If ΔDEF = ΔBCA, then write the part(s) of ΔBCA that correspond to
(i) ∠E
(ii) $\overline{EF}$
(iii) ∠F
(iv) $\overline{DF}$
Solution:

If ΔDEF = ΔBCA, then



(i) ∠E ↔ ∠C

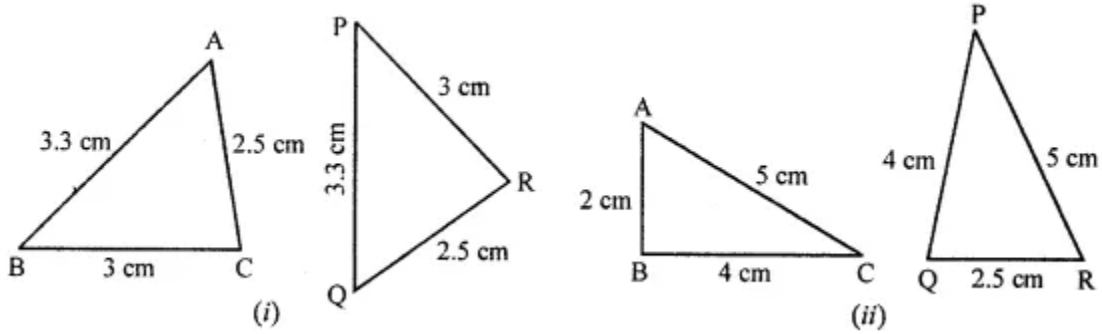
(ii) EF ↔ $\bar{CA}$

(iii) ∠F ↔ ∠A

(iv) DF ↔ $\bar{BA}$

Question 3.

In the figure given below, the lengths of the sides of the triangles are indicated. By using SSS congruency rule, state which pairs of triangles are congruent. In the case of congruent triangles, write the result in symbolic form:



Solution:

(i) In the given figure,

In ΔABC and ΔPQR

AB ↔ PQ, BC ↔ PR, and AC ↔ QR

Δs are congruent

ΔABC = ΔQPR

(ii) In the given figure,

In ΔABC and ΔPQR

AC ↔ PR, BC ↔ PQ

But AB ≠ QR

Δs are not congruent.

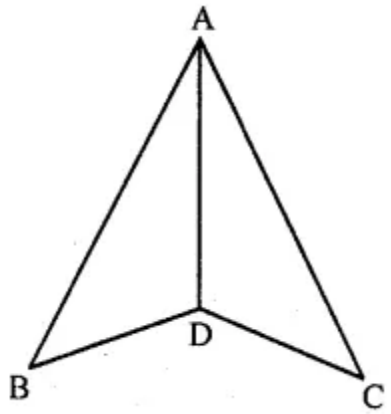
Question 4.

In the given figure, AB = 5 cm, AC = 5 cm, BD = 2.5 cm and CD = 2.5 cm

(i) State the three pairs of equal parts in ΔADB and ΔADC

(ii) Is ΔADB = ΔADC? Give reasons.

(iii) Is ∠B = ∠C? Why?



Solution:

In the given figure,

AB = 5 cm, AC = 5 cm, BD = 2.5 cm

and CD = 2.5 cm

In ΔABD and ΔACD

(i) AB = AC = 5 cm

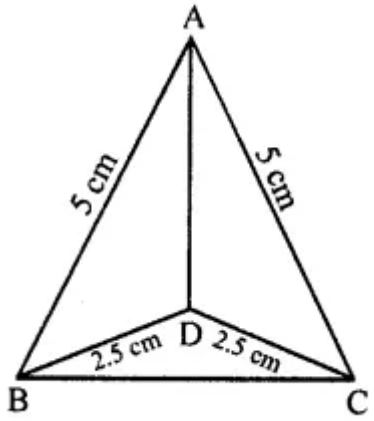
BD = CD = 2.5 cm

AD = AD (Common Side)

ΔABD = ΔACD

(ii) ΔADB = ΔADC (SSS axiom)

∠B = ∠C (c.p.c.t.)



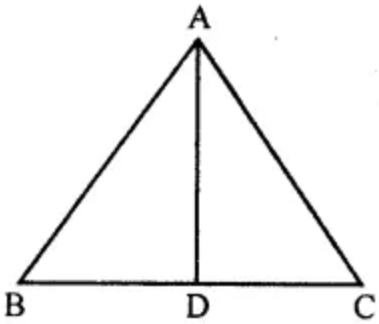
Question 5.

In the given figure, AB = AC and D is the mid-point of $\overline{BC}$.

(i) State the three pairs of equal parts in ΔADB and ΔADC.

(ii) Is ΔADB = ΔADC? Give reasons.

(iii) Is ∠B = ∠C? Why?



Solution:

(i) In ΔABC,

AB = AC

D is the mid-point of BC

BD = DC

Now in ΔADB and ΔADC

AB = AC (Given)

AD = AD (Common)

BD = DC (D is mid-point of BC)

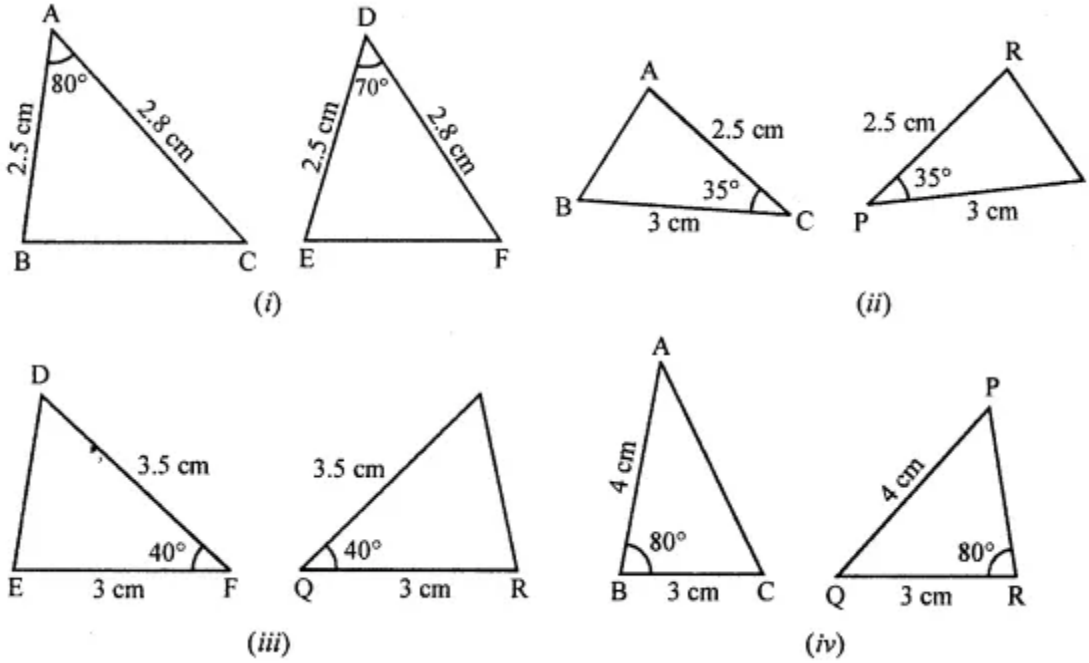
(ii) ΔADB = ΔADC (SSS axiom)

(iii) ∠B = ∠C (c.p.c.t.)

