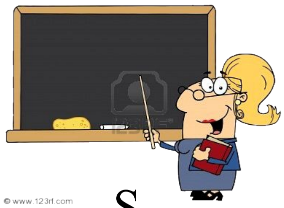
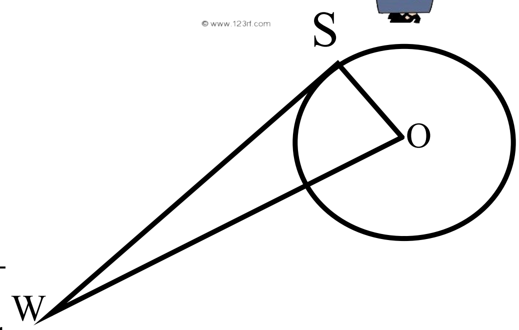
Curriculum Outcomes:

(SS1) Solve problems and justify the solution strategy using circle properties, including: the perpendicular from the centre of a circle to a chord bisects the chord; the measure of the central angle is equal to twice the measure of the inscribed angle subtended by the same arc; the inscribed angles subtended by the same arc are congruent; a tangent to a circle is perpendicular to the radius at the point of tangency.

Student Friendly:
How we can use the Chord properties to solve for unknown lengths. (Chord properties go hand and hand with Pythagorean theorem, angle sum of a triangle and isosceles triangles)

Warm Up





Fill in the blanks

1) The Tangent is _____

2) The center is labled with the letter _____

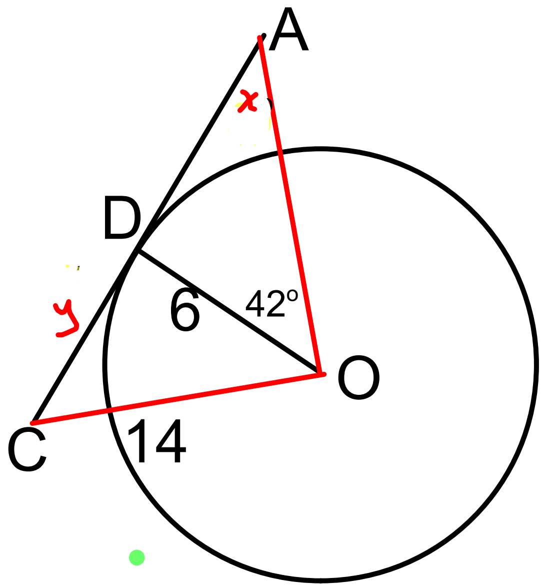
3) The point of tangency is labled with the letter ____

4) The radius is the line _____

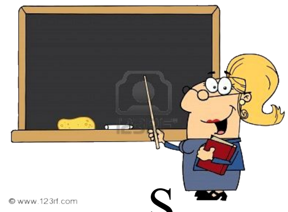
5) Find the length of the radius if OW = 17 and SW = 9

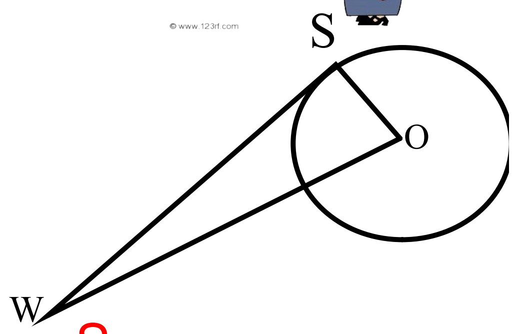
Warm Up

Determine the unknowns:



Warm Up





Fill in the blanks

1) The Tangent is SW

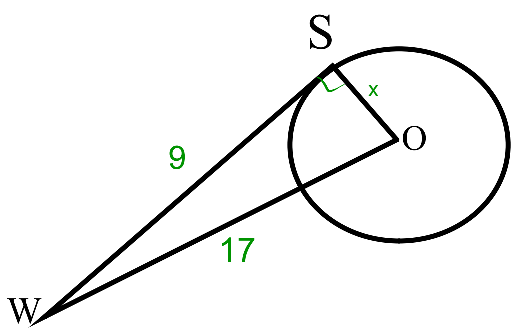
2) The center is labled with the letter O

