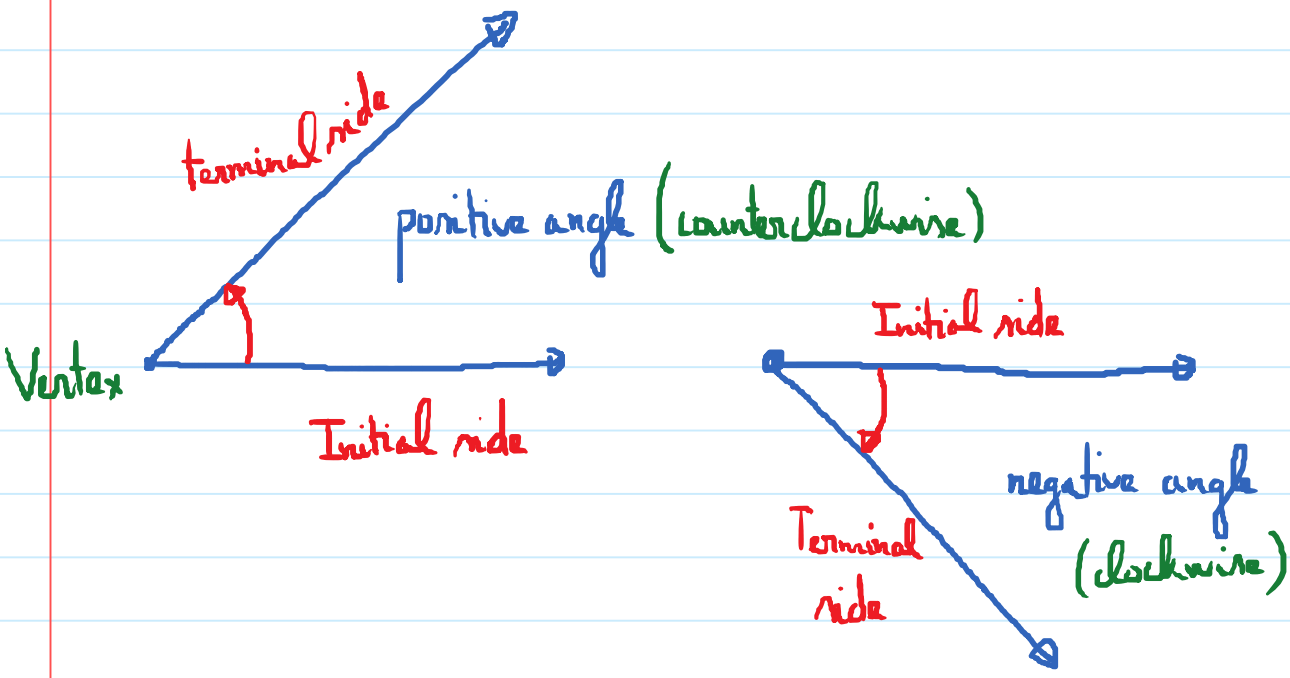
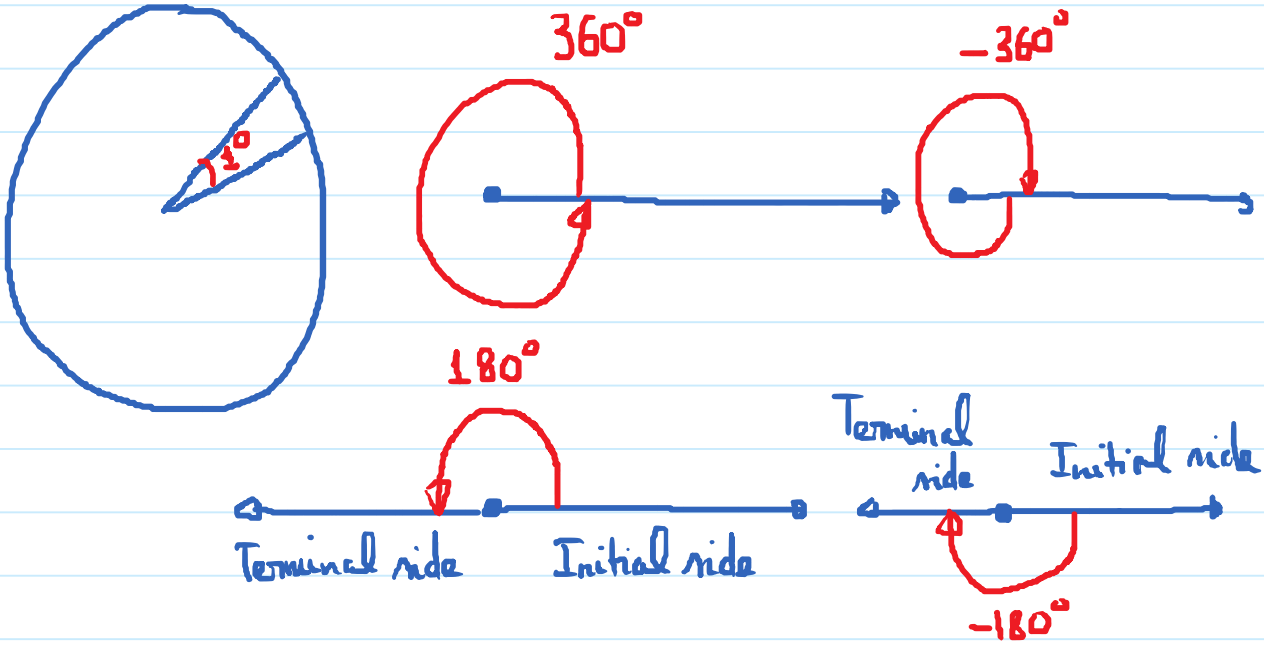
1.1 Angles

