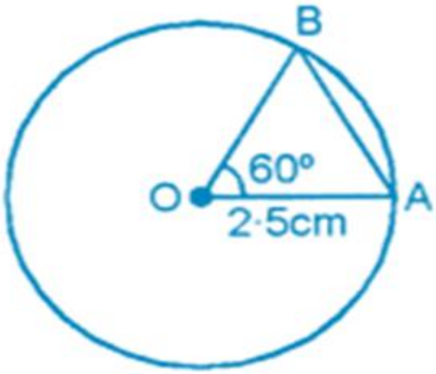
1. Draw a circle with centre O and radius 2.5 cm. Draw two radii OA and OB such that ∠AOB = 60^0. Measure the length of the chord AB.

Solution:

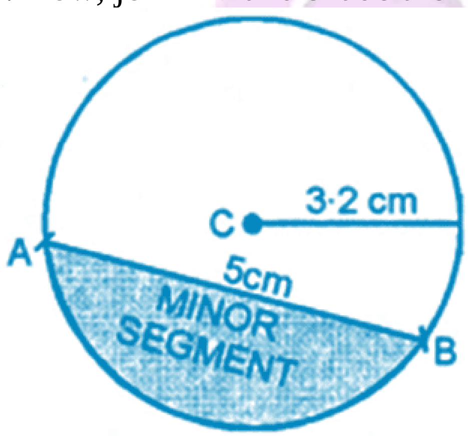
1. Draw a circle, taking centre as O and radius equal to 2.5 cm
2. Join OA, where A is any point on the circle
3. Draw ∠AOB equal to 60^0
4. Now, join AB and on measuring we get, AB = 2.5 cm



2. Draw a circle of radius 3.2 cm. Draw a chord AB of this circle such that AB = 5 cm. Shade the minor segment of the circle.

Solution:

1. Draw a circle, taking centre as O and radius = 3.2 cm
2. Take a point A on the circle
3. Taking A as centre and radius = 5 cm, draw an arc to meet the circle at point B
4. Now, join AB and shade the minor segment of the circle

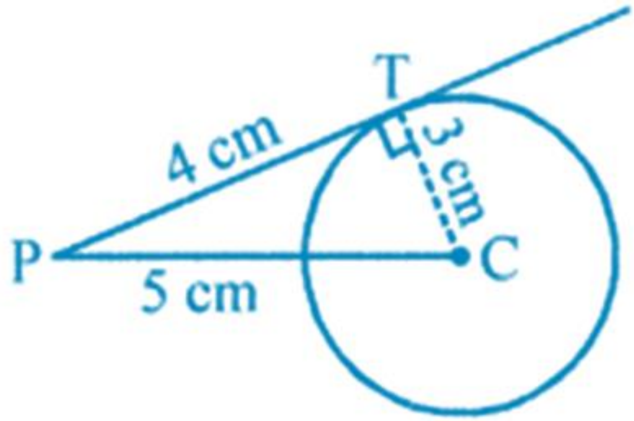


3. Find the length of the tangent drawn to a circle of radius 3 cm, from a point at a distance 5 cm from the centre.

Solution:

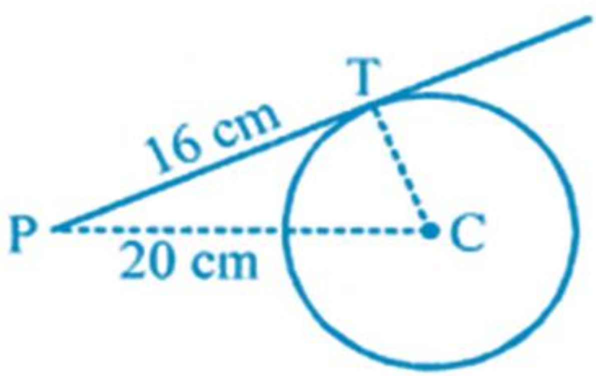
Draw a circle, taking C as centre and radius CT = 3 cm

Let PT be the tangent, drawn from point P to a circle with centre C
Let CP = 5 cm
CT = 3 cm (given)



$\angle CTP = 90^0$ (since radius is perpendicular to tangent)
From $\triangle CPT$,
$CP^2 = PT^2 + CT^2$ (By Pythagoras theorem)
$(5)^2 = PT^2 + (3)^2$
We get,
$PT^2 = 25 - 9$
$PT^2 = 16$
$PT = \sqrt{16}$
We get,
PT = 4
Therefore, length of tangent = 4 cm

