Congruence of Triangles

QUESTIONS

1. 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.

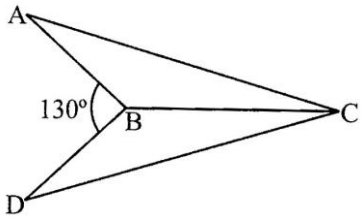
(c) They should have different lengths.

(d) They should have the same length.

2. In ΔABC, $AB = AC$ and AD is perpendicular to BC. State the property by which $\Delta ADB \cong \Delta ADC$.

(a) S.A.S. property (b) S.S.S. property (c) R.H.S. property (d) A.S.A. property

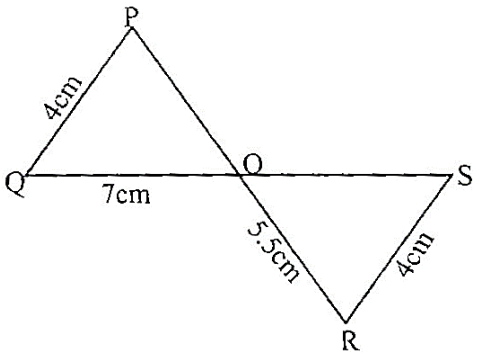
3. The given figure shows ΔABC & ΔDBC, $AB = DB$ and $CA = CD$



What is the measure of $\angle DBC$?

(a) 115° (b) 100° (c) 150° (d) 155°

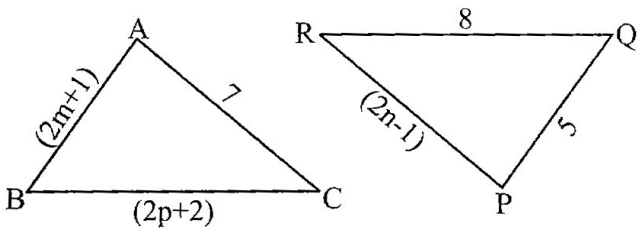
4. In the given figure $PQ \| RS$



What is the value of $(PR + QS)$?

(a) $21cm$ (b) $28cm$ (c) $25cm$ (d) $31cm$

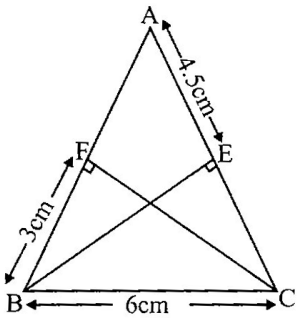
5. In the given figure, ΔABC is congruent to ΔPQR.



What is the value of $(m + 2n + 3p)$

(a) 8 (b) 10 (c) 17 (d) 19

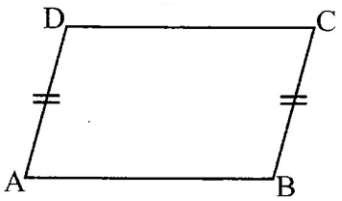
6. The given figure shows ΔABC with equal altitudes BE and CF.



What is the perimeter of ΔABC?

(a) 19 cm (b) 21 cm (c) 24 cm (d) 25 cm

7. In the given figure, if $AD = BC$ and $AD \parallel BC$ which of the following is true?



(a) $AB = AD$ (b) $AB = DC$ (c) $BC = CD$ (d) $AC = AD$

8. Which of the following is a pair of congruent figures?

(a) A regular pentagon and a regular hexagon.

(b) A rhombus and a square.

(c) Two equilateral triangles of the same length of their sides.

(d) A quadrilateral and a rectangle.

9. Two triangles, ΔPQR and ΔXYZ are of the same size and shape. What can we conclude about them?

(a) ΔPQR is smaller than ΔXYZ (b) ΔPQR is larger than ΔXYZ

(c) ΔPQR is congruent to ΔXYZ (d) ΔPQR is not congruent to ΔXYZ

10. Which of the following examines the congruence of plane figures?

(a) Trial and error method (b) Superposition method

(c) Substitution method (d) Transposition method

11. **Student A:** Two triangles are said to be congruent if two sides and an angle of one triangle are respectively equal to the two sides and an angle of the other.

Student R: Two triangles are congruent if two sides and the included angle of one are equal to the corresponding two sides and included angle of the other.

Given A & R, which of the following statements is correct?

