Properties of Triangle

QUESTIONS

1. Which of the following sets of measures cannot be the lengths of the sides of a right triangle?

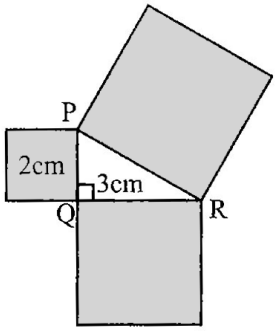
(a) 5 cm, 4 cm and 03 cm (b) 8 cm, 6 cm and 11 cm

(c) 1 cm, 2.4 cm and 2.6 cm (d) 60 cm, 25 cm and 65 cm

2. In a ΔPQR, If $PQ^2 = PR^2 + QR^2$, at which vertex is the right angle?

(a) P (b) Q (c) R (d) Either P or Q

3. The given figure shows a right-angled ΔPQR. Each of the three sides of the triangle also act as sides of a square.



What is the area of the shaded region in the given figure?

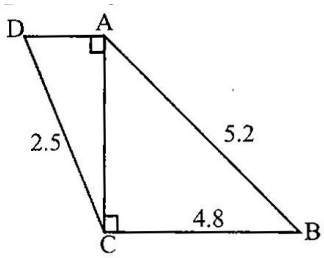
(a) 9 cm^2 (b) 13 cm^2 (c) 26 cm^2 (d) 18 cm^2

4. 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.

5. What is the perimeter of the given figure?



(a) 12 (b) 14 (c) 16.6 (d) 18.2

6. Which triangle is formed by $AB = 5\ cm$, $BC = 6\ cm$ and $AC = 7\ cm$?

(a) A scalene triangle. (b) An isosceles triangle.

(c) An equilateral triangle (d) none of above

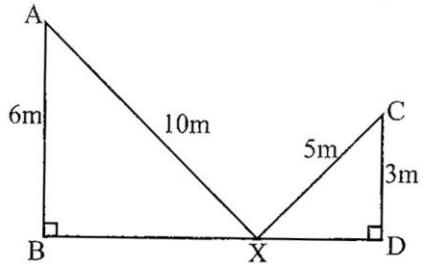
7. The length of one of the diagonals of a rhombus is $4\ cm$. If each side of the rhombus measures $2.5\ cm$, then what is the length of the other diagonal?

(a) 5 cm (b) 6 cm (c) 3.5 cm (d) 3 cm

8. If two angles in a triangle are $55°$ and $45°$, what is the third angle?

(a) 80° (b) 55° (c) 45° (d) 90°

9. The given figure shows two buildings AB and CD. X is a point between the buildings from which two ropes are tied without slack to the top of the buildings.



What is the distance between the buildings?

(a) $15m$ (b) $14m$ (c) $13m$ (d) $12m$

10. If one angle is the average of the other two angles and the difference between the greatest and least angles is $60°$, which triangle is formed?

(a) An isosceles triangle. (b) An equilateral triangle.

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

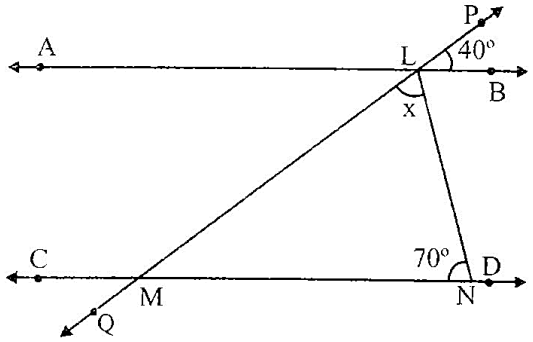
11. If two angles of a triangle measure $45°$ and $60°$, then which of the following angle cannot be the measure of one of the exterior angles of the triangle?

(a) $105°$ (b) $120°$ (c) $140°$ (d) $135°$

12. In ΔABC, If $AB = BC$ and $\angle B = 40°$, what is the measure of $\angle C$?

(a) $70°$ (b) $80°$ (c) $130°$ (d) $40°$

13. The given figure shows two parallel lines AB and CD, which are intersected by transversal PQ at L and M. LD is also joined as shown.



What is the value of x in the given figure?

