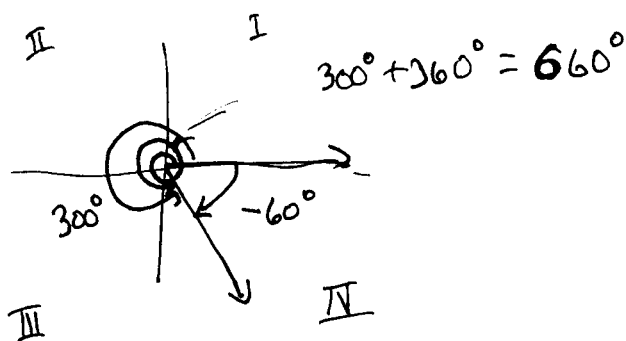


1.1 Angles and degree measure

Q: Is a 300° angle "the same" as a -60° angle?

A: No, but they are "coterminal angles".



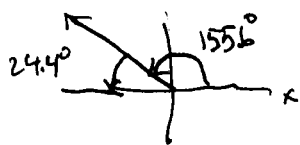
ex: #54) Find the smallest positive angle that is coterminal with 1235.6° . What quadrant is this in?

$$1235.6^\circ - 360^\circ = 875.6^\circ$$

$$875.6^\circ - 360^\circ = 515.6^\circ$$

$$515.6^\circ - 360^\circ = 155.6^\circ \text{ and stop}$$

Quadrant II
reference angle
 $= 180^\circ - 155.6^\circ$
 $= 24.4^\circ$



Method 2: $\frac{1235.6^\circ}{360^\circ} = 3.432$

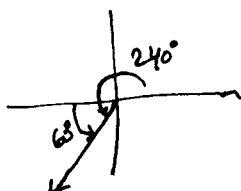
$$\begin{array}{r} 3 \text{, remainder } 155.6 \\ 360 \overline{) 1235.6} \\ \underline{1080} \\ 155.6 \end{array}$$

52) Same for $-840^\circ + 360^\circ = -480^\circ$

$$-480^\circ + 360^\circ = -120^\circ$$

$$-120^\circ + 360^\circ = 240^\circ$$

is in Quadrant III
reference angle $= 60^\circ$



Degrees, minutes, seconds

$$1 \text{ degree} = 60 \text{ minutes (of arc)}$$

$$1 \text{ minute} = 60 \text{ seconds (")}$$

ex: Convert to decimal degree

$$20^{\circ} 30' 15''$$

$$\text{observe: } 30 \text{ minutes} \times \frac{1 \text{ degree}}{60 \text{ minutes}} = \frac{30}{60} \text{ degrees} = \frac{1}{2} \text{ degree} \\ = 0.5 \text{ degree}$$

$$15 \text{ seconds} \times \frac{1 \text{ minute}}{60 \text{ seconds}} \times \frac{1 \text{ degree}}{60 \text{ minutes}} = \frac{15}{60 \cdot 60} \text{ degrees}$$

$$20^{\circ} 30' 15'' = 20 + \frac{1}{2} + \frac{15}{3600} \text{ degrees}$$

$$= 20 + 0.5 + 0.004166\bar{6}$$

$$= 20.504166\bar{6} \text{ degrees}$$

ex: Convert ~~75.255~~ 75.255° to DMS

Note:

$$.255 \text{ degrees} \times \frac{60 \text{ minutes}}{1 \text{ degree}} = (.255)(60) = 15.3 \text{ minutes}$$

Also:

$$.3 \text{ minutes} \times \frac{60 \text{ seconds}}{1 \text{ minute}} = (.3)(60) = 18 \text{ seconds}$$

$$75.255^{\circ} = 75^{\circ} 15' 18''$$

Interesting Fact: Nautical miles are designed so that 1 minute of arc on the earth's surface is 1 nautical mile.

Q: How many nautical miles is it from the equator to the north pole?

A: $90^\circ \text{ degrees} \times \frac{60 \text{ minutes}}{1 \text{ degree}} = (90)(60) \text{ minutes} = 5400 \text{ minutes}$

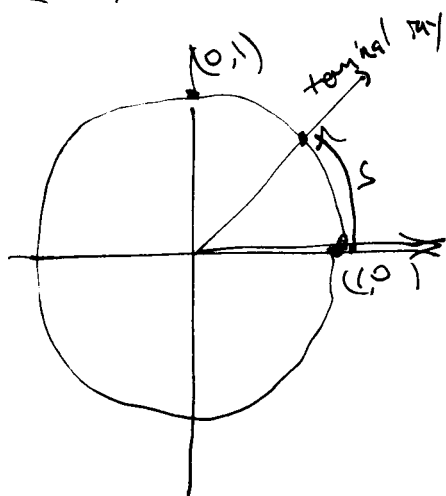
So this is 5400 nautical miles.

Another fact: A kilometer is designed so that it is 10,000 km from the equator to the north pole.

Yet a third set of facts:
 1 inch = 25.4 mm
 1 ft = 12 in
 1 statute mile = 5,280 ft.

Problem: On your next five-hour flight, use this to determine 1 ~~nautical~~ nautical mile = how many statute miles?

1.2 Intro to Radian measure



Q: what is the "radian measure" of an angle.

A: Put angle in standard position. Take a unit circle centered at origin. Wrap a string around the unit circle to subtend the angle. If the length of the string is s , we call s the radian measure of the angle.