MATHEMATICS

Chapter 7: Congruence of Triangle

Important Questions

Multiple Choice Questions :

Question 1. An angle is of 50° then its congruent angle is of:

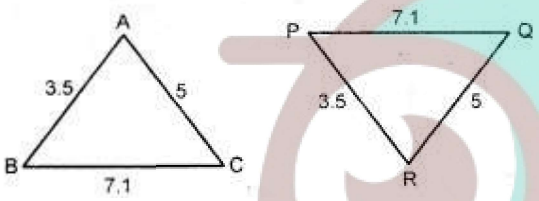
(a) 40°

(b) 60°

(c) 50°

(d) None of these

Question 2. Given two triangles are congruent then we can write :



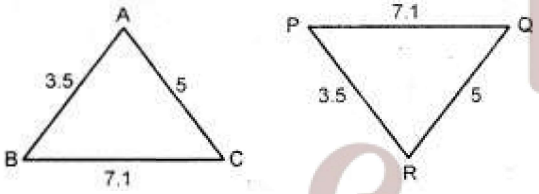
(a) ΔABC ≡ ΔPQR

(b) ΔABC ≡ ΔRPQ

(c) ΔABC ≡ ΔQRP

(d) none of these

Question 3. In the given figure, lengths of the sides of the triangles are given. Which pair of triangle are congruent ?



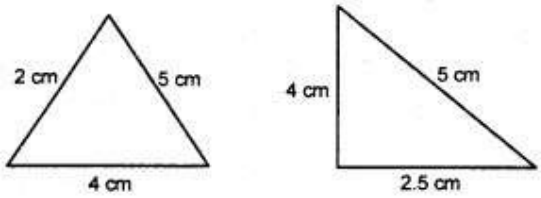
(a) ΔABC ≡ ΔPQR

(b) ΔBCA ≡ ΔPQR

(c) ΔABC ≡ ΔQRP

(d) none of these

Question 4. Are the following triangles congruent ?

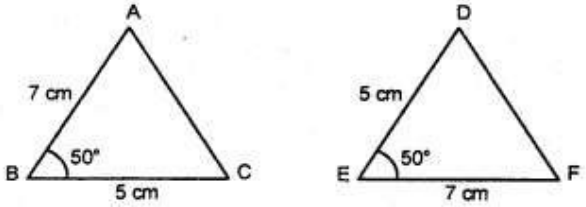


(a) yes

(b) no

(c) none of these

Question 5. Are the following triangles congruent ?

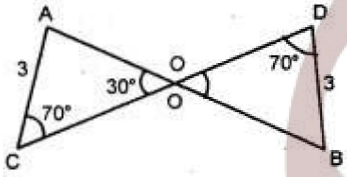


(a) yes

(b) no

(c) none of these

Question 6. In the given figure, say congruency of two triangles.



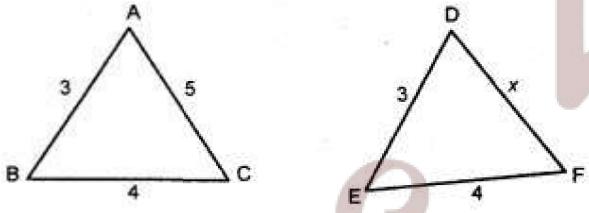
(a) ΔAOC U ΔBOD

(b) ΔAOC ≠ ΔBOD

(c) ΔAOC U ΔOBD

(d) none of these

Question 7. Given triangles are congruent, then what is the measurement of x ?



(a) 3

(b) 4

(c) 5

(d) none of these

Question 8. Given below are measurements of some parts of two triangles. Write the result in symbolic form.

In ΔABC, ∠B = 90°, AC 8 cm AB = 3 cm and

ΔPQR ,∠P = 90°, PR = 3 cm QR = 8 cm

(a) ΔABC ≡ ΔRPQ

(b) ΔABC ≡ ΔPQR

(c) ΔABC ≡ ΔRPQ

(d) none of these

Question 9. Given below are measurements of some parts of two triangles. Write the result in symbolic form if they are congruent.