Question 6.

In the figure given below, the measures of some parts of the triangles are indicated. By

using SAS rule of congruency, state which pairs of triangles are congruent. In the case of congruent triangles, write the result in symbolic form.



Solution:

(i) In ΔABC and ΔDEF

AB = DE (Each = 2.5 cm)

AC = DF (Each = 2.8 cm)

∠A ≠ ∠D (Have different measure)

ΔABC is not congruent to ΔDEF

(ii) In ΔABC and ΔRPQ

AC = RP (Each = 2.5 cm)

CB = PQ (Each = 3 cm)

∠C = ∠P (Each = 35°)

ΔACB and ΔRPQ are congruent (SAS axiom)

(iii) In ΔDEF and ΔPQR

FD = QP (Each = 3.5 cm)

FE = QR (Each = 3 cm)

∠F = ∠Q (Each 40°)

ADEF and APQR are congruent

(iv) In ΔABC and ΔPRQ

AB = PQ (Each = 4 cm)

BC = QR (Each = 3 cm)

But included angles B and ∠Q are not equal

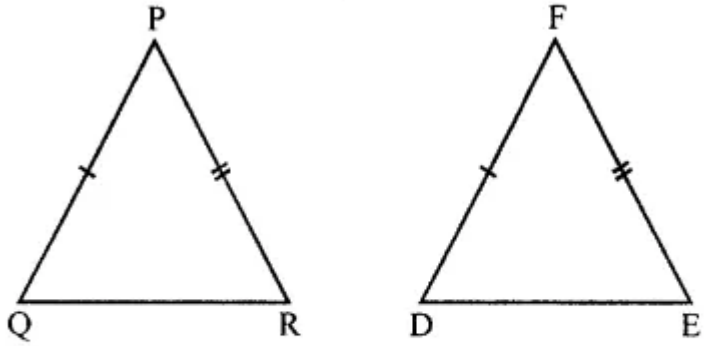
ΔABC and ΔPQR are not congruent.

Question 7.

By applying SAS congruence rule, you want to establish that ΔPQR = ΔFED. If is given that PQ = EF and RP = DF. What additional information is needed to establish the congruence?

Solution:

In ΔPQR and ΔFED



PQ = FE

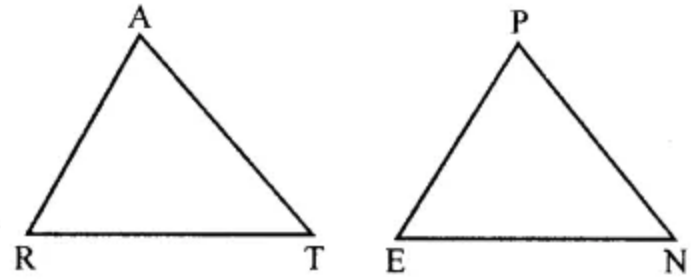
RP = DF

Their included angles ∠P must be equal to ∠F for congruency.

Hence, ∠P = ∠F

Question 8.

You want to show that ΔART = ΔPEN



(a) If you have to use SSS criterion, then you need to show

(i) AR = ...

(ii) RT = ...

(iii) AT = ...

(b) If it is given that ∠T = ∠N and you are to use the SAS criterion, you need to have (i) RT = ... and (ii) PN = ...

Solution:

(a) In ΔART and ΔPEN

For SSS criterion

AR = DE

RT = EN and AT = PN

ΔART = ΔPEN

(b) ∠T = ∠N (Given)

In ΔART and ΔPEN

If RT = EN

AT = PN and ∠T = ∠N

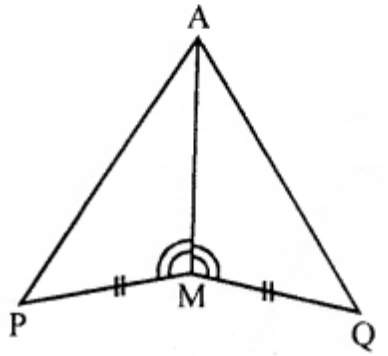
Then ΔART = ΔPEN (SAS criterion)

Question 9.

You have to show that ΔAMP = ΔAMQ.

In the following proof, supply the missing reasons.

Steps	Reasons
(i) PM = QM	(i) .....
(ii) ∠PMA = ∠QMA	(ii) .....
(iii) AM = AM	(iii) .....
(iv) ΔAMP = ΔAMQ	(iv) .....



Solution:

In order to show that,

ΔAMP = ΔAMQ

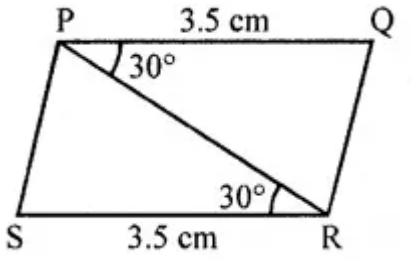
PM = QM (Given)

∠PMA = ∠QMA (Given)

AM = AM (Common)

ΔAMP = ΔAMQ (SAS criterion)

Question 10.Solution:
In the given figure:
(i) State three pairs of equal parts in ΔPSR and ΔRQP.
(ii) Is ΔPSR = ΔRQP? Give reasons
(iii) Is PS = RQ? Why?
(iv) Is ∠S = ∠Q? Why?



Solution:

In ΔPSR and ΔRQP

SR = PQ (each = 3.5 cm)

PR = PR (Common side)

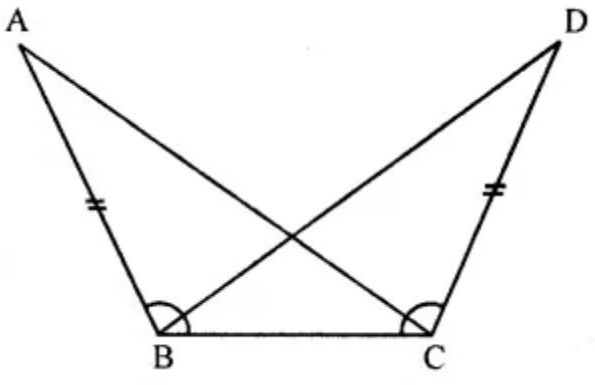
∠SRP = ∠RPQ (Each = 30°)

ΔPSR = ΔRQP (SAS criterion)

PS = RQ (c.p.c.t.)

