2 Marks   65 x 2 = 130
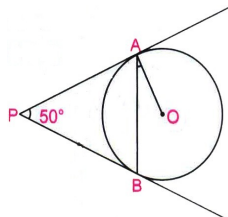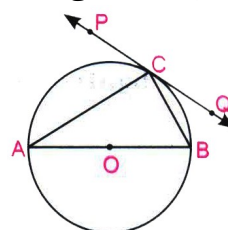
1) In figure, CP and CQ are tangents to a circle with centre O. ARB is another tangent touching the circle at R. If CP = 11cm, and BC = 7cm, then find the length of BR.
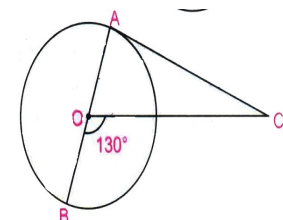

2) A point P is 26cm from the centre of the circle.The length of the tangent drawn from P to the circle is 24cm.Find the radius of the circle.
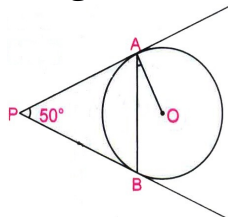
3) In figure, PQ is a tangent at a point C to a circle with centre O.If AB is a diameter and $\angle CAB = 30^0, \ and \ \angle PCA$.

4) In figure, AOB is a diameter of a circle with centre O and AC is a tangent to the circle at A.If $\angle BOC = 130^0$, then find $\angle ACO$.
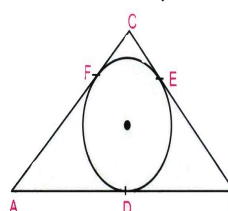

5) In figure, PA and PB are tangents to the circle with centre O such that $\angle APB = 50^0$ .Write the measure of $\angle OAB$


6) Two concentric circle of radii a and b (a > b) are given.FGind the length of the chord of the larger circle which touches the smaller circle

7) In figure, a circle inscribed in triangle ABC touches its sides AB, BC and AC at points D, E and F respectively. If AB=12cm, BC=8cm, and AC=10cm, then find the lengths of AD, BE, and CF.


8) In figure, XP and XQ are two tangents towo tangents to a circle with centre O from a point X outside the circle.ARB is tangent to circle at R.Prove that XA+AR=XB+BR
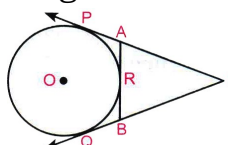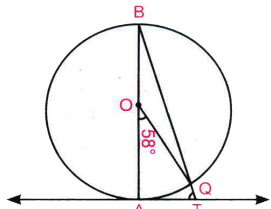
9) In figure, AP and BP are tangents to a circle with centre O, such that AP = 5cm and $\angle APB = 60^0$ .Find the length of chord AB.
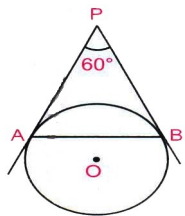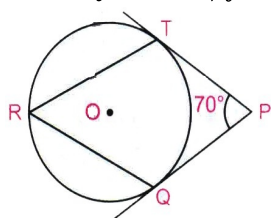
10) In figure from an external point P, two tangents PT and PS are drawn to a circle with centre O radius r.If OP=2r, show that $\angle OTS = \angle OST = 30^0$.
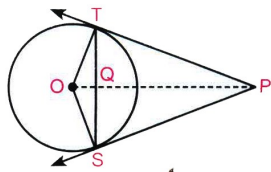
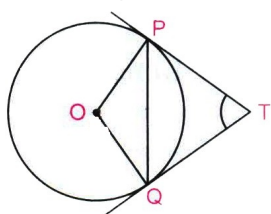**11)** In figure AB is the diameter of a circle with centre O and AT is a tangent. If $\angle AOQ = 58^0 \; find \; \angle ATQ$.

12) In figure O is the centre of a circle.PT and PQ are tangents to the circle from an external point P. If $\angle TPQ = 70^0, find \; \angle TRQ$

13) In figure, PQ is a chord of length 8cm of a circle of radius 5cm. The tangents at P and Q intersect at a point T. Find the lengths of TP and TQ.
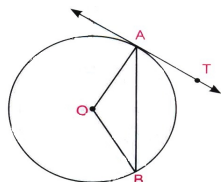
14) In figure, tangents PQ and PR are drawn from an external point P to a circle with centre O, such that $\angle RPQ = 30^0$. A chord RS is drawn parallel to the tangent PQ.Find $\angle RQS$.
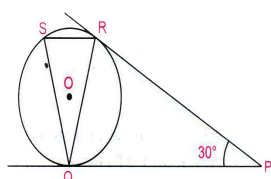
15) In figure two equal circles, with centres O and O', touch each other at X.OO' produced meets the circle with centre O' at A.AC is tangent to the circle with centre O, at the point C.O'D is perpendicular to AC. Find the value $\frac{DO'}{CO}$
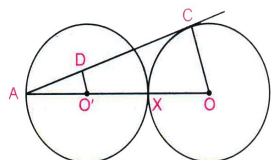
16) In given figure, O is the centre of the circle, AB is a chord and AT is the tangent at If $\angle AOB = 100^0$ then find $\angle BAT$

17) In the figure PA and PB are tangents to the circle with centre O.If $\angle APB = 60^0$, then find $\angle OAB$.
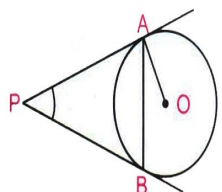
18) In figure PQ and PR are tangents to circle with centre A.If $\angle QPA = 27^0,$ then find $\angle QAR.$

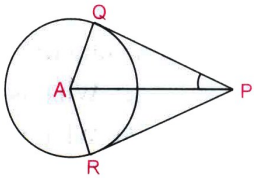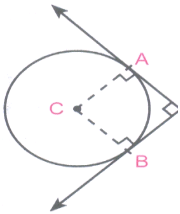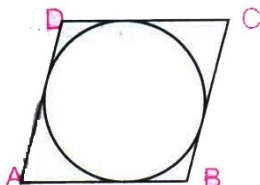**19)** In the figure, PA and PB are two tangents drawn from an external point P to a circle with centre C and radius 4cm.If PA⊥PB, find the length of each tangent.