In ΔABC,

∠A = 90°, AC = 5 cm, BC = 9 cm

In APQR,

∠P = 90°, PR = 3 cm QR = 8 cm

(a) are congruent

(b) are not congruent

Question 10. ΔABC and ΔPQR are congruent under the correspondence: ABC ↔ RPQ, then the part of ΔABC that correspond to PQ is

(a) AC

(b) AB

(c) BC

(d) None of These

Question 11. ΔABC is right triangle in which ∠A = 90° and AB = AC. The values of ∠B and ∠C will be

(a) ∠B = ∠C = 30°

(b) ∠B = ∠C = 50°

(c) ∠B = ∠C = 45°

(d) ∠B = ∠C = 60°

Question 12. Two students drew a line segment each. What is the condition for them to be congruent?

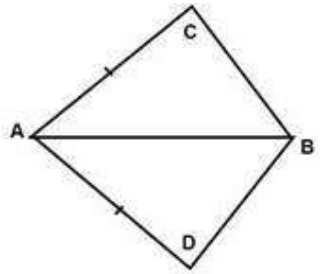
(a) They should be drawn with a scale.

(b) They should be drawn on the same sheet of paper.

(c) They should have different lengths.

(d) They should have the same length.

Question 13. In the quadrilateral ABCD, AC = AD and AB bisect ∠A and ΔABC ≅ ΔABD. The relation between BC and BD is



(a) BC < BD

(b) BC > BD

(c) BC = BD

(d) None of these

Question 14. A triangle in which all three sides are of equal lengths is called _____.

(a) Isosceles

(b) Equilateral

(c) Scalene

(d) None of these

Question 15. In ΔABC and ΔPQR, AB = 4 cm, BC = 5 cm, AC = 6 cm and PQ = 4 cm. QR = 5 cm. PR = 6 cm. then which of the following is true?

(a) ΔABC ≅ ΔQRP

(b) ΔABC ≅ ΔPQR

(c) ΔABC ≅ ΔRQP

(d) None of these

Very Short Questions :

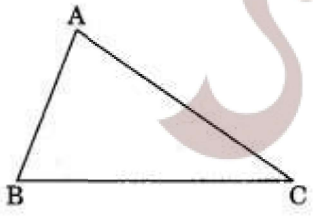
1. In the given figure, name

(a) the side opposite to vertex A

(b) the vertex opposite A to side AB

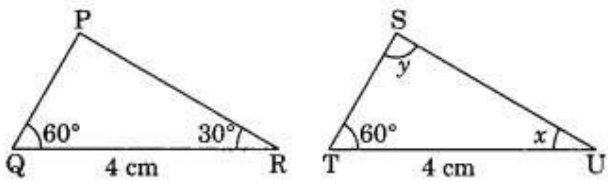
(c) the angle opposite to side AC

(d) the angle made by the sides CB and CA

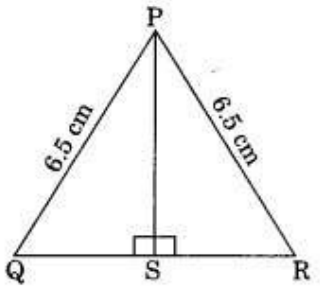


2. Examine whether the given triangles are congruent or not.

3. In the given congruent triangles under ASA, find the value of x and y, ΔPQR = ΔSTU.

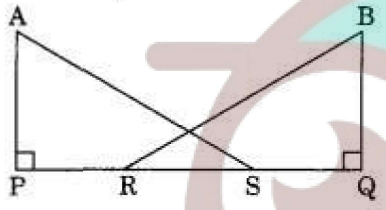


4. In the following figure, show that ΔPSQ = ΔPSR.



5. Can two equilateral triangles always be congruent? Give reasons.

6. In the given figure, AP = BQ, PR = QS. Show that ΔAPS = ΔBQR



7. Without drawing the figures of the triangles, write all six pairs of equal measures in each of the following pairs of congruent triangles.