∠S = ∠Q (c.p.c.t.)

Question 11.
In the given figure, AB = DC and ∠ABC = ∠DCB.
(i) State three pairs of equal parts in AABC and ADCB.
(ii) Is ΔABC = ΔDCB? Give reasons.
(iii) Is AC = DB? Why?



Solution:

In ΔABC and ΔDBC

AB = DC (Given)

∠ABC = ∠DCB (Given)

BC = BC (Common)

ΔABC = ΔDCB (SAS criterion)

AC = DB (c.p.c.t.)

Question 12.

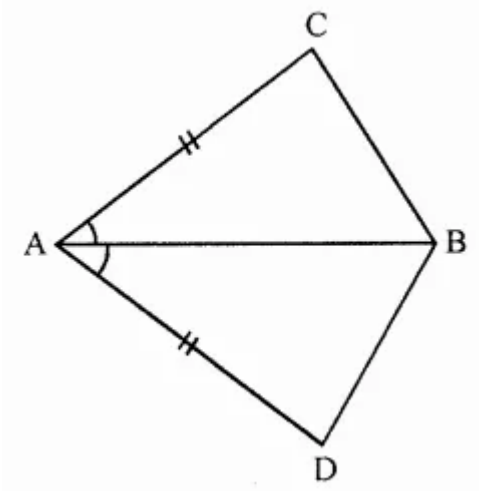
In the quadrilateral, AC = AD, and AB bisect ∠CAD.

(i) State three pairs of equal parts in ΔABC and ΔABD.

(ii) Is ΔABC = ΔABD? Give reasons.

(iii) Is BC = BD? Why?

(iv) Is ∠C = ∠D? Why?



Solution:

In quadrilateral ACBD,

AC = AD, AB bisects ∠CAD

Now in ΔABC and ΔABD

AC = AD (Given)

∠CAB = ∠DAB (Given)

(AB bisects ∠CAD)

AB = AB (Common)

ΔABC = ΔABD (SAS criterion)

BC = BD (c.p.c.t.)

∠C = ∠D (c.p.c.t.)

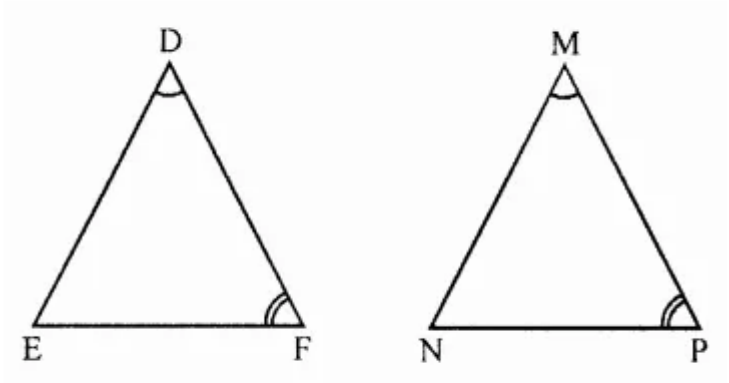
Exercise 12.2

Question 1.
You want to establish ΔDEF = ΔMNP, using ASA rule of congruence. You are given that ∠D = ∠M and ∠F = ∠P. What additional information is needed to establish the congruence?
Solution:

In ΔDEF and ΔMNP

∠D = ∠M (Given)

∠F = ∠P (Given)

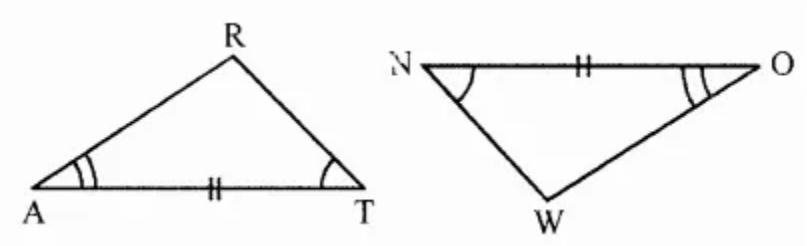


For using ASA rule, we need

DF = MP (Included side)

Then ΔDEF = ΔMNP

Question 2.
In the given figure, two triangles are congruent. The corresponding parts are marked. We can write ΔRAT =?



Solution:

In the given figure,

ΔART and ΔNOW

AT = NO (Given)

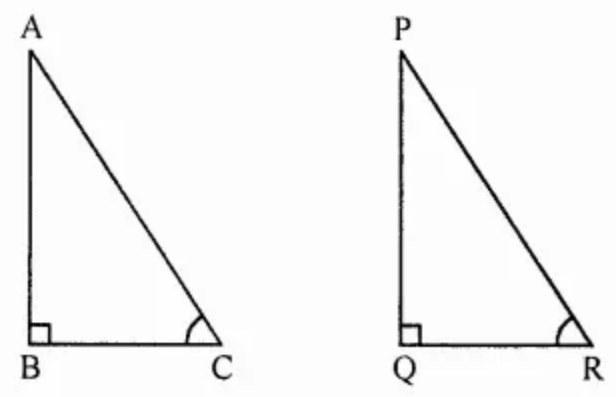
∠A = ∠O (Given)

∠T = ∠N (Given)

ΔART = ΔWON (ASA criterion)

Question 3.

If ΔABC and ΔPQR are to be congruent, name one additional pair of corresponding parts. What criterion did you use?



Solution:

In ΔABC and ΔPQR

∠B = ∠Q

∠C = ∠Q

Now we need BC = QR

ΔABC = ΔPQR (ASA criterion)

Question 4.

Given below are measurements of some parts of two triangles. Examine whether the two triangles are congruent or not, by ASA congruence rule. In the case of congruence, write its in symbolic form.

ΔDEF	ΔPQR
(i) ∠D = 60°, ∠F = 80°, DF = 5 cm	(i) ∠Q = 60°, ∠R = 80°, QR = 5 cm
(ii) ∠D = 60°, ∠F = 80°, DF = 6 cm	(ii) ∠Q = 60°, ∠R = 80°, QR = 5 cm
(iii) ∠E = 80°, ∠F = 30°, EF = 5 cm	(iii) ∠P = 80°, PQ = 5 cm, ∠R = 30°

Solution:

In ΔDEF and ΔPQR

(i) ∠D = 60°, ∠F = 80°, DF = 5 cm

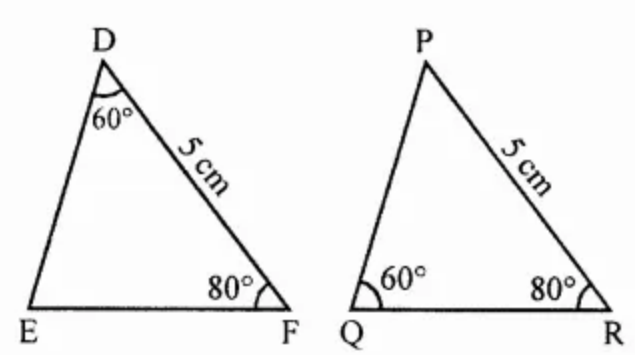
∠Q = 60°, ∠R = 80°, QR = 5 cm

∠D = ∠Q (Each 60°)

