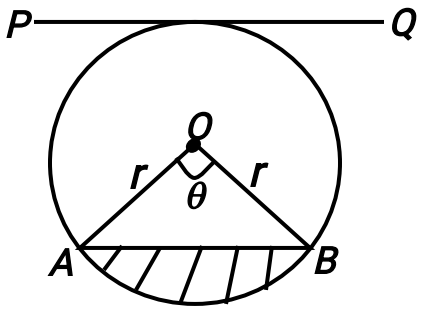
PARTS OF A CIRCLE

Summary:

1. *The following are the main parts of a circle with centre* ***O***



(i) AB *is called an arc* ***(ii) OAB*** *is called a sector*

(iii) *line* ***AB*** *is called a chord* ***(iv)*** *line* ***PQ*** *is called a tangent*

(v) *The shaded part is called a segment* ***(vi)*** θ *is the angle subtended by an arc*

(vii) OA = OB = *radius of the circle*

2. Theorem: *Since* ***OA = OB,*** *then* ***OAB*** *is an isosceles triangle with its line of symmetry bisecting chord* ***AB***

3. *The following formulas are used in relation to the above circle:*

(i) *Circumference* $= 2\pi r$ *or* πd ***(ii)*** *Area* $= \pi r^2$

(iii) *Arc length* ***AB*** $= \frac{\theta}{360} \times 2\pi r$ ***(iv)*** *Sector area* ***OAB***

$= \frac{\theta}{360} \times \pi r^2$

(v) *Segment area* ***= sector area – triangle area***

EXAMPLES:

1. *Find the length of an arc which subtends an angle of* ***126°*** *at the centre*

*of a circle of radius **14cm**. Find also the length of the major arc*

***2.** A chord is **8cm** away from the centre of a circle of radius **17cm**. Find the:*

(i) length of the chord

(ii) size of the angle subtended by the chord at the centre

***3.** A chord of length **10cm** is **12cm** away from the centre of the circle. Find the:*

(i) radius of the circle

(ii) length of the minor arc

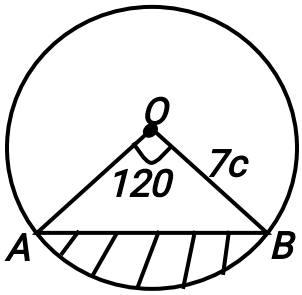
(iii) area of the minor sector

(iv) area of the minor segment

***4.** A sector of a circle of radius **12cm** has an angle of **150°** at the centre. The sector is folded to form a cone. Find the radius of the circular end of the cone*

5.** Find the distance between two parallel chords of lengths **32cm** and **24cm** which lie on opposite sides of the centre in a circle of radius **20cm

***6.** in the circle below, sector **OAB** has a radius of **7cm** and subtends an angle of **120°** at its centre **O**.*



Find the:

*(i) shortest distance of chord **AB** from the centre*

(ii) perimeter of the shaded segment

*(iii) perimeter of the region enclosed between chord **AB** and the major arc*

(iv) area of the shaded segment

*7. The length of the common chord of two intersecting circles of radius **10cm** and **17cm** is **6cm**. Find the:*

(i) angle subtended by the chord at the centre of the two circles

(ii) area common to the two circles

*8. Two equal circles of radius **5cm** intersect at right angles. Find the:*

(i) distance between the centres of the two circles

(ii) area common to the two circles

*9. A sector of a circle of radius **25cm** has an angle of **100·8°** at the centre. The sector is folded to form a cone. Find the:*

(i) radius of the circular end of the cone

(ii) height of the cone

(iii) volume of the cone

(iv) total surface area of the cone

***HINT: (iv) T·S·A** = πrl since its circular end is open*

*10. The minor segment of a circle has a height of **4cm** and a chord of length **16cm**. Find the:*

(i) radius of the circle

(ii) area of the segment

11. A dog tied on a rope 5m long is tethered to a tree 3m from a straight path. For what distance along the path is one in danger of being bitten by the dog?

EER:

1. A chord of length 70cm subtends an angle of 120° at the centre of the circle. Find the:

(i) radius of the circle

(ii) distance of the chord from the centre

(iii) area of the minor segment

2. A chord of length 6cm is 4cm away from the centre of the circle. Find the circumference of the circle

3. A dog tied on a rope 2·5m long is tethered to a tree 2m from a straight path. For what distance along the path is one in danger of being bitten by the dog?

4.A sector of a circle of radius 10cm has an angle of 100° at the centre. Find the

(i) perimeter of the sector

(ii) area of the minor segment

5. A chord of length 6cm makes an angle of 40° with the radius of the circle. Find the circumference of the circle

6. A chord 3·5cm away from the centre of the circle subtends an angle of 120° at its centre. Find the area of the major segment

7. The chord of a circle of radius 10cm subtends an angle of 120° at its

centre. Find the perimeter of the region enclosed between the chord and the major arc

8. *Find the distance between two parallel chords of lengths* ***32cm*** *and* ***24cm*** *which lie on the same side of the centre in a circle of radius* ***20cm***

9. *A sector of a circle of radius* ***12·5cm*** *has an angle of* ***100·8°*** *at the centre. The sector is folded to form a cone. Find the:*

