## sector area

## What's sector area?

A sector is the region of a circle bounded by the circumference and two radii. It's a piece of pie!

The area the sector occupies depends on the radius of the circle and the angle between the two radii.


## Calculating sector area

The area of any sector is part of the area of the circle. The greater the angle between the two radii is, the greater the area of the sector is. The biggest possible sector would have an angle of $360^{\circ}$ - the whole circle! Its area would be $\pi r^{2}$.

The area of a sector is simply $\frac{\theta}{360^{\circ}} \times$ the area of the circle.


$$
\text { The area of any sector is } \frac{\theta}{360^{\circ}} \times \pi r^{2}
$$

You can check that this makes sense. If you let $\theta$ be $180^{\circ}$, you create a sector that is a semicircle.

Substituting $180^{\circ}$ for $\theta$ into the equation for the area of a sector gives the following:

$$
\begin{aligned}
A_{\text {sector }} & =\frac{180^{\circ}}{360^{\circ}} \times \pi r^{2} \\
& =\frac{1}{2} \pi r^{2}
\end{aligned}
$$



Therefore the area of a sector with an angle $180^{\circ}$ between its radii is half the area of a full circle.

You can see that this must be true from the diagram to the right of the equations. Beware - this isn't proof! But it does illustrate the relationship between sector angle and sector area.

## Arc length

## What's arc length?

An arc is a part of the circumference of a circle. It is the curved part of the perimeter of a sector.

Like the area of a sector, the length of an arc depends on the radius of the circle and the angle between the two radii that form the sector that the arc is part of.


Since an arc is just a section of the circumference of a circle, the length of an arc is simply $\frac{\theta}{360^{\circ}} \times$ the circumference of the circle.

The circumference of a circle is given by $\pi d$, or equivalently, $2 \pi r$, so:

$$
\text { The length of any arc is } \frac{\theta}{360^{\circ}} \times \pi d
$$

$$
\text { The length of any arc is } \frac{\theta}{360^{\circ}} \times 2 \pi r
$$

## Labelling arcs and sectors



You may find arcs and sectors referred to as "arc AB" and "sector OAB", respectively. Some people get confused and think that $A B$ must be a straight line and OAB must be a triangle. The clue is in the wording. Triangle OAB is not the same thing as sector OAB.