Wednesday, January 15, 2020 9:35 AM



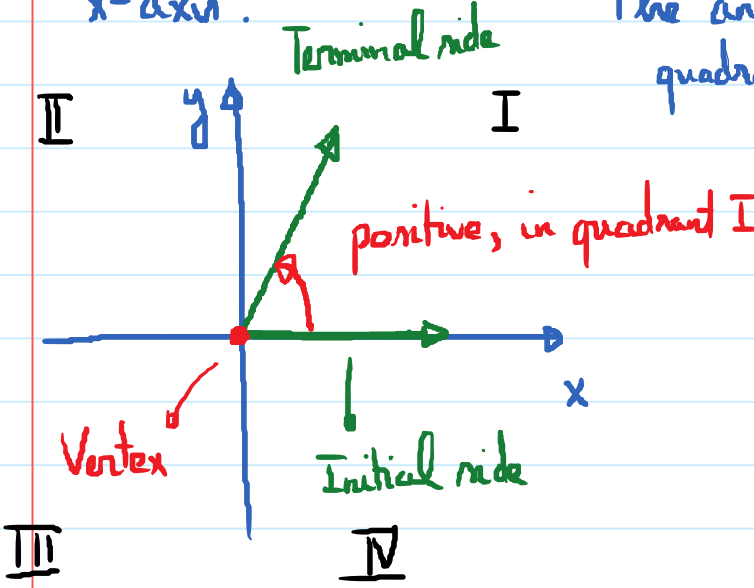
Degree Measure.

