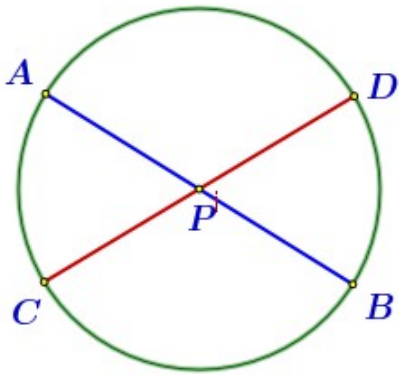
ONLINE MATHS CLASS - X - 32 (18 / 09 /2020)

Two intersecting chords

We know that diameter is the longest chord of a circle and two diameter intersect at the centre .

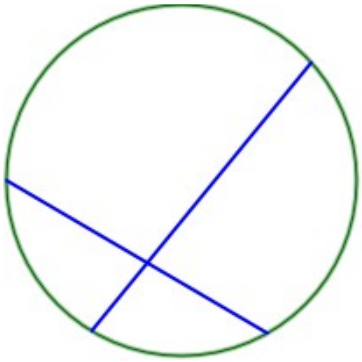
Do the lengths of the four pieces of the intersecting diameters have any peculiarity ?



In the figure two diameters AB and CD of a circle intersect at the point P within the circle (P is the centre)

PA = PB = PC = PD (Radii of a circle are equal)

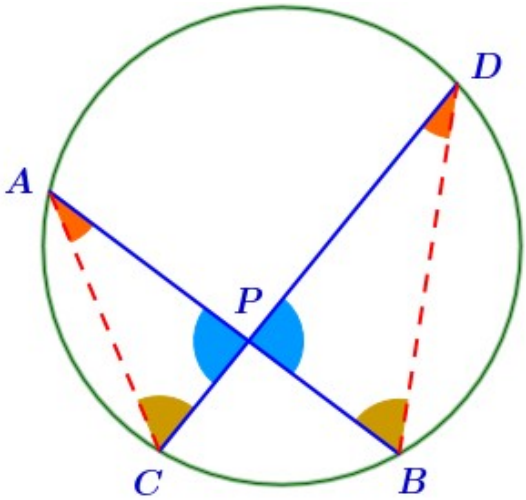
Do the length of the four parts of the intersecting chords within a circle (which are not the diameters) have any peculiarity ? Are they equal ?



It is very clear from the figure that they are not equal .

Let's discuss.

In the figure two chords AB and CD intersect at the point P .



< A = < D (All angles made by an arc on its alternate arc are equal)

< B = < C (All angles made by an arc on its alternate arc are equal)

< APC = < BPD (Opposite angles are equal)

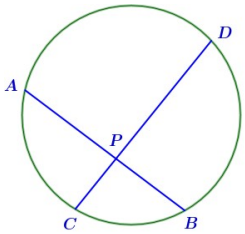
Triangles APC and BPD are similar triangles . (The angles of the triangles APC are BPD equal)

$$\frac{PA}{PD} = \frac{PC}{PB}$$ (The sides of similar triangles are scaled by the same factor)

$$PA \times PB = PC \times PD$$

In the figure two chords AB and CD of a circle intersect at the a point P within the circle , then

$$PA \times PB = PC \times PD$$



Finding

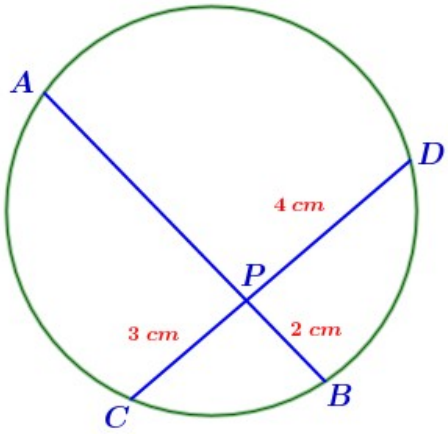
If two chords of a circle intersect within the circle , then the product of the parts of the two chords are equal .

Let's solve a problem related to this idea

1. In the figure two chords AB and CD intersect at a point P .

PB = 2 cm PC = 3 cm , PD = 4 cm

What is the length of AB ?



Answer .

$$PA \times PB = PC \times PD$$

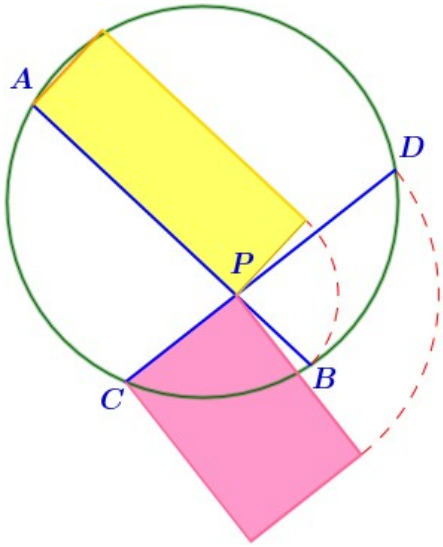
$$PA \times 2 = 3 \times 4$$

$$PA \times 2 = 12$$

$$PA = \frac{12}{2} = 6$$

$$AB = PA + PB = 6 + 2 = 8\ cm$$

Geometrical interpretation



In the figure two chords AB and CD of a circle intersect at a point P within the circle , then

$$PA \times PB = PC \times PD$$

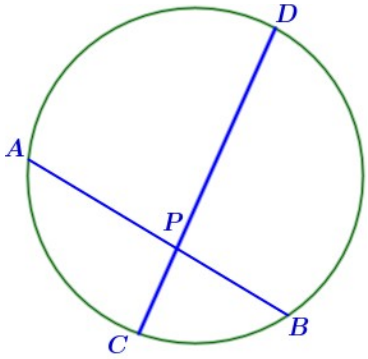
.

Area of the rectangle with sides PA and PB = PA x PB

Area of the rectangle with sides PC and PD = PC x PD

If two chords of a circle intersect within a circle, then the rectangles formed by the parts of the same chord have equal area .

More activity



In the figure two chords AB and CD of a circle intersect at a point P . PA = 9 cm , PD = 12 cm and AB = 13 cm

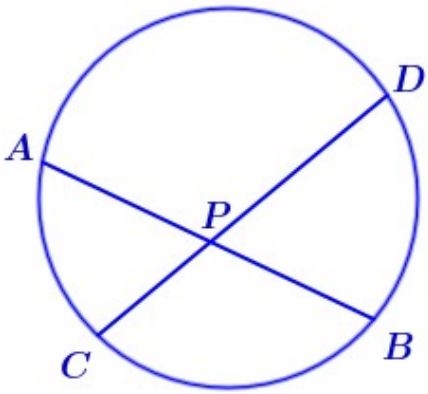
Find the lengths of PB , PC and CD ?

ONLINE MATHS CLASS - X - 33 (22 / 09 /2020)

WORKSHEET

1. In the figure two chords AB and CD intersect at P

PA = 9 cm , AB = 17 cm . The length of PD is twice as that of PC .



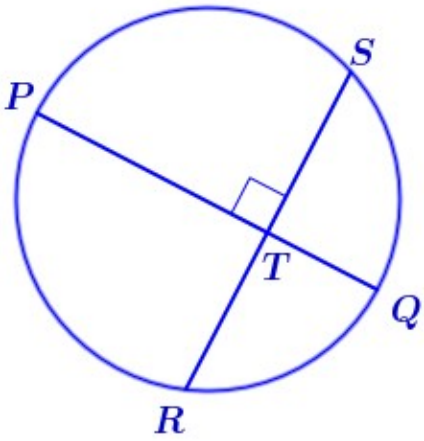
a) What is the length of PB ?

b) What is the length of PC ?

c) What is the length of CD ?