3) The point of tangency is labled with the letter S

4) The radius is the line OS

SHOW YOUR WORK

5) Find the length of the radius if OW = 17 and SW = 9



<OSW=90° (TangP)

os ⇒ radius ⇒ leg

$a^2=c^2-b^2$

$a^2=17^2-9^2$

$a^2=289-81$

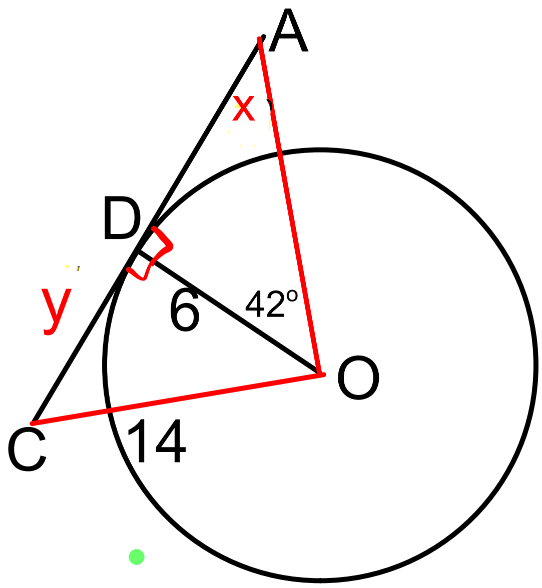
$a^2=208$

$a=\sqrt{208}$

$a = 14.4$

Warm Up

Determine the unknowns:



<ADO=90° (TangP)
<CDO=90° (TangP)

$X = 180 - 90 - 42$

$X = 48^\circ$ (SATT)

y ⇒ leg

$a^2 = c^2 - b^2$

$a^2 = 14^2 - 6^2$

$a^2 = 196 - 36$

$a^2 = 160$

$a = \sqrt{160}$

$a = 12.6$ cm

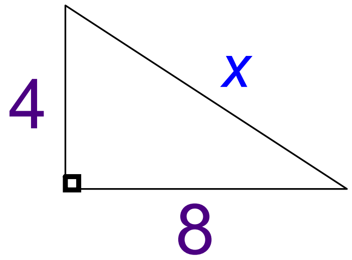
Calculating with **Tangents** We First

Identify the 90° <_ _ _ = 90° (Tang P)

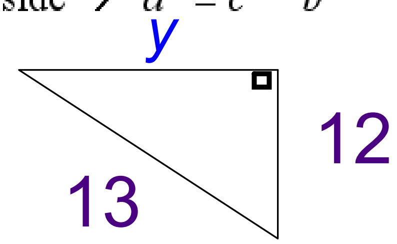
Then we use ...

