# Objective: convert between degrees and radians

Math history?

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19, 33, 31

(19) 1 $1.57 - 1 = 0.57$

$3.14 - 1 = 2.14$

(31) b $-36^\circ$ $-36^\circ + 360^\circ = 324^\circ$

$-36^\circ - 360^\circ = -396^\circ$

(33) b $230^\circ$ $230^\circ + 360^\circ = 590^\circ$

$230^\circ - 360^\circ = -130^\circ$

(13) a $\frac{-9\pi}{4}$ $-\frac{9\pi}{4} + 2\pi$

$-\frac{9\pi}{4} + \frac{8\pi}{4} = -\frac{\pi}{4}$

$-\frac{\pi}{4} + \frac{8\pi}{4} = \frac{7\pi}{4}$

Aug 24-10:34 AM

## WARM UP

Define in your own words:

- Degree $\frac{1}{360}$th of $\odot$
- Radian arc length = radius of $\odot$
- Coterminal angles $\measuredangle$s have same terminal side.
- Complementary angles 2 positive $\measuredangle$s sum is $90^\circ$ or $\frac{\pi}{2}$
- Supplementary angles 2 positive $\measuredangle$s sum is $180^\circ$ or $\pi$

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**Q:** How many degrees is $1\pi$ radians?

**A:** $180^\circ$ $\frac{\pi}{180^\circ}$ or $\frac{180^\circ}{\pi}$

**To convert from degrees to radians:** $\times \frac{\pi}{180}$

**To convert from radians to degrees:** $\times \frac{180}{\pi}$

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**Example**

**Convert degrees to radians.**

a) $30^\circ \times \frac{\pi}{180} = \frac{\pi}{6}$ b) $320^\circ \times \frac{\pi}{180} = \frac{16\pi}{9}$ c) $-50^\circ \times \frac{\pi}{180} = -\frac{5\pi}{18}$

**Convert radians to degrees.**

a) $\frac{\pi}{3} \times \frac{180}{\pi} = 60^\circ$ b) $\frac{5\pi}{3}$ $300^\circ$ c) 3 radians

$\frac{\pi}{3} = \frac{180^\circ}{3} = 60^\circ$

$3 \cdot \frac{180}{\pi} = \frac{540}{\pi}$

$\approx 171.89^\circ$

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## WARM UP II

Give the lengths of the following pieces of a circle with radius 4 units:

- Length (circumference) of entire circle
- Length of only top half
- Length of a quarter of the circle

**What do you notice or wonder?**

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**Arc Length** For a ⊙ of radius r, a central angle θ intercepts an arc of length s. $s = r\theta$ (θ in radians)

**Example**

A circle has a radius of 27 inches. Find the length of the arc intercepted by a central angle of 160 degrees.

Convert degrees to radians

$160^\circ \times \frac{\pi}{180} = \frac{8\pi}{9}$

$s = r\theta$

$s = 27 \cdot \frac{8\pi}{9}$

$s = 24\pi$ in.

$\approx 75.4$ in.

p. 266: #71 (HW)

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**Old school stuff...**

$64^0 32' 47''$ (minutes, seconds)

$64^\circ + \frac{32}{60} + \frac{47}{3600}$

$64 + .533 + .013$

$64.546^\circ$

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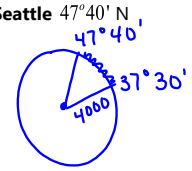
Find the distance (length!) between the cities. Assume Earth is a sphere of radius 4000 miles and the cities are on a the same longitude (one city is due north of the other city).

**San Francisco** 37°30' N

**Seattle** 47°40' N




$S = r\theta$

$S = 4000(.177)$

$S = 708$ miles

$10.167° \times \frac{\pi}{180} = .177$

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# HOMEWORK

**...can you switch from degrees to radians and think like a mature mathematician? How? Discuss arc length with your partner and come up with your own definition. Tell me.**

**4.1**: Hmwk #2

Page 266 39-75 odds, 76, 77-85 every other odd, 89, 91, 93

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