20) Prove that the lengths of tangents drawn from an external point to a circle are equal. Using the above, prove the following: A quadrilateral ABCD is drawn to circumscribe a circle. Prove that AB + CD = AD + BC.


21) Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact. Using the above, do the following: In figure, O is the centre of the two concentric circles.AB is a chord of the larger circle touching the smaller circle at C. Prove that AC = BC.
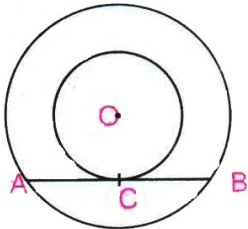

22) Two concentric circles of radii a and b, where a > b are given. Find the length of the chord of the larger circle which touches the smaller circle.

23) In figure, CP and CQ are tangents from an external point C to a circle with centre O. AB is another tangent which touches the circle at R. If CP=11 cm and BR=4cm, find the length of BC.
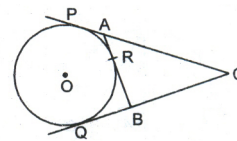
24) In figure, a circle is inscribed in a triangle PQR with PQ = 10cm, QR = 8 cm and PR = 12 cm. Find the lengths QM, RN and PL.
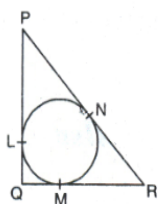
25) In the figure, PA and PB are the two tangents to the circle with centre O. Prove that $\angle AOB$ and $\angle APB$ are supplementary. If $\angle AOB = 50°,\ find \angle AOB$.
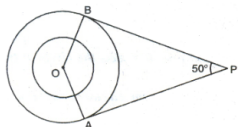
26) From a point Q13 cm away from the centre of a circle, the length of tangent PQ to the circle is 12 cm. Find the radius of the circle (in cm).

27) In the figure, PT is a tangent to the circle with centre O. If PT = 30 cm and the diameter of circle is 32 cm, then find the length of the segment OP.
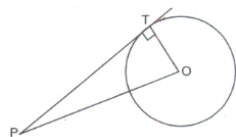
28) If a pair of tangents to a circle which are inclined to each other at an angle of $60°$, then find the degree measure of $\angle POQ$.

29) If tangent PA and PB from a point P to a circle with centre O are inclined to each other at an angle of $110°$, then find the degree measure of angle POA.

30) In figure, the sides AB, BC and CA of a triangle ABC, touch a circle at P, Q and R respectively. If PA = 4cm, BP = 3 cm AC = 11 cm, then find the length of BC (in cm).
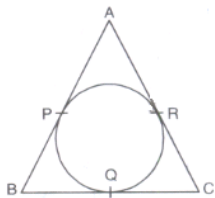
31) If the radii of two concentric circles are 5 cm and 13 cm, then find the length of the chord of one circle which is tangent to the other circle.

32) In figure, a circle is inscribed in a quadrilateral ABCD touching the sides AB, BC, CD and AD at P, Q, R and S respectively. If the radius of the circle is 10 cm, BC = 38 cm, PB = 27 cm and , then find the length of CD
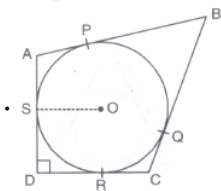
33) In the given figure, the quadrilateral ABCD is circumscribed to a circle with centre O. If $\angle AOB = 115°$, then find $\angle COD$.
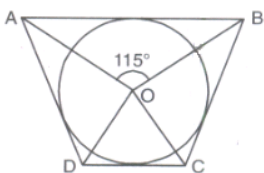
34) A circle is inscribed in a triangle ABC having sides AB = 8 cm, BC = 10 cm and CA = 12 cm as shon in fig. Find AD, BE and CF.

35) Prove that the tangent drawn at the ends of a chord of a circle make equal angles with the chord.

36) Find the distance between two parallel tangents of a circle of radius 3 cm.

37) PC is a tangent to the circle at C. AOB is the diameter which when extended meets the tangent at P. Find $\angle$CBA, $\angle$ AOC and $\angle$BCO, if $\angle$PCA = 110°.

38) Two concentric circles with centre O are of radii 5 cm and 3 cm. From an external point P, two tangents PA and PB are drawn to their circles respectively. If PA=12 cm, then find length of PB.
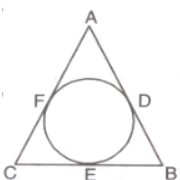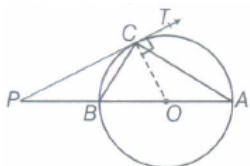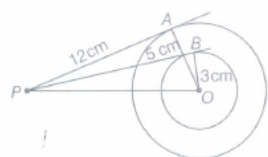
39) In the given figure, if TP and TQ are the two tangents to a circle with centre O, so that $\angle$POQ = 135°, then find $\angle$PTQ.
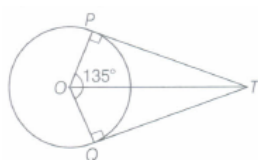
40) In the given figure, AD = 8 cm, C = 6 cm and TB is the tangent at B to the circle with centre O.Find OT, if BT is 4 cm.
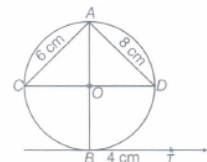
41) PA is a tangent to the circle with centre O.If BC = 3 cm, AC =4cm and ΔACB - ~ΔPAO, then find OA and $\frac{OP}{AP}$

