Arc Length and Sector Area - Lesson 2

Arc Length - Non-Calculator

LI

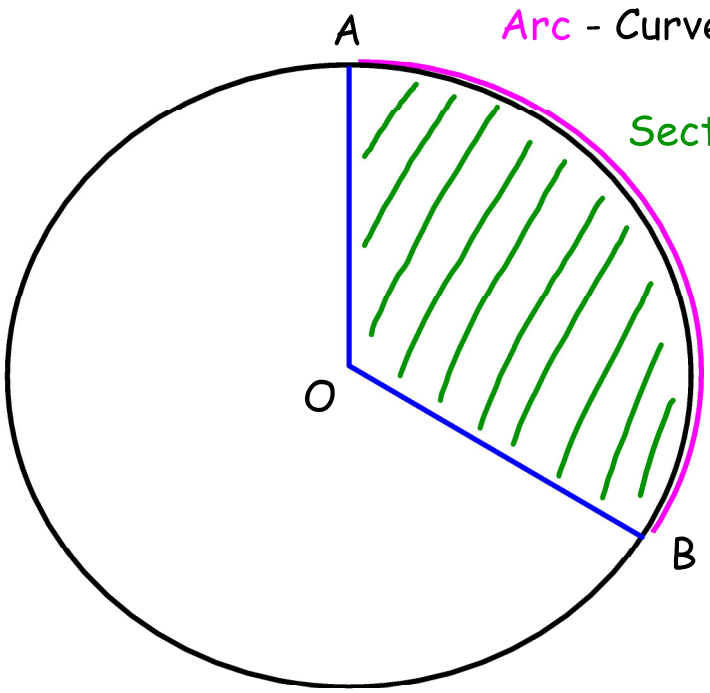
- Calculate the Arc Length of a circle without a calculator.

SC

- Use the Arc Length Formula.
- Non-calculator arithmetic.

Oct 26-07:57

Parts of a Circle



Arc - Curved part from A to B (along edge)

Sector - Region between O, A and B

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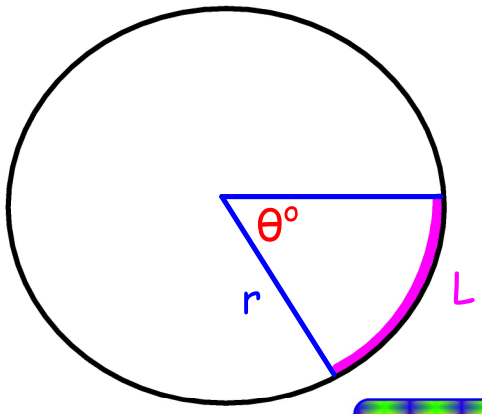

r = Radius

θ° = Sector Angle

L = Arc Length

The Arc Length (aka Length of Arc) is calculated using the formula :

$$L = \frac{\theta^\circ}{360^\circ} \times 2\pi r$$

May 10-14:51

Example 1

Calculate the exact arc length (meaning leave the answer in terms of π) of a circle with radius 2 cm and sector angle 180°.

$$\theta^\circ = 180^\circ, \; r = 2 \text{ cm}$$

$$L = \frac{\theta^\circ}{360^\circ} \times 2\pi r$$

$$\Rightarrow L = \frac{180^\circ}{360^\circ} \times 2 \times \pi \times 2$$

$$\Rightarrow L = 2 \times \pi \times 2 \div 2$$

$$\Rightarrow \boxed{L = 2\pi \text{ cm}}$$

Example 2

Calculate the exact arc length (meaning leave the answer in terms of π) of a circle with radius 15 mm and sector angle 120°.

$$\theta^\circ = 120^\circ, \; r = 15 \text{ mm}$$

$$L = \frac{\theta^\circ}{360^\circ} \times 2\pi r$$

$$\Rightarrow L = \frac{120^\circ}{360^\circ} \times 2 \times \pi \times 15$$

$$\Rightarrow L = 2 \times \pi \times 15 \div 3$$

$$\Rightarrow \boxed{L = 10\pi \text{ mm}}$$

Example 3

Taking $\pi = 3.14$, calculate the arc length of a circle with radius 2 m and sector angle 90°.

$$\theta^\circ = 90^\circ, \; r = 2 \text{ m}$$

$$L = \frac{\theta^\circ}{360^\circ} \times 2\pi r$$

$$\Rightarrow L = \frac{90^\circ}{360^\circ} \times 2 \times 3.14 \times 2$$

$$\Rightarrow L = 2 \times 3.14 \times 2 \div 4$$

$$\Rightarrow L = 2 \times 2 \div 4 \times 3.14$$

$$\Rightarrow \boxed{L = 3.14 \text{ m}}$$

Example 4

Taking $\pi = 3.14$, calculate the arc length of a circle with radius 3 cm and sector angle 180°.

$$\theta^\circ = 180^\circ, \; r = 3 \text{ cm}$$

$$L = \frac{\theta^\circ}{360^\circ} \times 2\pi r$$

$$\Rightarrow L = \frac{180^\circ}{360^\circ} \times 2 \times 3.14 \times 3$$

$$\Rightarrow L = 2 \times 3.14 \times 3 \div 2$$

$$\Rightarrow L = 2 \times 3 \div 2 \times 3.14$$

$$\Rightarrow L = 3 \times 3.14$$

$$\Rightarrow \boxed{L = 9.42 \text{ cm}}$$

Calculate the lengths of these arcs :

Exact length (answer in terms of π)	Take $\pi = 3.14$
1) $\theta^\circ = 180^\circ$, $r = 4$ cm	7) $\theta^\circ = 120^\circ$, $r = 9$ mm
2) $\theta^\circ = 45^\circ$, $r = 400$ mm	8) $\theta^\circ = 40^\circ$, $r = 45$ in
3) $\theta^\circ = 9^\circ$, $r = 160$ m	9) $\theta^\circ = 45^\circ$, $r = 16$ cm
4) $\theta^\circ = 40^\circ$, $r = 22.5$ ft	10) $\theta^\circ = 60^\circ$, $r = 3/2$ yd
5) $\theta^\circ = 72^\circ$, $r = 900$ yd	11) $\theta^\circ = 180^\circ$, $r = 100$ m
6) $\theta^\circ = 240^\circ$, $r = 330$ in	12) $\theta^\circ = 20^\circ$, $r = 72$ ft

Nov 30-12:12

Answers

Exact length (answer in terms of π)	Take $\pi = 3.14$
1) 4π cm	7) 18.84 mm
2) 100π mm	8) 31.4 in
3) 8π m	9) 12.56 cm
4) 5π ft	10) 1.57 yd
5) 360π yd	11) 314 m
6) 440π in	12) 25.12 ft