2. In the figure PQ is the diameter of the circle and

< PTS = 90° PQ = 13 cm , TQ = 4 cm



a) What is the length of TP ?

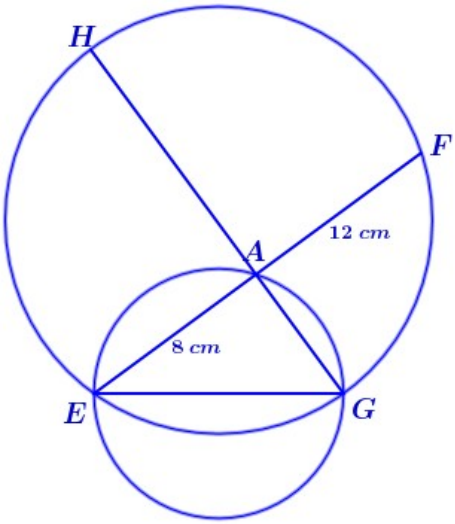
b) What is the length of TR ?

c) What is the length of RS ?

3. In the figure two chords EF and GH of the larger circle intersect at a point A on the smaller circle .

EG is the diameter of the smaller circle .

AE = 8 cm , AF = 12 cm and the perimeter of the smaller circle is 10 π cm .



a) What is the length of EG ?

b) What is the measure of < EAG ?

c) What is the length of AG ?

d) What is the length of AH ?

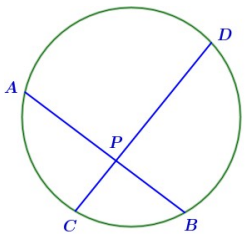
4). Draw a rectangle of length 5 cm and width 2 cm. Draw another rectangle of the same area with one side 7 cm ?

ONLINE MATHS CLASS - X - 33 (22 / 09 /2020)

What did we learn in the last class ?

In the figure two chords AB and CD of a circle intersect at the a point P within the circle , then

$$PA \times PB = PC \times PD$$



If two chords of a circle intersect within the circle , then the product of the parts of the two chords are equal .

Geometrical interpretation

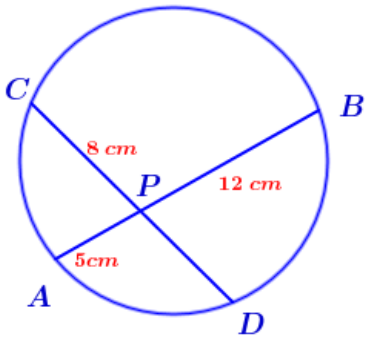
If two chords of a circle intersect within a circle, then the rectangles formed by the parts of the same chord have equal area .

Let's solve some problems related to this idea

2. *In the figure two chords AB and CD of a circle intersect at a point P .*

PA = 5 cm , PB = 12 cm , PC = 8 cm

What is the length of PD ?



Answer

$$PA \times PB = PC \times PD$$

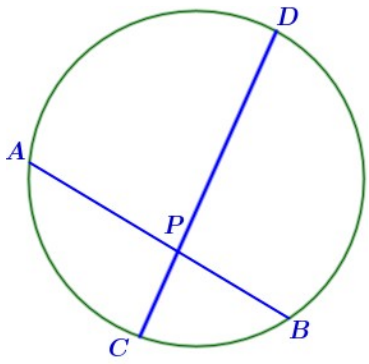
$$5 \times 12 = 8 \times PD$$

$$8 \times PD = 60$$

$$PD = \frac{60}{8} = 7.5cm$$

2. In the figure two chords AB and CD of a circle intersect at a point P . PA = 9 cm , PD = 12 cm and AB = 13 cm

Find the lengths of PB , PC and CD ?



Answer

$$PB = AB - PA = 13 - 9 = 4\,cm$$

$$PA \times PB = PC \times PD$$

$$9 \times 4 = PC \times 12$$

$$PC \times 12 = 36$$

$$PC = \frac{36}{12} = 3\,cm$$

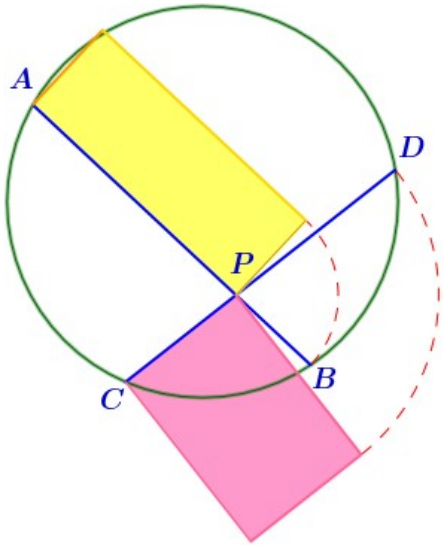
$$CD = PC + PD = 3 + 12 = 15\,cm$$

Let's discuss a construction base on this idea

In the figure two chords AB and CD of a circle intersect at a point P within the circle , then

$$PA \times PB = PC \times PD$$

.

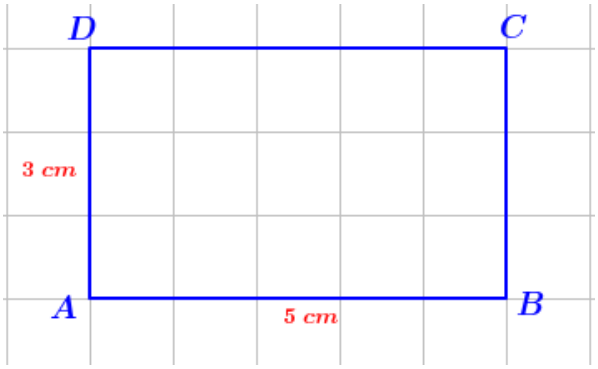


Area of the rectangle with sides PA and PB = PA x PB

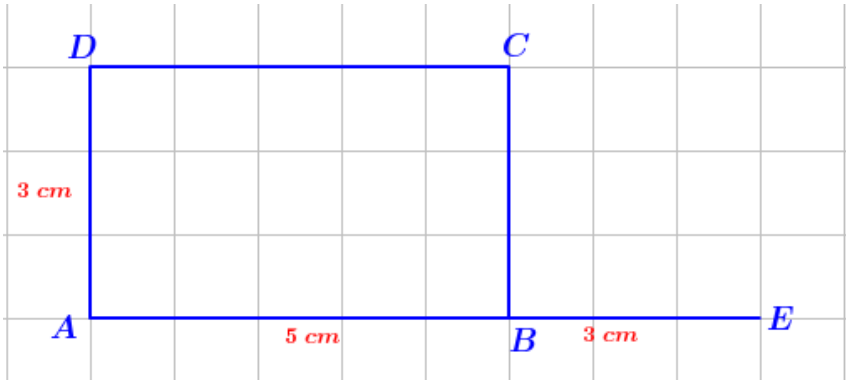
Area of the rectangle with sides PC and PD = PC x PD

- Draw a rectangle of length 5 cm and width 3 cm. Draw another rectangle of the same area with one side 6 cm ?