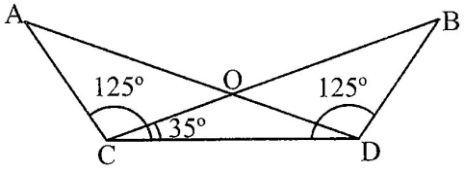
(a) A is false and R is the correct explanation of A.

(b) A is true and R is the correct explanation of A.

(c) A is true and R is false.

(d) A is false and R is true.

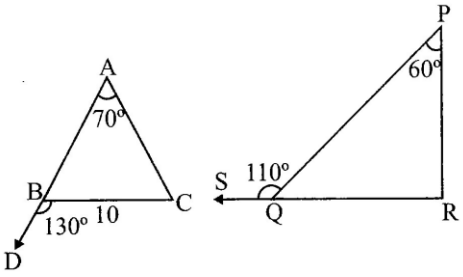
12. In the given figure, AC is equal to BD.



What is the measure of $\angle CAD$?

(a) 20° (b) 25° (c) 35° (d) 60°

13. The given figure shows ΔABC and ΔPQR with $AB = QR$.



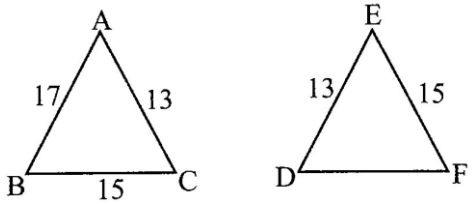
What is the value of $(AB + 5BC + 3AC + 2RP - 3PQ - QR)$?

(a) 60 (b) 55 (c) 70 (d) 25

14. In ΔABC, $AB = AC$ and AD is perpendicular to BC. The property by which ΔADB is congruent to ΔADC is.

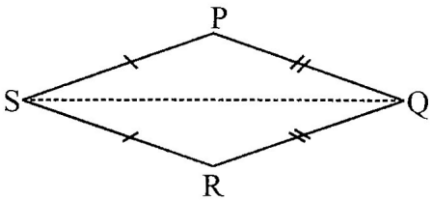
(a) SAS property (b) SSS property (c) RHS property (d) AAA property

15. If the given two Ales arc congruent, then what is true?



(a) $AB = DE$ (b) AC=DF (c) $BC = DF$ (d) $AB = DF$

16. In this given figure, $PS = SR$ and $PQ = QR$. Which of the following is the correct conclusion?



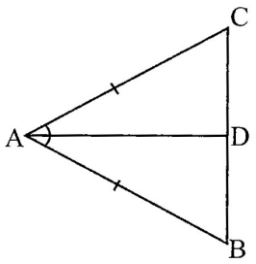
(a) ΔPQR and ΔRQS are isosceles triangle.

(b) QS bisects $\angle PSR$.

(c) QS bisects $\angle QPS$

(d) ΔPQR and ΔRQS are equilateral triangles.

17. In the given figure, $AB = AC$ and AD is the bisector of $\angle BAC$.



Which among the following statements is true?

(a) $\Delta ADB \cong \Delta ABC$ (b) $\Delta ADC \cong \Delta ABC$

(c) $\angle B = \angle C$ (d) $\angle ABC = \angle CAB$

18. Which of the following is an example of A.S.A. criterion of congruency for two triangles ΔABC and ΔDEF ?

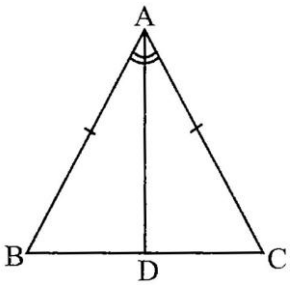
(a) $AB = EF$, $\angle B = \angle E$ and $\angle C = \angle F$

(b) $BC = EF$, $\angle B = \angle E$ and $\angle C = \angle F$

(c) $AC = EF$, $\angle B = \angle D$ and $\angle C = \angle F$

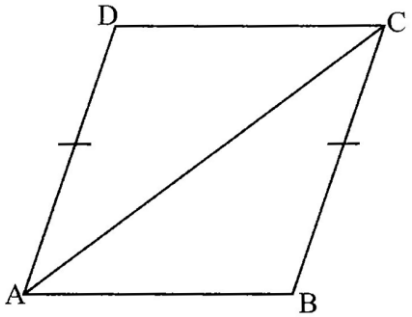
(d) $AC = DE$, $\angle B = \angle D$ and $\angle C = \angle F$