1) Pythagorean Theorem

finding the hypotenuse → $c^2 = a^2 + b^2$



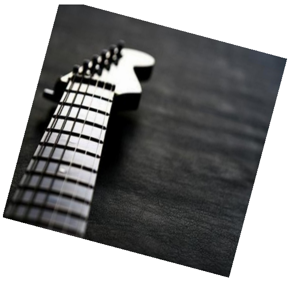
finding a side → $a^2 = c^2 - b^2$



or

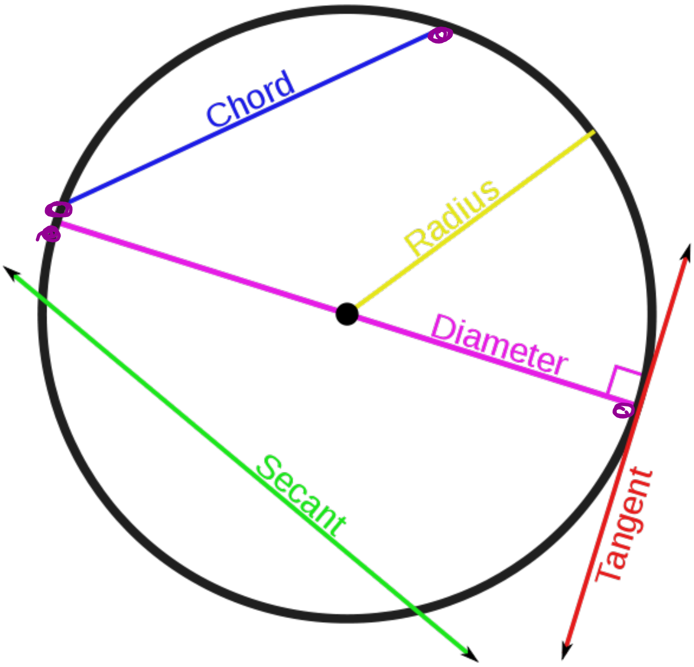
2) Angle Sum of Triangle

Unknown Angle= 180° - 90° - known angle



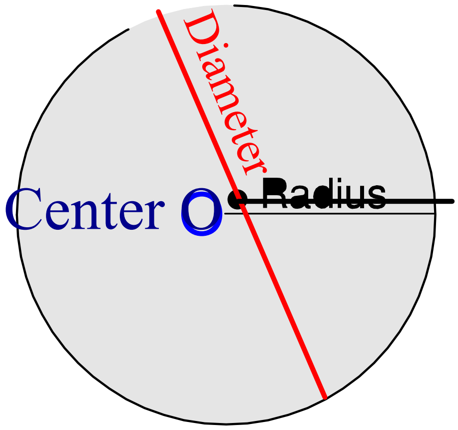
Section 8.2

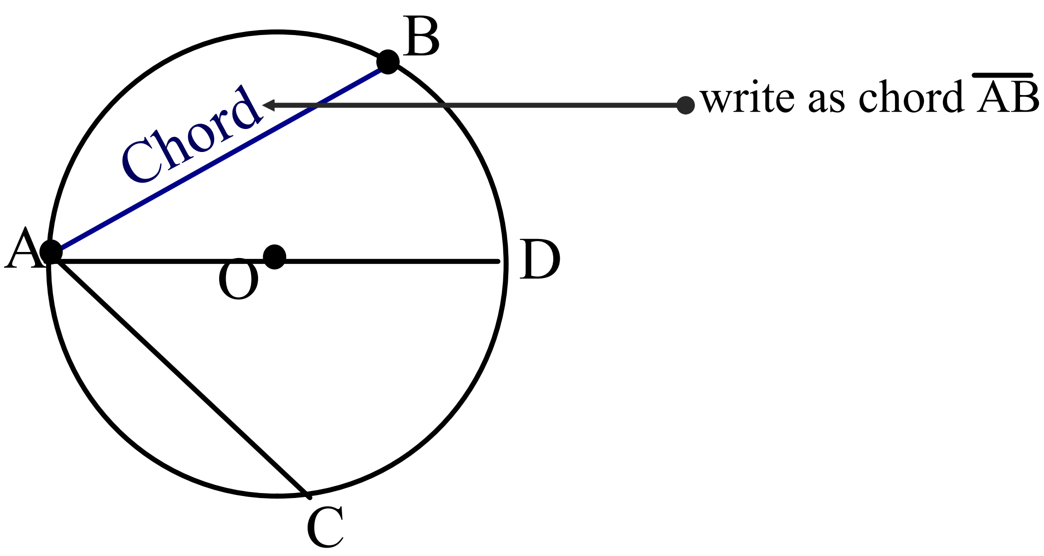
Properties of Chords in Circles



Properties of Circles & Terminology:

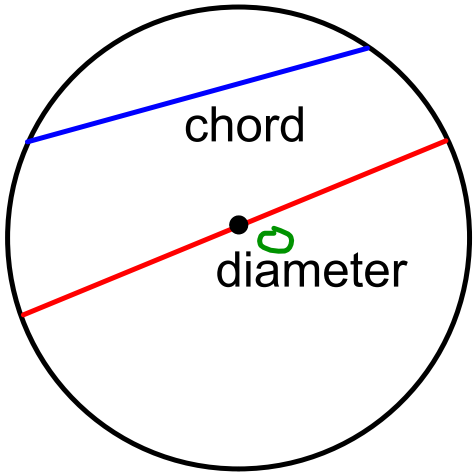
Circle - the set of all points that are equidistant from a fixed point.





