Radian Encyclopedia Article

Radian

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A radian is a unit of angular measure equal to the **angle** between two radii that enclose a section of a circle's **circumference** equal in length to the length of a radius. The entire angle of a **circle** is 2 radians and so 2 radians is equal to 360º. The word radian was first used in the late 19th century and is derived from the English word radius. Radians are usually denoted without a symbol or with the symbol *rad*.

The radian measure of an angle is the ratio of the length of the arc subtended by that angle in a circle to the radius of the circle. The radian measure of an angle and the degree measure of the same angle are related using the circumference of a circle. The circumference of a circle is given as: C = 2r, where r is the radius of the circle. Because the circumference of a circle contains exactly 2 of its radii, and because an arc with length equal to the length of the radius subtends one radian it goes that 2 radians = 360º. Another concept closely related to radians is the steradian. Just as the measure of an angle in a circle is in terms of radians the fraction of a **sphere** subtended by an object can be measured in steradians. The steradian is a unit of solid-angle measure defined as the solid angle of a sphere subtended by a portion of the surface whose **area** is equal to the **square** of the sphere's radius. The entire **space** subtended by a sphere is 4 steradians.

The radian and degree are both units of angular measure but of different size but may be used interchangeably. Engineers and technicians use degrees more frequently, whereas radian measure is used almost exclusively in theoretical studies. Studies such as **calculus** use radians because of the simplicity of results such as derivatives and series expansions of trigonometric **functions**.