Answer & Solutions

Level-I

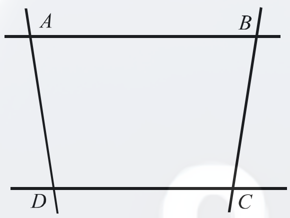
1. (c) In a right angled Δ, the length of the median is $\frac{1}{2}$ the length of the hypotenuse. Hence $BD = \frac{1}{2}AC = 3$ cm.

2. (b) In $\Delta ABC, \angle C = 180 - 90 - 30 = 60°$

$\therefore \Delta DCE = \frac{60}{2} = 30°$

Again in ΔDEC, $\Delta CED = 180 - 90 - 30 = 60°$

3. (d) The quadrilateral obtained will always be a trapeziam as it has two lines which are always parallel to each other.



4. (a) $AD = 24$, $BC = 12$

In ΔBCE & ΔADE

since $\angle CBA = \angle CDA$ (Angles by same arc)

$\angle BCE = \angle DAE$ (Angles by same arc)

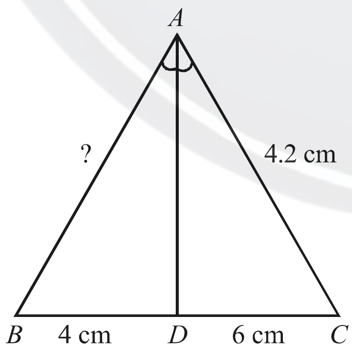
$\angle BEC = \angle DEA$ (Opp. angles)

$\therefore \angle BCE$ & $\angle DAE$ are similar Δs

with sides in the ratio 1 : 2

Ratio of area = 1:4 (i.e square of sides)

5. (a)



$\Delta ABD \sim \Delta ACD$

$\frac{AC}{DC} = \frac{AB}{BD} \Rightarrow \frac{4.2}{6} = \frac{AB}{4}$

$\therefore AB = 2.8$ cm

6. (c) Let n be the number of sides of the polygon

Now, sum of interior angles = 8 × sum of exterior angles

i.e. $(2n - 4) \times \frac{\pi}{2} = 8 \times 2\pi$

or $(2n - 4) = 32$

or $n = 18$

7. (a) 2.4 cm

8. (a) $\angle EDC = \angle BAD = 45°$ (alternate angles)

$\therefore x = DEC = 180° - (50° + 45°) = 85°$.

9. (a) $a + 36° + 70° = 180°$ (sum of angles of triangle)

$\Rightarrow a = 180° - 36° - 70° = 74°$

$b = 36° + 70°$(Ext. angle of triangle) = 106°

$c = a - 50°$ (Ext. angle of triangle) =74° – 50° = 24°.

10. (c) $b = \frac{1}{2}(48°)$

($\angle$at centre = 2 at circumference on same PQ) 24°

$\angle AQB = 90°$ ($\angle$In semi-circle)

$\angle QXB = 180° - 90° - 24°$ ($\angle$sum of Δ) = 66°

11. (d) $\angle MBA = 180° - 95° = 85°$

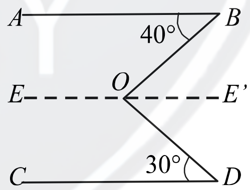
$\angle AMB = \angle TMN$ ...(Same angles with different names)

$\therefore \Delta MBA - \Delta MNT$ ......(AA test for similarity)

$\frac{MB}{MN} = \frac{AB}{NT}$ ....(proportional sides)

$\frac{10}{MN} = \frac{5}{9}$ $\therefore MN = \frac{90}{5} = 18$.

12. (b) Through O draw EOE' parallel to AB & so to CD.



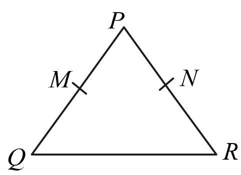
$\therefore \angle BOE' = \angle ABO = 40°$ (alternate angles)

$\angle E'OD = \angle CDO = 30°$ (alternate angles)

$\therefore \angle BOD = (40° + 30°) = 70°$. So, $x = 70$.