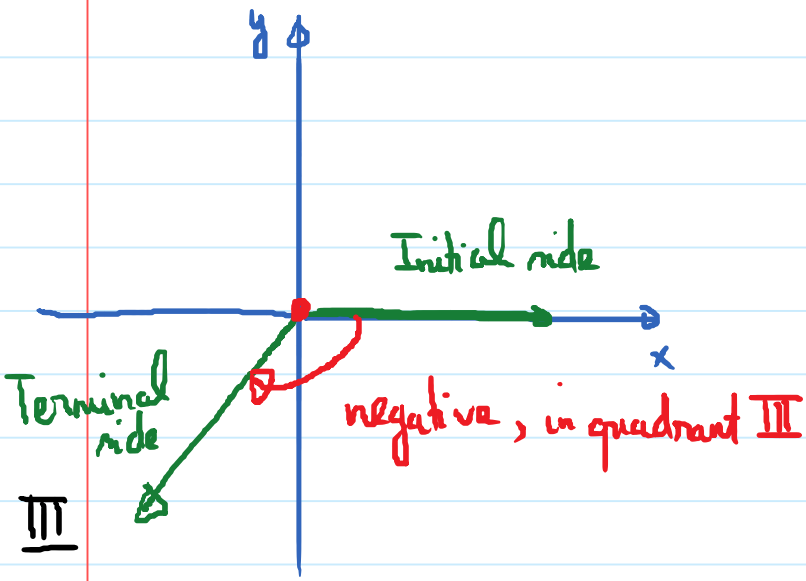


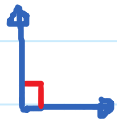
Standard Position.

Definition: An angle is in standard position if its vertex is at the origin and its initial side lies on the positive x-axis.

The angle is said to lie in the quadrant in which its terminal side lies





Type of angle	Measure	
Acute	Between 0° and 90°	
Right	Exactly 90°	
Obtuse	Between 90° and 180°	
Straight	Exactly 180°	

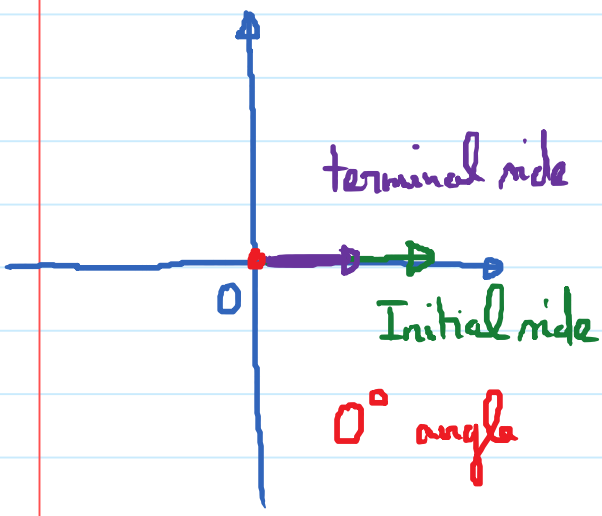
Complementary angles: two positive angle measures that add up to 90°.

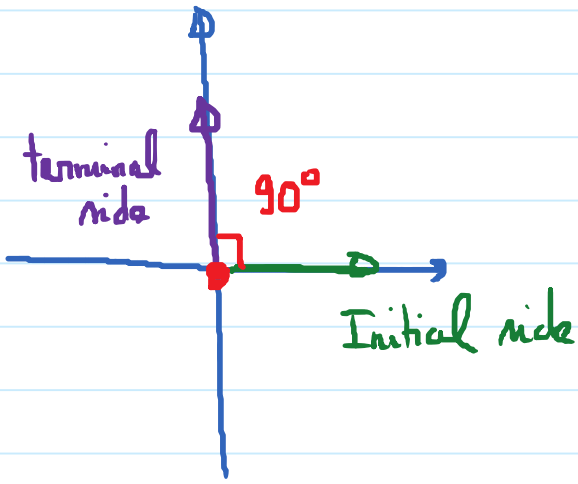
E.g. 45° and 45° ; 1° and 89°.