- A line segment that joins two points on a circle is a **chord**.

- A **diameter** of a circle is a chord through the centre of the circle. It's the longest chord.



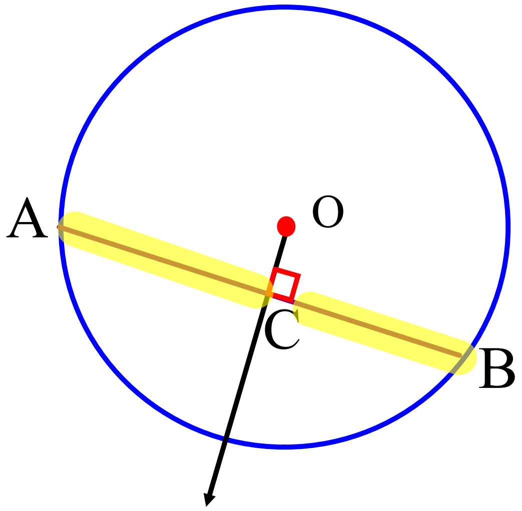
Perpendicular bisector:
→ line that cuts a chord into two equal pieces at 90° angle

Perpendicular to a Chord Property 1

- A line drawn from the centre of a circle that is perpendicular to a chord bisects the chord. (It cuts the chord into two equal parts.)

If OC is perpendicular to AB

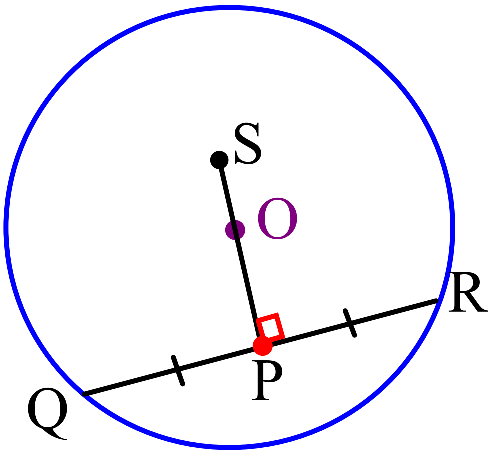
Then AC = CB (Chord P1)



Perpendicular to a Chord Property 2

- The perpendicular bisector of a chord in a circle passes through the centre of the circle.

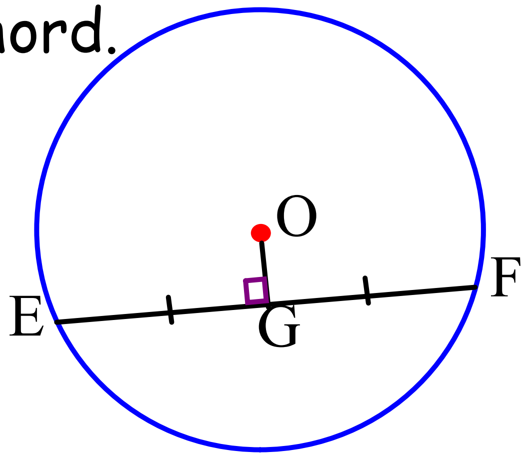
A perpendicular bisector of a chord must go through the centre.



Perpendicular to a Chord Property 3

- A line that joins the centre of a circle and the midpoint of a chord is perpendicular to the chord.

If O is the centre and EG = GF, then
$\angle OGE = \angle OGF = 90^0$.
(Chord P3)

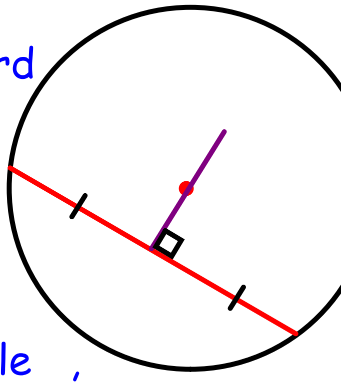


STOP!

