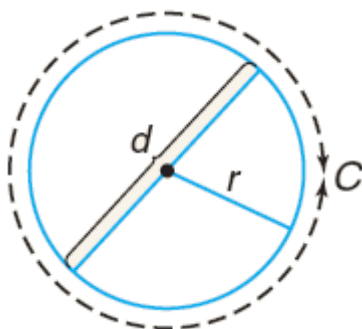


Circumference and Area of a Circle

Just as the perimeter of a polygon is the distance around the polygon, the **circumference** of a circle is the distance around the circle.

The ratio of the circumference C of a circle to its diameter d appears to be a number slightly greater than 3, regardless of the size of the circle. The ratio of the circumference of a circle to its diameter is always fixed and equals an irrational number called **pi** or π . Thus, $\frac{C}{d} = \pi$ or $C = \pi d$. Since $d = 2r$, the relationship can also be written as $C = 2\pi r$.

Theorem 1: If a circle has a circumference of C units and a radius of r units, then $C = 2\pi r$ or $C = \pi d$.



Properties of a circumference:

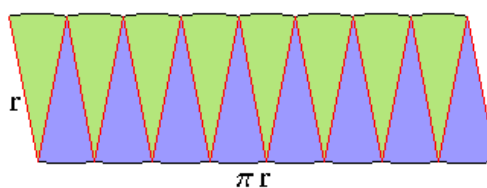
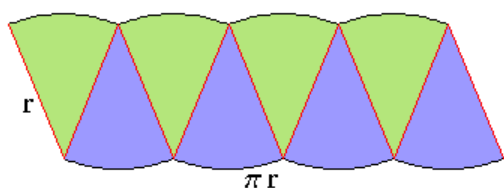
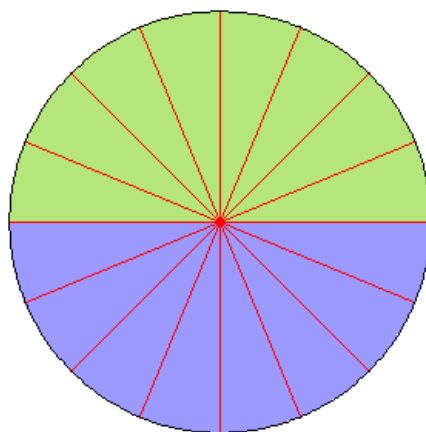
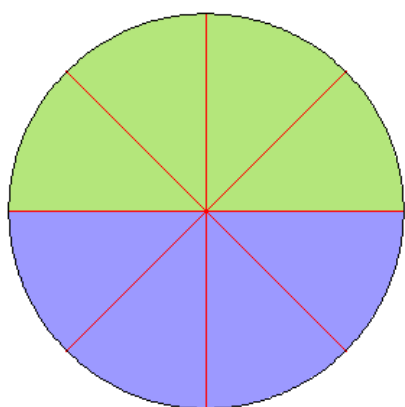
1. The circumference is the distance around a circle.
2. The circumference around a circle is often represented by the letter C .
3. The ratio between the circumference of a circle and its diameter is about 3:1. For each diameter, circumference is a little more than 3.

Area

To find the area of a circle, we use a formula, through the activity below we will discover the area formula.

If a circle is cut into n wedges, each $360/n$ degrees, each piece has the same area. After all, the pieces are identical; they are just in different locations in the plane. So cut a circle of radius r into smaller wedges as follows.

Take the bottom half of the unit circle and cut it into many wedges, like thin slices of pie. Place these wedges next to each other, points up, like the bottom teeth of a wild animal. Split the top half of the circle into wedges pointing down, the top teeth of the animal. Now close the animal's mouth. The teeth interlock perfectly. As the number of teeth increases the shape approaches a rectangle. The width is πr (half the circumference), and the height is r . Therefore the area is πr^2 .

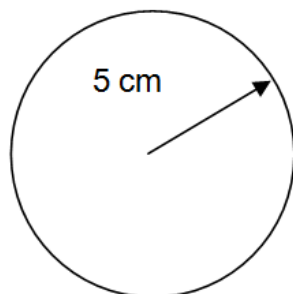


Note: There is a difference between a circle and a disk. A circle is a line, and so, for example, has no area - just as a line has no area. A disk however is a round object which has a circular outline. If you draw a circle on paper and cut it out, the round piece is a disk. This may seem like a minor distinction, but it is important to be precise in mathematics.

Theorem 2: If a circle has an area of A square units and a radius of r units, then $A = \pi r^2$.



Example 1: Find the area of the given circle knowing that its radius is 5 cm



$$\begin{aligned}
 \text{Area} &= \pi r^2 \\
 &= \pi \times 5^2 \\
 &= 3.14 \times 25 \\
 &= 78.5 \text{ cm}^2
 \end{aligned}$$