April 27, 2018

UNIT 8: CIRCLE GEOMETRY

8.2: PROPERTIES OF CHORDS IN A CIRCLE

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MATH 9

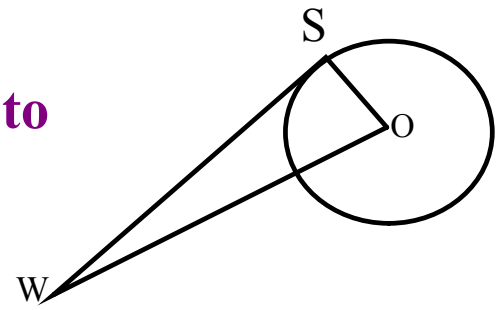
WHAT'S THE POINT OF TODAY'S LESSON?

We will continue working on the Math 9 Specific Curriculum Outcome (SCO) "Shape and Space 1" OR "SS1" which states:

"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."**

WARM UP QUIZ:
(sketch and use the diagram to the right)



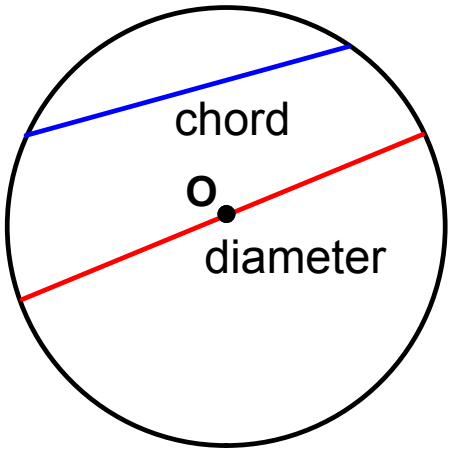
COPY AND ANSWER:

1. The tangent is line _____.
2. The centre of the circle is labeled _____.
3. The point of tangency is labeled _____.
4. The radius is line _____.
5. If OW is 17 cm and SW is 9 cm, what is the length of the radius to the nearest tenth?

HOMEWORK QUESTIONS?
(Pages 388/89/90/91, #3, 5, 6, 7, 9, 11, 12, 13, 14, 17, 18, 19, 20 & 22)

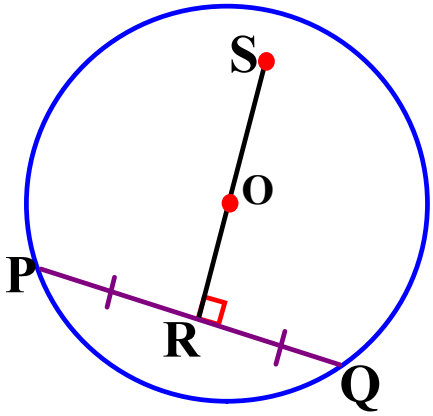
VOCABULARY:

1. CHORD: A line segment that joins two points on a circle. (A diameter of a circle is actually a special chord through the centre of the circle.)



VOCABULARY:

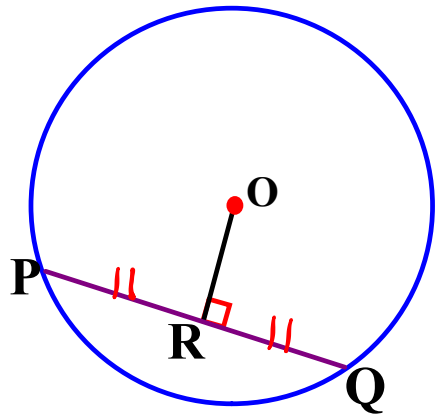
2. PERPENDICULAR BISECTOR: Intersects a line segment at 90° and divides the line segment into two equal parts.



PQ = chord (line segment)
SR = perpendicular bisector of PQ; therefore, PR = QR.

VOCABULARY:

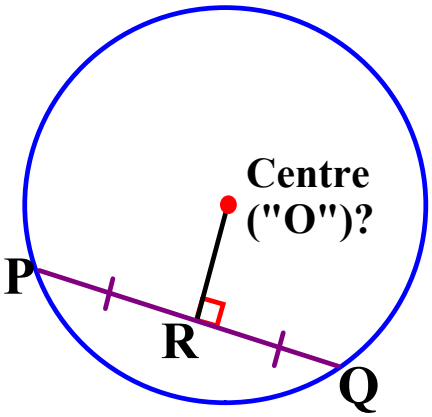
3. PERPENDICULAR TO CHORD PROPERTY 1 (PCP): The perpendicular from the centre of a circle to a chord bisects the chord.



O = centre of the circle (given)
<R = <R = 90° (given)
∴ PR = QR (PCP)

VOCABULARY:

4. PERPENDICULAR TO CHORD PROPERTY 2 (PCP): The perpendicular bisector of a chord in a circle passes through the centre of the circle.