19. State the property by which $\Delta ADB \cong \Delta ADC$, where AD is angle bisector of $\angle BAC$.



(a) SAS property (b) SSS property (c) RHS property (d) ASA property

20. In the given figure if $AD = BC$ and $AD \parallel BC$, then



(a) $AB = AD$ (b) $AB = DC$ (c) $BC = CD$ (d) $AD = CD$

21. In ΔPQR, $PS \perp QR$, $\angle Q = \angle R$. State by which property $\Delta PSQ \cong \Delta PSR$?

(a) SAS property (b) ASA property

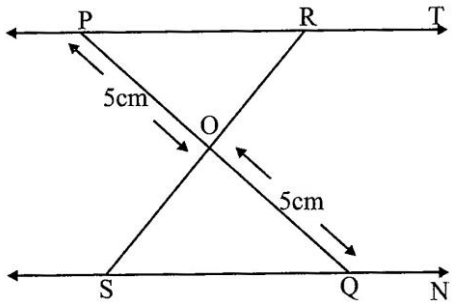
(c) RHS property (d) All i.e. (A), (B) and (C)

22. Which type of triangle is formed by $BC = 7.2\ cm,\ AC = 6\ cm$ and $\angle C = 120°$?

(a) An acute angled triangle. (b) An obtuse angled triangle.

(c) A right angled triangle. (d) An isosceles triangle.

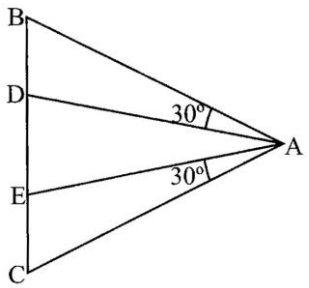
23. In the given figure, line PRT is parallel to SQN. If $RS = 8\ cm$ what is the length of RO?



(a) 7 cm (b) 3 cm (c) 4 cm (d) 6 cm

24. In the given figure, ΔABC and ΔADE are isosceles triangles with $AB = AC$ and $AD = AE$.

If $CE = 2\ cm$ and $DE = 6\ cm,$ then what is the length of side BC?



(a) $8\ cm$ (b) $9\ cm$ (c) $10\ cm$ (d) $1\ cm$

25. In ΔABC and $\Delta DEF,\ AC = DF,\ AB = EF$ and $BC = DE$. By which property are ΔABC and Δle (formed by three points D, E & F) congruent?

(a) R.H.S property (b) S.S.S. property (c) S.A.S. property (d) A.S.A. property

26. In ΔABC and ΔADE If $AC = EF,\ AB = DF$ and $BC = DE,$ what is the correct way of writing congruency?

(a) $\Delta ABC \cong \Delta DBF$ (b) $\Delta ACB \cong \Delta DEF$ (c) $\Delta ACB \cong \Delta DFE$ (d) $\Delta ABC \cong \Delta FDE$

27. If we apply Pythagoras theorem, R.H.S. property of congruency may be seen to be same as:

(a) SSS property (b) AAA property (c) ASA property (d) None of above

28. Which of the following criterion does not exist in the field of congruency of triangles.

(a) A.S.A. criterion (b) R.H.S. criterion (c) A.A.A. criterion (d) S.S.S. criterion

29. In two triangles, the three angles of one triangle are correspondingly equal to three angles of another triangle. Which of the following is a correct statement?

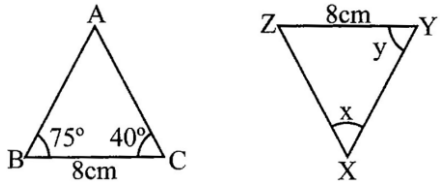
(a) One triangle is an enlarged copy of other

(b) The two triangles are necessarily congruent.

(c) The two triangle are congruent by A.A.A. congruency criterion.

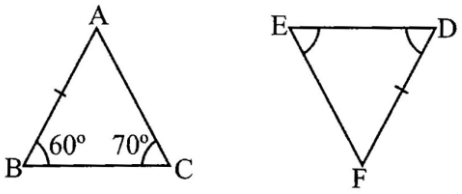
(d) All of the above.

30. ΔABX is congruent to ΔXYZ. Find the measures of $\angle x$ and $\angle y$ respectively.