13. (c) The triangle PQR is isosceles

$\Rightarrow MN \parallel QR$ by converse of Proportionality Theorem.



(b) Again by Converse of Proportionality theorem, $MN \parallel QR$.

14. **(a)** a + 36° + 70° = 180° (sum of angles of triangle)
$\Rightarrow$ a = 180° – 36° – 70° = 74°
b = 36° + 70° (Ext. angle of triangle) = 106°
c = a – 50° (Ext. angle of triangle) = 74° – 50°
= 24°.

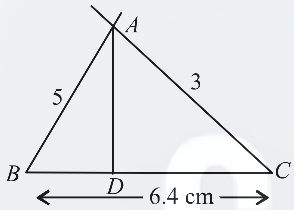
15. **(c)** Perimeter of ΔABC = 36 cm.
Perimeter of ΔPQR = 24 cm and PQ = 10 cm.
We have to find AB. Perimeter of $\Delta ABC = AB + BC + AC$.
Perimeter of $\Delta PQR = PQ + QR + PR$. Since $\Delta ABC \sim \Delta PQR$.

$$\therefore \frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PQ} = \frac{AB+BC+AC}{PQ+QR+PR} = \frac{36}{24}$$

$$\Rightarrow \frac{AB}{PQ} = \frac{36}{24} \Rightarrow AB = \frac{36}{24} \times PQ = \frac{36}{24} \times 10 = 15 \text{ cm.}$$

16. **(d)** AD is the bisector of $\angle A$.

$$\therefore \frac{AB}{AC} = \frac{BD}{DC} = \frac{5}{3}$$



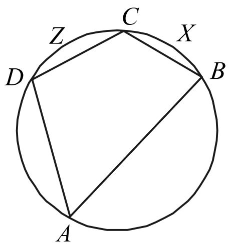
$$\Rightarrow \frac{DC}{BD} = \frac{3}{5} \Rightarrow \frac{DC+BD}{BD} = \frac{3+5}{5}$$

$$\Rightarrow \frac{BC}{BD} = \frac{8}{5} \Rightarrow BD = BC \times \frac{5}{8} = 6.4 \times \frac{5}{8} = 4$$

17. **(b)** $m\angle ACD = m\angle DEC$
$\therefore m\angle DEC = x = 40°$
$\therefore m\angle ECB = m\angle EDC$
$\therefore m\angle ECB = y = 54°$
$54° + x + z = 180°$ .... (sum of all the angles of a triangle)
$54° + 40° + z = 180°$
$\therefore z = 86°$

18. **(b)** In ΔBCD, $BC = CD$, $\angle BDC = \angle CBD = x$
In cyclic quadrilateral $ABCD$, $\angle ABC + \angle ADC = 180°$
$40° + x + 90° + x = 180° \Rightarrow x = 25°$.

19. **(c)** $m\angle DAB = 180° – 120° = 60°$ ...(opposite angles of a cyclic quadrilateral) $m(\text{arc } BCD) = 2\, m\angle DAB = 120°$.



$\therefore m(\text{arc } CXB) = m(\text{arc } BCD) – m(\text{arc } DZC)$
$= 120° – 70° = 50°$.

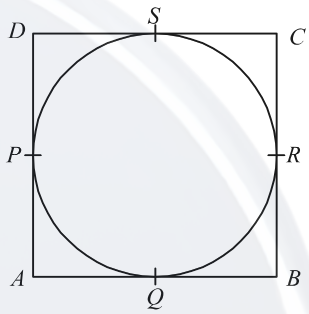
20. **(d)**

21. **(d)** $\frac{OP}{PT} = \tan 30° = \frac{1}{\sqrt{3}} \Rightarrow PT = \sqrt{3}\ OP = 3\sqrt{3}$ cm.

