

Snake Eyes

Lesson Information
<i>From 1000problems.com</i>
Subject:
Geometry
Topic:
Geometry and Measurement
Technology:
None
Level:
Difficult
Activity Structure:
Self-Guided Problem Solving
Duration of Activity:
Part of a Class

Overview:

An interesting problem that has students find the area of a particular section of a circle (one that resembles the pupil of a snake's eye). The result is rather surprising, because the area does not involve pi!

Learning Objectives:

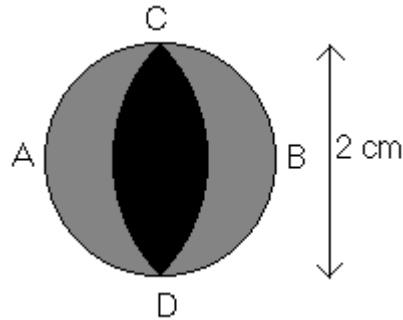
- To practice finding the area of a sector
- To practice using geometric area formulas to find a shaded area
- To practice using the Pythagorean theorem

Materials:

- Paper
- Pencil
- Worksheet

Snake Eyes

The King Cobra is the world's largest poisonous snake. It can grow to over 5 meters long and has large bronze-colored eyes, with a black central 'slit'. The shape of the eye is shown below.



Take the arcs drawn between C and D as having centers A and B.

The Problem:

Find the total area shown lightly shaded (the bronze part of a Cobra's eye).

Solution:

Surprisingly, the area concerned does not involve π !

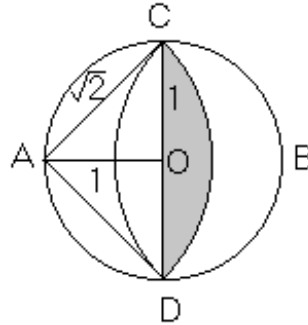
Radius of sector CAD = $\sqrt{2}$
Angle of sector CAD = 90°

Hence area of sector CAD = $\frac{1}{4} \pi (\sqrt{2})^2$
= $\frac{1}{2} \pi$

Area of triangle CAD = 1

Hence shaded area = $\frac{1}{2} \pi - 1$

And total area desired = $\pi(1)^2 - 2(\frac{1}{2} \pi - 1)$
= **2 cm²**



This is rather a nice change for those of us accustomed to π cropping up *whenever* circles are involved!