

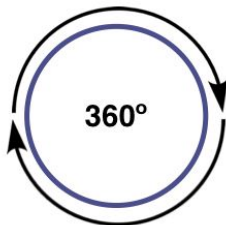
The SAT Initiative

G11 Topic Breakdown
SOL - Geometry
Written by Nicole D'Onofrio

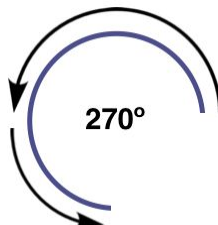
Using angles, arcs, chords, tangents, and secants

- Investigate, verify, and apply properties of circles
- Solve real-world problems involving properties of circles
- Find arc lengths and areas of sectors in circles

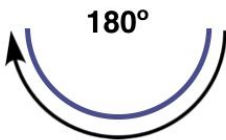
Full circle = 360°



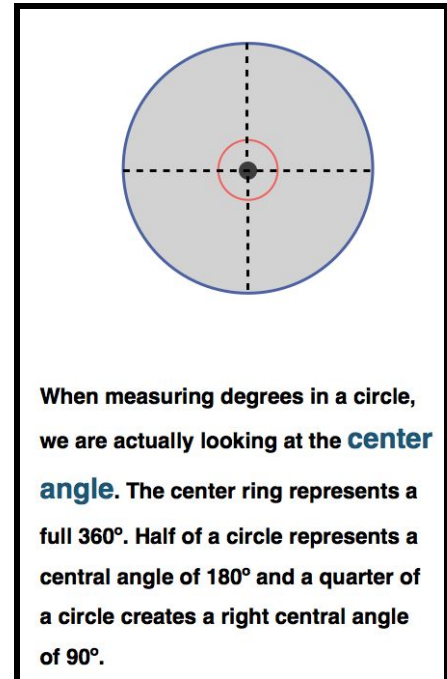
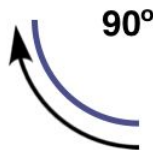
$\frac{3}{4}$ of a circle = 270°



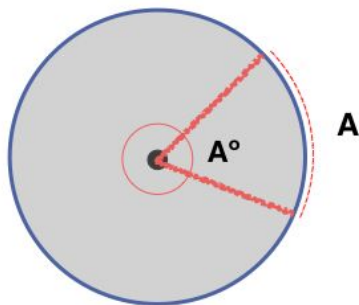
$\frac{1}{2}$ of a circle = 180°



$\frac{1}{4}$ of a circle = 90°



Note → The dotted red line segment represents an **"arc"**



OBJECTIVE: Finding an angle that lies on the center of a circle.

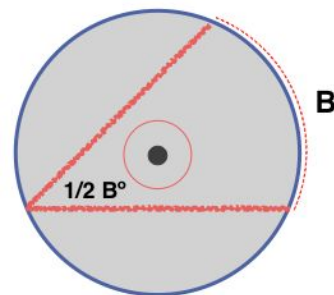
FORMULA: Angle A = Arc A

ASSUME: Arc A = 20°

SOLVE: Angle A

$$20 = 20$$

$$20^\circ$$



OBJECTIVE: Finding an angle that lies inside of a circle but not on the center.

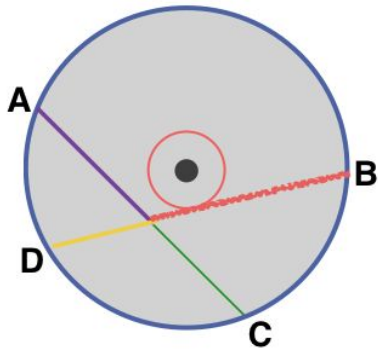
FORMULA: Angle = $\frac{1}{2}$ Arc B

ASSUME: Arc B = 30°

SOLVE: Inside Angle

$$30 = \frac{1}{2} (B)$$

$$15^\circ$$



OBJECTIVE: Solve for the length of line segments that intersect within a circle, but do not pass through the center point.