(i) *radius of the circular end of the cone*

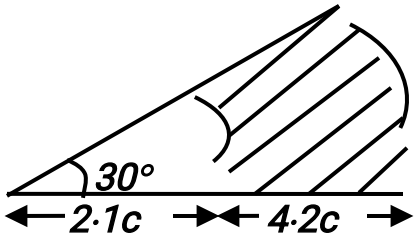
(ii) *height of the cone*

(iii) *volume of the cone*

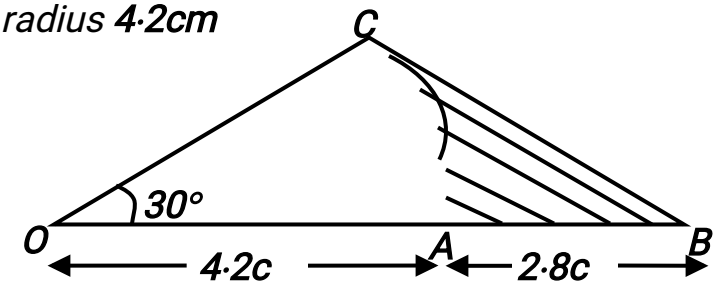
(iv) *total surface area of the cone*

10. *Find the distance between two parallel chords of lengths* ***24cm*** *and* ***10cm*** *which lie on opposite sides of the centre in a circle of radius* ***13cm***

11. *In the figure below, find the shaded area bounded by two concentric arcs*



12. *In the triangle* ***OBC*** *below, arc* ***AC*** *subtends an angle of* ***30°*** *at the centre* ***O*** *of a circle of radius* ***4·2cm***



If ***AB = 2·8cm,*** *find the area of the shaded region*

13. *The length of the common chord of two intersecting circles of radius* ***28cm*** *and* ***20cm*** *is* ***30cm.*** *Find the:*

(i) *angle subtended by the chord at the centre of the two circles*

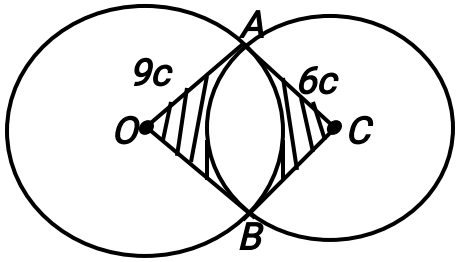
(ii) *area common to the two circles*

14. *The distance between the centres of two intersecting equal circles of radius* ***5cm*** *is* ***8cm.*** *Find the:*

(i) *length of the common chord of the two circles*

(ii) *area common to the two circles*

15. *Two circles with centres* ***O*** *and* ***C*** *and radius* ***9cm*** *and* ***6cm*** *intersect at points* ***A*** *and* ***B*** *as shown*



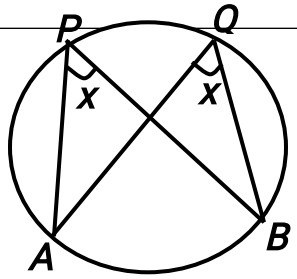
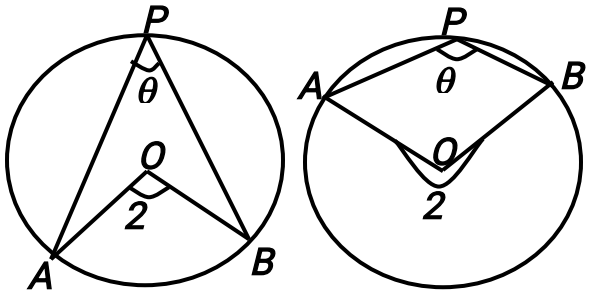
Given that the distance between ***O*** *and* ***C*** *is* ***13cm,*** *find the:*

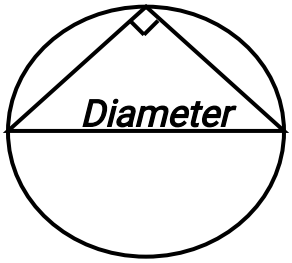
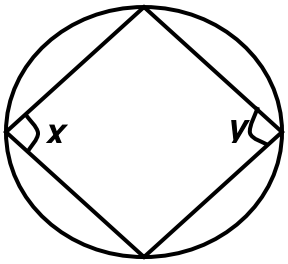
(i) *reflex angle* ***AOB***

(ii) *length of chord* ***AB***

(iii) *area of the shaded region*

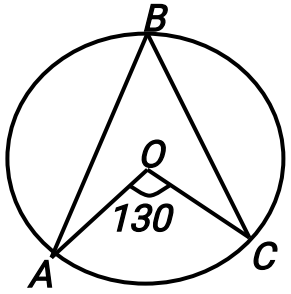
ANGLES IN A CIRCLE

Angles diagram	*Circle theorems*
	*The angles subtended at the circumference by the same arc are equal* *∴ ∠APB = ∠AQB* ***In short:*** *Angles in the same segment are equal*
	*The angle subtended at the centre by an arc is twice the angle it subtends at its circumference* *∴ ∠AOB = 2∠APB* ***In short:*** *Angle at the centre is twice the angle at the circumference*

	*The angles subtended at the circumference by a semi–circle is* ***90°***
	*The opposite angles of a cyclic quadrilateral add up to* ***180°*** ***∴ x + y = 180°***

EXAMPLES:

1. *In the figure below,* ***O*** *is the centre of the circle and* ***∠AOC = 130°.*** *Find* ***∠ABC***



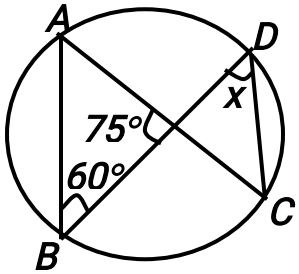
Soln:

$\angle AOC = 2\angle ABC$

$\Rightarrow 130^\circ = 2\angle ABC$

$\therefore \angle ABC = 65^\circ$

2. *In the circle below, find the size of angle marked* ***x***



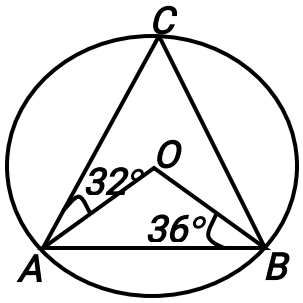
Soln:

