

# Degree

View the online version at

● [functions.wolfram.com](https://functions.wolfram.com)

Download the

● PDF File

## Notations

---

### Traditional name

The number of radians in one degree

### Traditional notation

°

### Mathematica StandardForm notation

Degree

## Primary definition

---

02.04.02.0001.01

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

Degree (°) is the number ( $\pi/180$ ) of radians in one degree.

Different representations of ° can be derived from corresponding representations of  $\pi$ ; see the page for  $\pi$ .

## Specific values

---

02.04.03.0001.01

$$^{\circ} = 0.0174532925199432957692369076848861271344287188854172545609719144017100911460344944368224156 \dots$$

Above approximate numerical value of ° shows 90 decimal digits.

## General characteristics

---

The number of radians in one degree ° is a constant. It is irrational and transcendental over  $\mathbb{Q}$  positive real number.

## Complex characteristics

---

### Real part

02.04.19.0001.01

$$\operatorname{Re}(^{\circ}) = ^{\circ}$$

## Imaginary part

02.04.19.0002.01

$$\text{Im}(\circ) = 0$$

## Absolute value

02.04.19.0003.01

$$|\circ| = \circ$$

## Argument

02.04.19.0004.01

$$\arg(\circ) = 0$$

## Conjugate value

02.04.19.0005.01

$$\bar{\circ} = \circ$$

## Signum value

02.04.19.0006.01

$$\text{sgn}(\circ) = 1$$

## Differentiation

---

### Low-order differentiation

02.04.20.0001.01

$$\frac{\partial \circ}{\partial z} = 0$$

### Fractional integro-differentiation

02.04.20.0002.01

$$\frac{\partial^{\alpha \circ}}{\partial z^{\alpha}} = \frac{z^{-\alpha \circ}}{\Gamma(1 - \alpha)}$$

## Integration

---

### Indefinite integration

02.04.21.0001.01

$$\int \circ dz = \circ z$$

02.04.21.0002.01

$$\int z^{\alpha-1 \circ} dz = \frac{\circ z^{\alpha}}{\alpha}$$

## Integral transforms

---

### Fourier exp transforms

02.04.22.0001.01

$$\mathcal{F}_i[^\circ](z) = \sqrt{2\pi} \delta(z)$$

### Inverse Fourier exp transforms

02.04.22.0002.01

$$\mathcal{F}_i^{-1}[^\circ](z) = \sqrt{2\pi} \delta(z)$$

### Fourier cos transforms

02.04.22.0003.01

$$\mathcal{F}_{c_i}[^\circ](z) = \sqrt{\frac{\pi}{2}} \delta(z)$$

### Fourier sin transforms

02.04.22.0004.01

$$\mathcal{F}_{s_i}[^\circ](z) = \frac{1}{z} \sqrt{\frac{\pi}{2}}$$

### Laplace transforms

02.04.22.0005.01

$$\mathcal{L}_i[^\circ](z) = \frac{1}{z}$$

### Inverse Laplace transforms

02.04.22.0006.01

$$\mathcal{L}_i^{-1}[^\circ](z) = \delta(z)$$

## Representations through more general functions

---

### Through Meijer G

02.04.26.0001.01

$$^\circ = {}^\circ G_{0,1}^{1,0}(z \mid 0) + {}^\circ G_{1,2}^{1,1}\left(z \mid \begin{matrix} 1 \\ 1, 0 \end{matrix}\right)$$

### Through other functions

02.04.26.0002.01

$$^\circ = \frac{1}{45} \left( 4 \tan^{-1}\left(\frac{1}{5}\right) - \tan^{-1}\left(\frac{1}{239}\right) \right)$$

02.04.26.0003.01

$$\circ = \frac{1}{45} \left( \tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{3}\right) \right)$$

02.04.26.0004.01

$$\circ = \frac{1}{45} \left( 2 \tan^{-1}\left(\frac{1}{3}\right) + \tan^{-1}\left(\frac{1}{7}\right) \right)$$

02.04.26.0005.01

$$\circ = \frac{1}{45} \left( \tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{5}\right) + \tan^{-1}\left(\frac{1}{8}\right) \right)$$