22. **(c)** $\angle OPQ = \angle OQP = 30°$, i.e., $\angle POQ = 120°$.
Also,

$$\angle PRQ = \frac{1}{2} \text{ reflex } \angle POQ$$

23. **(b)** Since $ABCD$ is a quadrilateral
Again AP, AQ are tangents to the circle from the point A.

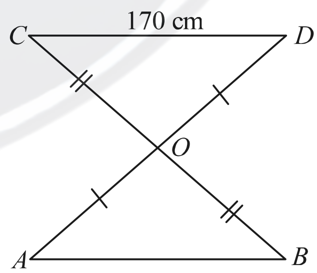


$\therefore \quad AP = AQ$
Similarly $BR = BQ$
$CR = CS$
$DP = DS$
$\therefore \quad (AP + DP) + (BR + CR) = AQ + DS + BQ + CS$
$= (AQ + BQ) + (CS + DS)$
$\Rightarrow \quad AD + BC = AB + CD$

24. **(d)** $\angle LCD = \angle ALC = 60°$ (alternate angles)
$\angle DCE = \frac{1}{2}\angle LCD = 30°$. ($EC$ is the angle bisector)
$\therefore \angle FEC = (180° – 30°) = 150°$.

25. **(b)** We have area of triangle $AFE = A/4$. (If A = Area of triangle ABC) and area of triangle $DHI = (A/4)/4 = A/16$. Hence, ratio = 1 : 4.

26. **(b)** In ΔAOB and ΔCOD



$AO = OD$, $BO = OC$
$\angle AOB = \angle COD$ (vertically opposite angles)
$\therefore \Delta AOB \cong \Delta COD$
$\therefore AB = CD = 170$ cm.

27. **(d)** $c = c_1$ (Vert. opp. $\angle s$). $b = c + s$ (Ext. $\angle$).
$d = c_1 + r$ (Ext. $\angle$)

But $b + d = 180°$ (Opp. $\angle s$, cyclic quad.)

$\Rightarrow \quad c + s + c_1 + r = 180°$

$\Rightarrow \quad r + s + 2c = 180° \Rightarrow r + s = 180° - 2c.$

28. (b) $m\angle PAC = m\angle PBC = 90°$

....(Tangent perpendicularity theorem)

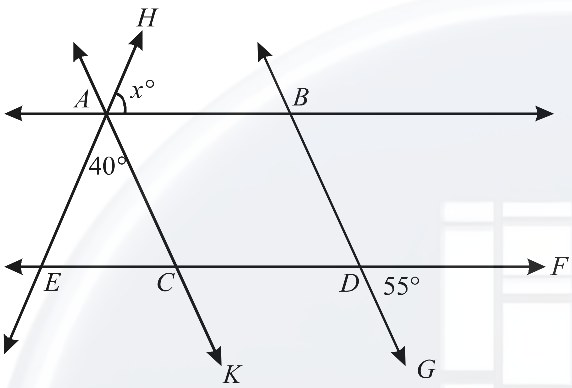
$m\angle PAC + m\angle PBC + m\angle ACB = 360°$

$\therefore \quad m\angle APB = 360 - (90 + 90 + 65) = 115°$

$\therefore \quad m(AXB) = 115°.$

29. (d) Basic concept

30. (a) $\angle DCK = \angle FDG = 55°$ (corr. $\angle s$)



$\therefore \angle ACE = 180° - (\angle EAC + \angle ACE)$

$\therefore \angle HAB = \angle AEC = 85°$ (corr. $\angle s$)

Hence, $x = 85°$

31. (c) Clearly option (a) shows the angles would be 30, 60 and 90. It can be the ratio of angle in a right angled triangle.

Option (b) shows the angles would be 45, 45 and 90, then it can be the ratio of angle in a right angled triangle.

But option (c) cannot form the ratio of angles of right angled triangle.