$\angle BAC = x$ *(angles in the same segment)*

$\Rightarrow x = 180^\circ - (60^\circ + 75^\circ)$ *(angles in a triangle)*

$\therefore \quad \mathbf{x = 45^\circ}$

3. *In the circle below* ***O*** *is its centre* $\angle \mathbf{ABO = 36^\circ}$ *and* $\angle \mathbf{OAC = 32^\circ}$*. Find* $\angle \mathbf{ACB}$ *and* $\angle \mathbf{OBC}$



Soln:

$\nabla \mathbf{AOB}$ *is isosceles since OA = OB*

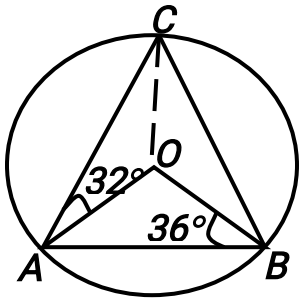
$\Rightarrow \angle \mathbf{AOB} = 180^\circ - (2 \times 36^\circ) = \mathbf{108^\circ}$ *(angles in a triangle)*

$\angle AOB = 2\angle ACB$

$\Rightarrow 108^\circ = 2\angle ACB$

$\therefore \angle \mathbf{ACB} = \mathbf{54^\circ}$

Also:



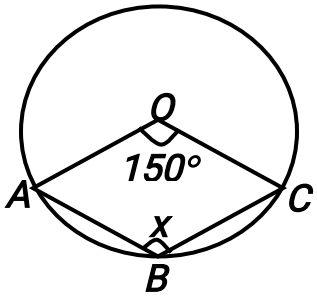
$\Rightarrow \angle \mathbf{AOC} = 180^\circ - (2 \times 32^\circ) = \mathbf{116^\circ}$ *(angles in a triangle)*

$\angle BOC = 360^\circ - (108^\circ + 116^\circ) = \mathbf{136^\circ}$ *(angles at a point)*

$\Rightarrow$ $2\angle OBC = 180^\circ - 136^\circ$ *(angles in an triangle)*

$\therefore$ $\angle OBC = 22^\circ$

4. *In the circle below* ***O*** *is its centre and* $\angle AOC = 150^\circ$. *Find the size of angle marked* ***x***



Soln:

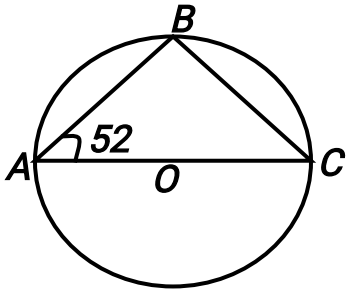
Reflex angle $\angle AOC = 360^\circ - 150^\circ =$ 210° *(angles at a point)*

$\Rightarrow$ $\angle AOC = 2\angle ABC$

$210^\circ = 2\angle ABC$

$\therefore$ $\angle ABC = 105^\circ$

5. *In the figure below,* ***O*** *is the centre of the circle of radius* ***7cm*** *and* $\angle BAC = 52^\circ$.



Find the:

(i) *size of angle* ***ACB***

(ii) *lengths of* ***AB*** *and* ***BC***

Soln:

(i) $\angle ABC = 90°$ *(angle in a semi–circle)*

$\therefore \angle ACB = 180° - (90° + 52°) = 38°$ *(angles in a triangle)*

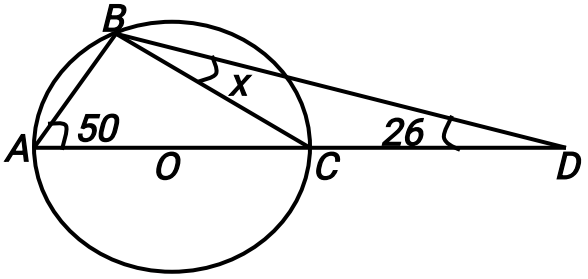
(ii) $\cos 52 = \frac{AB}{14}$

$\therefore AB = 8{\cdot}6193cm$

Also $\sin 52 = \frac{BC}{14}$

$\therefore AB = 11{\cdot}0322cm$

6. *In the circle below* ***O*** *is its centre. Find the size of angle marked* ***x***

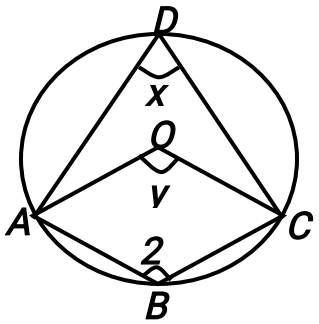


Soln:

(i) $\angle ABC = 90°$ *(angle in a semi–circle)*

$\therefore x = 180° - (90° + 50° + 26°) = 14°$ *(angles in a triangle)*

7. *In the circle below* ***O*** *is its centre. Find the size of the angles marked* ***x*** *and* ***y***



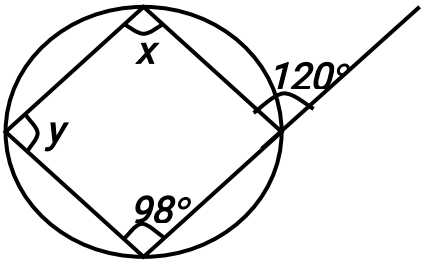
Soln:

$x + 2x = 180°$ *(angles in a cyclic quadrilateral)*

$\therefore$ $x = 60°$

Also $y = 2x = 2(60°) = 120°$

8. *In the circle below, find the size of the angles marked* **x** *and* **y**



Soln:

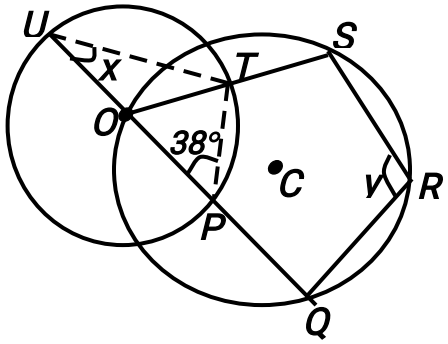
$x + 98° = 180°$ *(angles in a cyclic quadrilateral)*