42) In the following figure, PQ is a tangent at a point C to circle with centre O. If AB is a diameter and $\angle CAB = 30°$, then find $\angle PCA$.
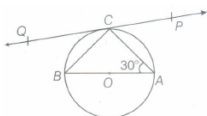
43) In the given figure, O is the centre of a circle, BOA is its diameter and the tangent at the point P meets BA extended at T. If ∠PBO = 30°,then find ∠PTA.
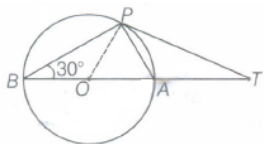
44) In adjoining figure, PQ and PR are tangents to the circle with centre O and S is a point on the circle such that ∠SQL = 50° and ∠SRM = 60° Find ∠QSR.
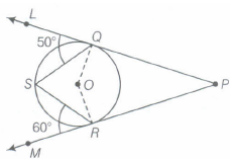
45) What is the length of the tangent drawn from a point 8 cm away from the centre of a circle of radius 6 cm?

46) If the angle between two radii of a circle is 130°, then what is the angle between the tangents at the end points of radii at their point of intersection?

47) AB is a chord of circle with centre O. At B, a tangent PB is drawn such that its length is 24 cm. The distance of P from the centre is 26 cm, If the chord AB is 16 cm, find its distance from the centre.

48) Prove that the intercept of a tangent between a pair of parallel tangents to a circle subtend a right angle at the centre of the circle.

49) In the following figure, a quadrilateral ABCD circumscribing a circle such that AB = 20 cm, BC = 24 cm and AD = 21 cm.

Two friends Rahul and Santosh observed the figure, Santosh said that length of DC is 30 cm. Is he right? Explain.

50) In given figure, AB is diameter of a circle with centre O and AT is tangent. If ∠AOQ = 58° , find ∠ATQ

51) If A(1,1) and B(7, 9) are the end points of a diameter of a circle, then find the coordinates of the centre of the circle.

52) Points A (-1, y) and B (5, 7) lie on a circle with centre O(2, -3y) such that AB is a diameter of the circle. Find the value of y. Also, find the radius of the circle.
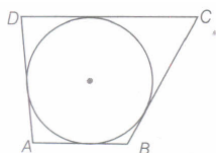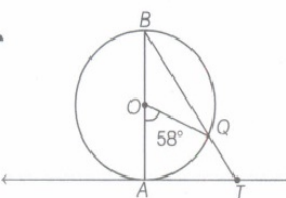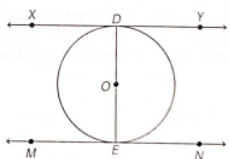
53) From an external point P, two tangents PA and PB are drawn to the circle with centre O. Prove that OP is the perpendicular bisector of chord AB.

54) XY and MN are the tangents drawn at the end points of the diameter DE of the circle with centre O. Prove that XY || MN.

55) In the given figure, $DE \parallel BC$. DE = 4 cm, BC = 8 cm, area of $\triangle ADE$ = 25 sq.cm. Find the area of $\triangle ABC$
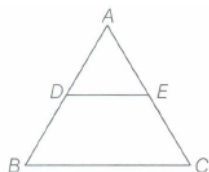
56) In the given figure, if $\angle 1 = \angle 2$ and $\triangle NSQ \cong \triangle MTR$, prove that $\triangle PTS \sim \triangle PRQ$
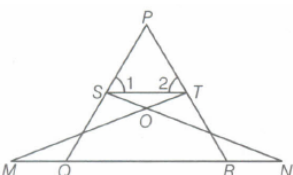
57) In $\triangle ABC$, if $\angle ADE = \angle B$, then prove that $\triangle ADE \sim \triangle ABC$. Also, if AD = 7.6 cm, AE = 7.2 cm, BE = 4.2 cm and BC = 8.4 cm, find DE.

58) A girl of height 100 cm is walking away from the base of a lamppost at a speed of 1.9 m/s. If the lamp is 5 m above the ground, find the length of her shadow after 4s.
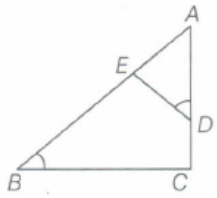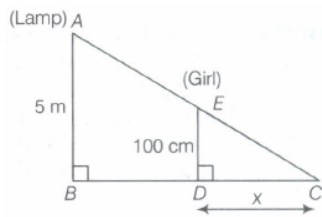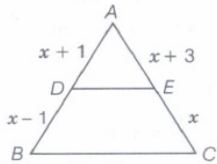

59) In $\triangle$ABC, DE || BC, find the value of x.

60) In ABC, if X and Y are points on AB and AC respectively such that $\frac{AX}{XB} = \frac{3}{4}$, AY=5 and YC=9, then state whether XY and BC parallel or not.

61) If two poles 5 m and 15 m high are 100 m apart, then find the height of the point of intersection of the line joining the top of each pole to the foot of the opposite pole.

62) In $\triangle ABC, DE \| BC$. If $DE = \frac{2}{3}$ BC and area of $\triangle ABC$ = 81 cm^2, then find the area of $\triangle DAE$.