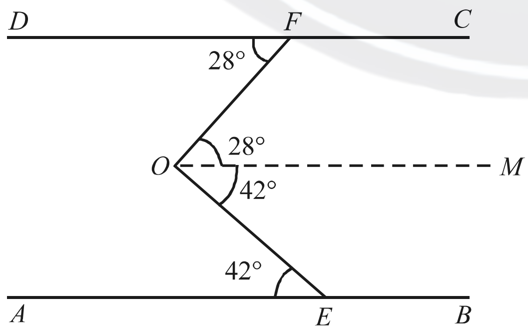
32. (b) In $\Delta ABC, \angle C = 180 - 90 - 30 = 60°$

$\therefore \angle DCE = \frac{60}{2} = 30°$

Again in ΔDEC, $\angle CED = 180 - 90 - 30 = 60°$

33. (c) $\angle DFO = \angle FOM$

and $\angle AEO = \angle EOM$ (since $CD \parallel AB$)



$\therefore \quad \angle FOE = (28° + 42°) = 70°$

34. (b) Go through option for quicker answer

Exterior angle $= \frac{360}{15} = 24°$ (for $n = 15$)

$\therefore \quad$ Interior angle $= 180° - 24° = 156°$

$\therefore \quad$ Interior – Exterior $= 156 - 24 = 132°$

Hence, option (b) is correct.

35. (c) $\angle ABC = 180 - (65 + 75) = 40°$

$\angle ORB = \angle OQB = 90°$

$\therefore \quad \angle ROQ = 360 - (90 + 90 - 40)$

$\therefore \quad \angle ROQ = 140°$

36. (c) ΔABC is similar to ΔEDC

$\therefore \quad \frac{AB}{ED} = \frac{BC}{DC} = \frac{AC}{EC}$

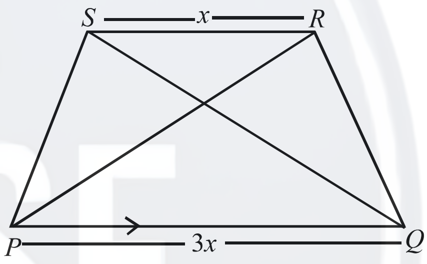
$\therefore \quad \frac{AB}{DE} = \frac{BC}{DC} \Rightarrow \frac{24}{10} = \frac{60}{DC}$

$\Rightarrow \quad DC = 25$ cm

37. (d) Clearly, triangle is obtuse, So (d) is the correct option.

38. (a) No such point is possible

39. (c)



$$\frac{ar(\Delta P \times Q)}{(\Delta R \times S)} = \frac{PQ^2}{RS^2} = \frac{(3x)^2}{x^2} = 9:1$$

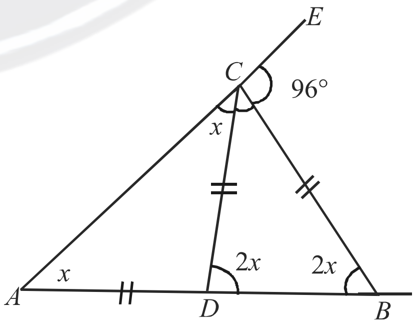
40. (a) The parallelogram $ABCD$ and ΔBCE lies between the same parallel lines AB and DE and has base of equal length. $\therefore A(\Delta BCE) = \frac{1}{2} A(\square ABCD) = \frac{1}{2} \times 16 = 8$ sq. cm.

41. (a) Form the figure given in the question ,we get

$x^2 - y^2 = 81, x^2 + y^2 = 625$ and $y^2 + 256 = z^2$

Form the option the only triplet satisfying the three equations is 15, 12, 20

42. (c)



Let $\angle CAD = \angle ACD = x$

At point C,

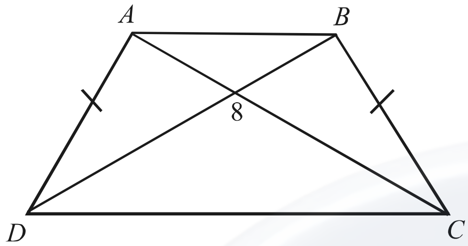
$x + (180° - 4x) + 96° = 180°$

$\Rightarrow 180° - 3x + 96° = 180°$

$\therefore\ x = 32°$

Hence, $\angle DBC = 2 \times 32 = 64°$

43. (b)



$\Delta APD \sim \Delta BPC$

$\therefore \quad \frac{PA}{PB} = \frac{PD}{PC}$

i.e., PA. PC = PB. PD.