$\therefore$ $x = 82°$

Also $y + 60° = 180°$ *(angles in a cyclic quadrilateral)*

$\therefore$ $y = 120°$

9. *In the diagram below,* **C** *and* **O** *are centres of two intersecting circles.*
$\angle CPT = 38°$



Find the size of the angles marked **x** *and* **y**

Soln:

(i) $\angle UTP = 90^\circ$ *(angle in a semi–circle)*

$\therefore x = 180^\circ - (90^\circ + 38^\circ) = 52^\circ$ *(angles in a triangle)*

Also: $\angle POT = 180^\circ - (2 \times 38^\circ) = 104^\circ$ *(angles in a triangle)*

$y + 104^\circ = 180^\circ$ *(angles in a cyclic quadrilateral)*

$\therefore y = 76^\circ$

10. *The points* $P(-2, -1)$, $Q(h, 7)$ *and* $R(-3, 6)$ *lie on a circle with diameter* PQ.

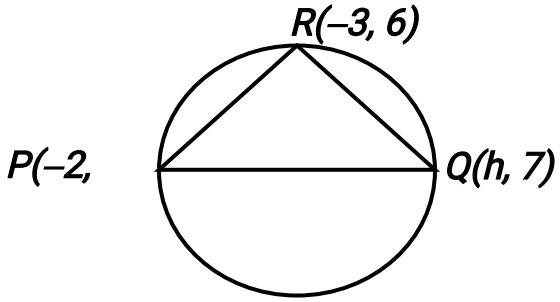
(i) *State with a reason the size of angle* PRQ

(ii) *Show that* $h = 4$

(iii) *Find the coordinates of the centre and radius of the circle*

Soln:

(i)



$\angle PRQ = 90^\circ$ *(angle in a semi–circle)*

(ii) Hint: *This could be done using gradient method*

Gradient of $PR = \frac{6 - {}^{-}1}{-3 - {}^{-}2} = -7$

Gradient of $QR = \frac{7 - 6}{h - {}^{-}3} = \frac{1}{h + 3}$

For perpendicular lines, $-7 \times \left(\frac{1}{h+3}\right) = -1$

$\therefore h = 4$

(iii) Hint: *Centre is the midpoint of the diameter and radius is half the diameter*

$$\textbf{Centre} = \left(\frac{-2+4}{2}, \frac{-1+7}{2}\right) = (2, 3)$$

$$\textbf{Radius} = \sqrt{(4-2)^2 + (7-3)^2} = 5 \text{ units}$$

EER:

1. *The vertices of an equilateral triangle* ***A, B*** *and* ***C*** *lie on a circle of radius* ***8cm.*** *Find the:*

(i) *distance of any side of the triangle from the centre of the circle*

(ii) *length of the side of the triangle*

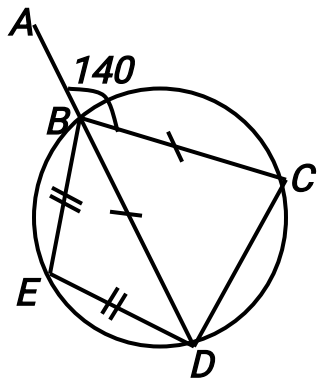
2. *The vertices of an equilateral triangle of side* ***12cm*** *lie on a circle. Find the:*

(i) *radius of the circle*

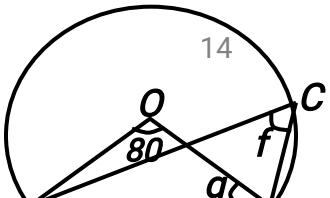
(ii) *distance of any side of the triangle from the centre of the circle*

(iii) *area of the segments cut off by the triangle*

3. *In the circle below,* ***BC = BD, BE= DE*** *and* ***∠ABC = 140°.*** *Find the size of angle* ***EDB***

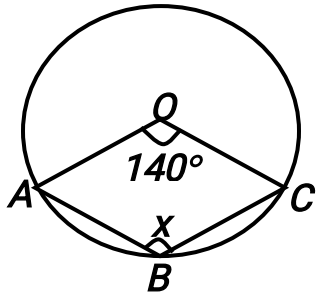


4. *In the circle below* ***O*** *is its centre and* ***∠AOB = 80°.*** *Find the size of the*

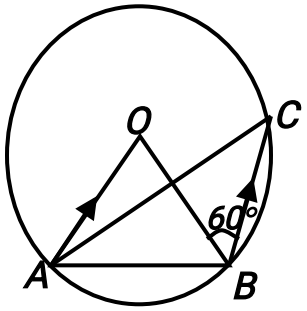


*angles marked **f** and **g***

5.** In the circle below **O** is its centre and ∠**AOC = 150°.** Find the size of angle marked **x



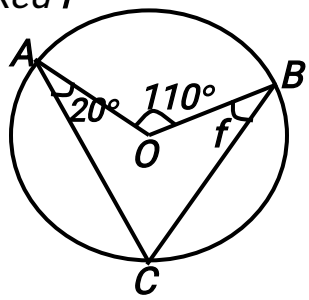
6.** In the circle below **O** is its centre, **AO** is parallel to **BC** and ∠**OBC = 60°.