63) Given $\triangle$ABC ~ $\triangle$POR, if $\frac{AB}{PQ} = \frac{1}{3}$, then find $\frac{\text{ar } \triangle ABC}{\text{ar } \triangle PQR}$

64) In the given figure, $\frac{EA}{EC} = \frac{EB}{ED}$, prove that $\triangle EAB \sim \triangle ECD$
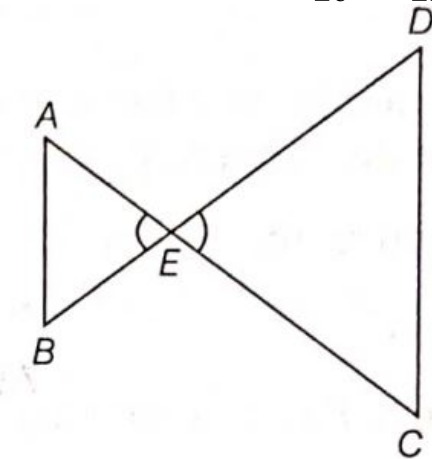
65) In the given figure, AD = 2 cm, BD = 3 cm, AE = 3.5 cm and AC = 7 cm. Is DE parallel to BC?
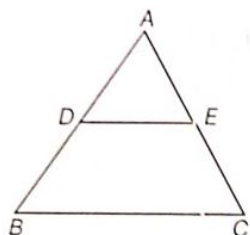
3 Marks   28 x 3 = 84

66) Prove that in two concentric circles, the chord of the larger circle, which touches the smaller circle, is bisected at the point of contact.

67) In the given figure, if $\triangle ABE \cong \triangle ACD$, show that $\triangle ADE \sim \triangle ABC$.
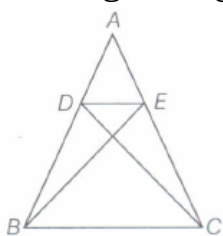
68) In two concentric circles, a chord of length 24 cm of larger circle becomes a tangent to the smaller circle whose radius is 5 cm. Find the radius of the larger circle.

69) If PA and PB are two tangents drawn from a point P to a circle with centre O touching it at A and B, prove that OP is perpendicular bisector of AB.

70) In the given figure, the chord AB of the larger of the two concentric circles, with centre O, touches the smaller circle
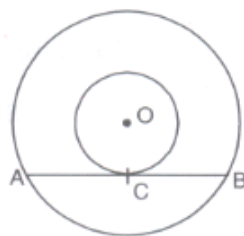
O, touches the smaller circle at C. Prove that, AC = CB.

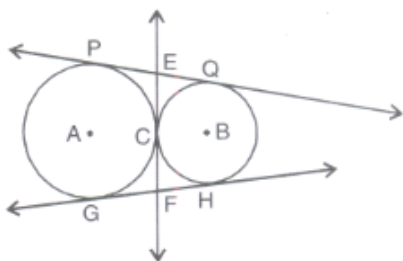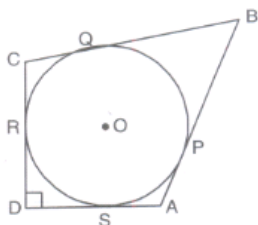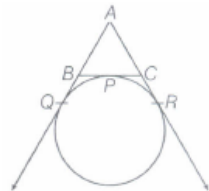**71)** In fig., two circles touch each other externally at C. Prove that the common tangent at C bisects the other two common tangents
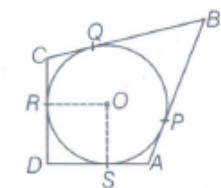

72) In the figure, $\angle ADC = 90°$, BC = 38 cm, CD = 28 cm and BP = 25 cm. Find the radius of the circle.

73) A circle touches the side BC of a ∆ABC at P and AB and AC when produced at O and R respectively as shown in the figure. Show that AQ = $\frac{1}{2}$ or show that AQ = $\frac{1}{2}(BC + CA + AB)$

74) In the given figure, ∠ADC = 90°, BC = 38 cm, CD = 28 cm and BP = 25 cm, then find the radius of the circle.

75) A circle is inscribed in a ∆BC having sides AB=8 cm, BC = 10 cm and CA = 12 cm as shown in figure. Find AD, BE and CF
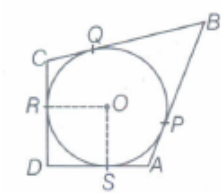
76) The radii of two concentric circles are 13 cm and 8 cm. AB is a diameter of the bigger circle. BD is a tangent to the smaller circle touching it at D.Find the length of AD.

77) ABC is triangle. A circle touches sides AB an AC produced and side BC at X, Y and Z respectively. Show that AX = $\frac{1}{2}$ perimeter of $\triangle ABC$.

78) In the given figure, O is the centre of the circle. Determine $\angle$AOB and $\angle$AMB, if PA and PB are tangents and LAPB = 75°.
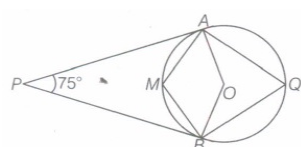
79) From a point P, the length of the tangent to a circle is 24 cm and the distance of P from the centre of the circle is 25 cm. Find the radius of the circle.

80) PA and PB are tangents drawn to a circle of centre O from an external point P. Chord AB makes an angle of 30° with the radius at the point of contact.
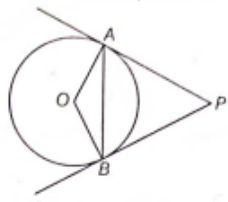
If length of the chord is 6 cm, find the length of the tangent PA and the length of the radius OA

81) If PQ = 28cm, then find the perimeter of △PLM

82) It is given that $\triangle ABC \sim \triangle EDF$ such that AB = 5 cm, AC = 7 cm, DF = 15 cm and DE = 12 cm. Find the lengths of the remaining sides of the triangles.

