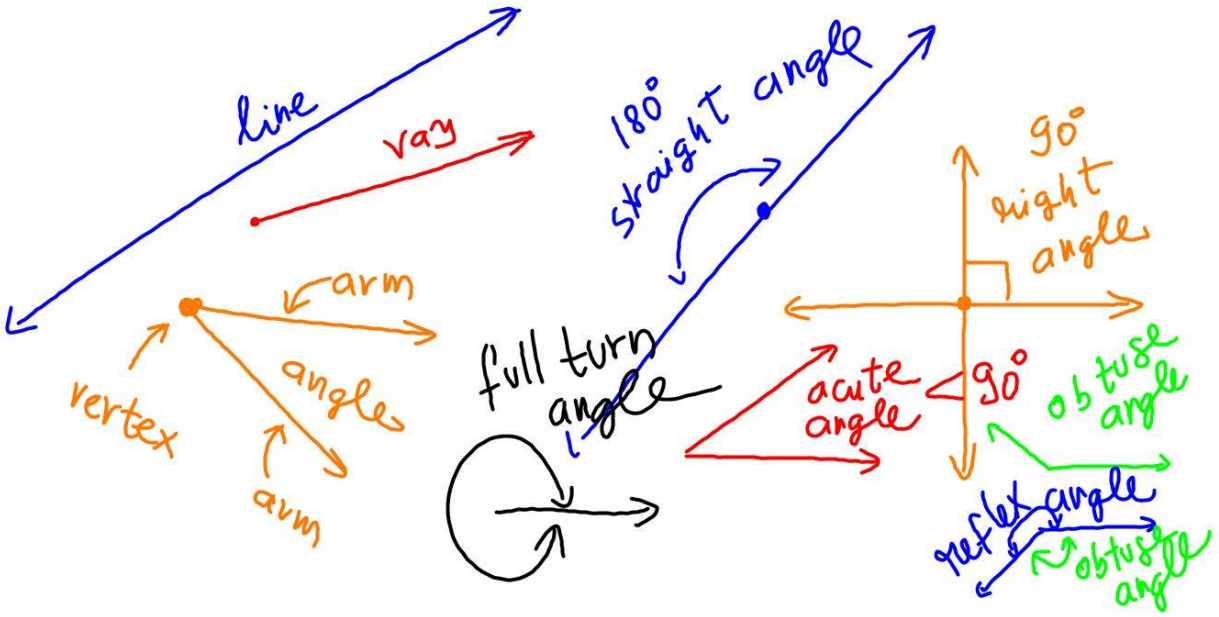

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counter clockwise

clockwise direction

Any angle greater than a right angle and less than a straight angle is called *obtuse* angle.
An angle that is greater than a straight angle is called *reflex* angle.
If the arms are coincident then a *full turn* angle is formed.

terminal arm

$\alpha > 0$

initial arm

B Sign

If the rotation of the initial arm toward the terminal arm is a *counter clockwise* rotation the angle is considered *positive*.
Otherwise the angle is *negative*.

x

initial arm

$\alpha < 0$

C Standard Position

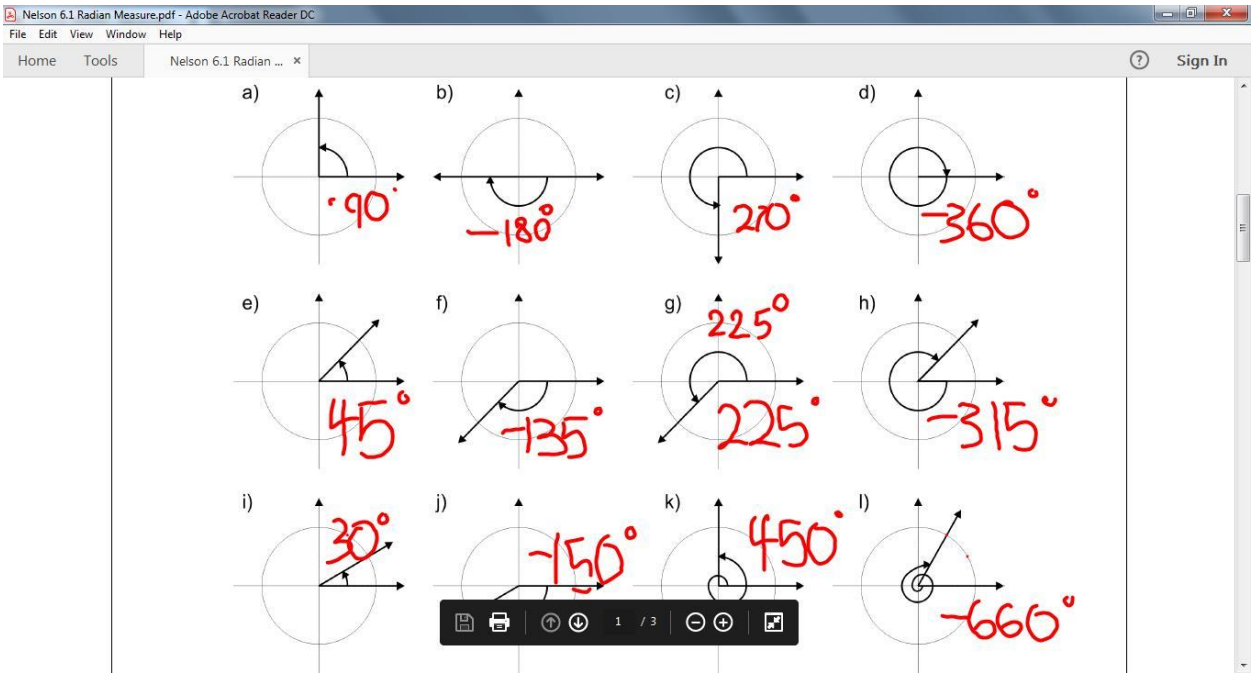
If the *initial arm* is *parallel to the x-axis* then the angle is in standard position.