$\therefore$ option (b)

44. (a) $\angle CAF = 100°$. Hence $\angle BAC = 80°$

Also, $\angle OCA = (90 – ACF) = 90 – 50 = 40° = \angle OAC$

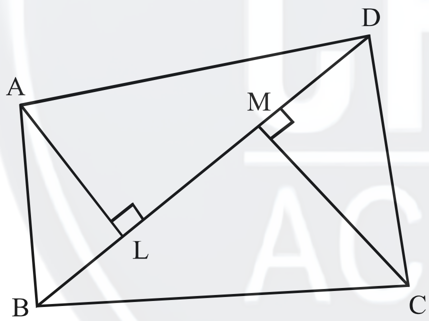
(Since the triangle OCA is isosceles)

Hence $\angle OAB = 40°$

In isosceles ΔOAB, $\angle OBA$ will also be 40°

Hence, $\angle BOA = 180 – 40 – 40 = 100°$

45. (b)



Given :

BD = 64 cm

AL = 13.2 cm

CM = 16.8 cm

So, Area (ABCD) = Area (ΔABD) + Area (ΔBCD)

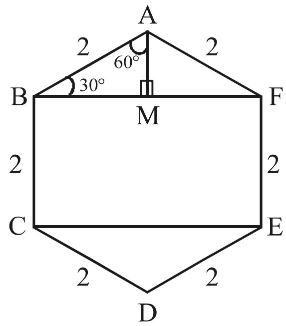
$= \frac{1}{2} \times AL \times BD + \frac{1}{2} \times CM \times BD$

$= \frac{1}{2} \times BD \times (AL + CM)$

$= \frac{64}{2}(13.2 + 16.8)$

$= 32 \times 30 = 960\ cm^2$

46. (b)



Given BC & EF are each 2 feet. Since area of rectangle is length × width.

To find out BF or CE, Take ΔABF. It has two equal sides (AB = AF), so the perpendicular from A to line BF divides ABF into two congruent Δs.

So, each of the two triangles is 30°-60°-90° right angle Δ with hypotenuse 2.

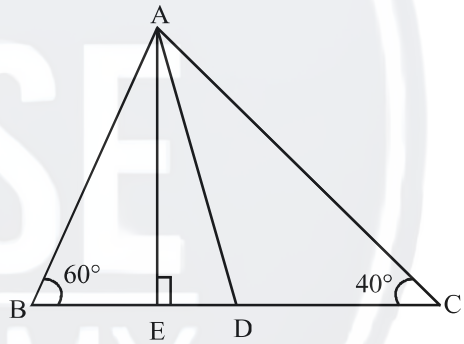
In ΔABM $\cos 30° = \frac{BM}{AB} \Rightarrow \frac{\sqrt{3}}{2} = \frac{BM}{2} \Rightarrow BM = \sqrt{3}$

So, BF = 2 × BM = $2\sqrt{3}$

Area of rectangle = $2\sqrt{3} \times 2 = 4\sqrt{3}$

47. (b)

48. (c)



In ΔABC,

$\angle A + \angle B + \angle C = 180°$

$\angle A + 60° + 40° = 180°$

$\angle A = 180° – 60° – 40° = 80°$

AD bisects $\angle BAC$

$\therefore \angle A = \angle BAD + \angle DAC$

$\angle BAD = \angle DAC = 40°$

Now, In ΔABE

$\angle B + \angle E + \angle BAE = 180°$

$60° + 90° + \angle BAE = 180°$

$\angle BAE = 30°$

$\therefore \angle EAD = \angle BAD – \angle BAE$

$= 40° – 30° = 10°$

49. (c) $\angle AEC = \angle ECD$ (Alternate interior angles as AB || CD)