Aren't they all saying the same thing?

Yes!
We know
that a

perpendicular bisector of a cord



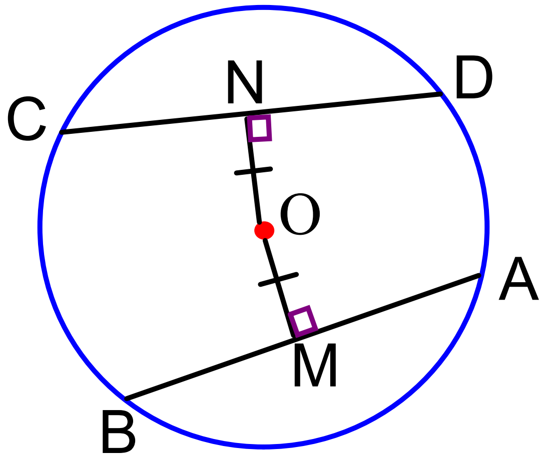
hits the cord at a 90 degree angle ,

the chord is cut in two equal pieces,

and passes through the centre.

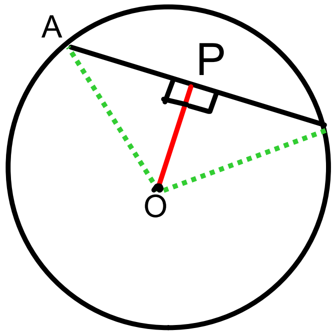
Perpendicular to a Chord Property 4

- Two chord that are equal distance from the center must be the same



If OM = ON,
then AB = CD
OR
If AB = CD,
then OM = ON

Chord Properties:

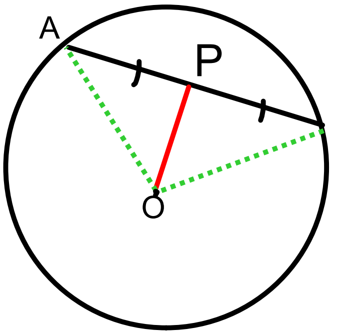


If given the 90°

<OPB=<OPA = 90° (Given)

then

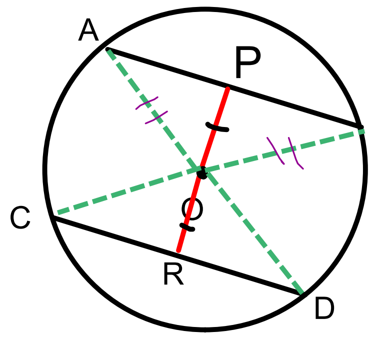
AP = PB (Chord P 1)



If the chord cut in two equal pieces **AP=PB (Given)**

then

<APO =<BPO = 90° (Chord P 3)



If given the perpendicular bisectors

OP =OR (Given)

then

AB = CD (Chord P 4)

If given two equal chords

AB= CD (Given)

then

OP = OR (Chord P 4)

To Solve use:

Angle= ___° (SATT) or (ITT)

Side= ___ cm (Pythagorean theorem)

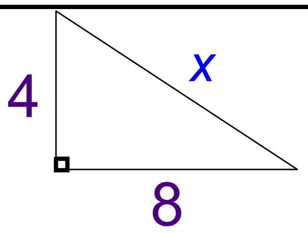
Working With Chords Lengths We Only Use ...

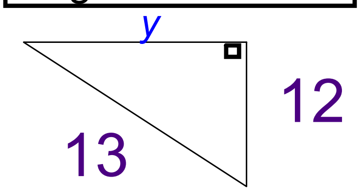
* **Note: the only reason they give you diameter is so you can use the radius** *

1) Pythagorean Theorem

hypotenuse $c^2 = a^2 + b^2$

leg $a^2 = c^2 - b^2$





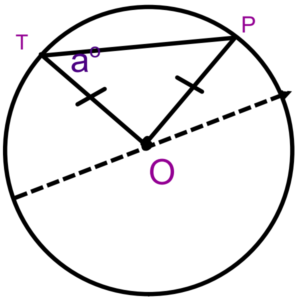
or

2) Angle Sum of Triangle (SATT)