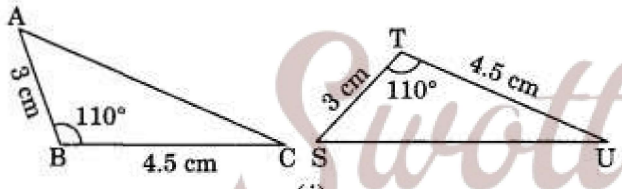
(i) ΔABC = ADEF

(ii) ΔXYZ = ΔMLN

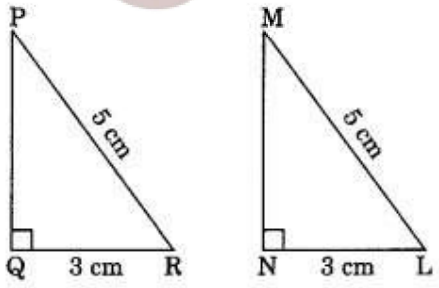
8. Lengths of two sides of an isosceles triangle are 5 cm and 8 cm, find the perimeter of the triangle.

Short Questions :

1. Write the rule of congruence in the following pairs of congruent triangles.

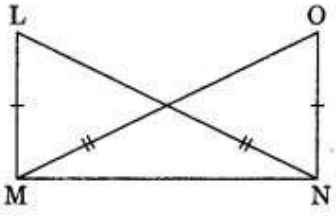


(i)



(ii)

2. In the given figure, state the rule of congruence followed by congruent triangles LMN and ONM.

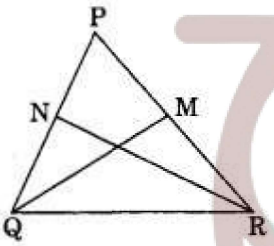


3. In the given figure, PQR is a triangle in which PQ = PR. QM and RN are the medians of the triangle. Prove that

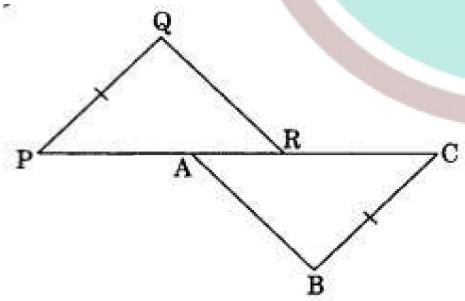
(i) ΔNQR = ΔMRQ

(ii) QM = RN

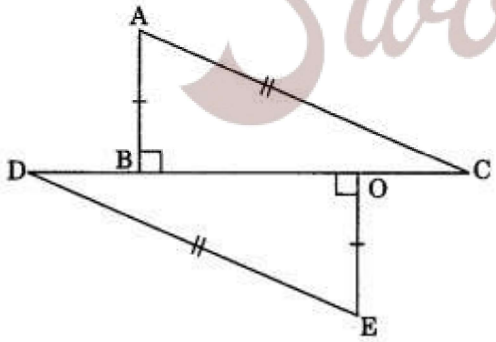
(iii) ΔPMQ = ΔPNR



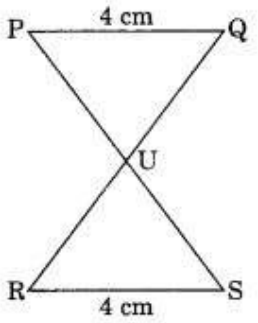
4. In the given figure, PQ = CB, PA = CR, ∠P = ∠C. Is ΔQPR = ΔBCA? If yes, state the criterion of congruence.