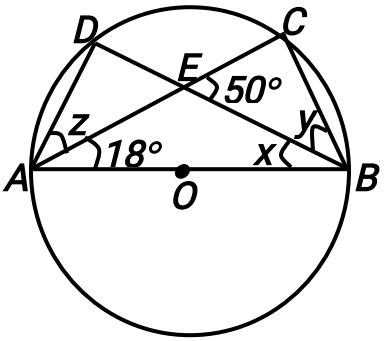
Find the size of angle:

(i) AOB** **(ii) ACB** **(iii) CAB

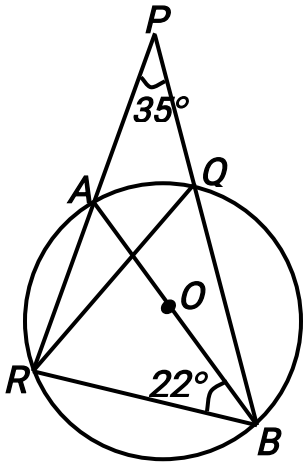
7.** In the circle below **O** is its centre, ∠**AOB = 110°** and ∠**OAC = 20°.** Find the size of angle marked **f



8. *In the figure below* ***AB*** *is the diameter of a circle centre* ***O.*** ***∠BAC = 18°*** *and* ***∠BEC = 50°.*** *Find the size of the angles marked* ***x, y*** *and* ***z***



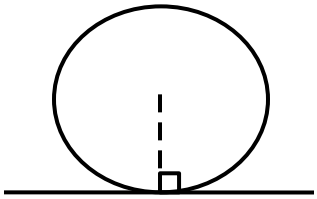
9. *In the figure below* ***AB*** *is the diameter of a circle centre* ***O.*** ***∠APQ = 35°*** *and* ***∠ABR = 22°.***

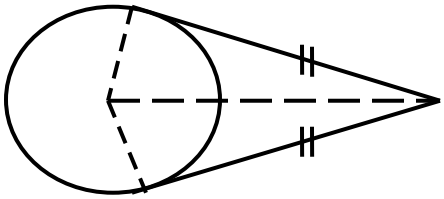
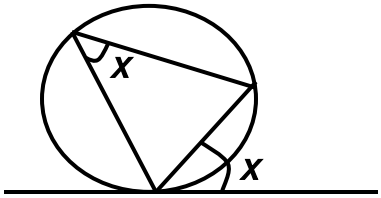


Find the size of angle:

(i) ABQ ***(ii) QRA*** ***(iii) AOR***

TANGENT PROPERTIES

Tangent diagrams	*Circle theorems*
	*The angle between a tangent and the radius is* ***90°***

	*Tangents from an external point are equal in length*
	*The angle between a tangent and a chord is equal to the angle the chord subtends in the opposite segment (alternate segment)*

EXAMPLES:

1. *A tangent from* ***T*** *to a circle, centre* ***O*** *and radius* ***7cm*** *touches the circle at* ***P****. If* ***OT = 25cm,*** *find the:*

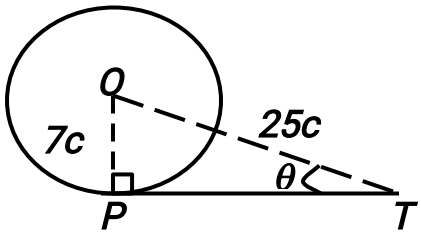
(i) *length of* ***PT***

(ii) *size of angle* ***PTO***

(iii) *area of* ***PTO*** *that lies outside the circle*

Soln:

(i)



$\angle OPT = 90°$ *(angle between a tangent and the radius)*

$\therefore\ PT = \sqrt{25^2 - 7^2} = 24cm$

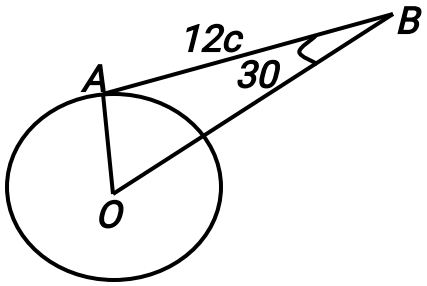
(ii) $\sin\theta = \frac{7}{25}$

$\therefore \theta = 16{\cdot}26°$

(iii) POT $= 180° - (90° + 16{\cdot}26°) = 73{\cdot}74°$ *(angles in a triangle)*

$\therefore$ *Required area* $= \frac{1}{2} \times 24 \times 7 - \frac{73 \cdot 74}{360} \times \frac{22}{7} \times 7^2 = 52 \cdot 4557cm^2$

2. *In the circle below* ***O*** *is its centre.* ***AB = 12cm*** *is a tangent to the circle at* ***A*** *and* $\angle OBA = 30°$.



Find the:

(i) *length of* ***OB***

(ii) *radius of the circle*

Soln:

(i) $\angle OAB = 90°$ *(angle between a tangent and the radius)*

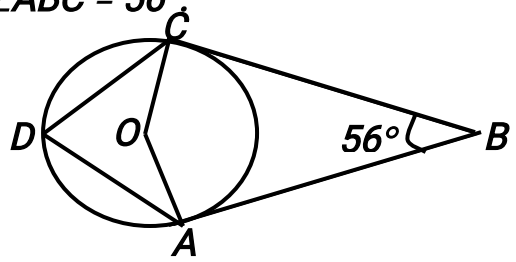
$\Rightarrow \cos 30 = \frac{12}{OB}$

$\therefore OB = 13{\cdot}8564cm$

(ii) $\tan 30 = \frac{OA}{12}$

$\therefore OA = 6{\cdot}9282cm$

3. *In the circle below* ***O*** *is its centre.* ***AB*** *and* ***CB*** *are tangents to the circle and* $\angle ABC = 56°$.