02.04.26.0006.01

$$\circ = \frac{1}{45} \left( 6 \tan^{-1}\left(\frac{1}{8}\right) + 2 \tan^{-1}\left(\frac{1}{57}\right) + \tan^{-1}\left(\frac{1}{239}\right) \right)$$

02.04.26.0007.01

$$\circ = \frac{1}{45} \left( 22 \tan^{-1}\left(\frac{1}{28}\right) + 2 \tan^{-1}\left(\frac{1}{443}\right) - 5 \tan^{-1}\left(\frac{1}{1393}\right) - 10 \tan^{-1}\left(\frac{1}{11018}\right) \right)$$

02.04.26.0008.01

$$\circ = \frac{1}{45} \left( 12 \tan^{-1}\left(\frac{1}{18}\right) + 3 \tan^{-1}\left(\frac{1}{70}\right) + 5 \tan^{-1}\left(\frac{1}{99}\right) + 8 \tan^{-1}\left(\frac{1}{307}\right) \right)$$

02.04.26.0009.01

$$\circ = \frac{1}{45} \left( 160 \tan^{-1}\left(\frac{1}{200}\right) - \tan^{-1}\left(\frac{1}{239}\right) - 4 \tan^{-1}\left(\frac{1}{515}\right) - 8 \tan^{-1}\left(\frac{1}{4030}\right) - \right. \\ \left. 16 \tan^{-1}\left(\frac{1}{50105}\right) - 16 \tan^{-1}\left(\frac{1}{62575}\right) - 32 \tan^{-1}\left(\frac{1}{500150}\right) - 80 \tan^{-1}\left(\frac{1}{4000300}\right) \right)$$

02.04.26.0010.01

$$\circ = \frac{1}{45} \left( \tan^{-1}\left(\frac{p}{q}\right) + \tan^{-1}\left(\frac{q-p}{p+q}\right) \right); p \in \mathbb{N}^+ \wedge q \in \mathbb{N}^+$$

02.04.26.0011.01

$$\circ = \frac{K(0)}{90}$$

02.04.26.0012.01

$$\circ = \frac{E(0)}{90}$$

02.04.26.0013.01

$$\circ = \frac{1}{180} \sqrt{6 \operatorname{Li}_2(1)}$$

02.04.26.0014.01

$$\circ = \frac{1}{180} \Gamma\left(\frac{1}{2}\right)^2$$

## Representations through equivalent functions

With related functions

$$02.04.27.0001.01 \\ \circ = \frac{\pi}{180}$$

$$02.04.27.0002.01 \\ \circ = -\frac{i}{180} \log(-1)$$

$$02.04.27.0003.01 \\ \circ = \frac{1}{90} i \log\left(\frac{1-i}{1+i}\right)$$

$$02.04.27.0004.01 \\ e^{180^\circ i} = -1$$

identity due to L. Euler

$$02.04.27.0005.01 \\ e^{360^\circ i} = 1$$

$$02.04.27.0006.01 \\ e^{180^\circ ik} = (-1)^k ; k \in \mathbb{Z}$$

$$02.04.27.0007.01 \\ e^{90^\circ ik} = i^k ; k \in \mathbb{Z}$$

## Inequalities

---

$$02.04.29.0001.01 \\ \frac{1}{60} < \circ < \frac{1}{57}$$

## History

---

– Babylonians divided the circle into 360 degrees, probably because this was approximately the number of days in the year

---

## Copyright

---

This document was downloaded from [functions.wolfram.com](http://functions.wolfram.com), a comprehensive online compendium of formulas involving the special functions of mathematics. For a key to the notations used here, see <http://functions.wolfram.com/Notations/>.

Please cite this document by referring to the [functions.wolfram.com](http://functions.wolfram.com) page from which it was downloaded, for example:

<http://functions.wolfram.com/Constants/E/>

To refer to a particular formula, cite [functions.wolfram.com](http://functions.wolfram.com) followed by the citation number.

*e.g.*: <http://functions.wolfram.com/01.03.03.0001.01>

This document is currently in a preliminary form. If you have comments or suggestions, please email [comments@functions.wolfram.com](mailto:comments@functions.wolfram.com).

© 2001-2008, Wolfram Research, Inc.