5. In the given figure, state whether ΔABC = ΔEOD or not. If yes, state the criterion of congruence.

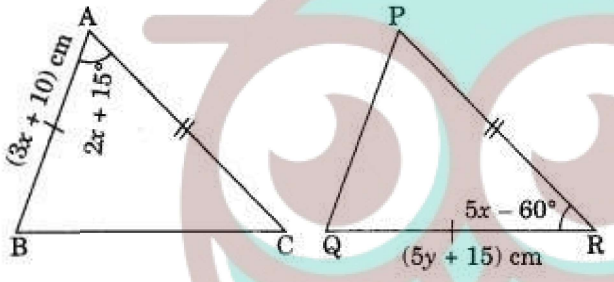


6. In the given figure, PQ || RS and PQ = RS. Prove that ΔPUQ = ΔSUR.



Long Questions :

1. In the given figure ΔBAC = ΔQRP by SAS criterion of congruence. Find the value of x and y.

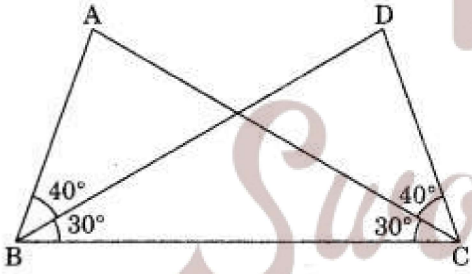


2. Observe the figure and state the three pairs of equal parts in triangles ABC and DCB.

(i) Is ΔABC = ΔDCB? Why?

(ii) Is AB = DC? Why?

(iii) Is AC = DB? Why?

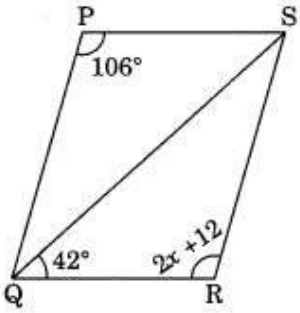


3. In the given figure, ΔQPS = ΔSRQ. Find each value.

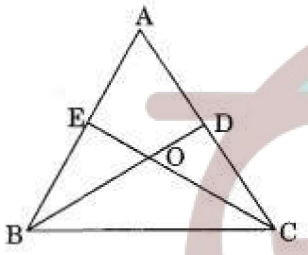
(a) x

(b) ∠PQS

(c) ∠PSR



4. In ΔABC, medians BD and CE are equal and intersect each other at O. Prove that ΔABC is an isosceles triangle.

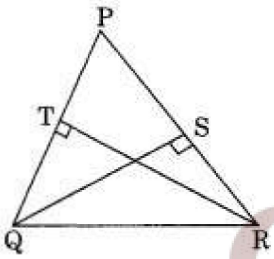


5. Prove that the lengths of altitudes drawn to equal sides of an isosceles triangle are also equal.

(i) ∠TRQ = ∠SQR?

(ii) If ∠TRQ = 30°, find the base angles of the ΔPQR.

(iii) Is ΔPQR an equilateral triangle?



ANSWER KEY -

Multiple Choice questions :

1. (c) 50°
2. (b) ΔABC ≡ ΔRPQ
3. (a) ΔABC ≡ ΔPQR
4. (b) no
5. (b) no
6. (a) ΔAOC ∪ ΔBOD
7. (c) 5
8. (a) ΔABC ≡ ΔRPQ

9. (b) are not congruent

10. (c) BC

11. (c) $\angle B = \angle C = 45°$

12. (d) They should have the same length.

13. (c) BC = BD

14. (b) Equilateral

15. (b) $\Delta ABC \cong \Delta PQR$

Very Short Answer :

1. (a) The side opposite to vertex A is BC.

(b) The vertex opposite to side AB is C.

(c) The angle opposite to side AB is $\angle ACB$.

(d) The angle made by the sides CB and CA is $\angle ACB$.

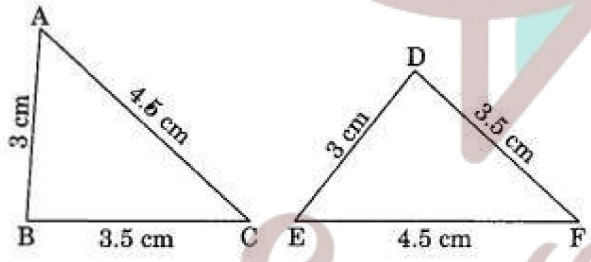
2. Here,

AB = DE = 3 cm

BC = DF = 3.5 cm

AC = EF = 4.5 cm

$\Delta ABC = \Delta EDF$ (By SSS rule)



So, ΔABC and ΔEDF are congruent.