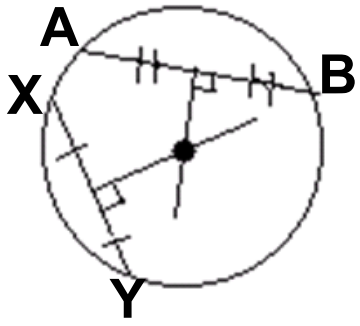


PR = QR (given)
<PRO = <QRO = 90° (given)
∴ O = centre of the circle (PCP)

PCP 2 - Taking it Further

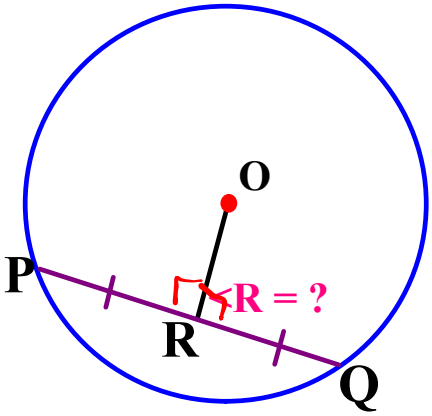
(You do not have to copy this - it is not used in grade 9 math; however, you may have to know this if you take more math courses after high school.)

To actually determine the location of the centre of a circle using PCP 2, two chords are drawn as well as their perpendicular bisectors. The point at which the two perpendicular bisectors intersect is the centre of the circle.



VOCABULARY:

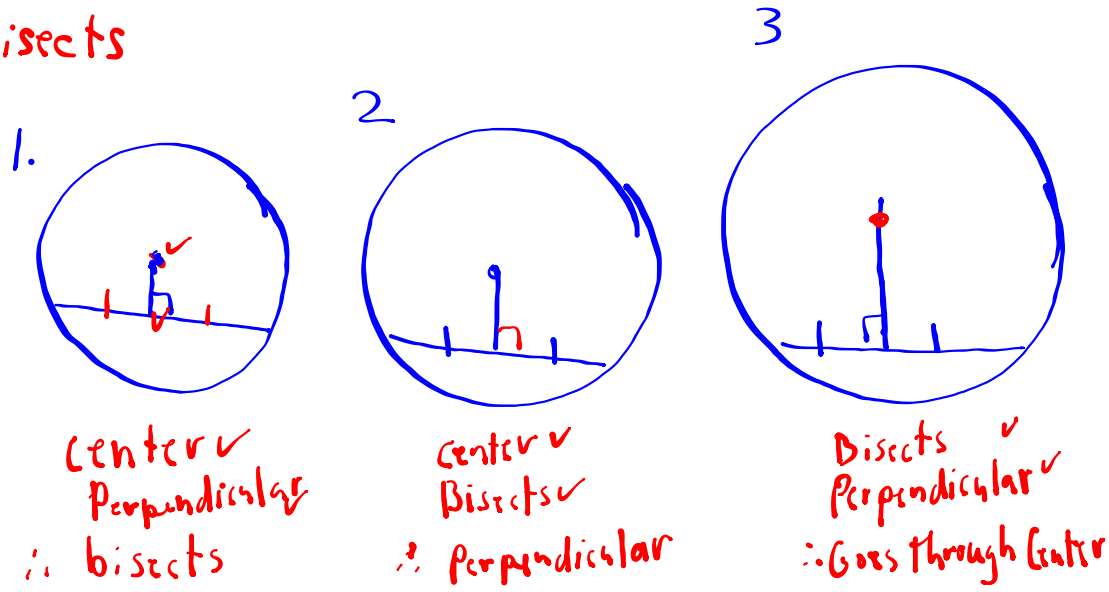
5. PERPENDICULAR TO CHORD PROPERTY 3 (PCP): A line that joins the centre of a circle to the midpoint of a chord is perpendicular to the chord.



PR = QR (given)
O = centre of the circle (given)
∴ <PRO = <QRO = 90° (PCP)

① center
② meets 90°
③ bisects

If you have 2 then you automatically have the third



STOP!

YES!!!

There are 3 pieces to the Perpendicular to Chord Property puzzle:

The perpendicular bisector of a chord in a circle passes through the centre of the circle, intersects with the chord at a 90° angle and cuts the chord into two equal pieces.

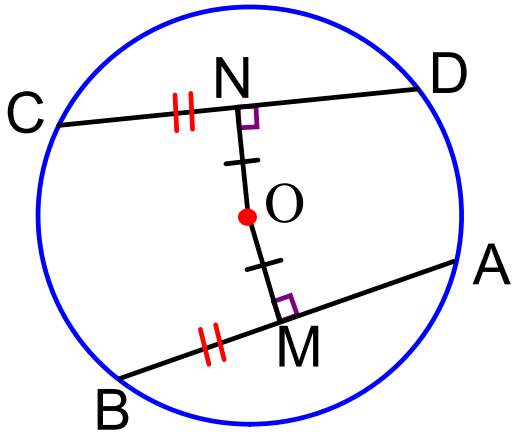
As long as you have 2 of the pieces of the puzzle, you automatically know the third.