Find the size of angle ***ADC***

Soln:

$\angle AOC + 90° + 90° + 56° = 360°$ *(angles in a quadrilateral)*

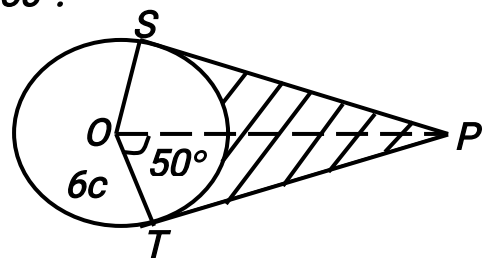
$\therefore \angle AOC = 124°$ *(angles in a triangle)*

If $\angle AOC = 2\angle ADC$

$\Rightarrow \quad 124° = 2\angle ADC$

$\therefore \quad \angle ADC = 62°$

4. *In the circle below* ***O*** *is its centre.* ***PT*** *and* ***PS*** *are tangents to the circle of radius* ***6cm*** *and* $\angle POT = 50°$.



Find the area of the shaded region

Soln:

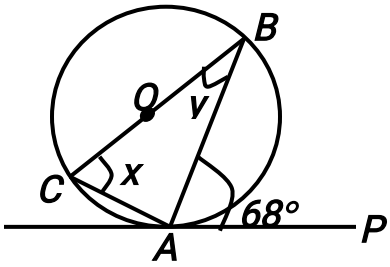
(i) $\angle OTP = 90°$ *(angle between a tangent and the radius)*

$\Rightarrow \tan 50 = \frac{PT}{6}$

$\therefore$ ***PT = 7·1505cm***

$\therefore$ *Shaded area* $= 2\left(\frac{1}{2} \times 7 \cdot 1505 \times 6\right) - \frac{100}{360} \times \frac{22}{7} \times 6^2 =$ ***11 · 4744cm*** ^{2}

5. *In the circle below* ***O*** *is its centre.* ***AP*** *is a tangent to the circle and* $\angle$***PAB = 68°.***



Find the size of the angles marked ***x*** *and* ***y***

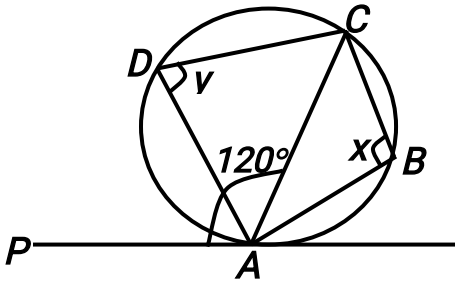
Soln:

x = 68° *(angle in alternate segments)*

$\angle$***BAC = 90°*** *(angle in a semi–circle)*

$\therefore$ ***y*** $= 180° - (90° + 68°) =$ ***22°*** *(angles in a triangle)*

6. *In the circle below* ***AP*** *is a tangent to the circle and* $\angle$***PAC = 120°.***



Find the size of the angles marked ***x*** *and* ***y***

Soln:

x = 120° *(angle in alternate segments)*

Also: $y + 120° = 180°$ *(angles in a cyclic quadrilateral)*

$\therefore$ ***y = 60°***

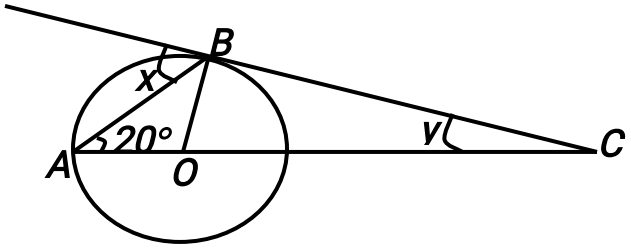
EER:

1. *The tangents at* ***A*** *and* ***B*** *on a circle of radius* ***7cm*** *intersect at* ***T,*** *and* ***C*** *is any point on the major arc* ***AB.*** *If* ***∠ATB = 48°,*** *find the:*

(i) *size of angle* ***ACB***

(ii) *area bounded by the tangents and the minor arc* ***AB***

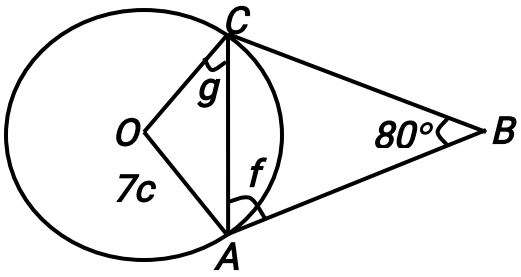
2. *In the circle below* ***O*** *is its centre.* ***BC*** *is a tangent to the circle and* ***∠BAO = 20°.***



Find the size of the angles marked ***x*** *and* ***y***

3. *The angles of a triangle are* ***50°, 60°*** *and* ***70°,*** *and a circle touches the sides at* ***A, B*** *and* ***C.*** *Find the angles of triangle* ***ABC***

4. *In the circle below* ***O*** *is its centre.* ***AB*** *and* ***CB*** *are tangents to the circle of radius* ***7cm*** *and* ***∠ABC = 80°.***



Find the:

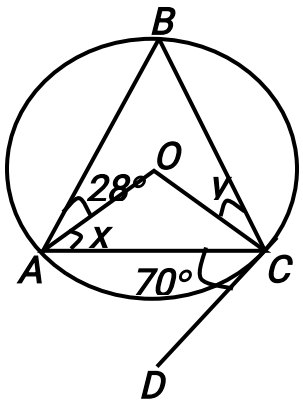
(i) *size of the angles marked* ***f*** *and* ***g***

(ii) *size of the reflex angle* ***AOC***

(iii) *area bounded by the tangents and the minor arc* ***AC***

5. *In the circle below* ***O*** *is its centre.* ***DC*** *is a tangent to the circle* ***∠BAO = 28°***