3. Given: $\Delta PQR = \Delta STU$ (By ASA rule)

$\angle Q = \angle T = 60°$ (given)

$\overline{QR} = \overline{TU} = 4$ cm (given)

$\angle x = 30°$ (for ASA rule)

Now in ΔSTU,

$\angle S + \angle T + \angle U = 180°$ (Angle sum property)

$\angle y + 60° + \angle x = 180°$

$\angle y + 60° + 30° = 180°$

$\angle y + 90° = 180°$

$\angle y = 180° - 90° = 90°$

Hence, x = 30° and y = 90°.

4. In ΔPSQ and ΔPSR

$\overline{PQ} = \overline{PR} = 6.5$ cm (Given)

$\overline{PS} = \overline{PS}$ (Common)

∠PSQ = ∠PSR = 90° (Given)

ΔPSQ = ΔPSR (By RHS rule)

5. No, any two equilateral triangles are not always congruent.

Reason: Each angle of an equilateral triangle is 60° but their corresponding sides cannot always be the same.

6. In ΔAPS and ΔBQR

AP = BQ (Given)

PR = QS (Given)

PR + RS = QS + RS (Adding RS to both sides)

PS = QR

∠APS = ∠BQR = 90° (Given)

ΔAPS = ΔBQR (by SAS rule)

7. (i) Given: ΔABC = ΔDEF

Here AB = DE

BC = EF

AC = DF

∠A = ∠D, ∠B = ∠E and ∠C = ∠F

(ii) Given ΔXYZ = ΔMLN

Here XY = ML

YZ = LN

XZ = MN

∠X = ∠M, ∠Y = ∠L and ∠Z = ∠N

8. Since the lengths of any two sides of an isosceles triangle are equal, then

Case I: The three sides of the triangle are 5 cm, 5 cm and 8 cm.

Perimeter of the triangle = 5 cm + 5 cm + 8 cm = 18 cm

Case II: The three sides of the triangle are 5 cm, 8 cm and 8 cm.

Perimeter of the triangle = 5 cm + 8 cm + 8 cm = 21 cm

Hence, the required perimeter is 18 cm or 21 cm.

Short Answer :

1. (i) Here, AB = ST = 3 cm

BC = TU = 4.5 cm

∠ABC = ∠STU = 110°

ΔABC = ΔSTU (By SAS rule)

(ii) Here ∠PQR = ∠MNL = 90°

hypt. PR = hypt. ML

QR = NL = 3 cm

ΔPQR = ΔMNL (By RHS rule)

2. In ΔLMN and ΔONM

LM = ON

LN = OM

MN = NM

ΔLMN = ΔONM

3. ΔPQR is an isosceles triangle. [∵ PQ = PR]

$\Rightarrow \frac{1}{2}PQ = \frac{1}{2}PR$

⇒ NQ = MR and PN = PM

(i) In ΔNQR and ΔMRQ

NQ = MR (Half of equal sides)

∠NQR = ∠MRQ (Angles opposite to equal sides)

QR = RQ (Common)

ΔNQR = ΔMRQ (By SAS rule)

(ii) QM = RN (Congruent parts of congruent triangles)

(iii) In ΔPMQ and ΔPNR

PN = PM (Half of equal sides)

PR = PQ (Given)

∠P = ∠P (Common)

ΔPMQ = ΔPNR (By SAS rule)

4. PQ = CB, PA = CR

and ∠P = ∠C

In ΔQPR and ΔBCA,

PQ = CB (Given)

∠QPR = ∠BCA (Given)

PA = CR (Given)

PA + AR = CR + AR (Adding AR to both sides)

or PR = CA

ΔQPR = ΔBCA (By SAS rule)

5. In ΔABC and ΔEOD

AB = OE

∠ABC = ∠EOD = 90°

AC = ED

ΔABC = ΔEOD

Hence, ΔABC = ΔEOD

RHS is the criterion of congruence.