(a) $63°$ (b) $58°$ (c) $70°$ (d) $85°$

14. Which triangle is formed by $BC = AC = 4.8\ cm$ and $\angle C = 90°$?

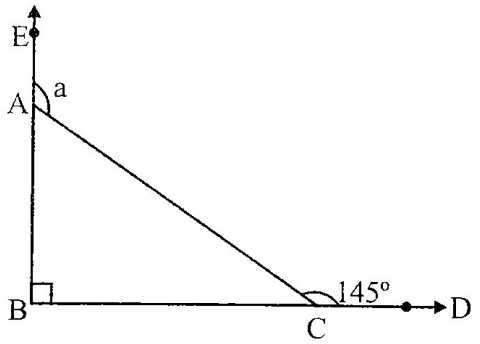
(a) A right angled triangle.

(b) An isosceles triangle.

(c) A right angled isosceles triangle.

(d) No triangle is formed.

15. What is the value of $\angle a$ in the given figure?



(a) 145° (b) 125° (c) 100° (d) 140°

16. Which of the following statement is true?

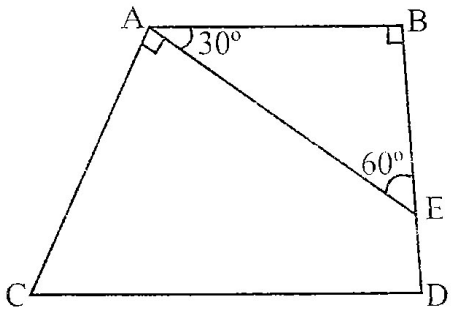
(a) The sum of two sides of a triangle is greater than the third side.

(b) In a right angled triangle, hypotenuse is the shortest side.

(c) A, B and C are not collinear if $AB + BC = AC$.

(d) The sum of angles in a triangle is less than $180°$.

17. $AB \| CD$ in the figure as shown below, then $\angle ACD$ is equal to



(a) 80° (b) 40° (c) 60° (d) 65°

18. What is the length of the hypotenuse of a right angled triangle whose two legs measure $30\ cm$ and 0.4 metres.

(a) 50 cm (b) 60 cm (c) $0.568\ cm$ (d) 37 cm

19. The three angles of a triangle are in the ratio $1:2:3$, then the greatest angle is

(a) 105° (b) 90° (c) 120° (d) 100°

20. If the two legs of a right angled triangle are equal and the square of the hypotenuse is $400\ sq\ cm$, what is the length of each leg?

(a) $40\ cm$ (b) $10\sqrt{2}\ cm$ (c) $50\sqrt{2}\ cm$ (d) 15 cm

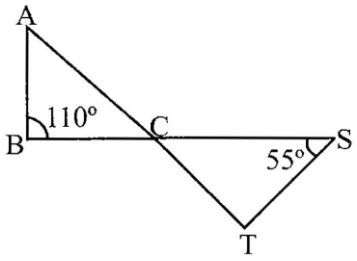
21. If one of the angles of an isosceles triangle measures $30°$, then what are the possible differences between the measures of its unequal angles?

(a) $20°$ and $70°$ (b) $45°$ and $90°$ (c) $30°$ and $90°$ (d) $45°$ and $105°$

22. If two sides of an isosceles triangle are 4 cm and 9 cm, what is the length of the third side?

(a) 4 cm (b) 9 cm (c) 4 cm or 9 cm (d) 12 cm

23. The given figure shows an isosceles ΔABC with $AB = BC$. Sides BC and AC are extended to S and T respectively, such that CS and CT along with ST form sides of ΔCST.



How can ΔCST be classified

(a) Acute - angled and scalene (b) Acute - angled and isosceles

(c) Right - angled and scalene (d) Right - angled and isosceles

24. In a ΔABC if $AB + BC = 8\ cm,\ BC + CA = 10\ cm,\ CA + AB = 12\ cm,$ what is the sum of the lengths of its sides?

(a) 15 cm (b) 20cm (c) 37.5 cm (d) 40 cm

25. ΔABC is right - angled at B. If the measures of $\angle A$ and $\angle C$ are in the ratio $7:5$ then what is the measure of $\angle C$?