Unknown Angle= 180° - 90° - known angle

or

3) Isosceles Triangle (ITT)



OT=0P⇒ radii

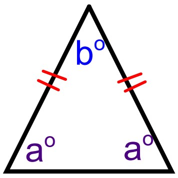
<OTP = <OPT (ITT)

Isosceles Triangle Theorem **(ITT)**

-Base angles in an isosceles triangles are equal

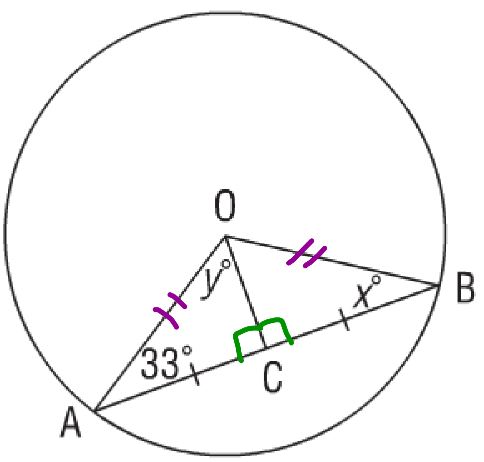
b= 180° - a° - a°

$a^\circ = \frac{180^\circ - b^\circ}{2}$



Determining the Measure of Angles in a Triangle

Example #1. Determine the values of x° and y°.



AC = BC (Given)

<OCA = <OCB = 90° (Chord P)

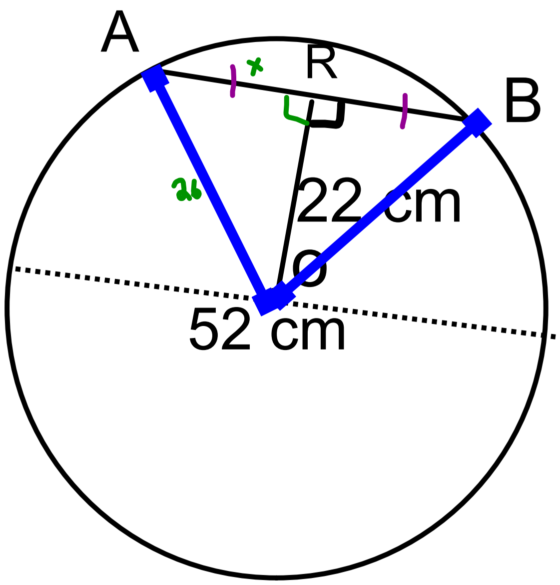
OB = OA (Radii)

y°= <AO

y°= <AOC = 57° (SATT)

x°= <OBC = 33° (ITT)

What is the length of the cord AB?



<ORB= <ORA = 90° (GIVEN)

AR = BR (Chord P)

OB = OA (Radii)= 26 cm

AR ⇒ leg

$a^2=c^2- b^2$

$a^2=26^2- 22^2$

$a^2=676 - 484$

$a^2=192$

$a =\sqrt{192}$

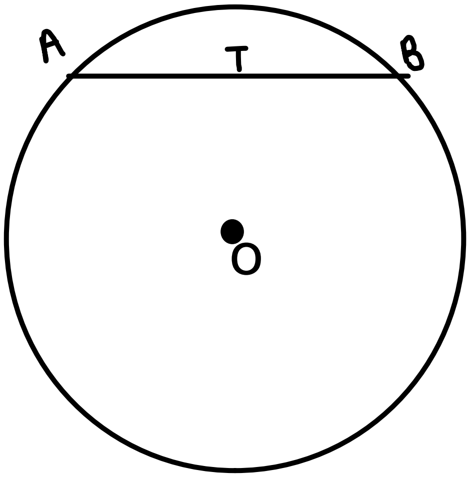
$a = 13.9$

AB = 2(13.9)

= 27.8cm

EXAMPLE...

A chord ATB that is 16.8 cm in length, is drawn in a circle that has a diameter of 21 cm. How far is the chord from the center of the circle?