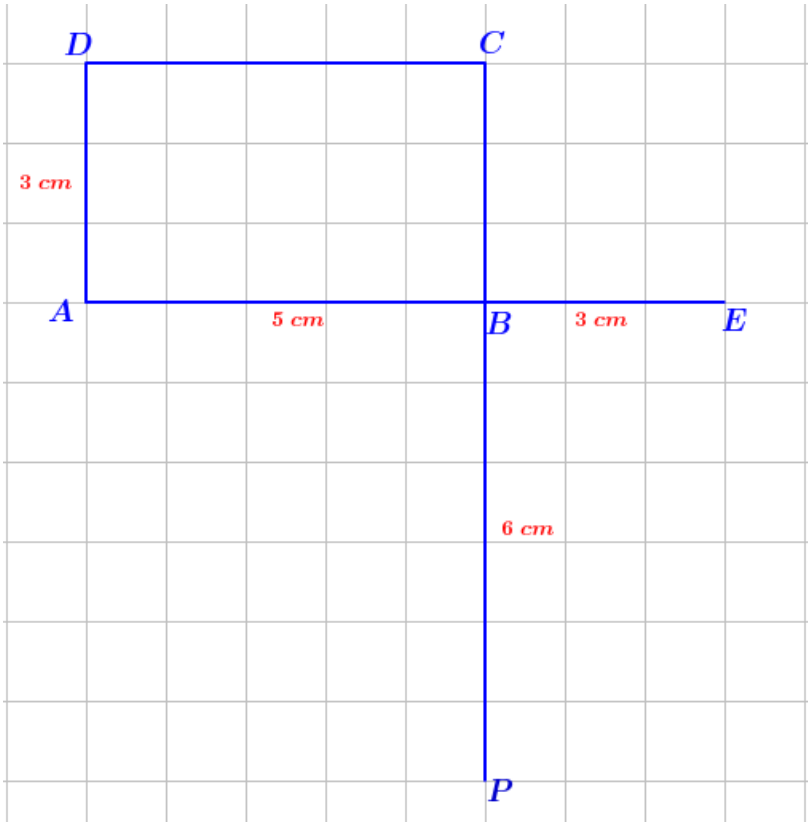
Step 1 : Draw a rectangle of width 5 cm and height 3 cm.



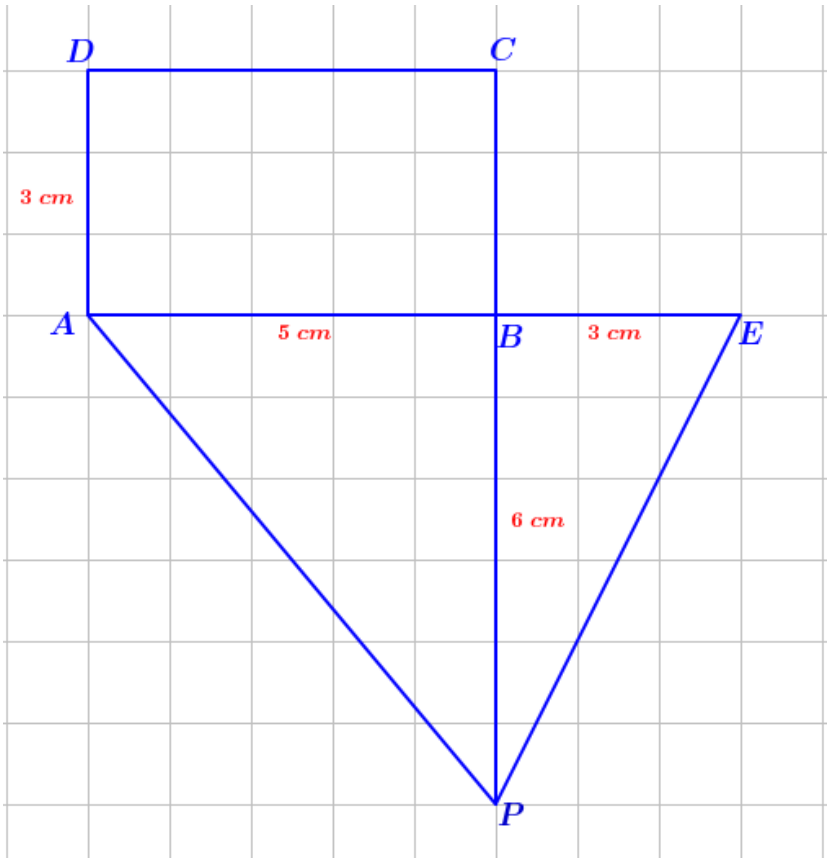
Step 2 : Extend the line AB by 3 cm.



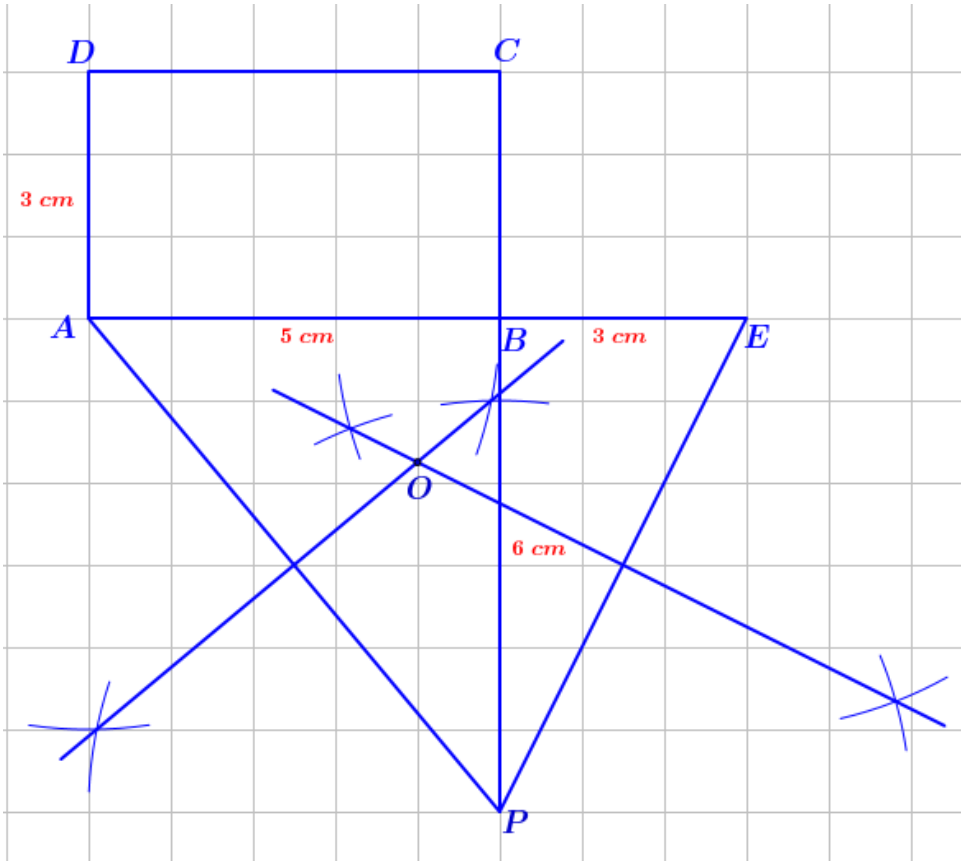
Step 3 : Extend the line CB downwards by 6 cm and mark a point P .