D Degrees

The measurement of a *right angle* in degrees is (by convention) 90°.

Ex 1. Find the measurement of each angle (given in standard position) in degrees.

a) b) c) d)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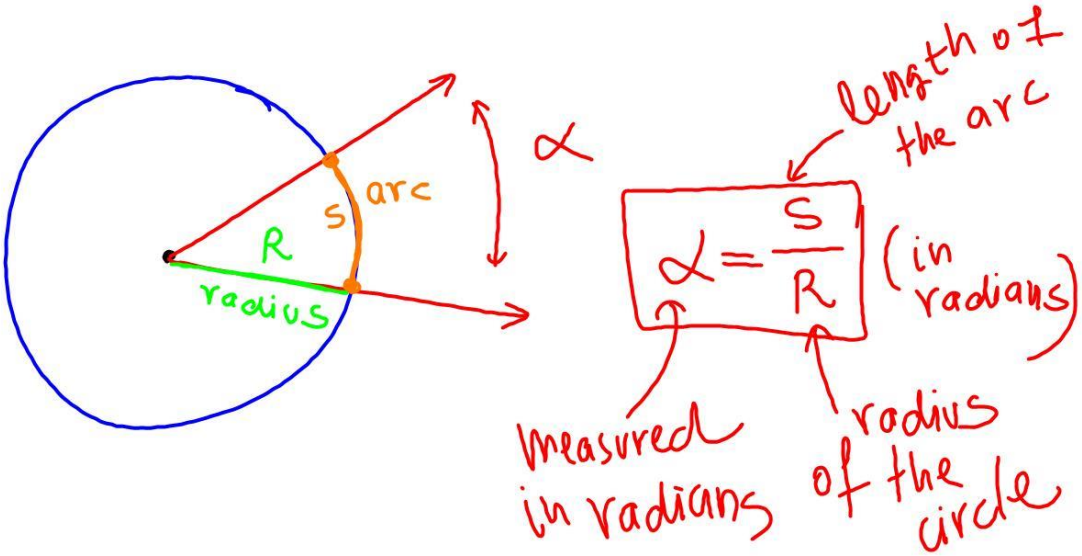
a)
b)
c)
d)
90°
−180°
270°
−360°
e)
f)
g)
h)
45°
−135°
225°
225°
−315°
i)
j)
k)
l)
30°
−150°
450°
−660°
1 / 3


α
arc
s
R
radius
length of the arc
$\alpha = \frac{s}{R}$
(in radians)
measured in radians
radius of the circle

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a) $\frac{\pi}{2}$ b) $-\pi$ c) $\frac{3\pi}{2}$ d) -2π

e) $\frac{\pi}{4}$ f) $\frac{-3\pi}{4}$ g) $\frac{5\pi}{4}$ h) $\frac{-7\pi}{4}$

$-\left(7\frac{\pi}{2}+\frac{1}{3}\frac{\pi}{2}\right)$

i) $\frac{\pi}{6}$ j) $\frac{-5\pi}{6}$ k) $\frac{5\pi}{2}$ l) $=-\frac{22\pi}{6}$

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D Conversion formula

The *conversion* between degree and radian measure is based on the equality:

$180° = \pi \text{ radians}$

which is equivalent to:

$1° = \frac{\pi \text{ radians}}{180}$ or $1 \text{ radian} = \frac{180°}{\pi}$

Ex 4. Do the required conversions.

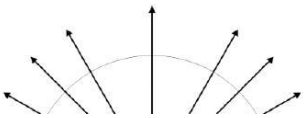
a) $10° = ? \text{ radians} = \frac{\pi}{18} \simeq 0.175$