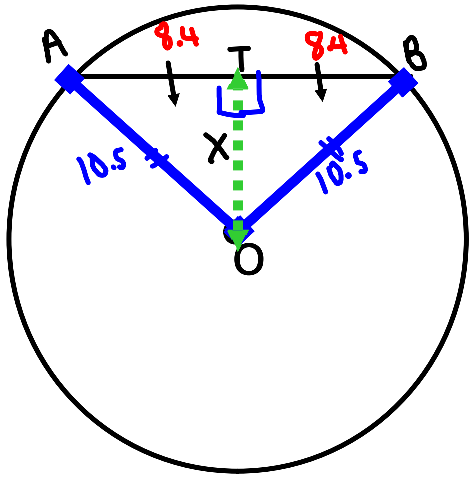
<_ _ _= <_ _ _ = 90°

_ _ = _ _ = __cm (Radii)

_ _ = _ _ = __ cm (Chord P)

EXAMPLE...

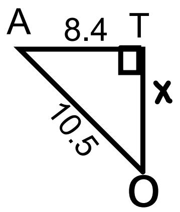
A chord ATB that is 16.8 cm in length, is drawn in a circle that has a diameter of 21 cm. How far is the chord from the center of the circle? ↳ $r=10.5$



<OTA= <OTB = 90° (Chord P)

OB = OA = 10.5 cm (Radii)

AT = BT = 8.4 cm (Chord P)



OT ⇒ leg

$a^2=c^2- b^2$

$a^2=10.5^2- 8.4^2$

$a^2=110.25 - 70.56$

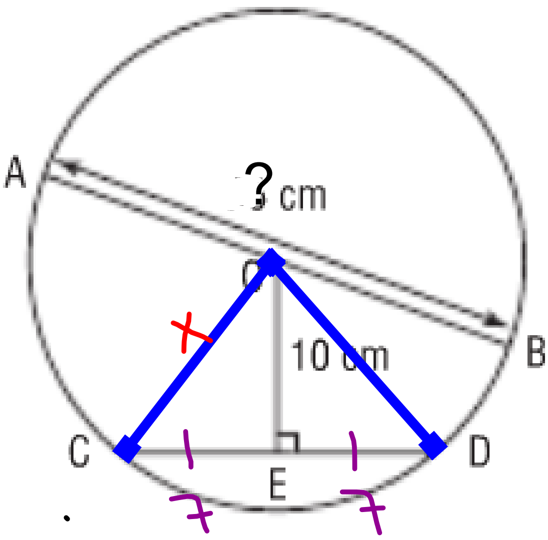
$a^2=39.69$

$a =\sqrt{39.69}$

$a = 6.3$ cm

Using the Pythagorean Theorem in a Circle

Example #2. What is the length of chord AB, to the nearest tenth, if CD is 14 cm?

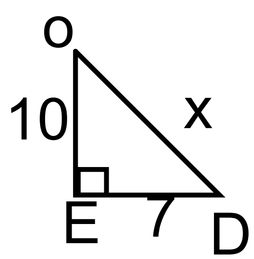


<OED = 90° (GIVEN)

CE = ED (Chord P)

OC = OD (Radii)

OD ⇒ Hyp



$c^2 = a^2 + b^2$

$c^2 = 7^2 + 10^2$

$c^2 = 49 + 100$

$c^2 = 149$

$c = \sqrt{149}$

$c = 12.2$ cm

AB=>Diametre

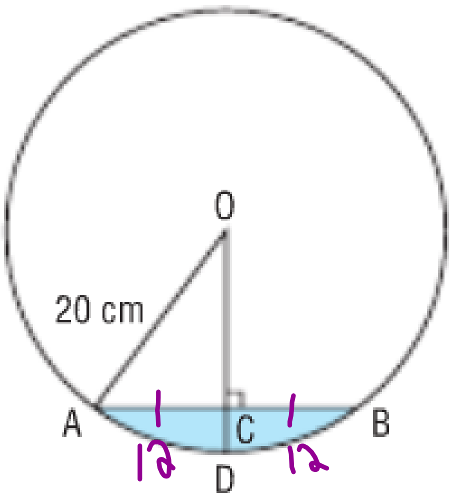
= 2(radius)