FORMULA: $A(C) = B(D)$

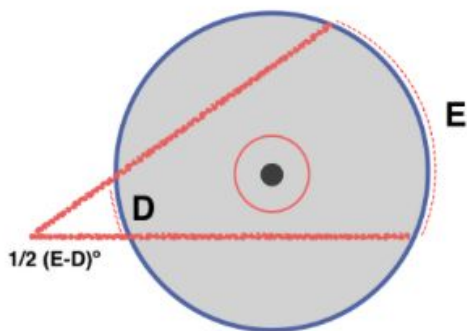
ASSUME: $A = 4$, $B = 8$, $D = 3$

SOLVE: Segment C

$$4(C) = 8(3)$$

$$4(C) = 24$$

$$C = 6$$



OBJECTIVE: Finding the measure of an angle that is outside of a circle.

FORMULA: Outside Angle = $\frac{1}{2}(\text{Arc E} - \text{Arc D})$.

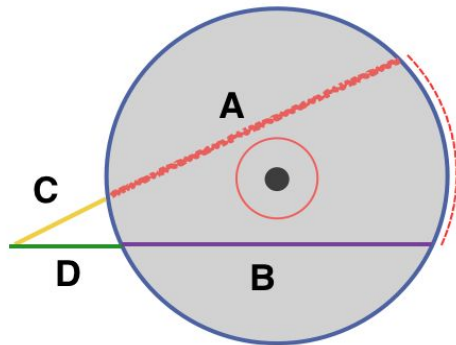
ASSUME: Arc E = 40° and Arc D = 20°

SOLVE: Outside Angle

$$\frac{1}{2}(40 - 20)$$

$$\frac{1}{2}(20)$$

$$10^\circ$$



OBJECTIVE: Finding the length of line segments that create an angle outside of the circle.

FORMULA: $c(c + a) = d(d + b)$.

ASSUME: $A = 3$, $C = 2$ and $D = 2$.

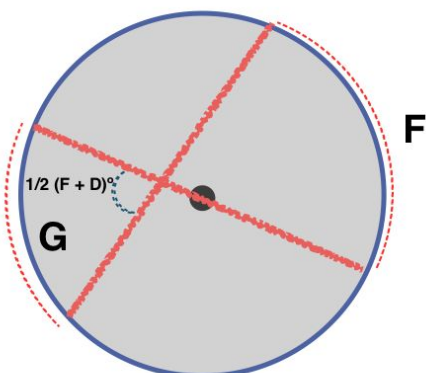
SOLVE: Segment B.

$$(2)(3 + 2) = (2)(2 + B)$$

$$10 = B2 + 4$$

$$6 = B2$$

$$B = 3$$



OBJECTIVE: Finding the measure of an angle that is inside of a circle but doesn't cross through the center point.

FORMULA: Inside Angle = $\frac{1}{2}(\text{Arc F} + \text{Arc G})$.

ASSUME: Arc F = 40° and Arc G = 30°

SOLVE: Inside Angle

$$\frac{1}{2}(30 + 40)$$

$$\frac{1}{2}(70)$$

$$35^\circ$$

OBJECTIVE: Finding the measure of a line segment, created by a radius and a tangent line to the circle.

FORMULA: $(AB)^2 + (BC)^2 = (AC)^2$

ASSUME: $AB = 8$ and $BC = 6$

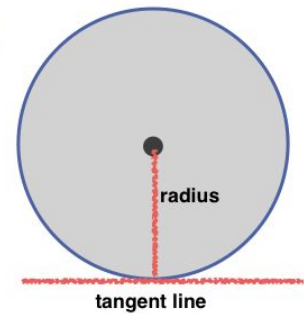
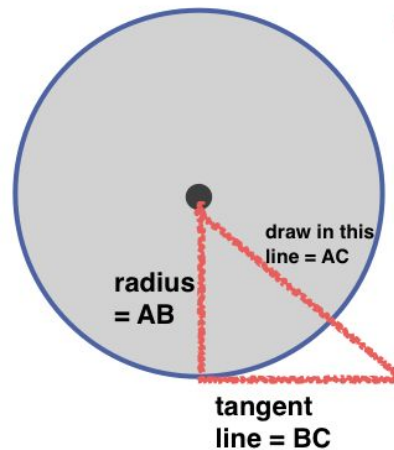
SOLVE: Segment AC