∠F = ∠R (Each 80°)

Included side DF = QR

ΔDEF = ΔQPR (ASA criterion)



(ii) In ΔDEF and ΔPQR

∠D = 60°, ∠F = 80°, DF = 6 cm

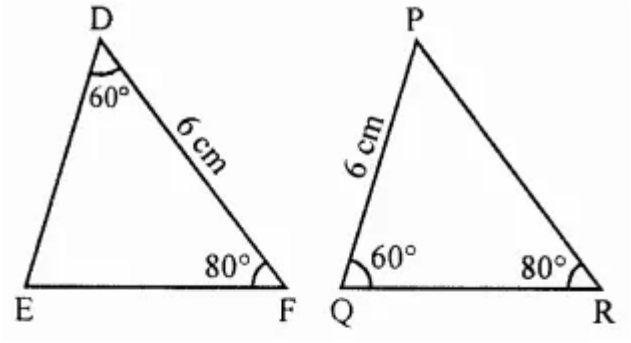
∠Q = 60°, ∠R = 80° and QP = 6 cm

Here, ∠D = ∠Q (Each 80°)

∠F = ∠R (Each 80°)

But included side DF ≠ QR

ΔDEF and ΔPQR are not congruent.



(iii) In ΔDEF and ΔPQR

∠E = 80°, ∠F = 30°, EF = 5 cm

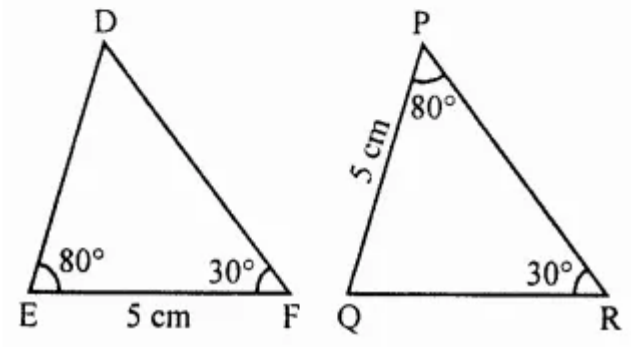
∠P = 80°, PQ = 5 cm, ∠R = 30°

Here, ∠E = ∠P (Each = 80°)

∠F = ∠R (Each = 30°)

But inlcuded sides are not equal.

ΔDEF and ΔPQR are not congruent.



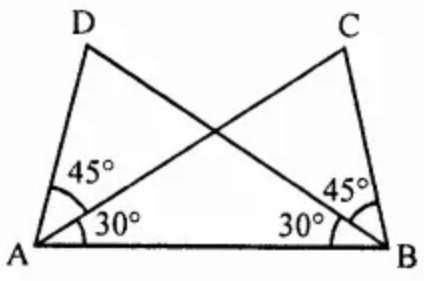
Question 5.

In the adjoining figure, measures of some parts are indicated.

(i) State three pairs of equal parts in triangles ABC and ABD.

(ii) Is ΔABC = ΔBAD? Give reasons.

(iii) Is BC = AD? Why?



Solution:

In the given figure,

∠DAC = 45°, ∠CAB = 30°, ∠CBD = 45° and ∠DBA = 30°

Now in ΔABC and ΔBAD,

∠DAC + ∠CAB = 45° + 30° = 75°

and ∠CBD + ∠DBA = 45° + 30° = 75°

∠DAB = ∠CBA

Now in ΔABC and ΔDAB

AB = AB (Common)

∠CBA = ∠DAB (Proved)

∠CAB = ∠DBA (Each = 30°)

ΔABC = ΔDAB (ASA criterion)

Yes, BC = AD (c.p.c.t.)

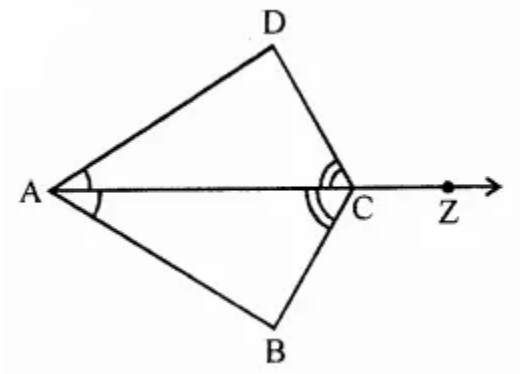
Question 6.

In the adjoining figure, ray AZ bisects ∠DAB as well as ∠DCB.

(i) State the three pairs of equal parts in triangles BAC and DAC.

(ii) Is ΔBAC = ΔDAC? Give reasons.

(iii) Is CD = CB? Give reasons.



Solution:

In the given figure

∠DAC = ∠BAC

∠DCA = ∠BCA

Now in ΔBAC and ΔDAC

AC = AC (Common)

∠BAC = ∠DAC (Given)

∠BCA = ∠DCA (Given)

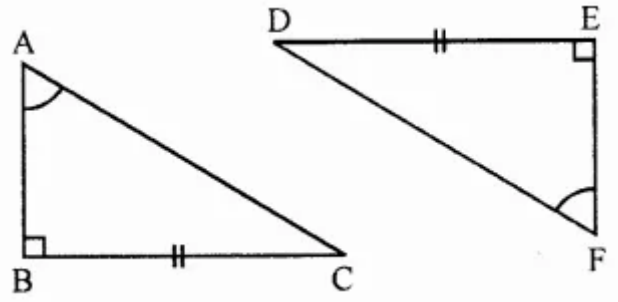
ΔBAC = ΔDAC (ASA criterion)

Yes,AB = AD (c.p.c.t.)

Yes, CD = CB (c.p.c.t.)

Question 7.

Explain why ΔABC = ΔFED?



Solution:

In ΔABC and ΔFED

BC = DE

∠B = ∠E (Each = 90°)

∠A = ∠F

∠C = 90° − ∠A and ∠D = 90° − ∠F

But ∠A = ∠F (Given)

∠C = ∠D

Now in ΔABC and ΔDEF

BC = DE (Given)

∠B = ∠E (Given 90°)

∠C = ∠D (Proved)

ΔABC = ΔDEF (ASA criterion)

Question 8.

Given below are the measurements of some parts of triangles. Examine whether the two triangles are congruent or not, using RHS congruence rule. In the case of congruent triangles, write the result in symbolic form

ΔABC	ΔPQR
(i) ∠B = 90°, AC = 8 cm, AB = 3 cm	(i) ∠P = 90°, PR = 3 cm, QR = 8 cm
(ii) ∠A = 90°, AC = 5 cm, BC = 9 cm	(ii) ∠Q = 90°, PR = 8 cm, PQ = 5 cm

Solution:

We are given the measurement of some parts of the triangles.