VOCABULARY:

PERPENDICULAR TO CHORD PROPERTY 4 (PCP):

(Again, you do not have to copy this - it is not used in grade 9 math; however, you may have to know this if you take more math courses after high school.)

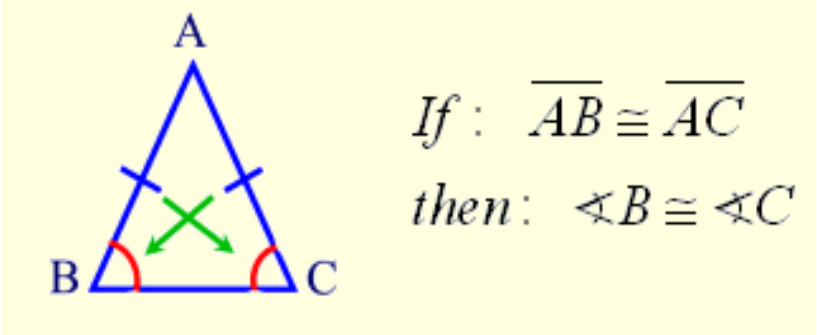
Two chords that are an equal distance from the centre of a circle are congruent.



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

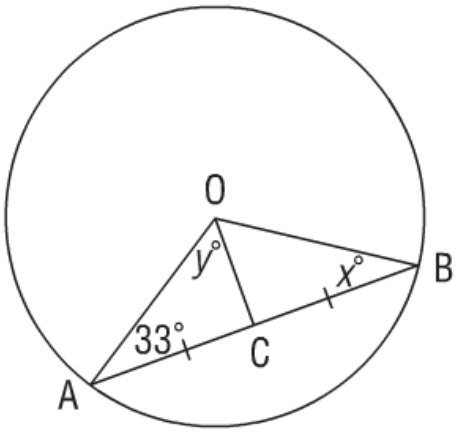
VOCABULARY:

6. ISOSCELES TRIANGLE THEOREM (ITT): The two angles that are opposite to the two congruent sides in an isosceles triangle are also congruent.



Determining the Measure of Angles in a Triangle

Example: Determine the values of x^o and y^o in the diagram below.

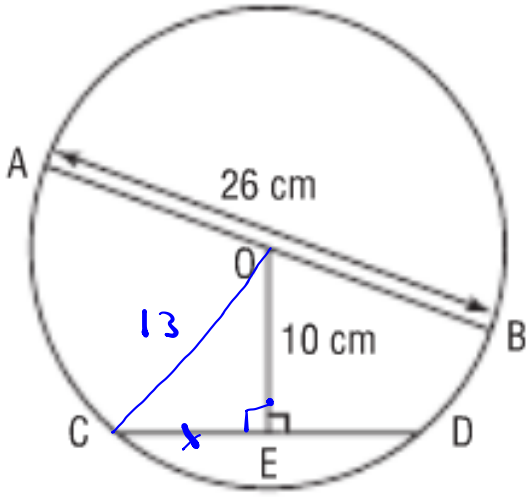


$\angle x = 33^o$ (ITT)

$\angle A = 33^o$ (given)
$\angle ACO = 90^o$ (PCP)
$\angle y = 57^o$ (SATT)

Using the Pythagorean Theorem in a Circle

Example: What is the length of chord CD to the nearest tenth?

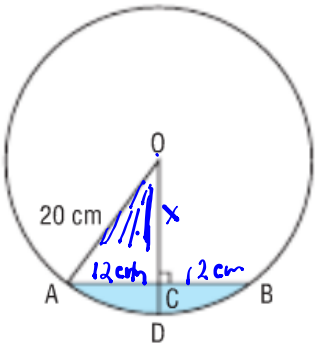


$a^2 = c^2 - b^2$
$= 13^2 - 10^2$
$= 169 - 100$
$= 69$
$a = \sqrt{69}$
$= 8.3$
$CD = 2(8.3)$
$= 16.6$ cm

ANSWER: 16.6 cm

Solving Problems Using the Property of a Chord and its Perpendicular

Example: Determine the length of CD in the diagram below.



AB = 24 cm

$OD = 20$ (radius) given

$OC = x$

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

$x^2 = 20^2 - 12^2$

$= 400 - 144$

$= 256$

$x = 16$

$CD = 20 - 16$

$= 4$ cm

ANSWER: 4 cm

CONCEPT REINFORCEMENT:

MMS9:

PAGE 397: #3 TO #6

PAGE 398: #7 TO #12 [10(a) = 3.5]

PAGE 399: #13, 14, 15, 17, 18 & 19

PAGE 403: #4 TO #7

PAGE 419: #5 TO #8