$$(8)^2 + (6)^2 = (AC)^2$$

$$64 + 16 = (AC)^2$$

$$100 = (AC)^2$$

$$10 = AC$$



FINDING THE LENGTH OF AN ARC

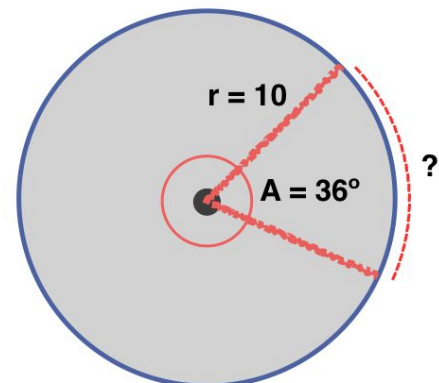
GIVEN: $r = 10$ and angle $= 36^\circ$

$$\text{Arc Length} = (\text{Given Angle} / 360) (2\pi r)$$

$$\text{Arc Length} = (36^\circ / 360) (2\pi 10)$$

$$\text{Arc Length} = .10 (20\pi)$$

$$\text{Arc Length} = 2\pi$$



FINDING THE AREA OF A SECTOR

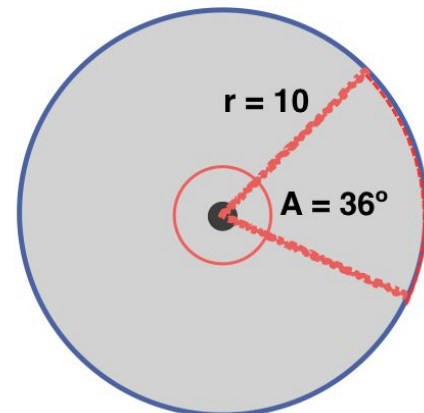
GIVEN: $r = 10$ and angle $= 36^\circ$

$$\text{Area} = (\text{Given Angle} / 360) (\pi r^2)$$

$$\text{Area} = (36^\circ / 360) (\pi 10^2)$$

$$\text{Area} = .10 (100\pi)$$

$$\text{Area} = 10\pi$$



REVIEW

CIRCUMFERENCE = π (diameter)

AREA = πr^2

VOCAB

CIRCLE = A closed figure in which every point on the perimeter is equally as far from the center

TANGENT LINE = A straight line segment that only touches one point on a circle

CHORD = A line segment that connects two points on a circle

RADIUS = A line segment that connects the center of the circle to any other point on the circle

DIAMETER = A chord that passes through the center of a circle

ARC = A curve created by two points on the perimeter of a circle

SEMICIRCLE = A curve created by two points; it is half of a circle

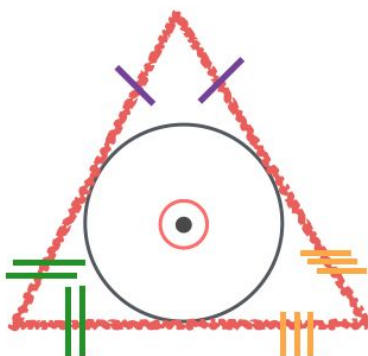
CENTRAL ANGLE = The angle that is created by two radii touching the center of a circle.

Secant Line v. Tangent Line

A **secant line** begins at one point on a circle then passes through another point on the same circle. A **tangent line** only touches one point on a circle.

Formula for Circle Area $(x-h)^2 + (y-k)^2 = r^2$

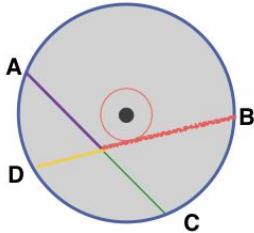
NOTE: x and y are usually given as **coordinate points** (x,y) and r represents the **radius** of the circle



The diagram to the left shows the relationship between segments of **tangent lines** that intersect outside of the circle. Segments with matching colored lines are **the same length**.

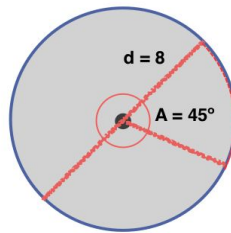
Practice Problems

G.11 Review



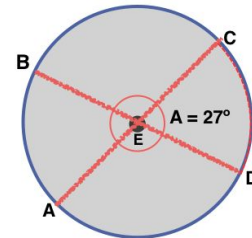
1. The two chords in the above circle intersect to create four distinct line segments. Segment A = 8, Segment B = 12 and Segment C = 6. What is the measurement of Segment D?