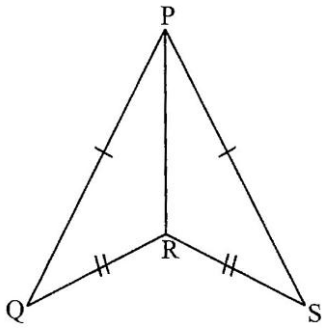
(a) 65°, 75° (b) 75°, 40° (c) 75°, 65° (d) 55°, 45°

31. $\Delta ABC \cong \Delta FDE$ What is the measure of $\angle F$?



(a) 50° (b) 60° (c) 80° (d) 75°

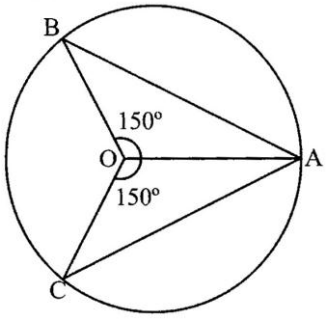
32. In the figure, $PQ = PS$ and $QR = SR$. If ΔPQR is congruent to ΔPSR, which of the following is correct?



(a) $\angle QPR = \angle PRS$ (b) $\angle RPS = \angle RQP$

(c) $\angle QRP = \angle SRP$ (d) $\overline{PR} = \overline{RS}$

33. AB and AC are two chords of a circle with centre O as shown.

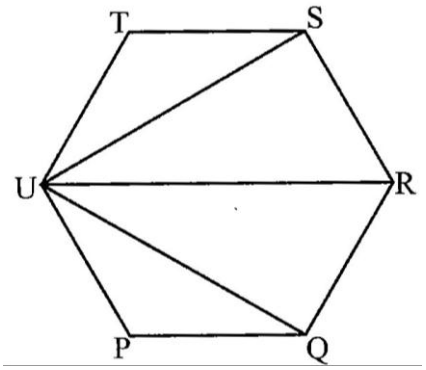


If ΔAOB is congruent to ΔAOC, which of the following is correct?

(a) $\angle OBA = \angle OCA$ (b) $\angle AOC = \angle OCA$

(c) $AO = AC$ (d) $AB = OC$

34. A regular hexagon is divided into four triangles as shown below:

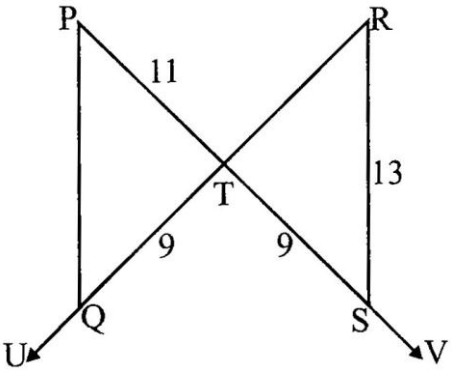


What of the following is correct?

(a) $\Delta PQU \cong \Delta TSU$ (b) $\Delta USR \cong \Delta RUQ$

(c) $\Delta PQU \cong \Delta UQR$ (d) $\Delta USR \cong \Delta QRU$

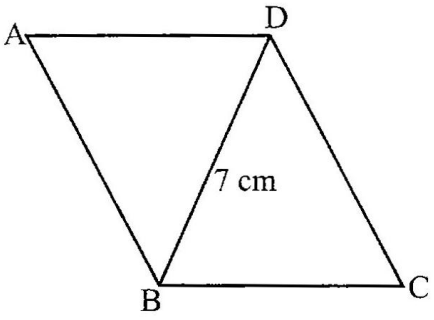
35. In the given figure, $\angle PQU = \angle RSV$



What is the perimeter of ΔPQT ?

(a) 28 units (b) 39 units (c) 33 units (d) 31 units

36. In the given figure,

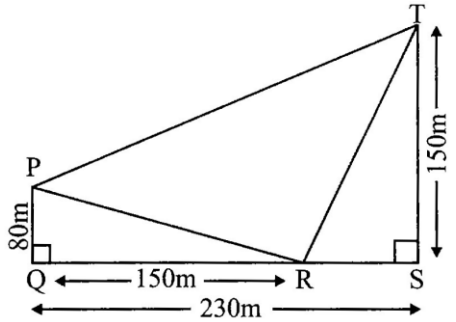


$AB \| CD$ and $AD \| BC$

If the perimeter of $\Delta ABD = 30\ cm$, then what is the perimeter of quadrilateral ABCD?

