

Degree – Radian Conversion

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EXIT

What is the radian measure of 60° ?

It was easy to determine the radian measure of 90° , 180° , 270° , and 360° . But determining the radian measures of other angles takes a little more work.

What is the radian measure of 60° ?

1. Use the fact that $180^\circ = \pi$ radians
2. Let x be the radian measure of 60° and create the proportion:

$$\frac{180^\circ}{\pi} = \frac{60^\circ}{x}$$

3. Solving for x , $x = \frac{\pi}{3}$

That is $60^\circ = \frac{\pi}{3}$

This procedure can be used to convert any angle in degrees to its corresponding radian measure.

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Q: What is the radian measure of -45° ?

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Answer--

1. $180^\circ = \pi$

2. $\frac{180^\circ}{\pi} = \frac{-45^\circ}{x}$

3. Solving for x,

$$x = \frac{-45\pi}{180}$$

$$x = \frac{-\pi}{4}$$

That is, $-45^\circ = \frac{-\pi}{4}$

Recall:

Two angles α, β are said to be coterminal
if

$$m(\alpha) = m(\beta) + k \bullet 360^\circ$$

for some integer k

We can replace 360° with its radian measure 2π . This gives an equivalent criteria for coterminal angles:

$$m(\alpha) = m(\beta) + 2\pi k$$

for some integer k

Determine two positive coterminal angles for $\frac{\pi}{6}$.

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$$m(\alpha) = m(\beta) + 2\pi k$$

Coterminal angle 1

let $k = 1$

$$m(\alpha) = \frac{\pi}{6} + 2\pi \cdot 1$$

$$= \frac{\pi}{6} + \frac{12\pi}{6}$$

$$= \frac{13\pi}{6}$$

Coterminal angle 2

let $k = 2$

$$m(\alpha) = \frac{\pi}{6} + 2\pi \cdot 2$$

$$= \frac{\pi}{6} + 4\pi$$

$$= \frac{\pi}{6} + \frac{24\pi}{6}$$

$$= \frac{25\pi}{6}$$

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That is $\frac{\pi}{6}, \frac{13\pi}{6}, \frac{25\pi}{6}$ are coterminal angles.

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Determine two negative coterminal angles for $\frac{\pi}{6}$.

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$$m(\alpha) = m(\beta) + 2\pi k$$

Coterminal angle 1

$$\text{let } k = -1$$

$$m(\alpha) = \frac{\pi}{6} - 2\pi$$

$$= \frac{\pi}{6} - \frac{12\pi}{6}$$

$$= \frac{-11\pi}{6}$$

Coterminal angle 2

$$\text{let } k = -2$$

$$m(\alpha) = \frac{\pi}{6} - 4\pi$$

$$= \frac{\pi}{6} - \frac{24\pi}{6}$$

$$= \frac{-23\pi}{6}$$

That is $\frac{\pi}{6}, \frac{-11\pi}{6}, \frac{-23\pi}{6}$ are coterminal angles.

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End of Degree – Radian Conversion

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