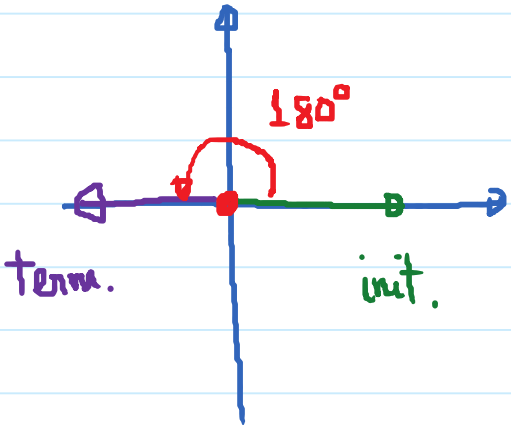
Supplementary angles: two positive angle measures that add up to 180°

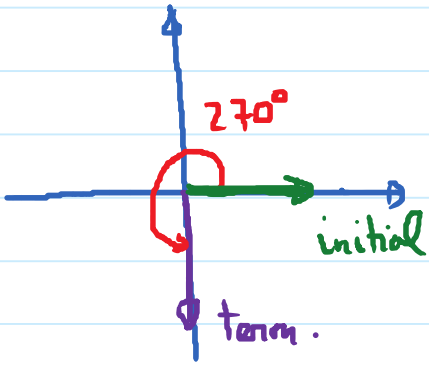
E.g. 90° and 90° ; 179° and 1°.

Quadrantal angles: is angle whose terminal side lies on x-axis or y-axis



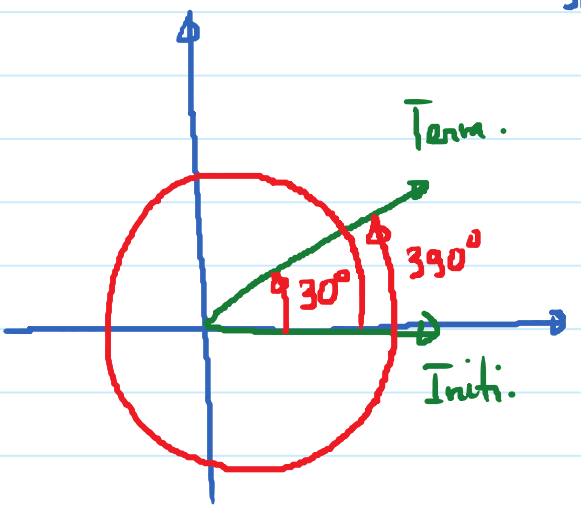






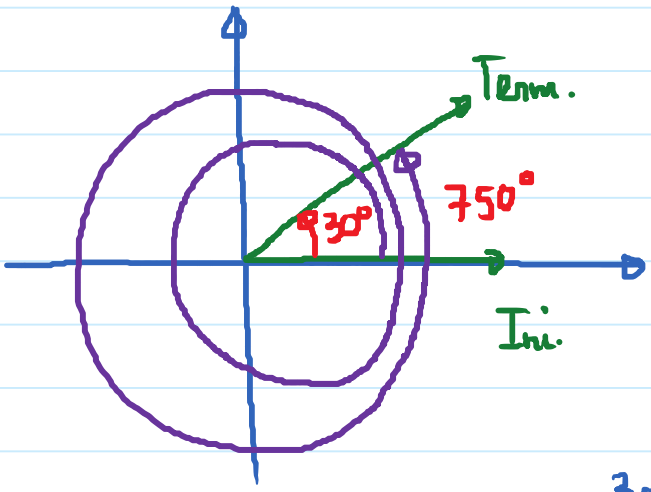
Coterminal angle: coterminal angles are angles that have the same initial side and terminal side but different amount of rotation. Their measures differ by a multiple of 360°