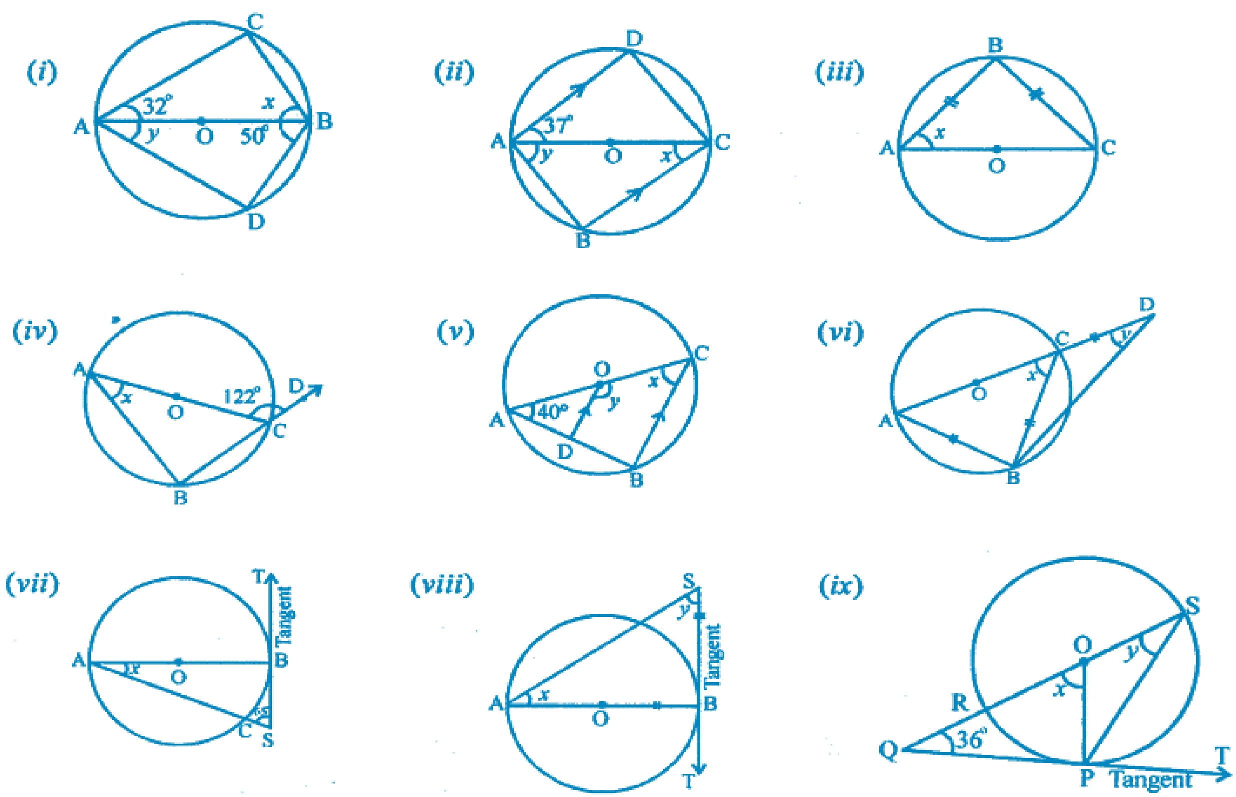
4. In the adjoining figure, PT is a tangent to the circle with centre C. Given CP = 20 cm and PT = 16 cm, find the radius of the circle.



Solution:
We know that,
Radius is always perpendicular to tangent

i.e, CT ⊥ PT
Therefore,
△CPT is a right angled triangle, where CP = hypotenuse
In right angled triangle,
By Pythagoras theorem, we get,
$CP^2 = PT^2 + CT^2$
$CT^2 = CP^2 – PT^2$
$CT^2 = (20)^2 – (16)^2$
We get,
$CT^2 = 400 – 256$
$CT^2 = 144$
CT = √144
We get,
CT = 12 cm
Therefore, radius of circle = 12 cm

5. In each of the following figure, O is the centre of the circle. Find the size of each lettered angle:



Solution:
(i) In the given figure,

AB is the diameter and O is the centre of the circle

Given $\angle CAB = 32^0$

$\angle ABD = 50^0$

$\angle C = 90^0$ (angles in the semicircle)