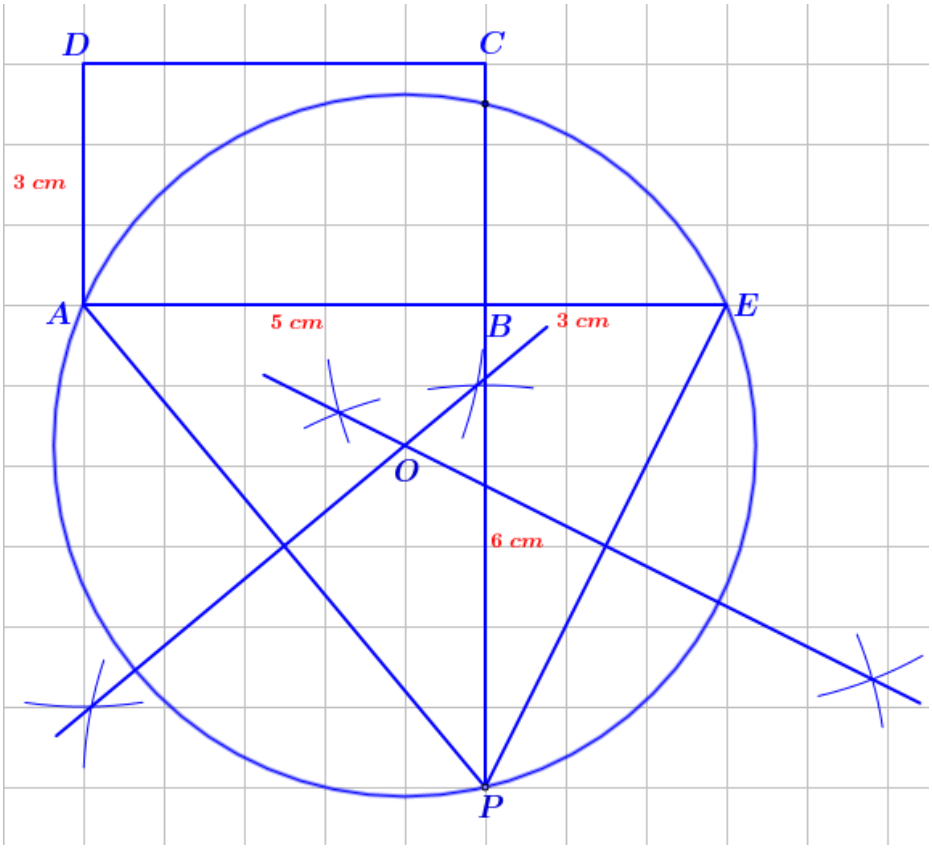
Step 4 : *Join the points A , E and P to form a triangle.*



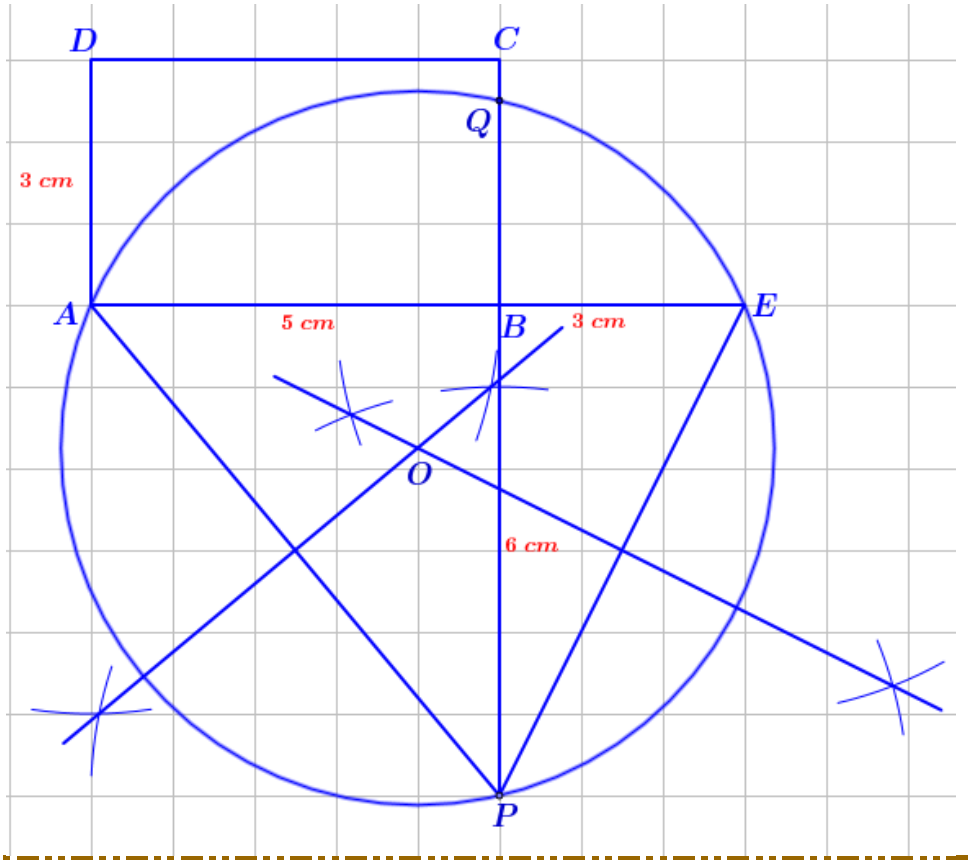
Step 5 : *Draw the perpendicular bisectors of the lines AP and EP . They intersect at O.*



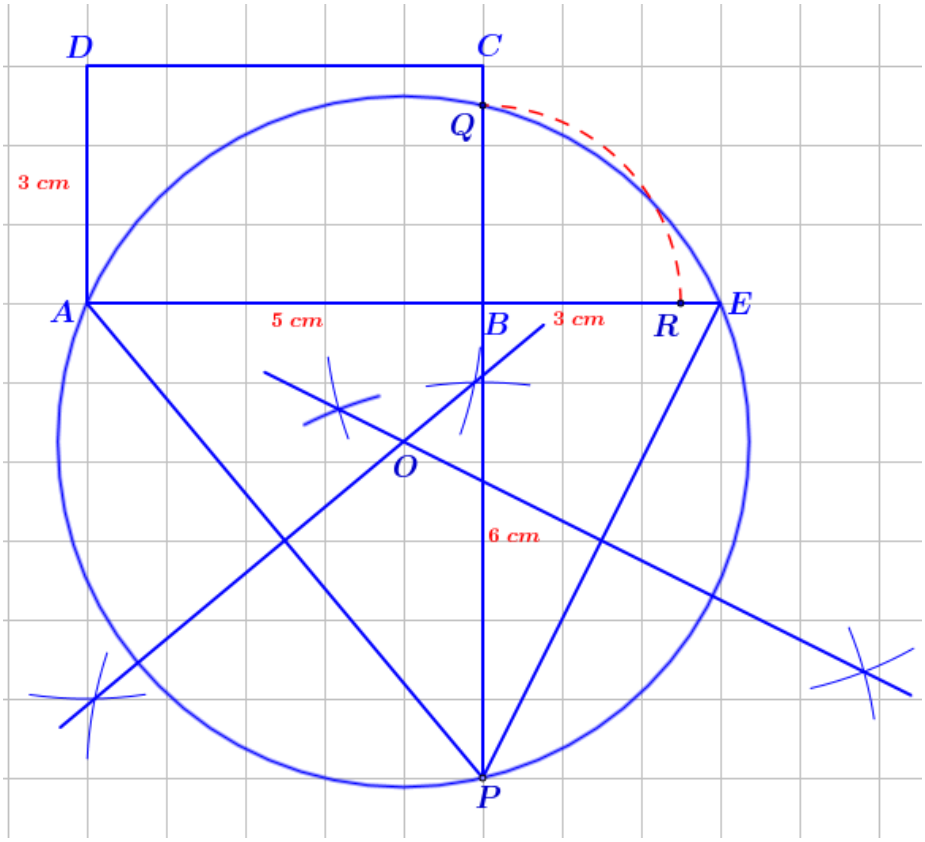
Step 6 : Draw the circumcircle of the triangle AEP. The centre of the circumcircle is O.