(a) 40° (b) 60° (c) 37.5° (d) 70°

26. Which of the following are the angles in a right angled triangle other than the right angle?

(a) Acute angles (b) Obtuse angles (c) Right angles (d) none of these

27. If a, b, and c are the sides of a triangle, which of the following is correct?

(a) $a - b > c$ (b) $c > a + b$ (c) $c = a + b$ (d) $b < c + a$

28. If the angles of a triangle are in the ratio $1:3:14$ what type of a triangle is it?

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

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

29. A triangle always has

(a) Exactly one acute angle. (b) Exactly two acute angles.

(c) At least two acute angles. (d) Exactly 2 right angles.

30. How many independent measurements are required to construct a triangle?

(a) 3 (b) 4 (c) 2 (d) 5

31. In a ΔABC, if $\angle B$ is an obtuse angle, which is the longest side?

(a) AB (b) BC (c) AC (d) Either (A) or (B)

32. Two chimneys 18 m and 13 m high stand upright on a ground. If their feet are 12 m apart, what is the distance between their tops?

(a) 10 cm (b) 27 m (c) 13 m (d) 9 m

33. The top of a broken tree touches the ground at a distance of 15 m from its base. If the tree is broken at a height of 8 m from the ground, what is the actual height of the tree?

(a) 18 m (b) 25 m (c) 27 m (d) 29 m

34. What is the ratio in which the centroid of a triangle divides the medians?

(a) $1:2$ (b) $1:3$ (c) $2:1$ (d) $3:1$

35. The centroid of a triangle is the point or concurrence of which of these?

(a) Angle bisectors (b) Perpendicular bisectors

(c) Altitudes (d) Medians

36. Which of the following statements is false?

(a) The centroid of an acute angled triangle lies in the interior of the triangle.

(b) The orthocenter of an acute angled triangle lies in the interior of the triangle

(c) The medians of a triangle are concurrent.

(d) From cicumcenter, we cannot draw a circle touching all the three vertices of triangle.

37. Which of the following statements is false?

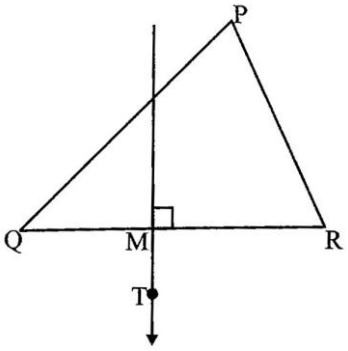
(a) The orthocenter of a right angled triangle is the vertex containing the right angle.

(b) The median of a triangle joins a vertex to the midpoint of the opposite side.

(c) The centroid of a right angled triangle lies in the interior of the triangle.

(d) Incentre lies outside then triangle.

38. In $\Delta PQR,\ PQ = PR$; M is a mid point on QR and $MT \perp QR$. What do you call MT?



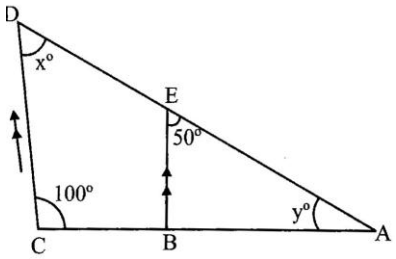
(a) Centroid (b) Median (c) Perpendicular bisector (d) Vertex

39. Which of the following statements is NOT true?

(a) A triangle can not have two obtuse angles. (b) A triangle can have three acute angles.

(c) A triangle can have two right angles. (d) A triangle can have all three angles equal.

40. Find the angles x and y respectively, $BE \parallel DC$



(a) $x = 30°,\ y = 50°$ (b) $x = 25°,\ y = 75°$

(c) $x = 50°, y = 30°$ (d) $x = 50°, y = 25°$

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

SOLUTIONS

1. (B): It is easy to mentally calculate the combinations $a^2+b^2=c^2$ ('p' y thagoras theorem) which is applicable in a right Δ i.e., In (A), it is easily can, $3^2+4^2=5^2$; In (C) $1^2+2.4^2=2.6^2$; In (D), $65^2=60^2+25^2$. However, to arvive at the same result, we can also apply a different method mathematically;

$65^2=(60+5)^2=60^2+2\times60\times5+5^2$

$=60^2\times600+25$

$=60^2+25$

Mind of a mathematician: A maths students tries to solve some problem in different ways, at least during practice".