In ΔCED,

$\angle ECD + \angle CED + x° = 180°$

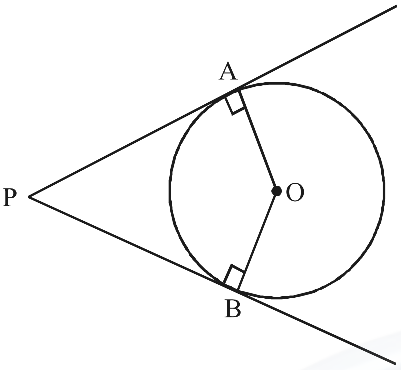
(Sum of angles of Δ are 180°)

$37° + 90° + x° = 180°$

$x° = 180° – 37° – 90°$

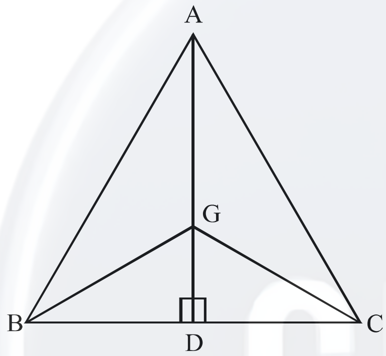
$x° = 53°$

50. (b)



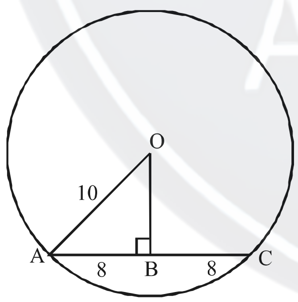
OAPB is concyclic because $\angle A + \angle B = 180°$
& $\angle O + \angle P = 180°$

51. (c)



AG = BC (Given)
BD = DC (given) AD is median
So, GD = BD = DC
ΔBCD & ΔGCD are both isosceles Δ.
Then $\angle BGC = 90°$

52. (d)

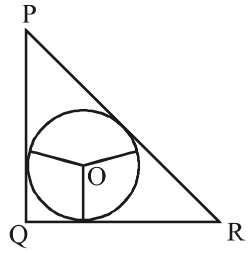


In OAB,
$OA^2 = OB^2 + AB^2$

[$\therefore AB = \frac{1}{2} AC$, because line drawn from centre to a chord bisect & perpendicular to it]
$(10)^2 = (OB)^2 + (8)^2$
$100 - 64 = OB^2$
$OB^2 = 36$
$OB = 6$

53. (d) $PR^2 = PQ^2 + PR^2 = 3^2 + 4^2 = 25$

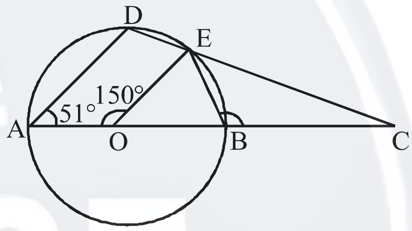
$\therefore PR = \sqrt{25} = 5$ cm



$$r = \frac{\text{Area of triangle}}{\text{Semi-perimeter of triangle}}$$

$$= \frac{\frac{1}{2} \times 3 \times 4}{\frac{3+4+5}{2}} = \frac{6}{6} = 1\text{cm}$$

54. (c)



$\angle AOE = 150°$
$\angle DAO = 51°$
$\angle EOB = 180° - 150° = 30°$
OE = OB

$\therefore \angle OEB = \angle OBE = \frac{150}{2} = 75°$

$\therefore \angle CBE = 180° - 75° = 105°$

55. (b) $\frac{\Delta ABC}{\Delta DEF} = \frac{AB^2}{DE^2}$

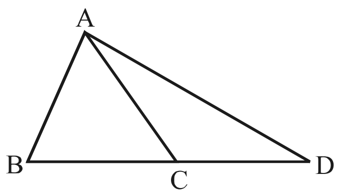
$\Rightarrow \frac{20}{45} = \frac{25}{DE^2}$