(a) 25 cm (b) 30 cm (c) 35 cm (d) 50 cm

37. In the given figure of a field, PQR and RST are right- angled at Q and S respectively. The measure of the sides are given (See figure)

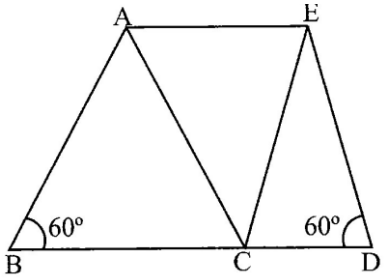


What type of a triangle is ΔPRT ?

(a) Isosceles triangle (b) Equilateral triangle

(c) Scalene right - angled triangle (d) Right - angled isosceles triangle.

38. In the given figure (not to scale) $AB = CD$ and $BC = DE$

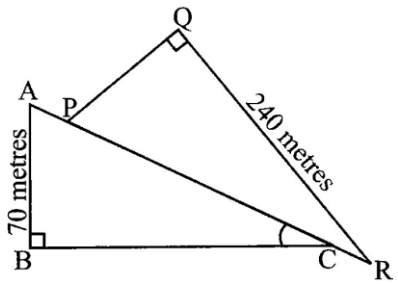


What type of a triangle is ΔACE ?

(a) Isosceles triangle (b) Equilateral triangle

(c) Scalene right - angled triangle (d) Right - angled isosceles triangle

39. In the given figure of a hockey field, ΔABC is congruent to ΔPQR .



If $PC = 200\ cm$, and $AP = CR$ then what is the length of AR?

(a) 150 metres (b) 300 metres (c) 470 metres (d) 500 metres

40. Which of the following is important in congruence of triangles?

(a) Naming the angles of the triangles using capital letters

(b) Measures of angles in degrees.

(c) The order of letters of the triangles.

(d) Exact length of the sides of the Δle .

ANSWER - KEY				
1. D	**2.** C	**3.** A	**4.** C	**5.** D
6. B	**7.** B	**8.** C	**9.** C	**10.** B
11. A	**12.** A	**13.** C	**14.** C	**15.** D
16. B	**17.** C	**18.** B	**19.** A	**20.** B
21. D	**22.** C	**23.** C	**24.** C	**25.** B
26. D	**27.** A	**28.** C	**29.** A	**30.** A
31. A	**32.** C	**33.** A	**34.** A	**35.** C
36. B	**37.** D	**38.** B	**39.** B	**40.** C

SOLUTIONS

1. (D) Not available

2. (C) Not available

3. (A): According to the given data, $\Delta\ \mathrm{AB}C \cong \Delta\Delta\mathrm{B}C$

$\therefore \angle DBC = \angle ABC = \frac{1}{2}\angle ABD \quad (1 \text{ larger } \angle \text{le})$

$= \frac{1}{2} \times (360° - 130°)$

4. (C): $PQ \| \mathrm{RS} \Rightarrow \angle \mathrm{QPO} = \angle SRO$ and $\angle \mathrm{OQP} = \angle OSR$; thus, $\Delta OQP \cong \Delta OSR \quad OS = 7\ cm$ and $PO = 5.5\ cm$

$\therefore\ QS = 7 + 7 = 14 cm;\ \ PR = 5.5 + 5.5 = 11\ cm$

$\therefore\ PR + QS = 11 + 14 = 25 cm$

5. (D): $\Delta \mathrm{AB}C \cong \Delta PQR \Rightarrow\ \overline{AB} = \overline{PQ},\ \overline{BC} = \overline{QR}; \overline{CA} = \overline{Rp} \Rightarrow 2m + 1 = 5 \Rightarrow m = 2;\ \ 2p + 2 = 8 \Rightarrow p = 3;$

$7 = 2n - 1 \Rightarrow n = 4$

$\Rightarrow m + 2n + 3p = 2 + 8 + 9 = 19$

6. (B): Perimeter $= AB + BC + CA : BC$ is already known $= 6\ cm$

From $\Delta BCF,\ CF = \sqrt{6^2 + 3^2} = 3\sqrt{3} = BE$

In $\Delta BEA,\ AB = \sqrt{45^2 \left(3\sqrt{3}\right)^2}$

Similarly, find CA and add $AB + BC + CA$

7. (B) Not available

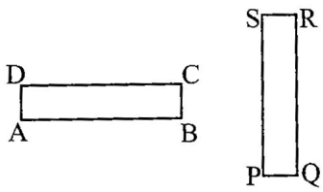
8. (C): In case (C), the two Ales satisfy both SSS criterion and the SAS criterion (as included angle is $60°$ in equilateral Δle). In fact, even one of this criterion is sufficient so, we have extraneous data (data more than what is required to solve the problem)