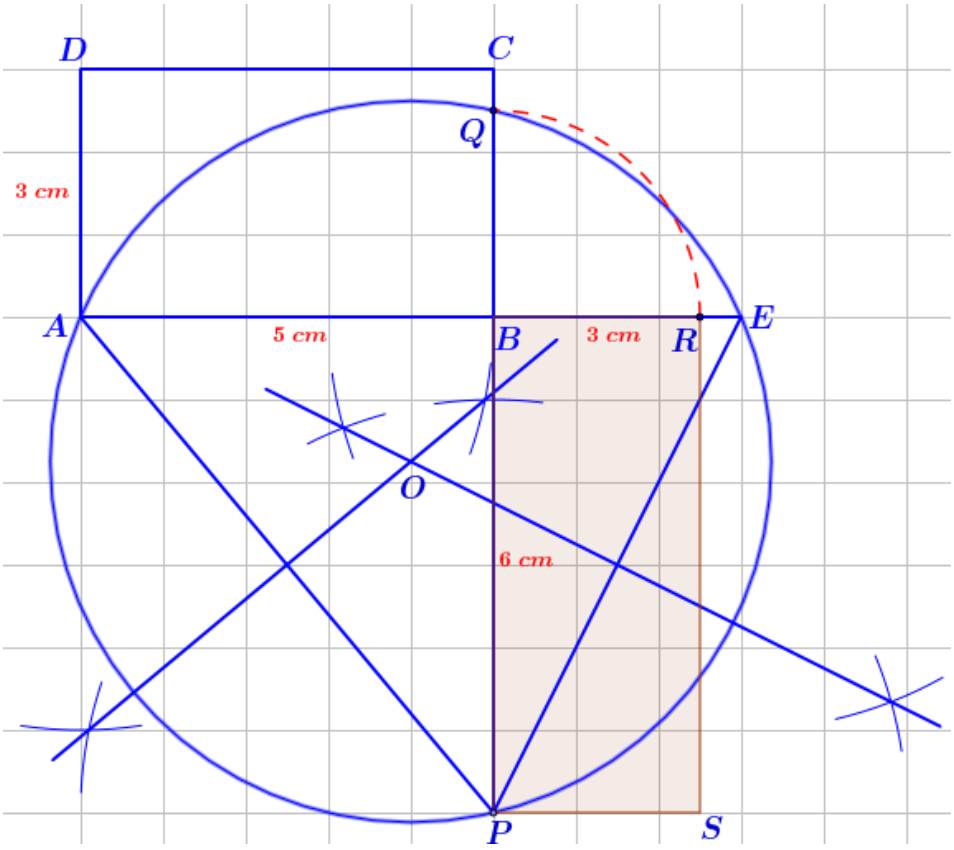
Step 7 : The circumcircle meets the line BC at Q.



Step 8 : Draw an arc with centre B and radius BQ. The arc meets the line BE at R.



Step 9 : Draw a rectangle with width BP and height BR.



More activity

Draw a rectangle of length 4 cm and width 3 cm. Draw another rectangle of the same area with one side 5 cm ?

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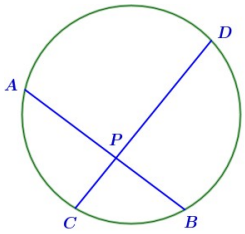
ONLINE MATHS CLASS - X - 34 (24 / 09 /2020)

What did we learn in the last class ?

In the figure two chords AB and CD of a circle intersect at the a point P within the circle , then $PA \times PB = PC \times PD$

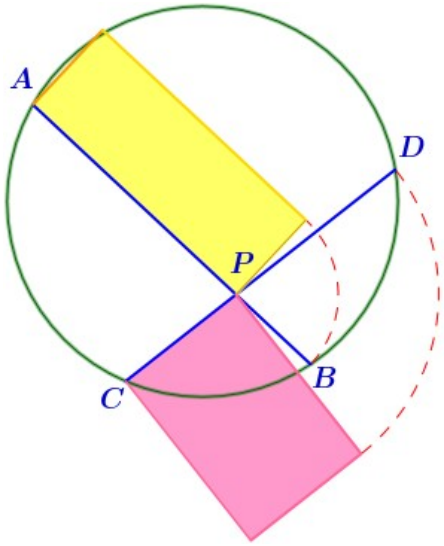


If two chords of a circle intersect within the circle , then the product of the parts of the two chords are equal .

Geometrical interpretation

In the figure two chords AB and CD of a circle intersect at a point P within the circle , then

$$PA \times PB = PC \times PD$$



Area of the rectangle with sides PA and PB = PA x PB

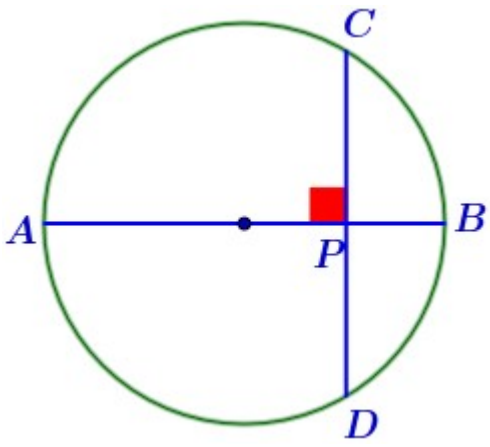
Area of the rectangle with sides PC and PD = PC x PD

If two chords of a circle intersect within a circle, then the rectangles formed by the parts of the same chord have equal area .

A square with the same area as a rectangle

In the figure AB is the diameter of the circle and CD is a chord perpendicular to it . Then we have

$$PA \times PB = PC \times PD$$



(The perpendicular drawn from the centre of a circle to a chord bisects the chord)

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$PC = PD$ (*Perpendicular from the centre of a circle to a chord bisects the chord*)

$PA \times PB = PC \times PD$

$= PC \times PC$

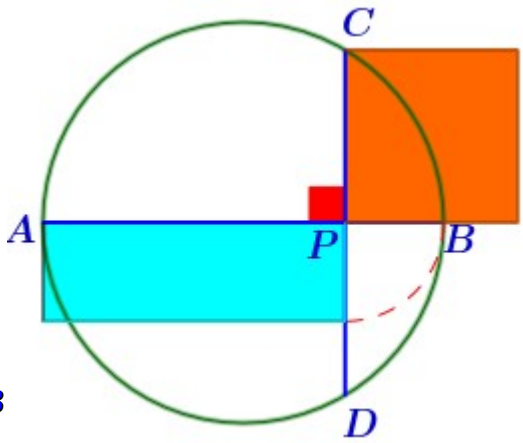
$= PC^2$

The product of the parts into which a diameter of a circle is cut by a perpendicular chord , is equal to the square of the half the chord .

Geometrical interpretation

In the figure AB is the diameter of the circle and CD is a chord perpendicular to it . Then we have ,

$$PA \times PB = PC^2$$



Area of the rectangle with sides PA and PB = $PA \times PB$

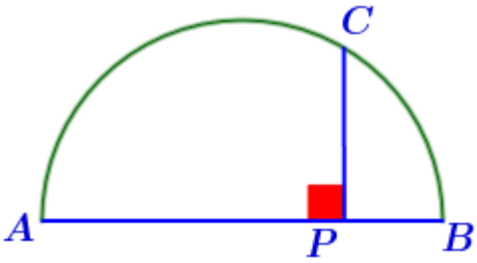
Area of the square with side PC = PC^2

The area of the rectangle formed into which a diameter of a circle is cut by a perpendicular chord is equal to the square of the half the chord .

We can state this result in another way as follows .

In the figure AB is the diameter of the circle and P is a point on it . The perpendicular to AB drawn through P intersect the circle at C , then

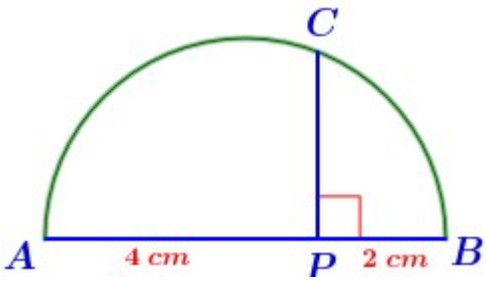
$$PA \times PB = PC^2$$



Let's solve some problems related to this idea

1. *In the figure AB is the diameter of the circle and P is a point on it . The perpendicular to AB drawn through P intersect the circle at C . PA = 4 cm , PB = 2 cm*

What is the length of PC ?