30° and 390° are coterminal angles



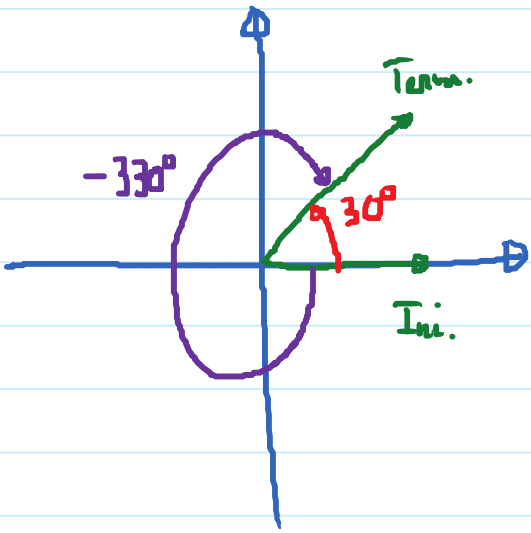
30° and 750° are coterminal angles

$750° - 30° = 2 \cdot 360°$



30° and $-330°$ are coterminal.

$-330° - 30° = -360°$



* We can find coterminal angles by adding or subtracting a multiple of 360° from a given angle.

θ : given angle

The expression $\boxed{\theta + n \cdot 360^\circ}$ where n is any integer

$n = \ldots, -3, -2, -1, 1, 2, 3, \ldots$ give an angle that is coterminal with θ

Ex: Use the expression $\theta + n \cdot 360^\circ$ to find

(a) 2 positive angles coterminal with $\theta = 135^\circ$

$n=1: 135^\circ + 1 \cdot 360^\circ = 495^\circ$; $n=2: 135^\circ + 2 \cdot 360^\circ = 855^\circ$

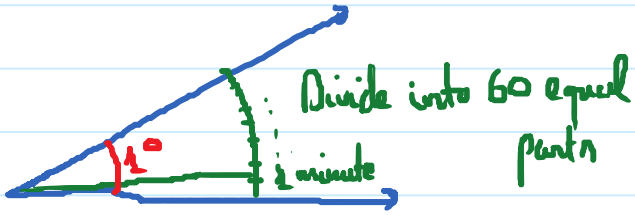
(b) 2 negative angles coterminal with $\theta = 135^\circ$.

$n = -1: \quad 135^\circ - 1 \cdot 360^\circ = -225^\circ$

$n = -2: \quad 135^\circ - 2 \cdot 360^\circ = -585^\circ$.

Degrees, Minutes, Seconds

1 degrees = 60 minutes. $\quad 1^\circ = 60'$



$1' = \left(\frac{1}{60}\right)^\circ$

Degrees $\xrightarrow{\text{multiply by } 60}$ minutes

Minutes $\xrightarrow{\text{multiply by } \frac{1}{60}}$ Degrees

1 minute = 60 seconds ; $1' = 60''$

Minutes $\xrightarrow{\text{mult. by } 60}$ Seconds

Seconds $\xrightarrow{\text{mult. by } \frac{1}{60}}$ Minutes

Degrees $\xrightarrow{\text{mult. by } 3600}$ Seconds

Seconds $\xrightarrow{\text{mult. by } \frac{1}{3600}}$ Degrees

Calculations with Degrees, minutes and seconds.

(a) $28^\circ 35' + 63^\circ 52'$

$= 91^\circ 87' = 91^\circ$ and 1° and $27' = 92^\circ 27'$

(b) $180^\circ - 117^\circ 29'$

$= 179^\circ 60' - 117^\circ 29' = 62^\circ 31'$

Convert an angle measure to decimal degrees.

$$105^\circ \boxed{20'}\boxed{32''} = 105^\circ + \left(\frac{20}{60}\right)^\circ + \left(\frac{32}{3600}\right)^\circ$$

$$\approx 105.342^\circ .$$

Convert an angle from degrees to degrees, minutes, seconds

$85.263^\circ \longrightarrow 85^\circ$

$0.263^\circ \xrightarrow[\text{by } 60]{\text{mult.}} 15.78'$

$85^\circ\ 15'\ 47''$

$0.78' \xrightarrow[\text{by } 60]{\text{mult.}} 46.8'' \longrightarrow 47''$