9. (C): Same size $\Rightarrow$ all corresponding sides are equal

Same shape $\Rightarrow$ all corresponding angles are equal

This necessarily means that $\Delta PQR \cong \Delta XYZ$

10. (B): Superposition means that if we correctly superimpose sides of one plane figure with sides of another plane figure, they completely overlap each after for e.g.;



Then, $\Delta BCD \cong QRSP$ if $AB = QR : BC = SR\ \ CD = SP$ and $DA = PQ$.

11. (A) Not available

12. (A): By congruency (SAS), $\Delta ACD \cong \Delta BDC$; Now in ΔACD, $\angle C = 125°$ $\angle D = 35°$

$\therefore \angle A = 180° - 125° - 35° = 20°$

13. (C): Tips: Sometimes the student needs to get into the thinking of the question setter.

The question setter has framed this problem in order to trick the student.

The two Ales do not look congruent. Not even do they look similar. But from the given data, they are seen to have their corresponding $\angle les$ as equal. Thus, they are similar. Now, also $AB = QR \Rightarrow$ the Δ les are congruent because if two Ales are similar & if even one of corresponding sides are equal, they become congruent $(\Delta ABC \cong \Delta QRP)$ in that order.

$AB = QR \Rightarrow AB - QR = O$

Similarly $3(AC - PQ) = 0$

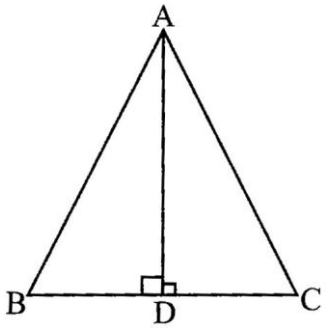
Thus, only terms left are

$5BC + 2RP$ and $BC = 10$ units

$= 5 \times 10 + 2 \times 10$ (SInec $BC = RP$)

$= 70$

14. (C):



In Δles ADB and ADC,

$AD = AD$ (common side)

$AB = AC$

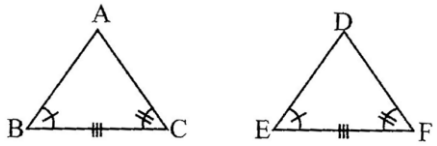
$\angle ADB = \angle ADC = 90° \Rightarrow$ congmency.

15. (D): Actually, the correct way of showing congmency of these two Δles would be $\Delta ABC = \Delta DFE$

16. (B): Not available

17. (C): $\angle B = \angle C$ (by property of isosceles Ale)

18. (B): Figuratively, we can show it as

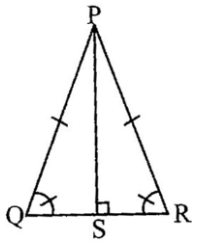


19. (A) Not available

20. (B) Not available

21. (D): In two Δles, if two corresponding $\angle les$ are equal, then the remaining third (corresponding) $\angle les$ are also equal.

$\therefore \angle QPS = \angle RPS$



Thus, in Ales PSQ and PSR,

PS (common side) : $\angle PSQ = \angle PSR = 90°,\ \angle QPS = \angle RPS$

By pytharos theorem, All three properties - ASA, SAS and RHS apply.

22. (C) Not available

23. (C): $\Delta POR \cong \Delta QOS$ (by ASA congmency) since $\angle RPO = \angle SQO : \angle POR = \angle QOS$ and

$PO = OQ$

$\therefore\ RO = SO = \frac{1}{2} RS = 4cm$

24. (C): In Ales ABD and ACE, $AB = AC$; $AD = AE$ and included $\angle les$ are $30°$ each Hence, they are congruent.

