Making Sense of Radians

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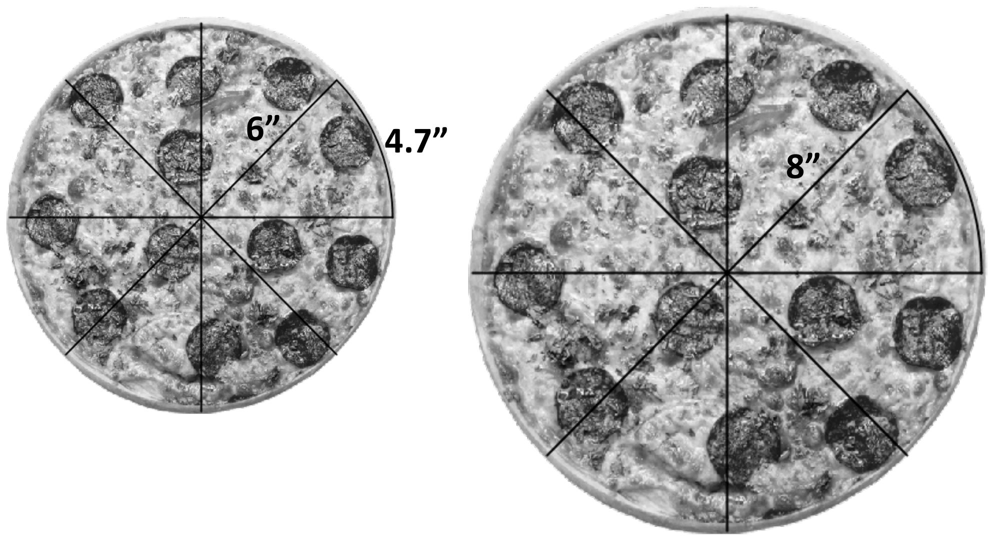
Radians, Proportions, and Pizzas

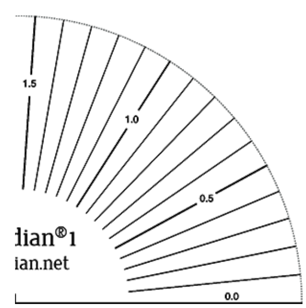
1. Al Brown is doing a sequel to his popular, “The Crust is an Annulus,” episode from Unit 3. Since he has just learned about radians, he wants to know if they’ll help his pizza/crust ratio analysis.



a. If a slice (1/8) of a 12” diameter pizza has 4.7” of crust, how much crust will a slice from a 16” pizza have?

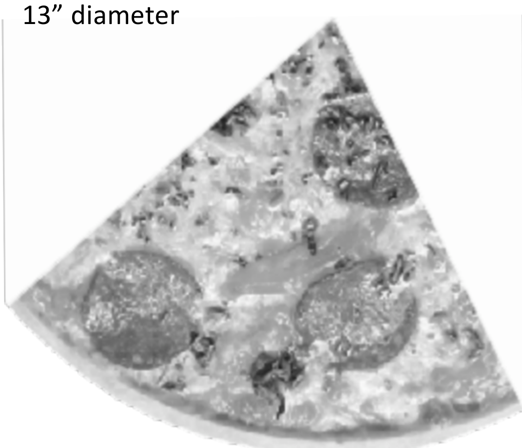
b. Use the measurements from [a] to calculate the central angle in radians.

c. Use ProRadian1 to measure the angle. Mark it on this image:

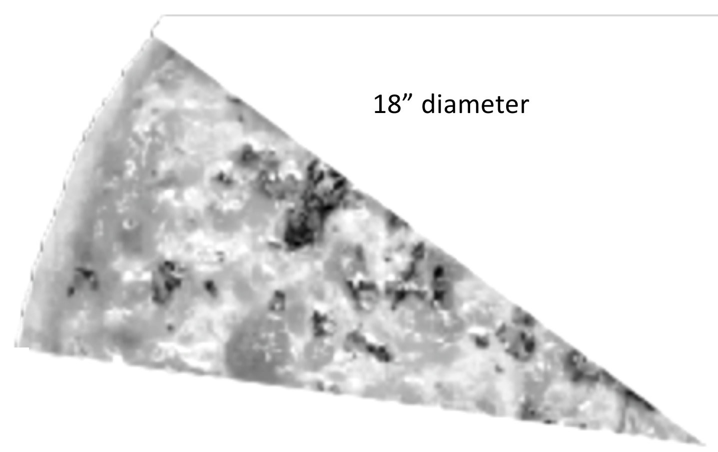


2. Measure each angle to find out how much crust (in inches) would he get with each of these slices.

13” diameter



18” diameter

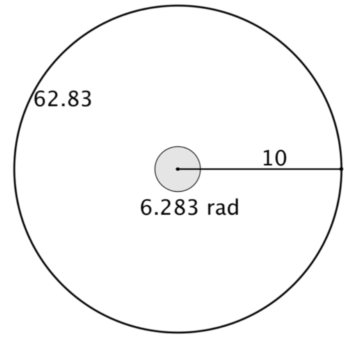


3. And then Al began to wonder… would radians help find the **area** of the pizza?

   Let's recap how we found the area of a sector. (Remember Hector, the pizza guy?)

   Area of a circle: πr^2 Fractional part: a°/360° **Area of a sector: (a°/360°)(πr^2)**

We've been working with the direct variation equation, **s = θ r**, with θ in radians.



Can we connect a "π-based" definition to a radian measure?

Recall that the formula for the circumference of a circle is C=2πr.

What if your arc was actually the whole circle? Then _____ = C.

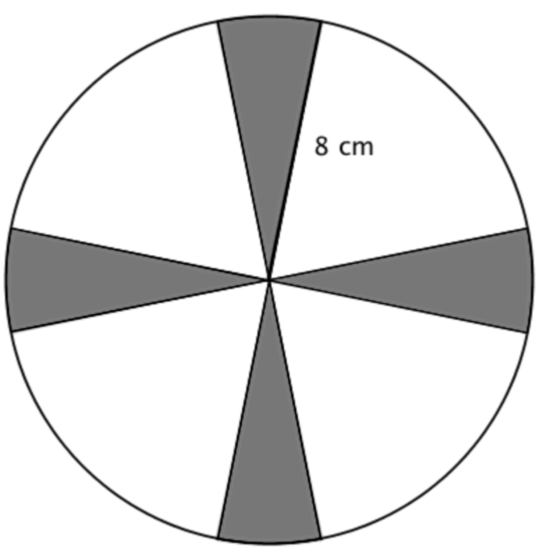
If $\boxed{C = 2\pi r}$, $\boxed{C = s}$, and $\boxed{s = \theta\, r}$, then $\boxed{2\pi r = \theta\, r}$ and $\boxed{2\pi = \theta}$ is a full circle.

That means that a fractional part of the circle is θ/(2π). Then, the area of a sector is: $\boxed{A = \frac{\theta}{2\pi} \cdot \pi r^2 = \frac{1}{2}\theta r^2}$
That's it!!

4. Find the area of each slice of pizza in number [2] on the front of this page.

5. Measure the angles in radians and find the areas of each of the following figures.

a. Find the total area of the darker stripes.



b. Find the area of Pac-Man, including his eye.