2. (C) Not available

3. (C): Shaded region (on 2 cm side) $=2^2=4$

Shaded region (on 3 cm side) $=3^2=9$

Shaded region (on 2 cm side) $=2^2+3^2=13$

$\therefore$ Total $=4+9+13$

$=26$

4. (B): This is obvious as $\angle C=120°>90°$

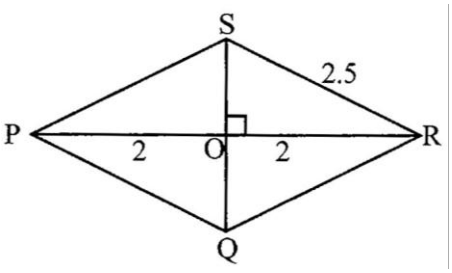
5. (B): $AC=\sqrt{5.2^2-4.8^2}=\sqrt{0.4\times10}=2$

$AD=\sqrt{CD^2-AC^2}=\sqrt{2.5^2-2^2}=\sqrt{0.5\times4.5}=1.5$

$\therefore AD+CD+CB+BA=1.5+2.5+4.8+5.2=14$

6. (A) Not available

7. (D): In a rhombus, diagonals are $\perp$ lar to each others.



In right Δ *le* SOR, so $=\sqrt{2.5^2-2^2}=1.5$

$\Rightarrow$ other diagonal $=3\ cm$

8. (A): Third $\angle le=180°-55°-45°=80°$

9. (D): Distance

$=BX+XD=\sqrt{10^2-6^2}+\sqrt{5^2-3^2}$

$=8+4=12$

10. (C): Mind of a Mathematician: Let $\angle les$ be $x-\alpha,\ x,\ x,+\ \alpha$ (we can choose such variables intelligently ; by making such choice, middle angle is automatically average of first and third angles): Now difference

$=(x+\alpha)-(x-\alpha)=2\alpha=60°$

Also sum of $\angle les$

$=x-\alpha+x+x+\alpha$

$=3x=180°$

$=x=60°$

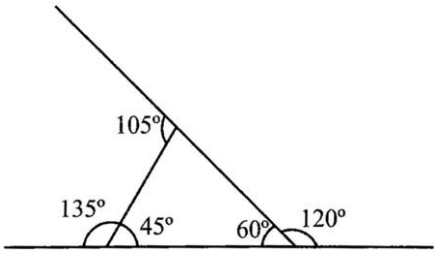
$=x-\alpha=30°$

$=x=60°$

$=x+\alpha=90°$

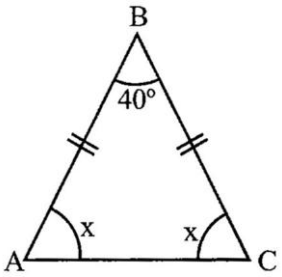
$=\angle right\ \Delta\ le.$

11. (C):



We can easily see that three exterior $\angle les$ are $105°,\ 135°,\ 120°$ therefore (C) $140°$ is the answer.

12. (A):

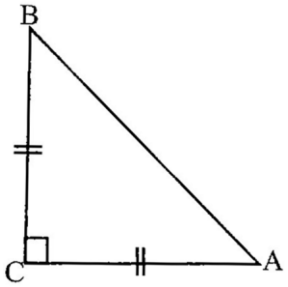


It is isosceles $\Delta le\ \Rightarrow x+x+40°=180°\quad \therefore x=70°$

13. (C): $\angle LNM=70°=NLB$ (alternate $\angle les$)

Now, $\angle x+\angle NLB+40°=180°\Rightarrow\angle x=180°-40°-70°=70°$

14. (C):



15. (B): 'a' = exterior

$\angle le = \angle ABC + \angle ACB = 90° + \angle ACB$

$\angle ACB = 180° - 145° = 35°$

$\therefore\ a = 90 + 35°$

$= 125°$

16. (A) Not available

17. (C): $\angle ACD + \{\angle CAE + 30°\} = 180°$ [internal $\angle les$ ' sum]