By angle sum property of triangle, we get,

$\angle C + \angle CAB + \angle ABC = 180^0$

$90^0 + \angle CAB + \angle x = 180^0$

$90^0 + 32^0 + \angle x = 180^0$

$32^0 + \angle x = 180^0 – 90^0$

We get,

$\angle x = 90^0 - 32^0$

$\angle x = 58^0$

Similarly,

In right angled triangle ADB,

By angle sum property of triangle, we get,

$\angle ABD + \angle D + \angle BAD = 180^0$

$50^0 + 90^0 + \angle BAD = 180^0$

$50^0 + 90^0 + \angle y = 180^0$

$\angle y = 180^0 - 140^0$

We get,

$\angle y = 40^0$

(ii) In the figure,

AC is the diameter of circle with centre O

$\angle DAC = 37^0$

AD || BC

$\angle ACB = \angle DAC$ (Alternate angles)

Hence,

$x = 37^0$

In $\triangle ABC$,

$\angle B = 90^0$ (Angle in a semicircle)

By angle sum property of triangle, we get,

$\angle x + \angle y + \angle B = 180^0$

$37^0 + \angle y + 90^0 = 180^0$

$\angle y = 180^0 - 127^0$

We get,

$\angle y = 53^0$

(iii) In the figure,

AC is the diameter of the circle with center as O

BA = BC

Hence,

$\angle BAC = \angle BCA$ (angles of isosceles triangle)

But $\angle ABC = 90^0$ (angles in a semicircle)

In triangle ABC,

By angle sum property of triangle, we get,

$\angle BAC + \angle ABC + \angle BCA = 180^0$

$\angle BAC + \angle BCA = 180^0 - 90^0$

$\angle x + \angle x = 90^0$

$\angle 2x = 90^0$

We get,

$\angle x = 45^0$

(iv) In the figure,

AC is the diameter of the circle, with centre as O,

$\angle ACD = 122^0$

$\angle ACB + \angle ACD = 180^0$ (Linear pair)

$\angle ACB + 122^0 = 180^0$

$\angle ACB = 180^0 - 122^0$

We get,

$\angle ACB = 58^0$

In $\triangle ABC$,

$\angle ABC = 90^0$ (Angles in a semicircle)

By angle sum property of triangle, we get,

$\angle ABC + \angle BCA + \angle ACB = 180^0$

$90^0 + x + 58^0 = 180^0$

$x = 180^0 - 148^0$

We get,

$x = 32^0$

(v) In the figure,

AC is the diameter of the circle, with centre as O,

OD || CB and $\angle CAB = 40^0$

In $\triangle ABC$,

$\angle B = 90^0$ (Angle in a semicircle)

By angle sum property of triangle, we get,

$\angle BCA + \angle ABC + \angle BAC = 180^0$

$\angle BCA + \angle BAC + 90^0 = 180^0$

∠BCA + ∠BAC = $180^0 – 90^0$
∠BCA + ∠BAC = 90^0
$x + 40^0 = 90^0$
$x = 90^0 - 40^0$
We get,
$x = 50^0$
∵ OD || CB
Hence,
∠AOD = ∠BCA (corresponding angles)
∠AOD = 50^0
But ∠AOD + ∠DOC = 180^0 (Linear pair)
$50^0 + y = 180^0$
$y = 180^0 – 50^0$
We get,
$y = 130^0$
Therefore, $x = 50^0$ and $y = 130^0$

(vi) In the figure,
AC is the diameter of the circle with centre as O
BA = BC = CD
In △ABC,
∠ABC = 90^0 (Angle in a semicircle)
By angle sum property of triangle, we get,
∠BAC + ∠BCA + ∠ABC = 180^0
∠BAC + ∠BCA + 90^0 = 180^0
∠BAC + ∠BCA = 90^0
But given that, BA = BC
Therefore, ∠BAC = ∠BCA = x
$x + x = 90^0$
$2x = 90^0$
$x = 45^0$
In △BCD,
BC = CD
Hence,
∠CBD = ∠CDB = y and
Exterior ∠ACB = Sum of interior opposite angles
∠ACB = ∠CBD + ∠CDB
x = y + y
Therefore,