$\Rightarrow BD = CE = 2\ cm$

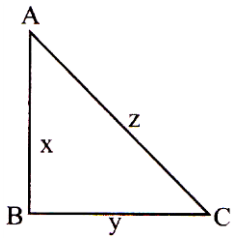
$\therefore BC = BD + DE + CE; = 2 + 6 + 2 = 10cm$

25. (B): When sides of ΔABC and superimposed over sides of Ale FED, they are equal.

Here, we are not calling Ale formed by three points D, E & F as Ale DEF. It is actually ΔFED by theory of congruency.

26. (D) Not available

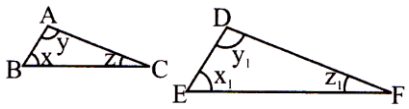
27. (A):



When we apply Pythagoras theorem in a Δle ABC, its third side (x or y or z) is obtained from two given sides. Thus, all sides are known.

28. (C): AAA criterion means corresponding $\angle les$ are equal. But this is easily seen to fail us.

For e.g.



$\angle x = \angle x_1$

$\angle y = \angle y_1$; Hence, although shapes are same, sizes are different.

$\angle z = \angle z_1$

Mind of a mathematician: In mathematics, if you can find even one example contrary to the given proposition, then the proposition is wrong. By the above example, we can see that AAA does not hold for congruency.

29. (A) Not available

30. (A) Not available

31. (A): They are congruent $\Rightarrow \angle A = \angle F$; Now

$\angle A = 180° - 60° - 70° = 50°$

$\therefore \angle F = 50°$

32. (C): As $\Delta PQR \cong \Delta PSR$, corresponding angles, $\angle QRP$ and $\angle SRP$ are equal.

33. (A): $\angle OBA$ and $\angle OCA$ are corresponding of congruent Ales.

34. (A): In ΔPQU & ΔTSU

$PQ = TS$; $UT = UP$; $\angle UPQ = \angle UTS$

35. (C): Considering Ales PQT & RST,

$QT = ST = 9$; $\angle PTQ = \angle RTS$;

$\angle PQT = 180° - \angle PQV \Rightarrow \angle PQT = \angle RST$

$\therefore \Delta PQT \cong \Delta RST \Rightarrow PQ = RS = 13$

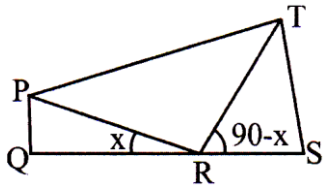
$\Rightarrow$ Perimeter $\Delta PQT = 13 + 11 + 9 = 33$

36. (B): Perimeter ABCD $= 2 \times$ Perimeter

$\Delta ABD - 2 \times BD$

$= 2 \times 30 - 2 \times 7 = 46$

37. (D): This is also an excellent problem to test the mind of students

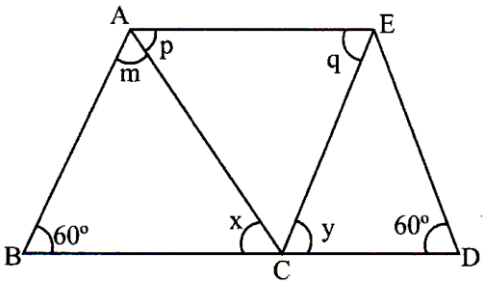


$\Delta PQR = \Delta RST$: Hence, if $\angle PRQ = x$ then $\angle SRT = 90 - x°$

$\Rightarrow \angle PRT = 90°$

Also $PR = RT \Rightarrow (D)$

38. (B): This is again an excellent test of mind for the students:



From given data, $\Delta ABC \cong \Delta CDE$

$\Rightarrow AC = EC \Rightarrow \angle p = \angle q$

$\angle y = \angle m;\ \angle x = 180° - 60° - m = 120° - m$

At point C: $\angle ACE = 180° - x - y$

$= 180° - (120 - m) - m = 60°$

Also $\angle ACE = 180° - \angle p - \angle q = 180° - 2\angle p = 60°$

$\Rightarrow \angle p = \angle q = 60° \Rightarrow \Delta$ ACE is equilateral Δ *le* .

39. (B): $AC = \sqrt{AB^2 + BC^2} = \sqrt{AB^2 + QR^2}$ (Since $BC = QR$ by congruency)

$= \sqrt{70^2 + 240^2} = 250m;\ AP = AC - PC = 250 - 200 = 50$

Also, $CR = AP = 50$

$\Rightarrow AR = AC + CR$

$= 250 + 50$

$= 300$

40. (C) Not available