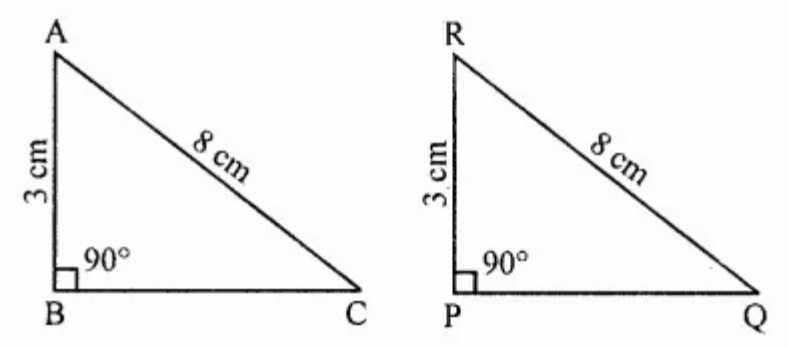
We have to examine whether the two triangles are congruent

or not using RHS congruency rule.

In ΔABC and ΔPQR

(i) ∠B = 90°, AC = 8 cm, AB = 3 cm

∠P = 90°, PR = 3 cm, QR = 8 cm



We see that in two Δs ABC and RPQ

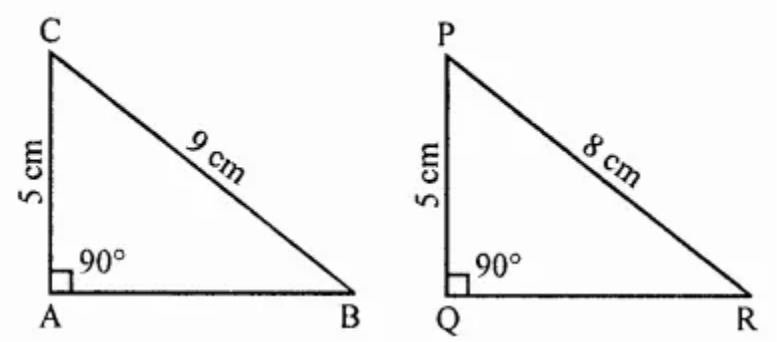
∠B = ∠P (Each = 90°)

Side AB = RP (Each = 3 cm)

Hypotenuse AC = RQ

ΔABC = ΔRPQ (RHS criterion)

(ii) In ΔABC and ΔPQR



∠A = ∠Q (Each = 90°)

Side AC = QP (Each = 5 cm)

But hypotenuse BC and PR are not equal to each other.

Triangles are not congruent.

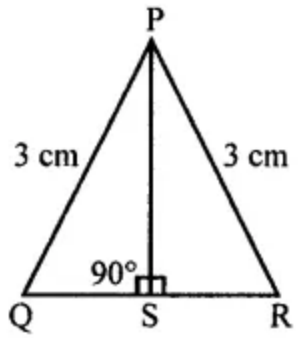
Question 9.

In the given figure, measurements of some parts are given.

(i) State the three pairs of equal parts in ΔPQS and ΔPRS.

(ii) Is ΔPQS = ΔPRS? Give reasons.

(iii) Is S mid-point of $\overline{QR}$? Why?



Solution:

In the given figure,

PQ = 3 cm, PR = 3 cm

PS ⊥ QR

(i) Now in right ΔPQS and ΔPRS right angles at S. (∵ PS ⊥ QR)

side PS = PS (Common)

Hypotenuse PQ = PR (Each = 3 cm)

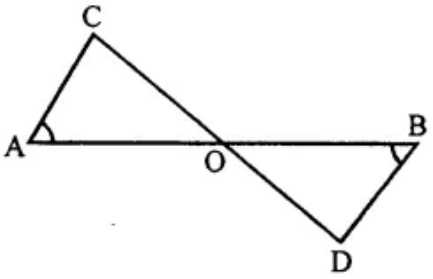
(ii) ΔPQS = ΔPRS (RHS criterion)

(iii) QS = SR (c.p.c.t.)

S is the mid point of QR

Question 10.

In the given figure, O is mid-point of $\overline{AB}$ and ∠A = ∠B. Show that ΔAOC = ΔBOD.



Solution:

In the given figure,

O is the mid-point of AB

AO = OB

Now in ΔAOC and ΔBOD

AO = OB ($\because$ O is mid-point of AB)

$\angle A = \angle B$ (Given)

$\angle AOC = \angle BOD$ (Vertically opposite angles)

$\Delta AOC = \Delta BOD$ (ASA criterion)

Objective Type Questions

Question 1.
Fill in the blanks:
(i) Two line segments are congruent if .....
(ii) Among two congruent angles, one has a measure of 63°; the measure of the other angle is .....
(iii) When we write ∠A = ∠B, we actually mean .....
(iv) The side included between ∠M and ∠N of ΔMNP is .....
(v) The side QR of ΔPQR is included between angles .....
(vi) If two triangles ABC and PQR are congruent under the correspondence A ↔ R, B ↔ P and C ↔ Q, then in symbolic form it can be written as ΔABC = ...
(vii) If ΔDEF = ΔSRT, then the correspondence between vertices is .....
Solution:

(i) Two line segments are congruent if they are of the same length.

(ii) Among two congruent angles, one has a measure of 63°;
the measure of the other angle is 63°.

(iii) When we write ∠A = ∠B, we actually mean m∠A = m∠B.

(iv) The side included between ∠M and ∠N of ΔMNP is MN.

(v) The side QR of ΔPQR is included between angles ∠Q and ∠R.

(vi) If two triangles ABC and PQR are congruent
under the correspondence A ↔ R, B ↔ P and C ↔ Q,
then in symbolic form it can be written as ΔABC = ΔRPQ.

(vii) If ΔDEF = ΔSRT, then the correspondence between vertices is
D ↔ S, E ↔ R and F ↔ T.

Question 2.
State whether the following statements are true (T) or false (F):
(i) All circles are congruent.
(ii) Circles having equal radii are congruent.
(iii) Two congruent triangles have equal areas and equal perimeters.
(iv) Two triangles having equal areas are congruent.
(v) Two squares having equal areas are congruent.
(vi) Two rectangles having equal areas are congruent.
(vii) All acute angles are congruent.
(vii)All right angles are congruent.
(ix) Two figures are congruent if they have the same shape.
(x) A two rupee coin is congruent to a five rupee coin.
(xi) All equilateral triangles are congruent.
(xii) Two equilateral triangles having equal perimeters are congruent.

(xii) If two legs of one right triangle are equal to two legs of another right angle triangle, then the two triangles are congruent by SAS rule.
(xiv) If three angles of two triangles are equal, then triangles are congruent.
(xv) If two sides and one angle of one triangle are equal to two sides and one angle of another triangle, then the triangle are congruent.