$2y = x = 45^0$
$y = 45^0 / 2$
$y = 22.5^0$ or
$y = (22\frac{1}{2})^0$

(vii) In the figure,
AB is the diameter of circle with centre O
ST is the tangent at point B
$\angle ASB = 65^0$
In $\triangle ABS$
$\because$ TS is the tangent and OB is the radius
OB is perpendicular to ST or
$\angle ABS = 90^0$
But in $\triangle ASB$,
$\angle BAC + \angle ASB + \angle ABS = 180^0$
$x + 65^0 + 90^0 = 180^0$
$x + 155^0 = 180^0$
$x = 180^0 - 155^0$
We get,
$x = 25^0$
Therefore, $x = 25^0$

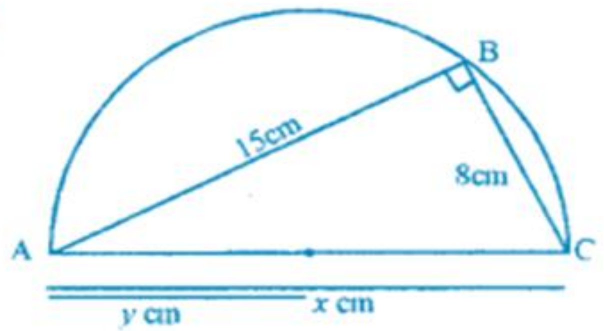
(viii) In the figure,
AB is the diameter of the circle with centre O
ST is the tangent to the circle at point B
AB = BS
Hence,
ST is the tangent and OB is the radius
$OB \perp ST$ or $\angle OBS = 90^0$
In $\triangle ABS$,
$\angle BAS + \angle BSA + \angle ABS = 180^0$
By angle sum property of triangle
$\angle BAS + \angle BSA + 90^0 = 180^0$
$\angle BAS + \angle BSA = 90^0$
$x + y = 90^0$
$\because AB = BS$
Hence,
$x = y$

Therefore, $x = y = 90^0 / 2 = 45^0$

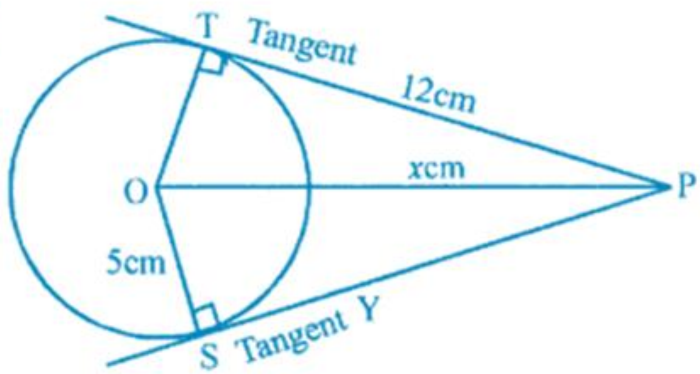
(ix) In the figure,
RS is the diameter of the circle with centre as O
SR is produced to Q
QT is the tangent to the circle at point P
OP is joined
$\angle Q = 36^0$
QT is the tangent and OP is the radius of the circle
Hence,
OP is perpendicular to QT
$\angle OPQ = 90^0$
In △OPQ,
By angle sum property of triangle, we get,
$\angle OQP + \angle POQ + \angle OPQ = 180^0$
$\angle OQP + \angle POQ + 90^0 = 180^0$
Hence,
$\angle OQP + \angle POQ = 90^0$
$36^0 + x = 90^0$
$x = 90^0 - 36^0$
We get,
$x = 54^0$
In △OPS,
OP = OS (Radii of the circle)
Hence,
$\angle OPS = \angle OSP = y$ and
Exterior angle $\angle POQ = \angle OPS + \angle OSP$
$x = y + y$
$x = 2y = 54^0$

6. In each of the following figures, O is the centre of the circle. Find the values of x and y.

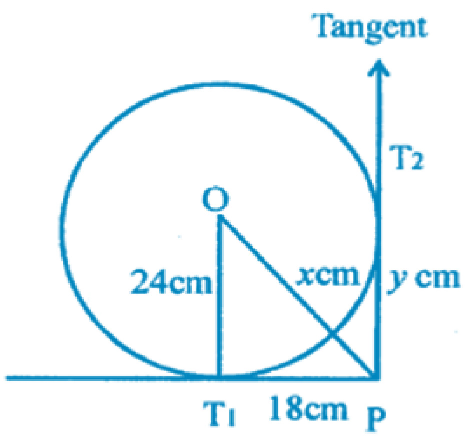
(i)



(ii)



(iii)