$\angle CAE = 90° \Rightarrow \angle ACD = 180° - 90° - 30° = 60°$

18. (A): 30 cm & 0.4m $\Rightarrow$ 30 cm & 40 cm

$\therefore$ hypotenuse $= \sqrt{30^2 + 40^2} = 50$

19. (B): Let $\angle les$ be $x,\ 2x,\ 3x$

$\therefore\ x + 2x + 3x = 180° \Rightarrow 3x = 90°$

20. (B): Let equal legs be

$x \therefore x^2 + x^2 = 400 \Rightarrow x^2 = 200$

$\therefore\ x = \sqrt{200} = 10\sqrt{2}\,cm$

21. (B): Case $1: 30°$ can be equal $\angle le, \Rightarrow \angle les$ are $30°, 30°, 120°$ then, difference

$= 120° - 30° = 90°$

Case $2: 30°$ is not equal $\angle le; \Rightarrow \angle les$ are $30, 75°, 75°,$ then, difference $= 75° - 30° = 45°$

22. (C): Third side may be equal to 9 (then equal sides are 4, 4) Or, Third side may be equal to 4 (then equal sides are 9.9)

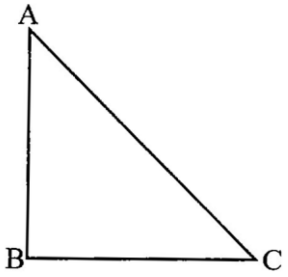
23. (C): Since ΔABC is isosceles $\therefore \angle ACB = 35°$

Now, $\angle TCS = 35°$ (vertically oppositely)

$\therefore TSC = 55° \therefore CTS = 180° - 55° - 35° = 90°$

24. (A) Not available

25. (C):



$\angle A + \angle C = 90°$: Now, let $\angle A = 7x;\ \angle C = 5x$

Then, $7x + 5x = 90°$

$$\Rightarrow x = \frac{90°}{12} = 7.5° \ \therefore \ \angle C = 5x = 37.5°$$

26. (A) Not available

27. (D): Sum of any sides is always greater than 3rd side $\Rightarrow$ (D) is correct

Difference of two sides is always less then 3rd sides $\Rightarrow$ (A) is wrong

28. (B): Angles will be $x, 3x, 14x$

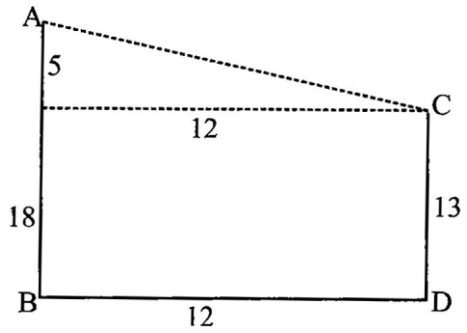
$\therefore \ \angle les$ are $10°, 30°, 140° \Rightarrow$ OBTUSE

29. (C) Not available

30. (A): We may know three sides; OR, two sides and included angle etc.

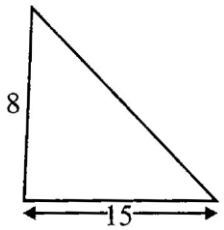
31. (C): Side opposite to largest $\angle le$ (here $\angle B$) will be longest. Hence it is AC.

32. (C):



Distance between tops $= AC = \sqrt{5^2 + 12^2} = 13$

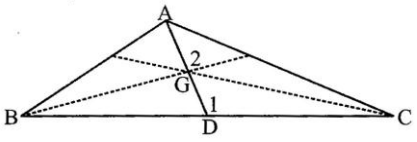
33. (B):



Height of tree = 8 + hypotenuse

$$= 8 + \sqrt{8^2 + 15^2} = 8 + 17 = 25$$

34. (C): This can shown in figure as below



G is the centroid $\frac{AC}{GD} = \frac{2}{1}$

35. (D) Not available

36. (D) Not available

37. (D) Not available

38. (C): $MT \perp QR$ and M being mid-point ($\Rightarrow$ MT bisects QR)

$\therefore$ MT is $\perp$ lar bisector. (Tips: Use mathematical symbols as far as possible) for eg use $\perp$ for "is perpendicular to".

39. (C): A Ale has 3 angles, if out of this, two $\angle les$ are right $\angle les$ third $\angle le = 0°$, which means Δle cannot be formed.

40. (C): Since $BE \| DC \Rightarrow \angle ABE = 100°$ and $\angle x = 50°$

In ΔABE, $\angle y = 180° - 100° - 50° = 30°$