Answer

$$PA \times PB = PC^2$$

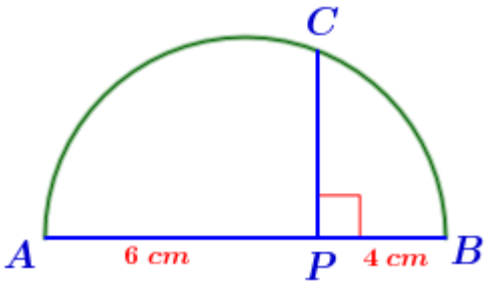
$$4 \times 2 = PC^2$$

$$PC^2 = 8$$

$$PC = \sqrt{8} = 2\sqrt{2}cm$$

2. *In the figure AB is the diameter of the circle and P is a point on it . The perpendicular to AB drawn through P intersect the circle at C . PA = 6 cm , PB = 4 cm*

What is the length of PC ?



Answer

$$PA \times PB = PC^2$$

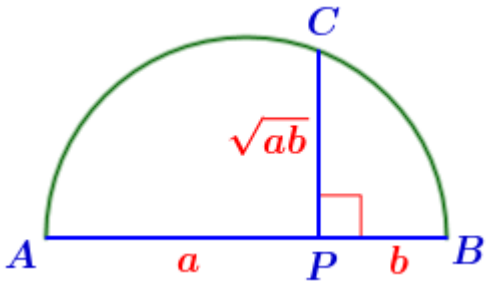
$$6 \times 4 = PC^2$$

$$PC^2 = 24$$

$$PC = \sqrt{24} = 2\sqrt{6}cm$$

NB :

In the figure AB is the diameter of the circle and P is a point on it . The perpendicular to AB drawn through P intersect the circle at C . PA = a , PB = b



$$PA \times PB = PC^2$$

$$a \times b = PC^2$$

$$PC^2 = ab$$

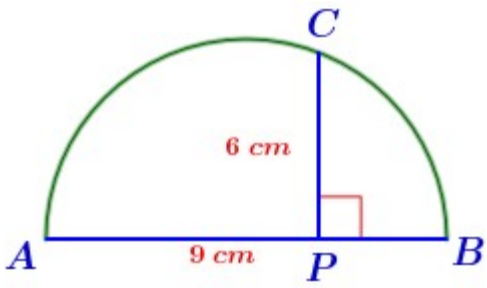
$$PC = \sqrt{ab}$$

Thus we can use this method to draw some lines of irrational lengths .

$$(example : \sqrt{5}, \sqrt{7}, \sqrt{8}, ...)$$

3 . *In the figure AB is the diameter of the circle and P is a point on it . The perpendicular to AB drawn through P intersect the circle at C . PA = 9 cm , PC = 6 cm*

What is the length of PB ?



Answer

$$PA \times PB = PC^2$$

$$9 \times PB = 6^2$$

$$9 \times PB = 36$$

$$PB = \frac{36}{9} = 4\ cm$$

Constructions

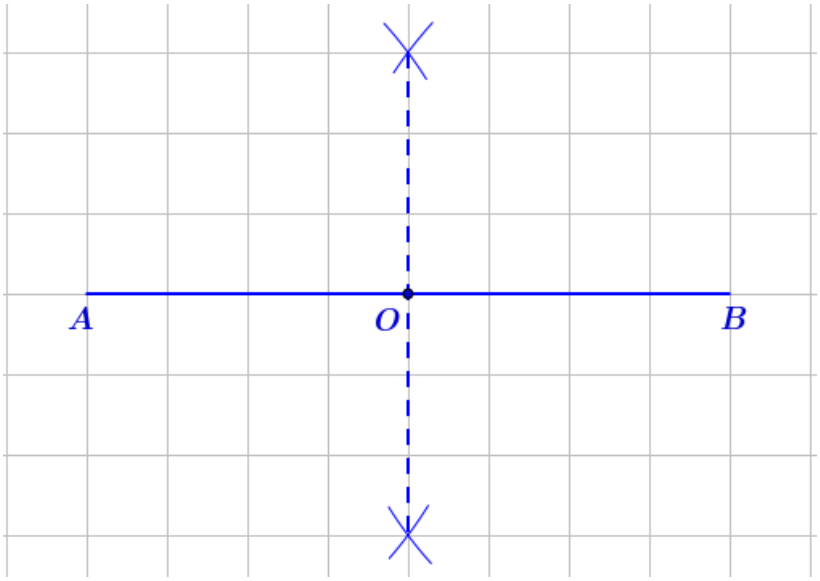
4. Draw a line of length $\sqrt{12}\ cm$

Answer

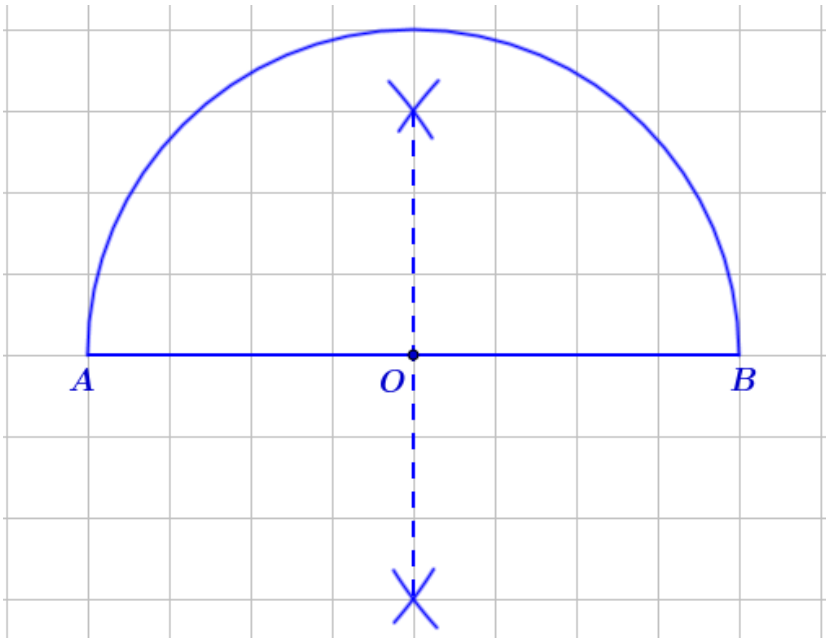
$$(PA \times PB = PC^2 \implies 6 \times 2 = 12 = (\sqrt{12})^2)$$

Step 1 : Draw a line AB of length 8 cm .

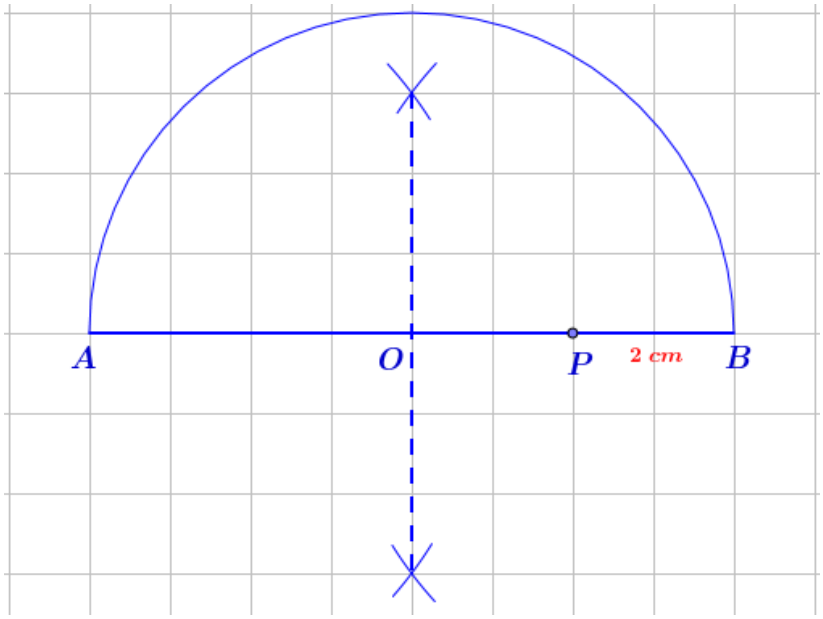
Step 2 : Mark the midpoint (O) of the line AB .