= 2(12.2)

= 24.4cm

Solving Problems Using the Property of a Chord and its Perpendicular

Example #3. Determine the length of CD, if the chord AB = 24cm

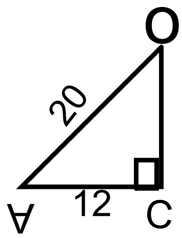


<OCA= <OCB= 90° (GIVEN)

OD=OB = OA = 20cm (Radii)

AB = BC = 12 (Chord P)

OT ⇒ leg



$a^2=c^2-b^2$

$a^2=20^2-12^2$

$a^2=400-144$

$a^2=256$

$a=\sqrt{256}$

$a = 16$ cm

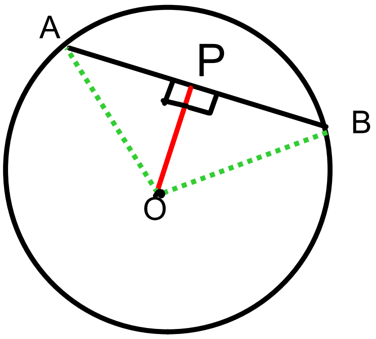
x=> CD

= OD-OC

= 20 - 16

= 4 cm

Chord Properties:

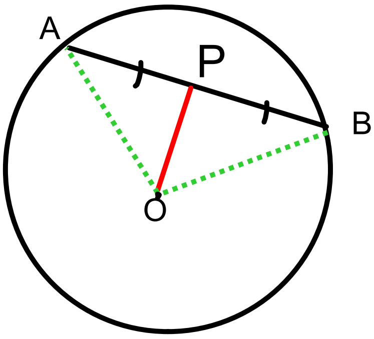


If given the 90^{o}

<OPB=<OPA = 90^{o} (Given)

then

AP = PB (Chord P 1)

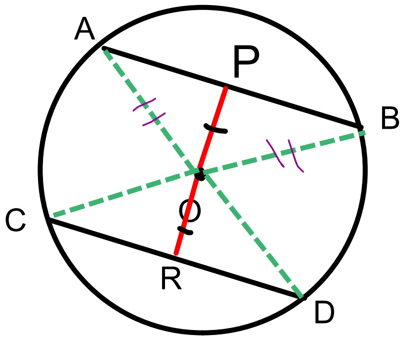


If the chord cut in two equal pieces

AP=PB (Given)

then

<APO =<BPO = 90^{o} (Chord P 3)



If given the perpendicular bisectors

OP =OR (Given)

then

AB = CD (Chord P 4)

If given two equal chords

AB= CD (Given)

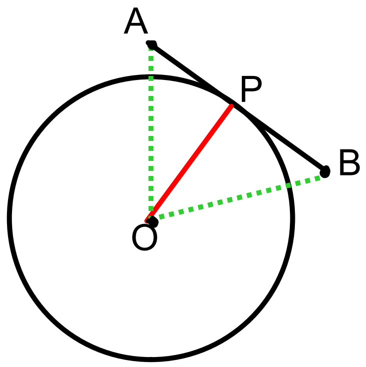
then

OP = OR (Chord P 4)

To Solve use:

Angle= ___ ^{o} (SATT) or (ITT)

Side= ___ cm (Pythagorean theorem)



Tangent Properties:

$<APO = 90^{o}$ (Tang P)

$<BPO = 90^{o}$ (Tang P)

To Solve use:

Angle= ___^{o} (SATT) $180^{o} - 90^{o}$ - given angle

Side= ___ cm (Pythagorean theorem)

$c = \sqrt{a^2 + b^2}$ Hypotenuse

$a = \sqrt{c^2 - b^2}$ Leg

Class/Homework

-click on the "Homework" link on my teachers page for optional review questions

- If you have any questions you can contact me on the

Remind app

or

through email:

melanie.burns@nbed.nb.ca