Solution:

(i) All circles are congruent. (False)

Correct:

As if all circles have equal radii otherwise not.

(ii) Circles having equal radii are congruent. (True)

(iii) Two congruent triangles have equal areas

and equal perimeters. (True)

(iv) Two triangles having equal areas are congruent. (False)

Correct:

As they may have different sides and angles.

(v) Two squares having equal areas are congruent. (True)

(vi) Two rectangles having equal areas are congruent. (False)

Correct:

As their side can be different.

(vii) All acute angles are congruent. (False)

Correct:

As acute angles have different measures.

(viii) All right angles are congruent. (True)

(ix) Two figures are congruent if they have the same shape. (False)

Correct:

As the same shapes have different measures.

(x) A two rupee coin is congruent to a five rupee coin. (False)

Correct:

As they have different size.

(xi) All equilateral triangles are congruent. (False)

Correct:

As they have different sides in length.

(xii) Two equilateral triangles having equal perimeters are congruent. (True)

(xiii) If two legs of one right triangle are equal to
two legs of another right angle triangle,
then the two triangles are congruent by SAS rule. (True)

(xiv) If three angles of two triangles are equal,
then triangles are congruent. (False)

Correct:

They can be similar to each other.

(xv) If two sides and one angle of one triangle are equal to two sides
and one angle of another triangle, then the triangle is congruent. (False)

Correct:

If the angles are included, they can be congruent.

Multiple Choice Questions

Choose the correct answer from the given four options (3 to 14):

Question 3.

Which one of the following is not a standard criterion of congruency of two triangles?

(a) SSS

(b) SSA

(c) SAS

(d) ASA

Solution:

The axiom SSA is not a standard criterion
of congruency of triangles. (b)

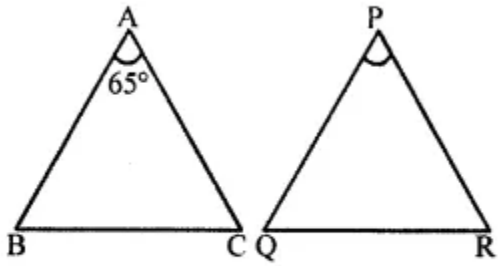
Question 4.

If $\Delta ABC = \Delta PQR$ and $\angle CAB = 65°$, then $\angle RPQ$ is

(a) 65°

(b) 75°
(c) 90°
(d) 115°
Solution:

ΔABC = ΔPQR



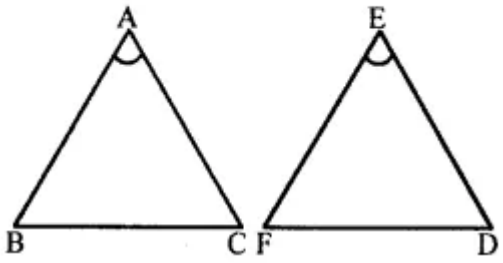
∠CAB = 65°

∠RPQ = 65° (corresponding angles) (a)

Question 5.
If ΔABC = ΔEFD, then the correct statement is
(a) ∠A = ∠D
(b) ∠A = ∠F
(c) ∠A = ∠E
(d) ∠B = ∠E
Solution:

ΔABC = ΔEFD

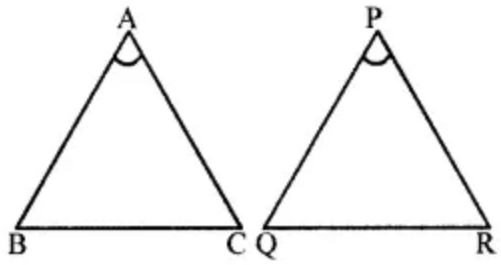
Then ∠A = ∠E (c)



Question 6.
If ΔABC = ΔPQR, then the correct statement is
(a) AB = QR
(b) AB = PR
(c) BC = PR
(d) AC = PR

Solution:

ΔABC = ΔPQR



Then AB = PQ

AC = PR (d)

Question 7.
If ∠D = ∠P, ∠E = ∠Q and DE = PQ, then ΔDEF = ΔPQR, by the congruence rule
(a) SAS
(b) ASA
(c) SSS
(d) RHS
Solution:

In ΔDEF = ΔPQR

∠D = ∠P, ∠E = ∠Q

DE = PQ

ΔDEF = ΔPQR (ASA axiom) (b)

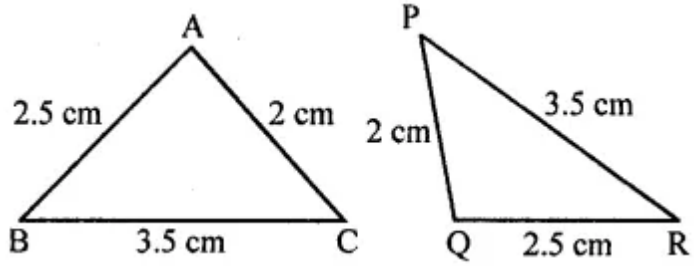
Question 8.
In ΔABC and ΔPQR, BC = QR and ∠C = ∠R. To establish ΔABC = ΔPQR by SAS congruence rule, the additional information required is
(a) AC = PR
(b) AB = PR
(c) CA = PQ
(d) AB = PQ
Solution:

If ΔABC = ΔPQR by SAS

BC = QR and ∠C = ∠R, then AC = PR (a)

Question 9.
In the given figure, the lengths of the sides of two triangles are given. The correct statement is
(a) ΔABC = ΔPQR

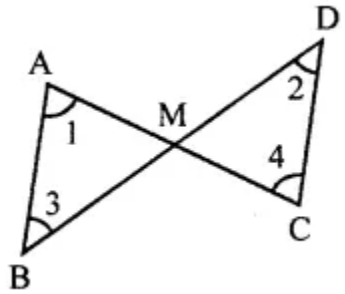
(b) ΔABC = ΔQRP
(c) ΔABC = ΔQPR
(d) ΔABC = ΔRPQ



Solution:

Correct statement is ΔABC = ΔQRP. (b)

Question 10.
In the given figure, M is the mid-point of both AC and BD. Then
(a) ∠1 = ∠2
(b) ∠1 = ∠4
(c) ∠2 = ∠4
(d) ∠1 = ∠3

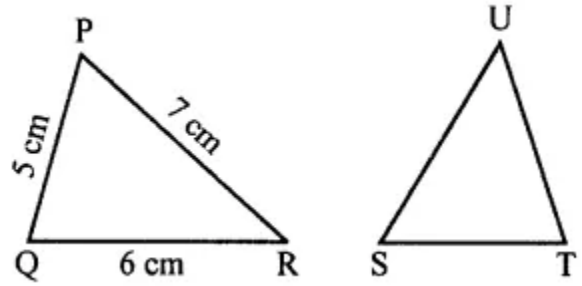


Solution:

In the given figure,

M is mid-point of AC and BD both then ∠1 = ∠4. (b)

Question 11.
In the given figure, ΔPQR = ΔSTU. What is the length of TU?
(a) 5 cm
(b) 6 cm
(c) 7 cm
(d) cannot be determined



Solution:

In the given figure,

ΔPQR = ΔSTU

TU = QR = 6 cm (b)

Question 12.