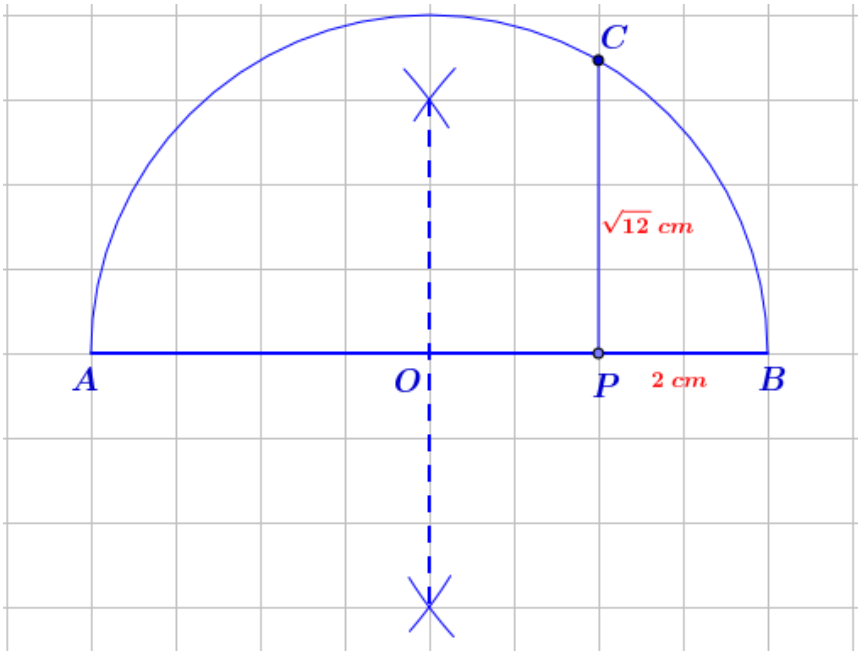
Step 3 : Draw a semicircle with AB as diameter .



Step 4 : Mark a point P on AB 6 cm away from A .



Step 5 : The perpendicular to AB drawn through P intersect the circle at C . Draw the line CP



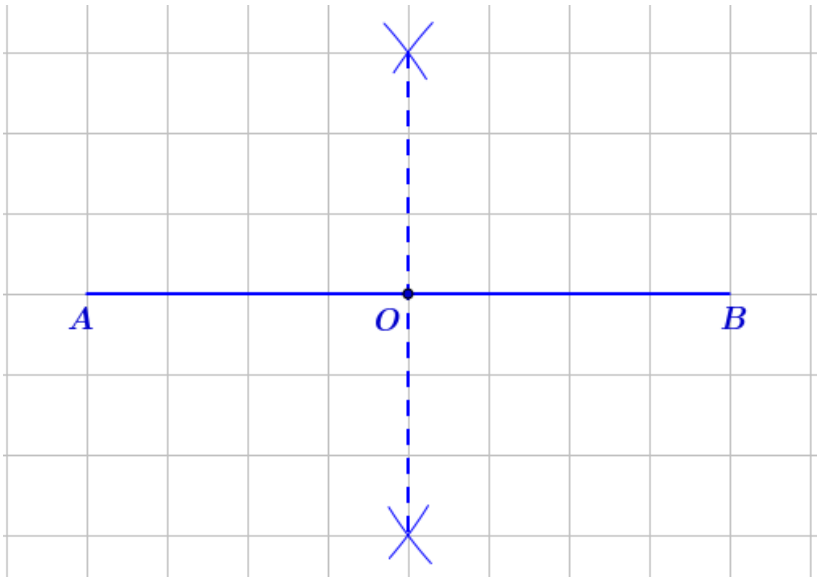
5) *Draw a square of area* 15 cm^2

Area = 15 cm^2 ====> *A side* = $\sqrt{15}\ cm$

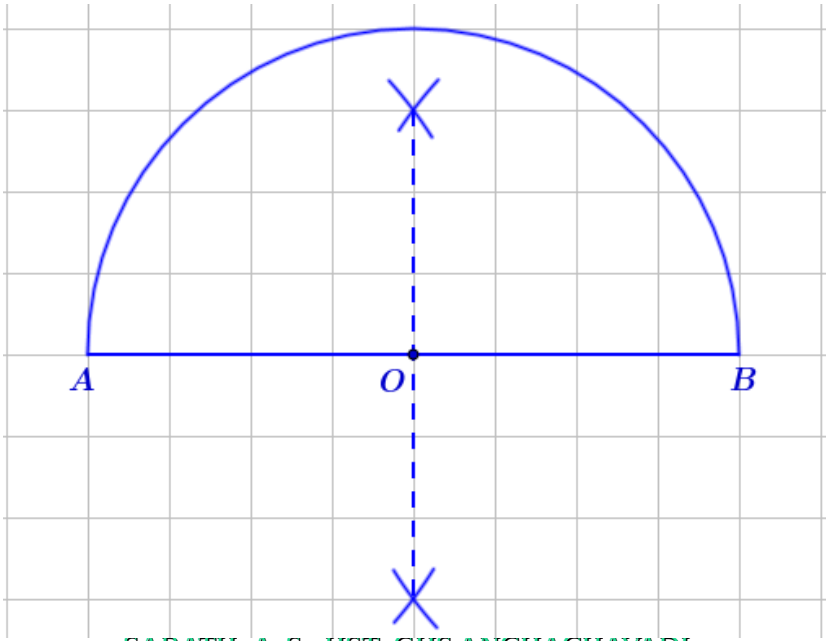
($PA \times PB = PC^2$ ===> $5 \times 3 = 15 = (\sqrt{15})^2$)

Step 1 : *Draw a line AB of length 8 cm .*

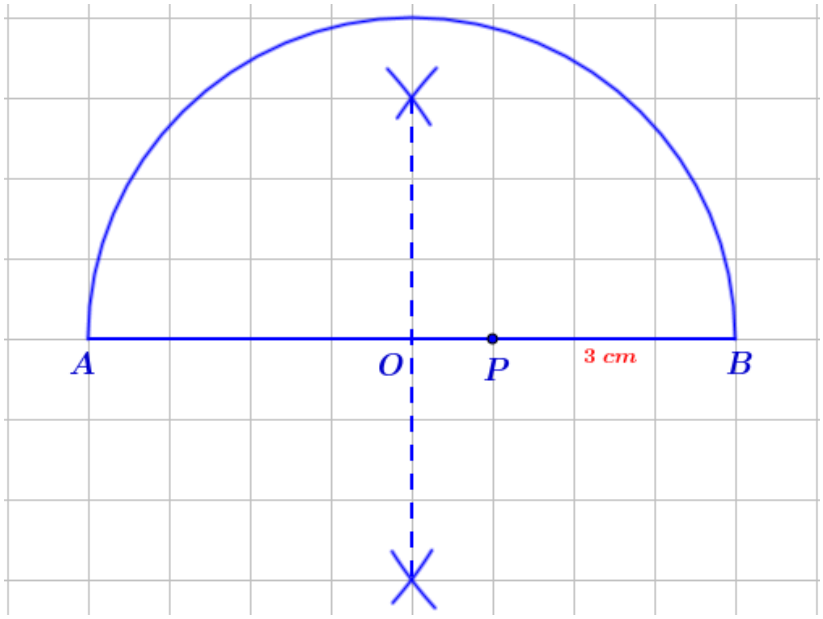
Step 2 : *Mark the midpoint (O) of the line AB .*