83) If D and E are points on the respective sides AB and AC of $\triangle ABC$ such that AD = 6 cm. BD = 9 cm, AE = 8 cm, EC = 12 cm. Prove that $DE \parallel BC$.

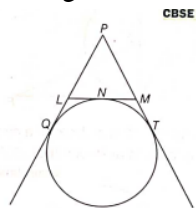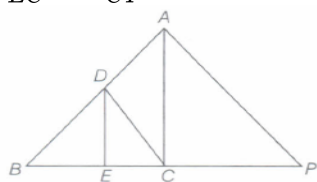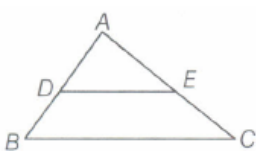**84)** In the given figure of $\triangle ABC$, $DE \parallel AC$. If $DC \parallel AP$, where point P lies on BC produced, then prove that $\frac{BE}{EC} = \frac{BC}{CP}$.

85) In the given figure, $DE \parallel BC$. If AD = 3 cm, DB = 4 cm and AE = 6 cm, find EC.

86) In $\triangle DEW, AB \parallel EW$. If AD = 4 cm, DE = 12 cm and DW = 24 cm, find the value of DB.
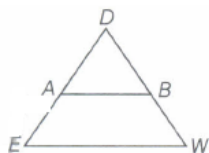
87) In $\triangle ABC$, D and E are points on the sides AB and AC respectively, such that $DE \parallel BC$. If AD = 4x - 3, AE = 8x - 7, BD = 3x - 1 and CE = 5x - 3, find the value of x.

88) In the given figure, D and E are two points lying on side AB, such that AD = BE. If $DP \parallel BC$ and $EQ \parallel AC$, then prove that $PQ \parallel AB$.
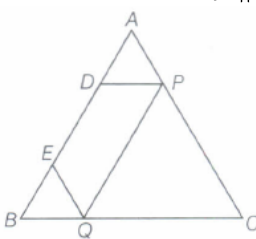
89) In the given figure, PQR and QST are two right angled triangles, right angled at R and T, respectively. Prove that QR x QS = QP x QT.
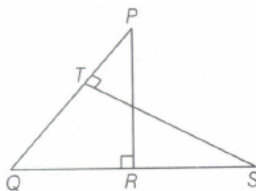
90) In the given figure, $\triangle ACB = 90°$ and $CD \perp AB$. Prove that $\frac{BC^2}{AC^2} = \frac{BD}{AD}$
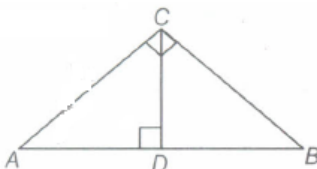
91) In figure, $DE \parallel BC$ AD = 1cm and BD = 2 cm. What is the ratio of the ar (MBC) to the ar ($\triangle ADE$)?

92) In the given figure, $\angle ABC = \angle ACB$ and $\frac{BC}{BE} = \frac{BD}{AC}$

Show that $\triangle ABE \sim \triangle DBC$ and AE || DC.

93) In the given figure, if ∠1 = ∠2 and ΔNSQ = ΔMTR, prove that ΔPTS ~ ΔPRQ.
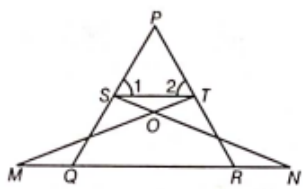
Case Study Questions   6 x 4 = 24

94) A Ferris wheel (or a big wheel in the United Kingdom) is an amusement ride consisting of a rotating upright wheel with multiple passenger-carrying compo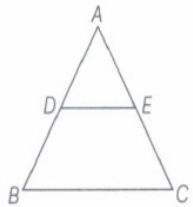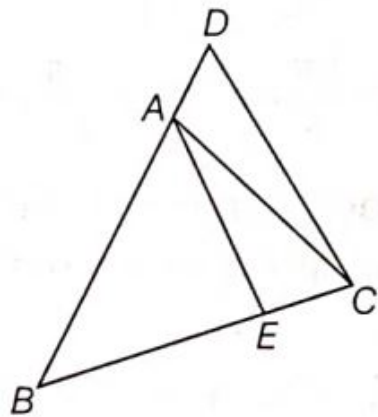nents (commonly referred to as passenger cars, cabins, tubs, capsules, gondolas, or pods) attached to the rim in such a way that as the wheel turns, they are kept upright, usually by gravity.

After taking a ride in Ferris wheel, Aarti came out from the crowd and was observing her friends who were enjoying the ride . She was curious about the different angles and measures that the wheel will form. She forms the figure as given below.
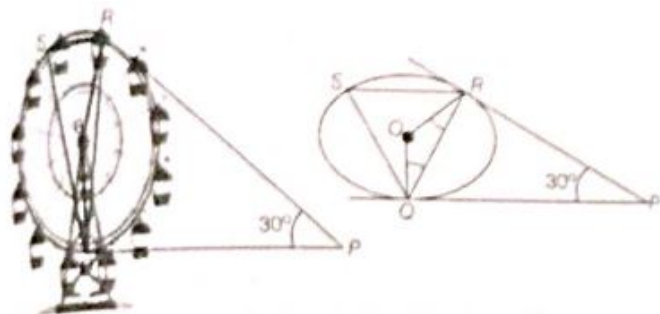
(i) In the given figure, find ∠ROQ
(a) 60°   (b) 100°   (c) 150°   (d) 90°
(ii) Find ∠RQP.
(a) 75°   (b) 60°   (c) 30°   (d) 90°
(iii) Find ∠RSQ
(a) 60°   (b) 75°   (c) 100°   (d) 30°
(iv) Find ∠ORP.
(a) 90°   (b) 70°   (c) 100°   (d) 60°