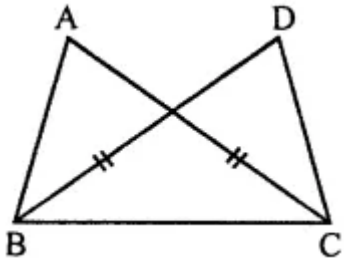
In the given figure, ΔABC and ΔDBC are on the same base BC. If AB = DC and AC = DB, then which of the following statement is correct?

(a) ΔABC = ΔDBC

(b) ΔABC = ΔCBD

(c) ΔABC = ΔDCB

(d) ΔABC = ΔBCD



Solution:

In the given figure,

AB = DC, AC = DB

Then, ΔABC = ΔDCB (c)

Question 13.

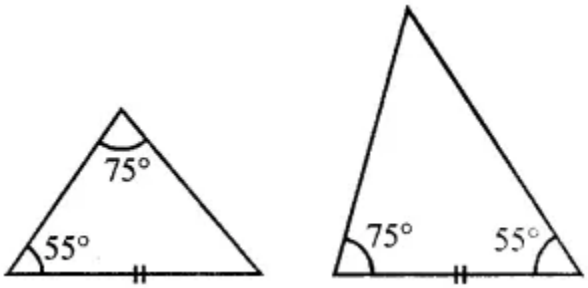
The two triangles shown in the given figure are:

(a) congruent by AAS rule

(b) congruent by ASA rule

(c) congruent by SAS rule

(d) not congruent.



Solution:

In the given two triangles are not congruent.

In first triangle, AAS are given while in second ASA are given. (d)

Question 14.

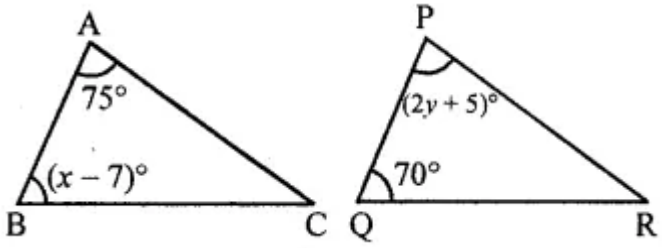
In .the given figure, ΔABC = ΔPQR. The values of x and y are:

(a) x = 63, y = 35

(b) x = 77, y = 35

(c) x = 35, y = 77

(d) x = 63, y = 40



Solution:

In the given figure,

ΔABC = ΔPQR

∠A = ∠P and ∠B = ∠Q

Now x – 7 = 70°

⇒ x = 70° + 7 = 77°

and 2y + 5 = 75

⇒ 2y = 75° – 5 = 70°

⇒ y = 35°

x = 77°, y = 35° (b)

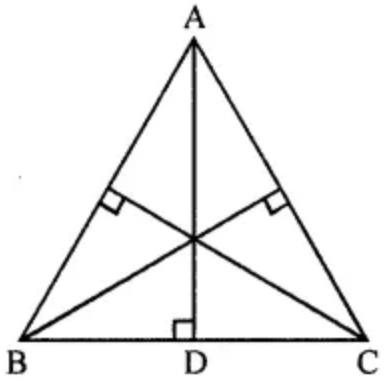
Higher Order Thinking Skills (HOTS)

Question 1.
If all the three altitudes of a triangle are equal, then prove that it is an equilateral triangle.
Solution:

Given: In ΔABC,

AD, BE and CF are altitudes of the triangle

and AD = BE = CF.



To prove: ΔABC is an equilateral.

Proof: In ΔABD and ΔCFB

AD = CF (Given)

∠D = ∠F (Each = 90°)

∠B = ∠B (Common)

ΔABD = ΔCFB (AAS criterion)

AB = BC .....(i)

Similarly in ΔBEC and ΔADC

BE = AD (Given)

∠C = ∠C (Common)

∠E = ∠D (Each = 90°)

ΔBEC = ΔADC (AAS criterion)

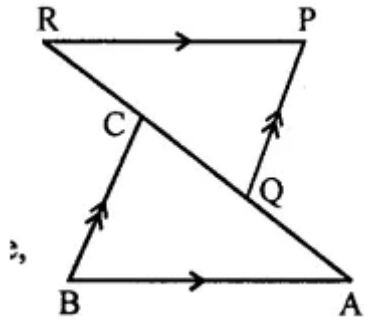
BC = AC .....(ii)

From (i) and (ii)

AB = BC = AC

ΔABC is an equilateral triangle.

Question 2.
In the given fig., if BA || RP, QP || BC and AQ = CR, then prove that ΔABC = ΔRPQ.



Solution:

In the given figure, BA || RP

QP || BC and AQ = CR

To prove : ΔABC = ΔRPQ

Proof: AQ = CR

Adding CQ to both sides

AQ + CQ = CR + CQ

⇒ AC = RQ

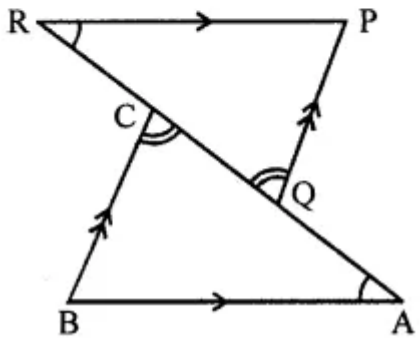
Now in ΔABC and ΔRPQ

∠A = ∠R (Alternate angles)

∠C = ∠Q (Alternate angles)

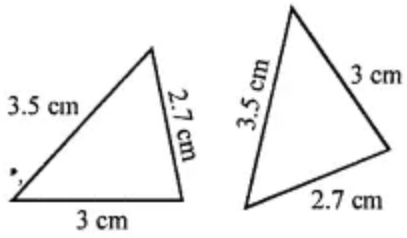
AC = RQ (Proved)

ΔABC = ΔRPQ (ASA criterion)

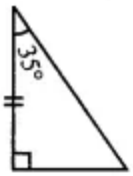


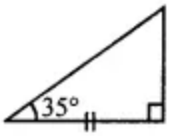
Check Your Progress

Question 1.
State, giving reasons, whether the following pairs of triangles are congruent or not:

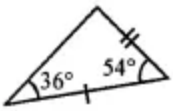


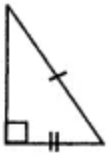
(i)



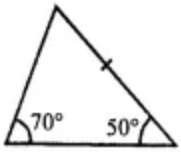


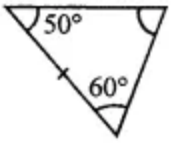
(ii)



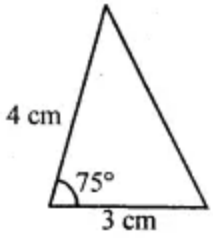


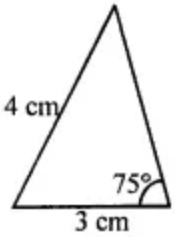
(iii)

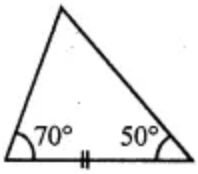


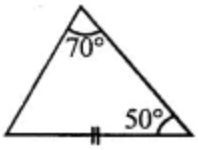


(iv)









(v)

(vi)

Solution:

(i) In the given figure, using the SSS criterion triangles one congruent.