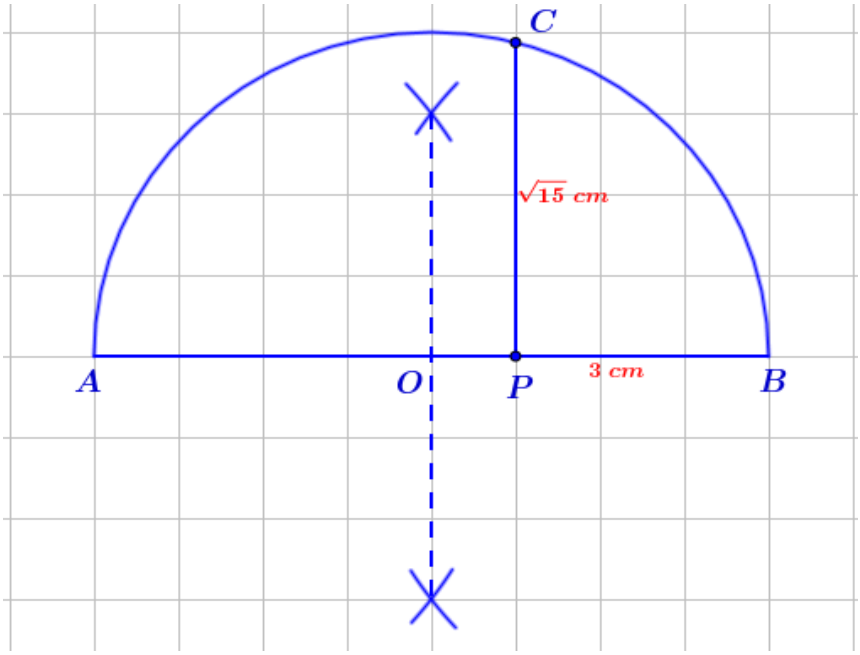
Step 3 : *Draw a semicircle with AB as diameter .*



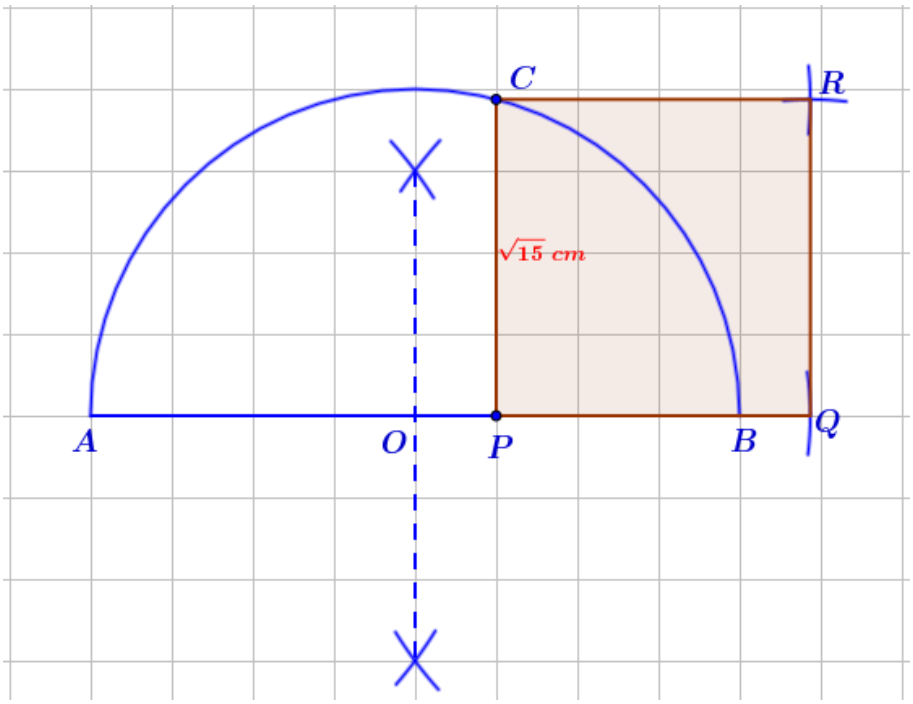
Step 4 : Mark a point P on AB 5 cm away from A .



Step 5 : The perpendicular to AB drawn through P intersect the circle at C . Draw the line CP



Step 6 : Draw a square with PC as side .



ONLINE MATHS CLASS - X - 34 (24 / 09 /2020)

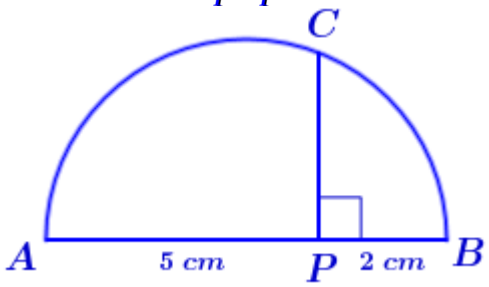
WORKSHEET

1. *In the figure AB is the diameter of the semicircle and the line PC is perpendicular to AB*

PA = 5 cm , PB = 2 cm

a) What is the length of PC ?

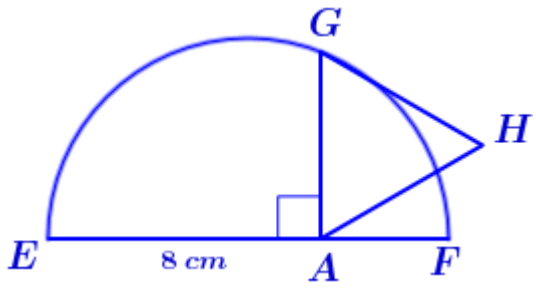
b) Draw a line of length $\sqrt{7}$ *cm ?*



2. *In the figure EF is the diameter of the semicircle and the line AG is perpendicular to EF. AGH is an equilateral triangle . Radius of the semicircle is 5 cm and AE = 8 cm*

a) *AE x AF = --------*

b) *What is the perimeter of the triangle AGH ?*

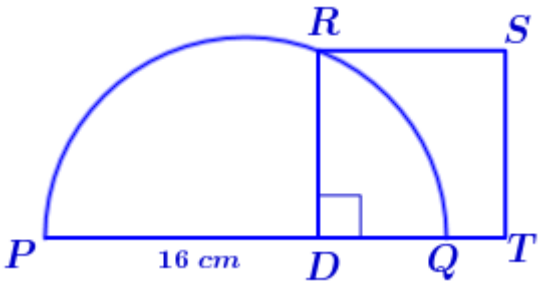


3. *In the figure PQ is the diameter of the semicircle and the line DR is perpendicular to PQ. DRST is a square .Radius of the semicircle is 10 cm and DP = 16 cm*

a) DP x DQ = --------

b) *What is the area of the square DRST ?*

c) *What is the perimeter of the square DRST ?*

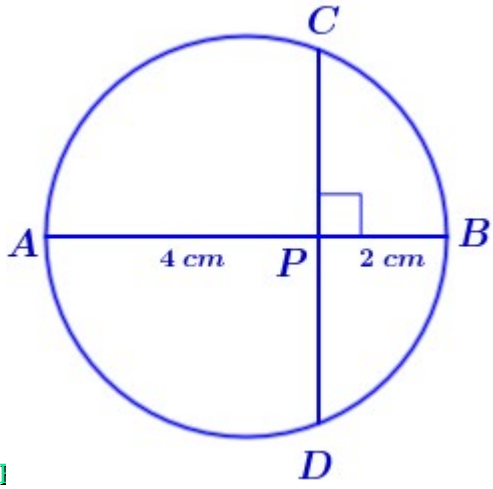


4. *In the figure AB is the diameter of the circle and the line CD is a chord perpendicular to AB . PA = 4 cm , PB = 2 cm*

a) *What is the length of PC ?*

b) *What is the length of PD ?*

c) *Draw an equilateral triangle of a side* $\sqrt{32}$ *cm ?*



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