Degrees to Radians

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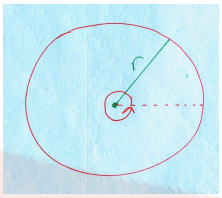
Change of angle: Degrees to Radians

We're used to measuring angles in degrees however, there is another measure for angles, radians. What is a radian? Let's consider a circle and it's perimeter. The perimeter of a circle is the length of the line that wraps around the cirlcle.



The perimeter of the circle is given by P and the formula below,

$$\begin{aligned} P &= \text{ length of the distance around the circle} \\ &= 2\pi r \end{aligned}$$

If we solve for 2π we get the following,

$$\frac{P}{r} = 2\pi$$

which is the angle revolved around to go around edge of the circle one time. In degrees we know that one revolution around a circle is $360°$. This means,

$$\begin{aligned} 2\pi &= 360° \\ \pi &= 180° \text{ or} \\ \pi \text{ radians} &= 180° \end{aligned}$$

Given that π radians $= 180°$ we can convert degrees to radians and vice versa. Let's consider some examples.

Example

Convert the following to radians,

$$180°, , \ 135°, \ 75°, \ 300°$$

Solution:

Convert $180°$ to radians.

1. First, let x represent what we are looking for.

$$180° = x \text{ radians}$$

2. Second, write out the relationship between degrees and radians.

$$180° = \pi \text{ radians}$$

3. Third, equate the ratios.

$$\frac{180°}{180°} = \frac{x \text{ radians}}{\pi \text{ radians}}$$

4. Fourth, Solve for x.

$$\begin{aligned} \frac{180°}{180°} &= \frac{x}{\pi} \\ \pi &= x \text{ radians} \end{aligned}$$

Therefore, $180° = \pi$ radians.

Convert $135°$ to radians.

$$\begin{aligned} 135° &= x \text{ radian} \\ \frac{135}{180} &= \frac{x}{\pi} \\ \frac{3}{4} &= \frac{x}{\pi} \\ \frac{3}{4}\pi &= x \end{aligned}$$

Therefore, $\frac{3}{4}\pi = 135°$.

Convert $75°$ to radians.

$$\begin{aligned} 75° &= x \text{ radians} \\ \frac{75}{180} &= \frac{x}{\pi} \\ \frac{5}{12}\pi &= x \\ \therefore 75° &= \frac{5\pi}{12} \text{ radians} \end{aligned}$$

Convert $300°$ to radians

$$\begin{aligned} 300° &= x \text{ radians} \\ \frac{300}{180} &= \frac{x}{\pi} \\ \frac{5\pi}{3} &= x \\ \therefore 300° &= \frac{5\pi}{3} \text{ radians} \end{aligned}$$

Exercises

1. Convert the following angles to radians.

a) 95°

b) 100°

c) 35°

d) 200°

e) 265°

f) 300°

g) 315°

h) 45°

i) 90°

j) 225°