- A) 8
- B) 2
- C) 6
- D) 4



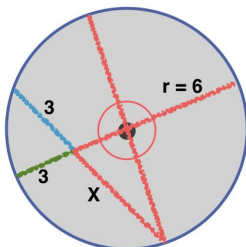
2. The circle above has a diameter of 8. There is also a given central angle of 45° . What is the area of the sector?

- A) 360π
- B) 2π
- C) 8π
- D) 45



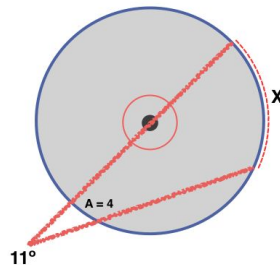
3. The above circle has a given central angle of 27° . Segment AC = 12. What is the length of arc CD?

- A) $.9\pi$
- B) 12
- C) 6π
- D) 1.8π



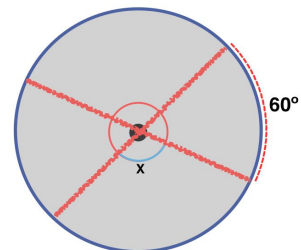
4. The circle above has a radius of 6. Find the length of the line segment labeled X.

- A) 18
- B) 9
- C) 6
- D) 3



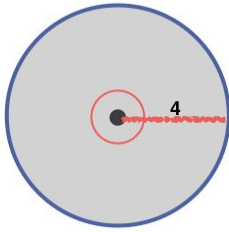
5. The circle above shows two secant lines that intersect to create an angle of 11° . Arc A = 4. Find the length of Arc X.

- A) 15
- B) 26
- C) 22
- D) 44



6. The circle above shows an arc of 60° . Find the measurement, in degrees, of Angle X.

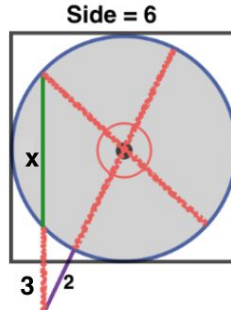
- A) 320°
- B) 60°
- C) 120°
- D) 240°



7. Circle Q has a radius of 4 and h value of -2. Which of the following equations could represent circle Q?

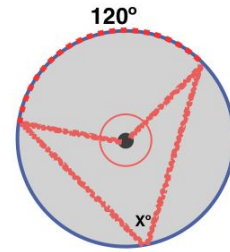
- A) $(x-2)^2 + (y-2)^2 = 4$
- B) $(x+2)^2 + (y-2)^2 = 4$
- C) $(x-2)^2 + (y-1)^2 = 16$
- D) $(x+2)^2 + (y-1)^2 = 16$

Figure is not drawn to scale.



8. The figure above shows a circle inscribed in a square. The length of the side of the square is 6 units. Find the length of the segment labeled X.

- A) $7/3$ units
- B) 7 units
- C) 3 units
- D) 2 units



9. The circle above shows an arc with 120° and two chords that intersect to form Angle X. Find the value of Angle X.

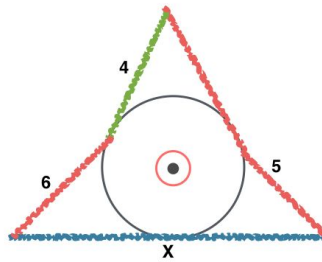
- A) 60°
- B) 120°
- C) 30°
- D) 90°



side = 14

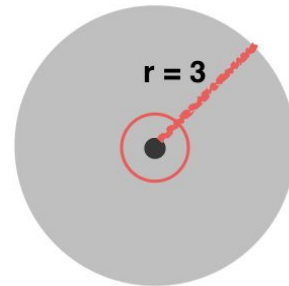
10. The figure above shows a circle inscribed in a square. The square's side has a length of 14 units. Find the area of the circle.

- A) 14π
- B) 49π
- C) 196
- D) 147π



11. The figure above shows a circle surrounded by tangent lines. Find the length of tangent line X.

- A) 15
- B) 10
- C) 11
- D) 6



12. The figure above shows a circle with a radius of 3. Find the area of the circle.

- A) 36π
- B) 12π
- C) 3π
- D) 9π

Answer Key: Practice Problems

G.11 Geometry

1.	D
2.	B
3.	A
4.	B
5.	B
6.	C
7.	D
8.	A
9.	A
10.	B
11.	C
12.	D