6. In ΔPUQ and ΔSUR

PQ = SR = 4 cm

∠UPQ = ∠USR (Alternate interior angles)

∠PQU = ∠SRU (Alternate interior angles)

ΔPUQ = ΔSUR (By ASA rule)

Long Answer :

1. Given: ΔBAC = ΔQRP (By SAS rule)

So, BA = QR

⇒ 3x + 10 = 5y + 15 ……(i)

∠BAC = ∠QRP

⇒ 2x + 15° = 5x – 60° ……(ii)

From eq. (ii), we have

2x + 15 = 5x – 60

⇒ 2x – 5x = -15 – 60

⇒ -3x = -7 5

⇒ x = 25

From eq. (i), we have

3x + 10 = 5y + 15

⇒ 3 × 25 + 10 = 5y + 15

⇒ 75 + 10 = 5y + 15

⇒ 85 = 5y + 15

⇒ 85 – 15 = 5y

⇒ 70 = 5y

⇒ y = 14

Hence, the required values of x and y are 25 and 14 respectively.

2. (i) In ΔABC and ΔDCB

∠ABC = ∠DCB = 70° (40° + 30° = 70°) (Given)

∠ACB = ∠DCB = 30° (Given)

BC = CB (Common)

ΔABC = ΔDCB (By ASA rule)

(ii) Yes,

AB = DC (Congruent parts of congruent triangles)

(iii) Yes,

AC = DB (Congruent parts of congruent triangles)

3. (a) ΔQPS = ΔSRQ

∠QPS = ∠SRQ (Congruent part of congruent triangles)

106 = 2x + 12

⇒ 106 – 12 = 2x

⇒ 94 = 2x

⇒ x = 47

∠QRS = 2 × 47 + 12 = 94 + 12 = 106°

So, PQRS is a parallelogram.

∠QSR = 180° – (42° + 106°) = 180° – 148° = 32°

(b) ∠PQS = 32° (alternate interior angles)

(c) ∠PSQ = 180° – (∠QPS + ∠PQS) = 180° – (106° + 32°) = 180° – 138° = 42°

∠PSR = 32° + 42° = 74°

4. We know that the medians of a triangle intersect each other in the ratio 2 : 1.

BD = CE (Given)

$\frac{2}{3}BD = \frac{2}{3}CE$

⇒ OB = OC

$\frac{1}{3}BD = \frac{1}{3}CE$

⇒ OE = OD

In ΔBOE and ΔCOD,

OB = OC

OE = OD

∠BOE = ∠COD (Vertically opposite angles)

ΔBOE = ΔCOD (By SAS rule)

BE = CD (Congruent parts of congruent triangles)

2BE = 2CD

⇒ AB = AC

Hence ΔABC is an isosceles triangle.

5. In ΔQTR and ΔRSQ

∠QTR = ∠RSQ = 90° (Given)

∠TQR = ∠SRQ (Base angle of an isosceles triangle)

∠QRT = ∠RQS (Remaining third angles)

QR = QR (Common)

ΔQTR = ΔRSQ (By ASA rule)

QS = RT (Congruent parts of congruent triangles)

Hence proved.

(i) ∠TRQ = ∠SQR (Congruent parts of congruent triangles)

(ii) In ΔQTR,

∠TRQ = 30° (Given)

∠QTR + ∠TQR + ∠QRT = 180° (Angle sum property)

⇒ 90° + ∠TQR + 30° = 180°

⇒ 120° + ∠TQR = 180°

⇒ ∠TQR = 180° – 120° = 60°

⇒ ∠TQR = ∠SRQ = 60°

Each base angle = 60°

(iii) In ΔPQR,

∠P + ∠Q + ∠R = 180° (Angle sum property)

⇒ ∠P + 60° + 60° = 180° (From ii)

⇒ ∠P + 120° = 180°

⇒ ∠P = 180° – 120° = 60°

Hence, ΔPQR is an equilateral triangle.