(ii) Triangles are congruent for the criterion ASA criterion.

(iii) Triangles are congruent for the criterion RHS.

(iv) In the first triangle, third angle = 180° − (70° + 50°) = 180° − 120° = 60°

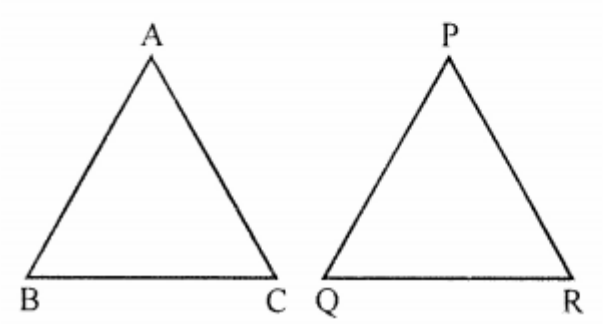
Now triangles are congruent for ASA criterion.

(v) Not congruent as included angles of the given two sides are not equal.

(vi) Not congruent as the included sides are different.

Question 2.
Given below are measurements of some parts of two triangles. Examine whether the two triangles are congruent or not. In case of congruence, give reasons and write in symbolic form:

ΔABC	ΔPQR
(i) AB = 4 cm, BC = 5 cm, ∠B = 70°	(i) QR = 4 cm, RP = 5 cm, ∠R = 70°
(ii) AB = 4 cm, BC = 5 cm, ∠B = 80°	(ii) PQ = 4 cm, RP = 5 cm, ∠R = 80°
(iii) BC = 6 cm, ∠A = 90°, ∠C = 50°	(iii) QR = 6 cm, ∠R = 50°, ZQ = 40°
(iv) AB = 5 cm, ∠A = 90°, BC = 8 cm	(iv) PR = 5 cm, ∠P = 90°, QR = 8 cm



Solution:

(i) In ΔABC and ΔPQR

AB = QR = 4 cm

BC = RP = 5 cm

∠B = ∠R = 70°

ΔABC = ΔPQR (SAS criterion)

(ii) In ΔABC and ΔPQR

AB = PQ = 4 cm

BC = RP = 5 cm not corresponding sides

∠B = ∠R = 80° not corresponding angles

Triangles are not congruent.

(iii) BC = QR = 6 cm

∠A = ∠P = 90° (Third angle)

∠C = ∠R = 50°

Triangles are congruent for ASA criterion.

(iv) AB = PR = 5 cm (Side)

∠A = ∠P = 90°

BC = QR = 8 cm (Hypotenuse)

Triangles are congruent for RHS criterion.

Question 3.

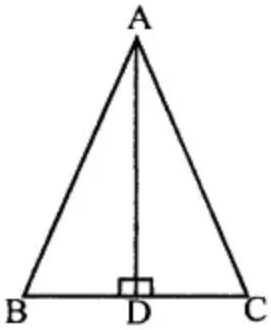
In the given figure, ABC is an isosceles triangle with AB = AC and AD is one of its altitudes.

(i) State the three pairs of equal parts in ΔADB and ΔADC.

(zz) Is ΔADB = ΔADC? Give reasons.

(iii) Is ∠B = ∠C? Why?

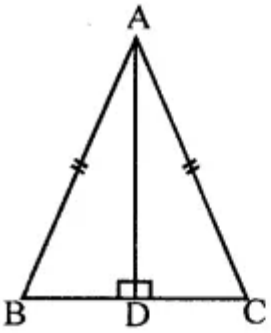
(iv) Is BD = DC? Why?



Solution:

ΔABC is an isosceles triangle with AB = AC

and AD is one of the altitudes.



(i) In ΔADB and ΔADC

Side AD = AD (Common)

Hypotenuse, AB = AC (Given)

∠ADB = ∠ADC = 90° (∵ AB ⊥ BC)

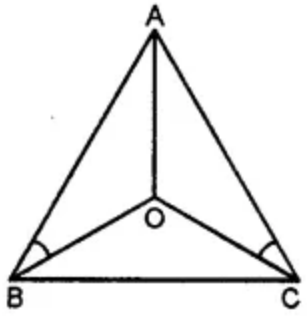
ΔADB = ΔADC

∠B = ∠C (c.p.c.t)

and BD = CD (c.p.c.t)

Question 4.

In the given figure, OA bisects ∠A and ∠ABO = ∠OCA. Prove that OB = OC.



Solution:

In ΔOAB and ΔOAC

∠OAB = ∠OAC (∵ OA bisects ∠A)

∠ABO = ∠ACO (Given)

OA = OA (common)

ΔOAB = ΔOAC (AAS congruence rule)

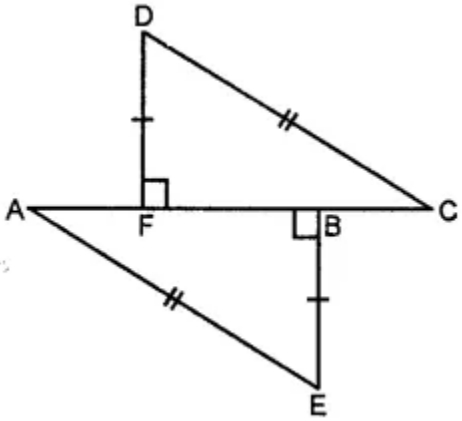
OB = OC (Corresponding parts of congruent As)

Question 5.

In the given figure , prove that

(i) AB = FC

(ii) AF = BC.



Solution:

In ΔABE and ΔDFC

$\angle B = \angle F$ (each 90°)

AE = DC (Given)

BE = DF (Given)

$\Delta ABE = \Delta DFC$ (RHS congruence rule)

(i) AB = FC (Corresponding parts of congruent Δs)

(ii) As AB = FC (Proved above)

$\Rightarrow$ AF + FB = FB + BC

$\Rightarrow$ AF + FB – FB = BC

$\Rightarrow$ AF = BC