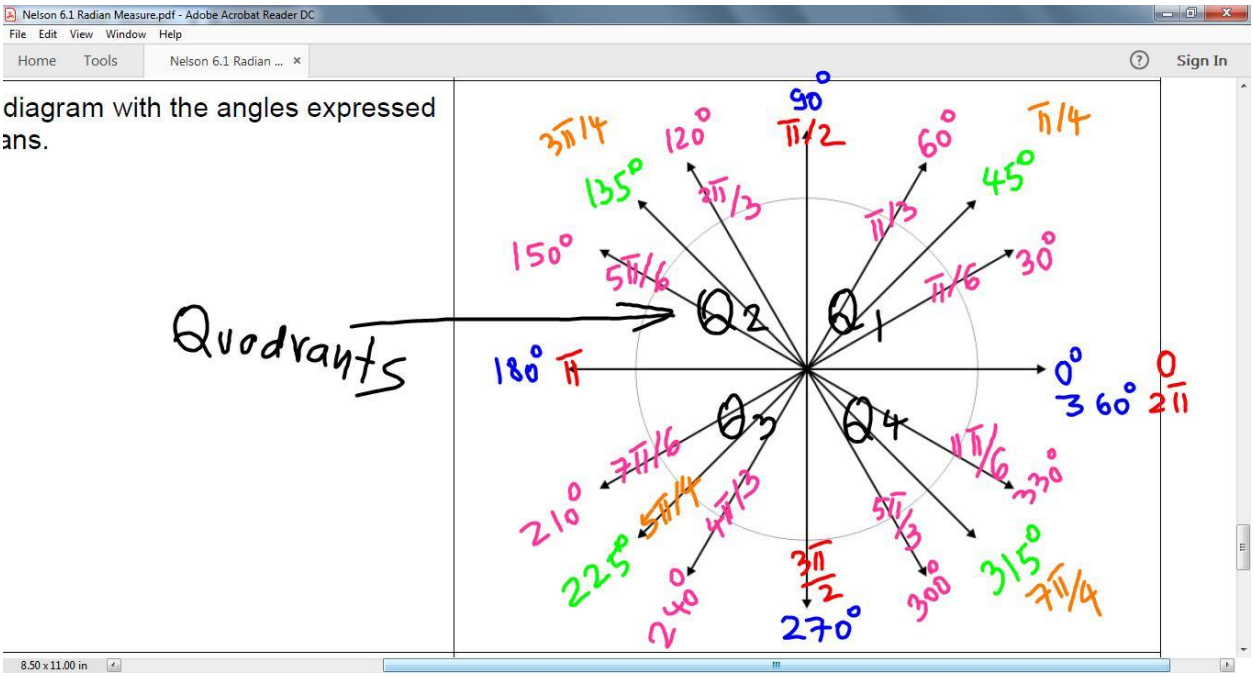
b) $-1° = ? \text{ radians} = -1\frac{\pi}{180} = -\frac{\pi}{180} \simeq -0.017$

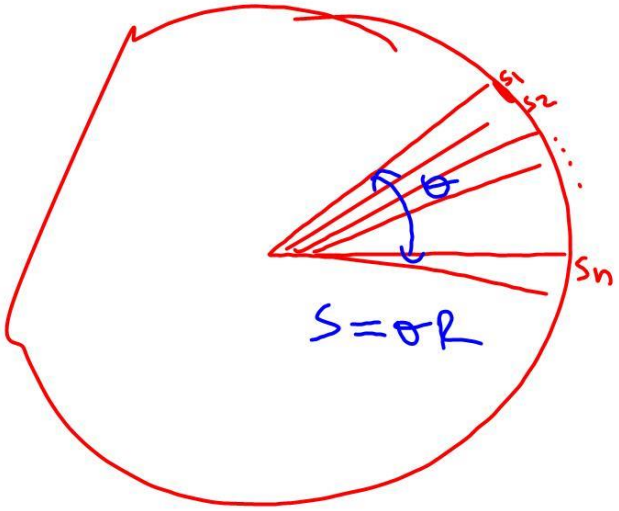
c) $\sqrt{2} \text{ radians} = ?° = \sqrt{2}\,\frac{180°}{\pi} \simeq 81.03°$

d) $-0.1 \text{ radians} = ?° = -0.1\,\frac{180°}{\pi} \simeq -5.73°$

Ex 5. Complete the diagram with the angles expressed in degrees and radians.







$$A = \frac{S_1 R}{2} + \frac{S_2 R}{2} + \cdots + \frac{S_n R}{2}$$

$$= \frac{(S_1 + S_2 + \cdots + S_n)R}{2}$$

$$= \frac{SR}{2} = \frac{(\theta R)R}{2}$$

$$= \frac{1}{2}\theta R^2$$

E Arc Length The arc length subtended by the angle θ (in radians) on a circle of radius R is given by: $s = \theta R$	Ex 6. Find the length of the arc subtended by an angle of $50°$ on a circle of radius $30cm$. $s = (50°)30cm = (50)\frac{\pi}{180}(30cm) = \frac{8\pi}{3}cm$ $\simeq 26.18cm$
F Sector Area The sector area delimited by an angle θ (in radians) and a circle of radius R is given by: $A = \frac{1}{2}\theta R^2$	Ex 7. Find the area delimited by an angle of $120°$ and a circle of radius $10cm$. $A = \frac{1}{2}(120)\frac{\pi}{180}(10cm)^2 \simeq 104.72cm^2$

Reading: Nelson Textbook, Pages 316-320
Homework: Nelson Textbook, Page 321: #5, 6, 7abc, 8abc, 11, 16