Varun has been selected by his school to design logo for sports day t-shirts for students and staff. The logo design is as given in the figure and he is working on the fonts and different colours according to the theme.
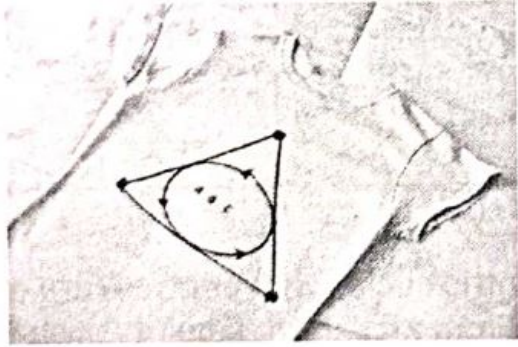
In given figure, a circle with centre O is inscribed in a $\triangle ABC$, such that it touches the sides AB, BC and CA at points D, E and F, respectively. The lengths of sides AB, BC and CA are 12 cm, 8 cm and 10 cm, respectively.
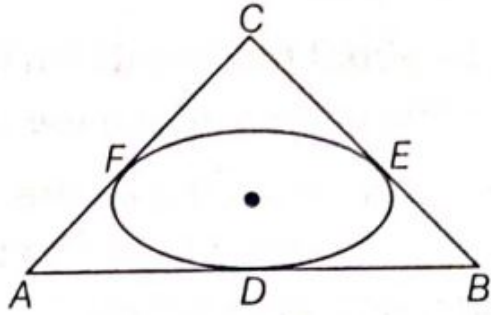
(i) Find the length of AD.

(a) 7 cm (b) 8 cm (c) 5 cm (d) 9 cm

(ii) Find the length of BE.

(a) 8 cm (b) 5 cm (c) 2 cm (d) 9 cm

(iii) Find the length of CF.

(a) 9 cm (b) 5 cm (c) 2 cm (d) 3 cm

(iv) If radius of the circle is 4 cm, Find the area of $\triangle OAB$.

(a) 20 cm^2 (b) 36 cm^2 (c) 24 cm^2 (d) 48 cm^2

(v) Find area of $\triangle ABC$.

(a) 50 cm^2 (b) 60 cm^2 (c) 100 cm^2 (d) 90 cm^2

96) A scale drawing of an object is the same shape at the object but a different size. The scale of a drawing Is a comparison of the length used on a drawing to the length it represents. The scale is written as a ratio. The ratio of two corresponding sides in similar figures is called the scale factor.

$$\text{Scale factor} = \frac{\text{length in image}}{\text{corresponding length in object}}$$

If one shape can become another using revising,then the shapes are sinilar. Hence,two shapes are similar when one can become the other after a resize, flip, slide or turn. In the photograph below showing the side view of a train engine. Scale factor is 1:200.

This means that a length of 1 cm on the photograph above corresponds to a length of 200 cm, or 2 metres, on the actual engine. The scale can also be written as the ratio of two lengths.

(a) If the length of the modelis 11cm, then the overall length of the engine in the photograph above, including the couplings(mechanism used to Connect) is

(i) 22 cm   (ii) 220 cm   (iii) 220 m   (iv) 22 m

(b) What will affect the similarity of any two polygons?

(i) They are flipped horizontally
(ii) They are dilated by a scale factor.
(iii) They are translated down
(iv) They are not the mirror image of one another

(c) What is the actual width of the door if the width of the door in photograph is 0.35 cm?

(i) 0.7 m   (ii) 0.7 cm   (iii) 0.07 cm   (iv) 0.07 m

(d) If two similar triangles have a scale factor of 5 : 3, which statement regarding the two triangles is true

(i) The ratio of their perimeters is 15 : 1
(ii) Their altitudes have a ratio 25 : 15
(iii) Their medians have a ratio 10 : 4
(iv) Their medians have a ratio 10 : 4

(e) The length of AB in the given figure is
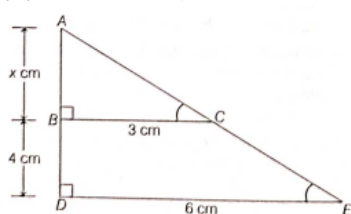
(i) 8 cm   (ii) 6 cm   (iii) 4 cm   (iv) 0.07m

97) Vijay is trying to find the average height of a tower near his house. He is using the properties of similar triangles. The height of Vijay's house, if 20 m when Vijay's house casts a shadow 10m long on the ground.

At the same time, the tower casts a shadow 50 m long on the ground and the house of Aiay casts 20 m shadow on the ground.
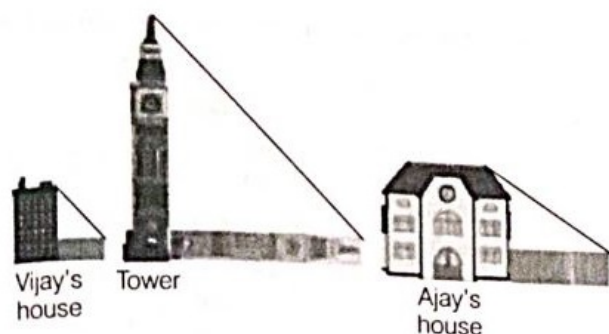

(i) What is the height of the tower?
(a) 20 m (b) 50 m (c) 100 m (d) 200 m
(ii) What will be the length of the shadow of the tower when Vijay's house casts a shadow of 12 m?
(a) 75 m (b) 50 m (c) 45 m (d) 60 m
(iii) What is the height of Ajay's house?
(a) 30 m (b) 40 m (c) 50 m (d) 20 m
(iv) When the tower casts a shadow of 40 m, same time what will be the length of the shadow of Ajay's house?
(a) 16 m (b) 32 m (c) 20 m (d) 8 m
(v) When the tower casts a shadow of 40 m, same time what will be the length of the shadow of Vijay's house?
(a) 15 m (b) 32 m (c) 16 m (d) 8 m