$\Rightarrow DE^2 = \frac{45 \times 25}{20} = \frac{225}{4}$

$\therefore DE = \frac{15}{2} = 7.5$ cm

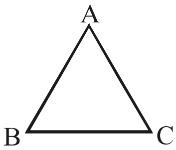
56. (d) $\angle ACB = 80°$
$\angle ACD = 180° - 80° = 100°$
$\because AC = CD$
$\therefore \angle CAD = \angle CDA$

$= \frac{80}{2} = 40°$



$\angle BAC = 111° - 40°$
$= 71°$
$\angle ABC = 180° - 71° - 80° = 29°$

57. (d)

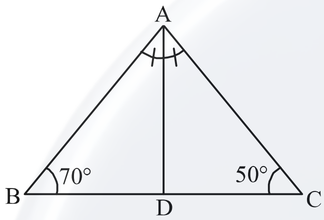


$\angle A + \angle B = 145°$
$\angle C + 180° - 145° = 35°$
$\angle C + 2\angle B = 180°$
$\Rightarrow 2\angle B = 180° - 35° = 145°$

$\Rightarrow \angle B = \frac{145}{2} = 72.5° = \angle A$

$\angle B > \angle C$
$\therefore AC > AB$

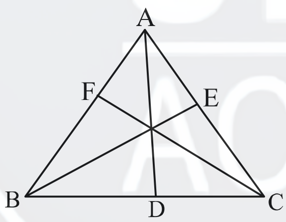
58. (c)



According to angle bisector theorem : The angle bisctor, like segment AD, divides the sides of the triangle proportionally.
In Δ ABC
$\angle A + \angle B + \angle C = 180°$
$\angle A = 180° - 70° - 50° = 60°$

$\angle BAD = \frac{60}{2} = 30°$

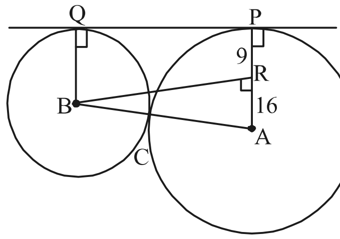
59. (b)



Let ABC be the triangle and D, E and F are midpoints of BC, CA and AB respectively.
Hence, in Δ ABD, AD is median
AB + AC > 2 AD
Similarly, we get
BC + AC > 2 CF
BC + AB > 2 BE
On adding the above inequations, we get
(AB + AC + BC + AC + BC + AB) > 2(AD + BE + CF)
2 (AB + AC + BC) > 2 (AD + BE + CF)
∴ AB + BC + BC > AD + BE + CF
Thus, the perimeter of triangle is greater than the sum of the medians.

60. (c)

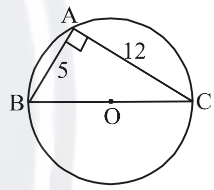
61. (b)



Let the two circles with centre A, B and radii 25 cm and 9 cm touch each other externally at point C. Then
AB = AC + CB
= 25 + 9 = 34 cm
Let PQ be the direct common tangent i.e. BQ ⊥ PQ and AP ⊥ PQ. Draw BR ⊥ AP. Then BRQP is a rectangle. (Tangent ⊥ radius at pt. of contact)
In Δ ABR
$AB^2 = AR^2 + BR^2$
$(34)^2 = (16)^2 + (BR)^2$
$BR^2 = 1156 - 256 = 900$

$BR = \sqrt{900} = 30$ cm

62. (a) In Δ ABC,

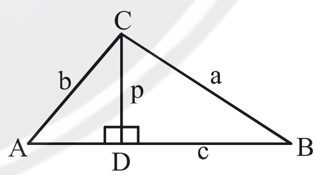


$BC^2 = AB^2 + AC^2$
$BC^2 = (5)^2 + (12)^2$
$BC^2 = 25 + 144$
$BC^2 = 169$

$BC = \sqrt{169} = 13$ cm

Radius of triangle $= \frac{BC}{2} = \frac{13}{2} = 6.5$ cm

63. (b) Here,
$\angle ACB = 90°$
$\angle ADC = 90°$
$\angle BDC = 90°$



Triangles ACB, ADC and BDC are right angle triangles.
Here, Area of ΔABC = Area of ΔADC + Area of ΔBDC