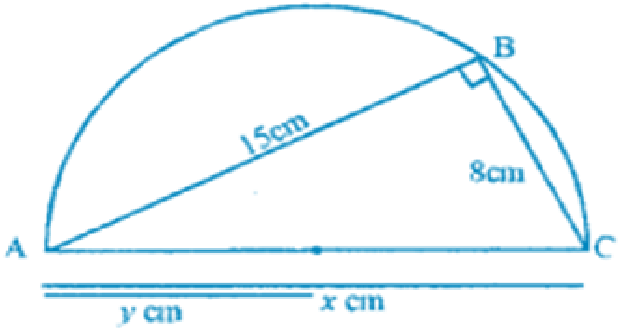
Solution:

(i) Given

O is the centre of the circle

AB = 15 cm,

BC = 8 cm



$\angle ABC = 90^0$ (Angles in a semicircle)

By Pythagoras Theorem,

$AC^2 = AB^2 + BC^2$

$AC^2 = (15)^2 + (8)^2$

$AC^2 = 225 + 64$

$AC^2 = 289$

$AC^2 = (17)^2$

AC = 17 cm

x = 17 cm

y = 1 / 2

(Since AC is the diameter and AO is the radius of the circle)

= 1 / 2 × 17

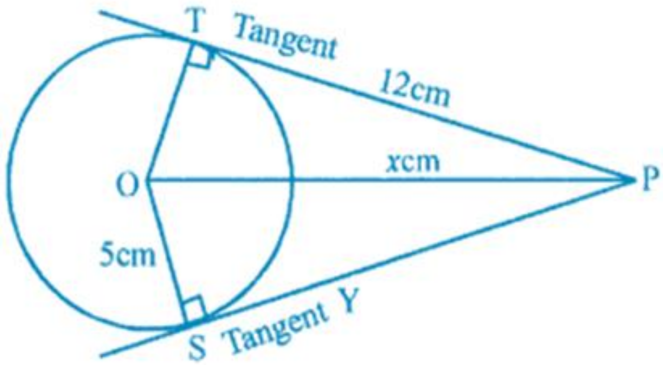
= 17 / 2 cm

= 8.5 cm

(ii) O is the centre of the circle

PT and PS are the tangents to the circle from point P

OS and OT are the radii of the circle



Hence, $\angle OSP = \angle OTP = 90^0$

OS = OT = 5 cm and

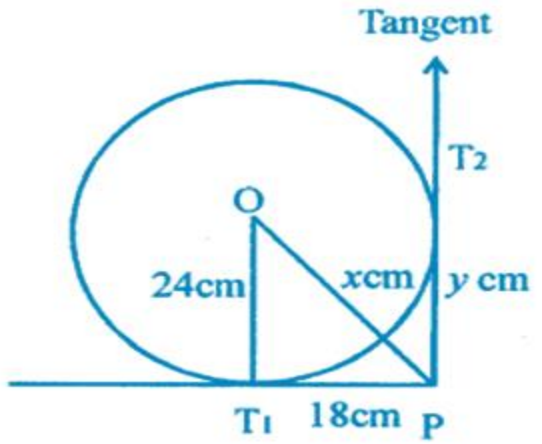
PT = PS = 12 cm

Now,

In right angled triangle OTP,

By Pythagoras Theorem
$OP^2 = OT^2 + PT^2$
$= (5)^2 + (12)^2$
$= 25 + 144$
$= 169$
We get,
$OP^2 = (13)^2$
Therefore, OP = 13 cm
i.e, x = 13 cm
Since PS = PT = 12 cm
Therefore,
y = 12 cm

(iii) O is the centre of the circle
OT_1 is the radius of the circle
PT_1 and PT_2 are the tangents of the circle from point P
OT_1 = 24 cm and PT_1 = 18 cm



Here,
OT_1 is the radius and PT_1 is the tangent,
Hence,
$OT_1 \perp PT_1$
Now,
In right angled triangle OPT,
By Pythagoras Theorem
$OP^2 = OT_1^2 + PT_1^2$
$OP^2 = (24)^2 + (18)^2$
$OP^2 = 576 + 324$
We get,
$OP^2 = 900$

$OP^2 = (30)^2$
OP = 30 cm
x = 30 cm
Since, PT_1 and PT_2 are the tangents from point P
Therefore,
$PT_1 = PT_2 = 18$ cm
i.e, y = 18 cm