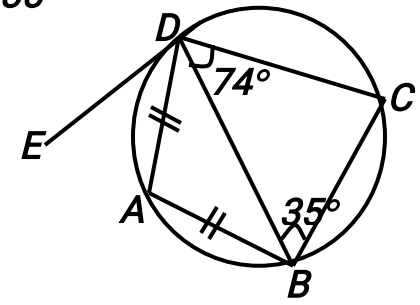
and ***∠ACD = 70°***



Find the size of the angles marked ***x*** *and* ***y***

6. *In the circle below* ***ED*** *is a tangent to the circle,* ***AB = AD, ∠BDC = 74°***

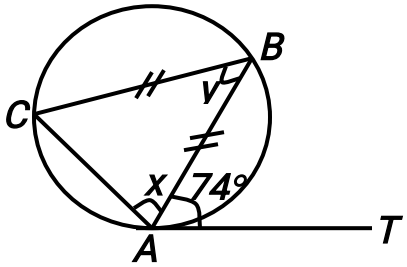
and ***∠DBC = 35°***



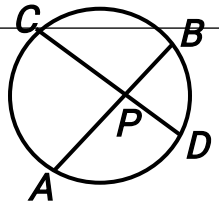
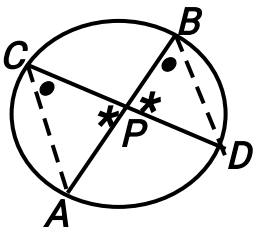
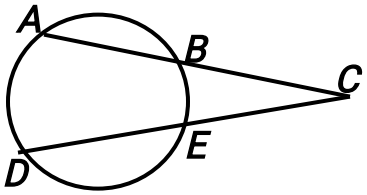
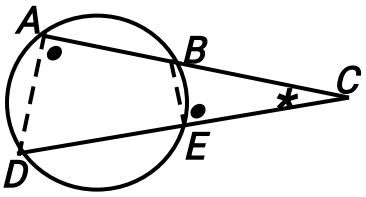
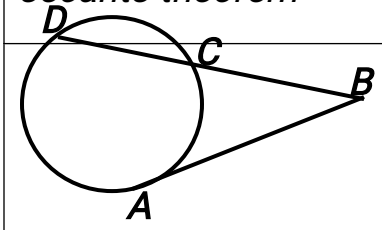
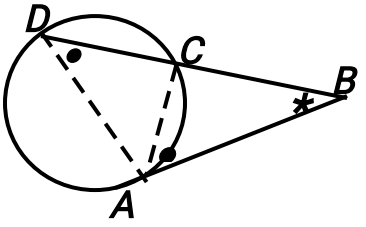
Find the size of angle:

(i) DAB ***(ii) BDE*** ***(iii) DBA*** ***(iv) EDA***

7. *In the circle below* ***AT*** *is a tangent to the circle,* ***AB = CB*** *and* ***∠BAT = 74°.***
Find the size of the angles marked ***x*** *and* ***y***

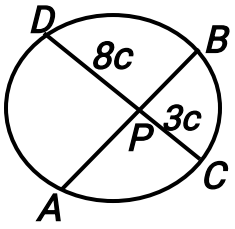


CIRCLES AND SIMILAR TRIANGLES

Circle diagrams	*Analysis diagrams*	*Conclusion*
 *" intersecting chords theorem "*		*Triangles **ACP** and **PBD** are similar* $\Rightarrow \frac{AP}{PD} = \frac{CP}{PB}$ $\therefore AP \cdot PB = CP \cdot PD$ *" Each length is measured from the meeting point"*
 *" intersecting secants theorem "*		*Triangles **ACD** and **ECB** are similar* $\Rightarrow \frac{AC}{CE} = \frac{DC}{CB}$ $\therefore CA \cdot CB = CD \cdot CE$ *" Each length is measured from the meeting point"*
 *" intersecting tangent– secant theorem "*		*Triangles **ABC** and **ABD** are similar* $\Rightarrow \frac{AB}{BC} = \frac{DB}{AB}$ $\therefore BA^2 = BD \cdot BC$ *" Each length is measured from the meeting point"*

EXAMPLES:

1. *In the circle below chords* ***AB*** *and* ***CD*** *intersect at* ***P.*** *If* ***CP = 3cm, DP = 8cm*** *and* ***AB = 10cm,*** *find the length of* ***AP***



Soln:

If $AP = x$, $PB = 10 - x$

Using $AP \cdot PB = CP \cdot PD$ *(intersecting chords theorem)*

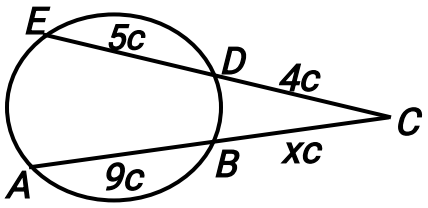
$\Rightarrow \quad x(10 - x) = 3(8)$

$$x^2 - 10x + 24 = 0$$

$$x = \frac{10 \pm \sqrt{100 - 96}}{2}$$

$\therefore$ $x = 6cm$ *or* $4cm$

2. *In the circle below chords* ***AB*** *and* ***ED*** *are produced to intersect at* ***C.*** *If* ***CD = 4cm, ED = 5cm, AB = 9cm*** *and* ***BC = xcm,***



find the:

(i) *value of* ***x***

(ii) *ratio of the areas of triangle* ***ACE*** *to that of* ***BCD***

(iii) *area of* ***ABDE*** *if the area of triangle* ***ACE*** *is* $54cm^2$

Soln:

(i) *Using* $CB \cdot CA = CD \cdot CE$ *(Each length from* ***C****)*

$\Rightarrow \quad x(x + 9) = 4(9)$

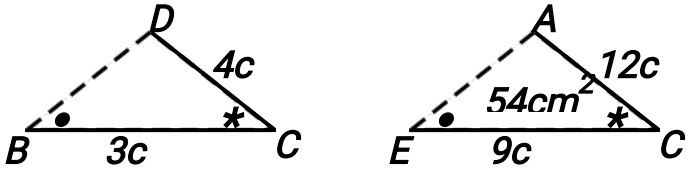
$$x^2 + 9x - 36 = 0$$

$$x = \frac{-9 \pm \sqrt{81 + 144}}{2}$$

$x = 3 \quad or \quad -12$

$\therefore \quad x = 3$

(ii) *Using similar triangles* ***ACE*** *and* ***BCD***



$$\frac{\text{Area } ACE}{\text{Area } BCD} = \left(\frac{12}{4}\right)^2 = 9$$

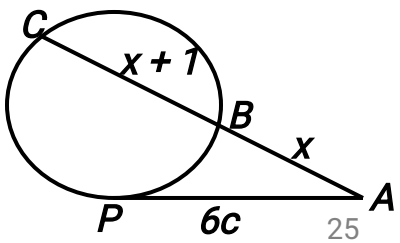
$\therefore$ *Required ratio =* ***9:1***

(iii) $\frac{\text{Area } BCD}{54} = \left(\frac{4}{12}\right)^2$

$\therefore$ *Area* ***BCD*** $= 6cm^2$

$\Rightarrow$ *Required area* $= 54 - 6 =$ $48cm^2$

3. *In the circle below secant* ***ABC*** *intersects tangent* ***AP*** *at* ***A.*** *If* ***AP= 6cm, AB = xcm*** *and* ***BC = (x + 1)cm,*** *find the value of* ***x***



Soln:

Using $AB \cdot AC = AP^2$ *(Each length from* ***A****)*

$\Rightarrow \quad x(2x + 1) = 6^2$

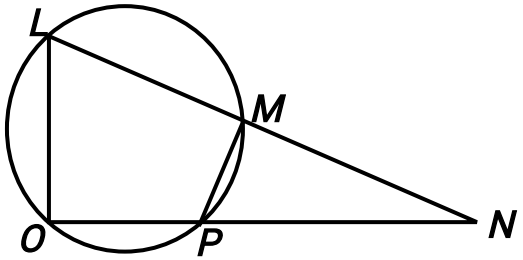
$2x^2 + x - 36 = 0$

$x = \frac{-1 \pm \sqrt{1 + 288}}{4}$

$x = 4 \quad or \quad -4{\cdot}5$

$\therefore \quad x = 4$

4. *In the circle below* ***OL= 4·5cm, PM = 3cm, NM = 4cm*** *and* ***LN = 7·5cm.***



Find the:

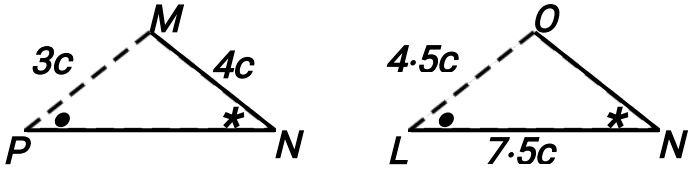
(i) *lengths of* ***ON*** *and* ***OP***

(ii) *radius of the circle*

(iii) *area of* ***OLMP***

Soln:

(i) *Using similar triangles* ***PMN*** *and* ***OLN,***



$\Rightarrow \frac{ON}{4} = \frac{4 \cdot 5}{3}$

$\therefore$ ***ON = 6cm***

Also: $\frac{PN}{7 \cdot 5} = \frac{3}{4 \cdot 5}$

$\therefore$ ***PN = 5cm***

$\Rightarrow$ ***OP = ON – PN*** $= 6 - 5$ ***= 1cm***

(ii) PMN *is a right triangle based on its dimensions* ***(∠PMN = 90°)***

$\Rightarrow$ ***∠POL = 90°,*** *thus* ***LP*** *is a diameter* ***(****angle in a semi–circle****)***

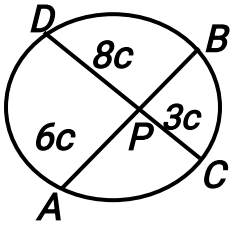
$\therefore$ ***LP*** $= \sqrt{4 \cdot 5^2 + 1^2} =$ ***4 · 6098cm***

$\Rightarrow$ *Required radius* $= \frac{1}{2} \times 4 \cdot 6098 =$ ***2 · 3049cm*** ^{2}

(iii) *Required area* $= \frac{1}{2} \times 6 \times 4 \cdot 5 - \frac{1}{2} \times 4 \times 3 =$ ***7 · 5cm*** ^{2}

EER:

1. *In the circle below chords* ***AB*** *and* ***CD*** *intersect at* ***P.*** *If* ***CP = 3cm, DP = 8cm*** *and* ***AP = 6cm,***



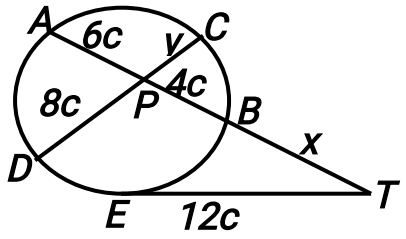
find the:

(i) length of ***PB***

(ii) *area of triangle* ***BPC*** *if the area of triangle* ***APD*** *is* ***20cm*** ^{2}

*(iii) ratio of the areas of triangle **APC** to that of **BPD***

2.** In the circle below **TE = 12cm** is a tangent to the circle at **E.** Chords **AB** and **CD** intersect at **P** and **AB** is produced at **T.** If **AP = 6cm, PB = 4cm, BT = xcm, CP = ycm** and **DP = 8cm,



find the:

*(i) values of **x** and **y***

*(ii) ratio of the areas of triangle **APD** to that of **BPC***

3.** In the circle below **TE** is a tangent to the circle at **E.** Chords **AB** and **CD** are produced to intersect at **T.** If **AB = 5cm, DC = 9cm** and **CT = 3cm,** find the lengths of **BT** and **ET