$\Rightarrow \frac{1}{2} a \times b = \frac{1}{2} \times p \times AD + \frac{1}{2} \times p \times DB$

$\Rightarrow ab = p\,(AD + DB)$

$\Rightarrow ab = pc \Rightarrow c = \frac{ab}{p}$ … (1)

Now, In ΔABC,

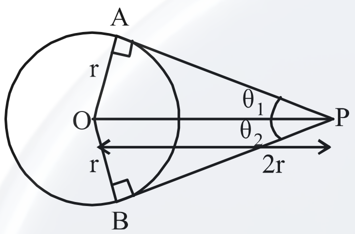
$$c^2 = a^2 + b^2 \left(\frac{ab}{p}\right)^2 = a^2 + b^2$$

$$\Rightarrow \frac{a^2b^2}{p^2} = a^2 + b^2$$

$$\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$$

64. (a) Given OP = 2r = Diameter of circle

$(\because OA \perp PA \,\&\, OB \perp PB)$



$\therefore$ In Δ OAP, $\sin\theta_1 = \frac{r}{2r} = \frac{1}{2}$

$\sin\theta_1 = \sin 30° \Rightarrow \theta_1 = 30°$

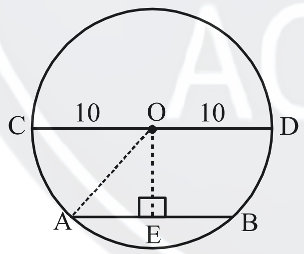
Similary, in ΔOBP, $\sin\theta_2 = \frac{r}{2r} = \frac{1}{2}$

$\sin\theta_2 = \sin 30° \Rightarrow \theta_2 = 30°$

$\therefore \angle APB = \theta_1 + \theta_2 = 30° + 30° = 60°$

65. (b) Given, AB = 12 cm; CD = 20 cm

OE = ?



Now, $AE = EB$ = 6cm (The line drawn from centre of circle to the chord bisect the chord)

In ΔOAE, By phythagoras theorem

$(OA)^2 = (OE)^2 + (AE)^2 \Rightarrow (10)^2 = (OE)^2 + (6)^2$

$100 - 36 = (OE)^2 \Rightarrow 64 = OE^2 \Rightarrow$ OE = 8 cm

66. (d) $\angle A + \angle B + \angle C = 180°$

$3\angle C + 5\angle C + \angle C = 180°$

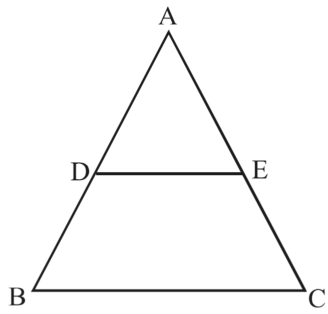
$9\angle C = 180°$

$\angle C = 20°$

$\angle B = 100°$

67. (a)

68. (b)



Since DE is parallel to BC

$\Delta ADE \cong \Delta ABC$

$$\frac{ar(\Delta ABC)}{ar(\Delta ADE)} = \frac{(AB)^2}{(AD)^2} = \frac{25}{4}$$

$$\frac{ar(DECB)}{ar(ADE)} + \frac{ar(ADE)}{ar(ADE)} = \frac{25}{4}$$

$$\frac{ar(DECB)}{ar(ADE)} = \frac{25}{4} - 1 = \frac{21}{4} = 5\frac{1}{4}$$

69. (c) Second angle of parallelogram

= 180° – 45° = 135°

$\therefore$ Required value

= 135 + 2 × 45

= 135 + 90 = 225°