98) In the figure given below, a folding table is shown. The legs of the table are represented by line segments AB and CD intersecting at O. Join AC and BD. Considering table top is a parallel to the ground and OB = x, OD = x + 3, OC = 3x + 19 and OA = 3x + 4, answer the following questions.
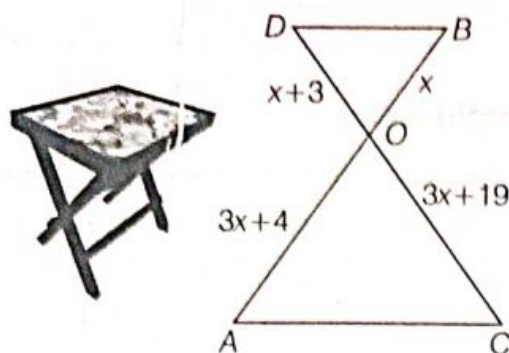
(i) Prove that Δ OAC is similar to Δ OBD

(ii) Prove that $\frac{OA}{AC} = \frac{OB}{BD}$

(iii) (a) Observe the figure and find the value of x. Hence, find the length of OC.

Or

(b) Observe the figure and find $\frac{BD}{AC}$.

99) A boy is standing on the top of light house. He observed that Boat Pand Boat Qare approaching the light house from opposite directions. He finds that angle of depression of Boat P is 45° and angle of depression of Boat Q is 30°. He also knows that height of the light house is 100 m.
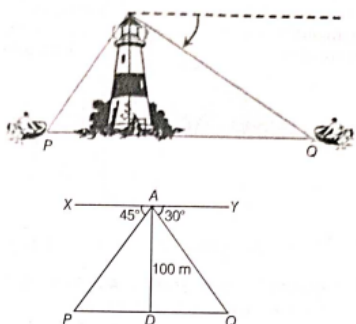

Based on the above information, answer the following questions.

(i) What is the measure of ∠APD?

(ii) If ∠YAQ 30°, then ∠AQDis also 30°. Why?

(iii) How far is Boat P from the light house? Or How far is Boat Q from the light house?

**5 Marks**   **24 x 5 = 120**

100) Two concentric circles are of radii 5 cm and 3 cm. Find the length of the chord of the larger circle which touches the smaller circle.

101) A quadrilateral ABCD is drawn to circumscribe a circle (see figure). Prove that AB+CD=AD+BC.
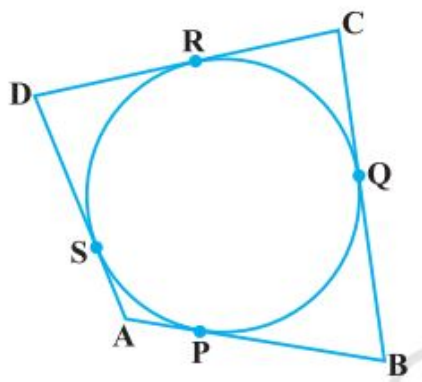

102) Prove that the parallelogram circumscribing a circle is a rhombus.

103) Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle PTQ = 2\angle OPQ$.

104) In the given figure, A, B and C are points on OP, OQ and OR respectively, such that $AB \parallel PQ$ and $AC \parallel PR$. Show that $BC \parallel QR$.
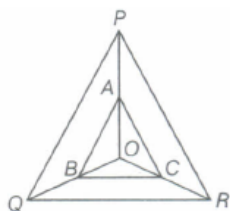
105) In figure, O is the centre of a circle of radius 5 cm. T is a point such that OT = 13 cm and OT intersects circle at E. If AB is a tangent to the circle at E, find the length of AB, where TP and TQ are two tangents to the circle.
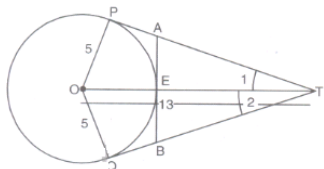

106) In the given figure, O is the centre of the circle. Determine $\angle AOC$, if DA and DC are tangents and $\angle ADC = 50^0$.
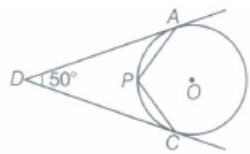

107) In the adjoining figure, a right angled ΔABC, circumscribes a circle of radius r. If AB and BC are of lengths 8 cm and 6 cm respectively, then find the value of r.
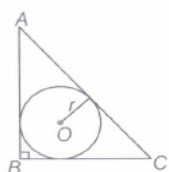

108) PA and PB are the tangents to a circle which circumscribes an equilateral ΔABQ. If $\angle PAB = 60°$, as shown in the figure, prove that QP bisects AB at right angle.
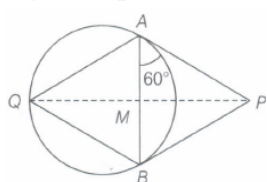

109) In the given figure AB is a chord of a circle, with centre O, such that AB = 16 cm and radius of circle is 10 cm. Tangents at A and B intersect each other at P. Find the length of PA.

110) In the given figure, AB is chord of length 6 cm of a circle of radius 5cm. The tangents at A and B intersect at a point P. Find the length of PB.
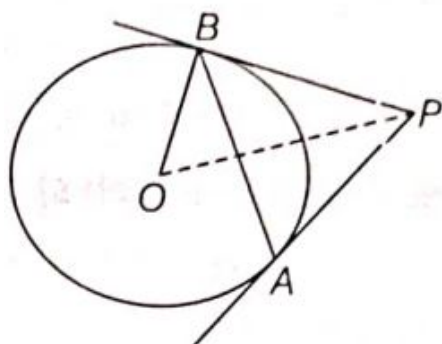
111) Two circles with centres O and O' of radil 6 cm and 8 cm, respectively Intersect at two points P and Q such that OP and O'P are tangents to the two circles. Find the length of the common chord PQ.
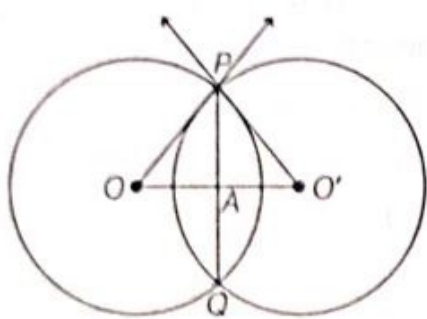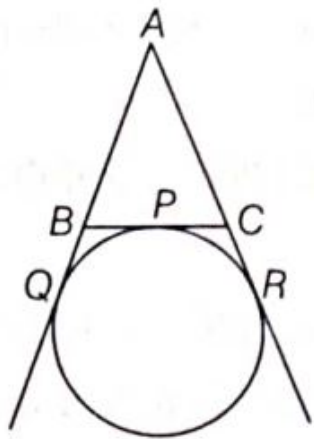

112) In the given figure, PA is a tangent to the circle drawn from the external point P and PBC is the secant to the circle with BC as diameter.
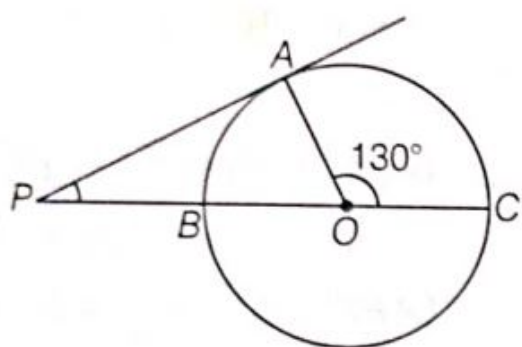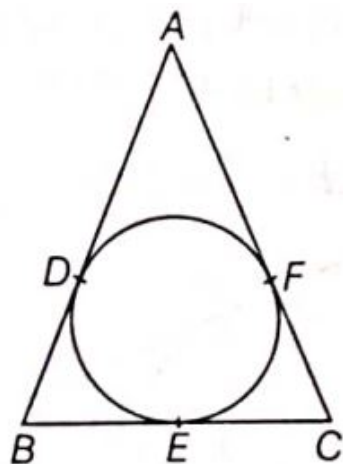

If $\angle AOC=130°$, then find the measure of $\angle APB$, where 0 is the centre of the circle.

113) A circle touches the side BC of a $\triangle ABC$ at a point P and touches AB and AC when produced at Q and R respectively. Show that $AQ = \frac{1}{2}$ (Perimeter of $\triangle ABC$).


114) ABC is an isosceles triangle with AB = AC, circumscribed about a circle. Prove that BC is bisected at E.
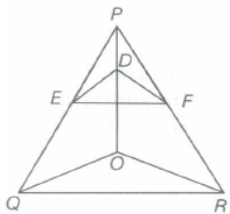

115) A $\triangle ABC$ is drawn to circumscribe a circle of radius 4 cm such that the segments BD and DC are of lengths 10 cm and 8 cm, respectively. Find the lengths of the sides AB and AC, if it is given that area $\triangle ABC$ = 90 cm^2.
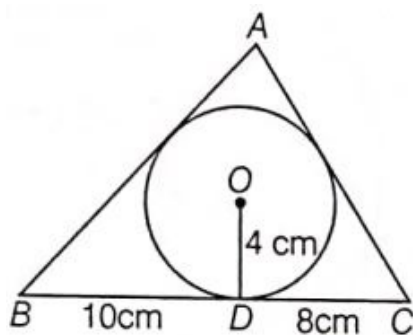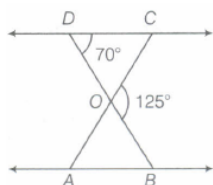

116) In the given figure, $AB \parallel PQ \parallel CD$, AB = x units, CD = y units and PQ = z units. Prove that $\frac{1}{x} + \frac{1}{y} = \frac{1}{z}$
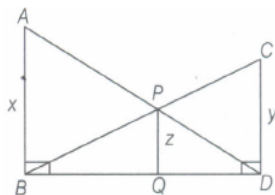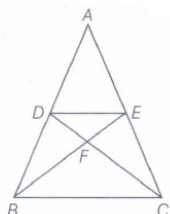

117) In the given figure, $DE \parallel OQ$ and $DF \parallel OR$. Show that $EF \parallel QR$.

118) In the given figure, $\triangle ODC \sim \triangle OBA, \angle BOC = 125°$ and $\angle CDO = 70°$. Find $\angle DOC, \angle DCO$ and $\angle OAB$.

119) In the given figure, if $DE \parallel BC$ and AD : DB = 5 : 4, then find $\frac{ar(\triangle DFE)}{ar(\triangle CFB)}$.

120) Prove that the ratio of the areas of two similaoswall triangles is equal to the square of the ratio of their corresponding meidans.

121) State and prove Basic Proportionality theorem.

122) Through the mid-point M of the side CD of a parallelogram ABCD,the line BM is drawn intersecting AC in L and AD produced in E. Prove that EL = 2BL.

123) In $\triangle$ABC, if AD $\perp$ BC and $AD^2 = BD \times DC$, then prove that $\angle BAC = 90°$.

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