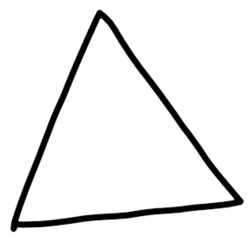
Exercise 9.1

Trigonometry

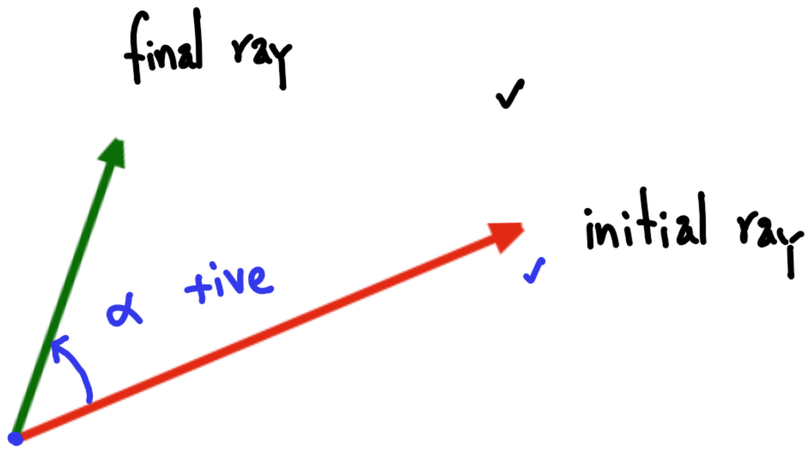
Trei three

Goni angle

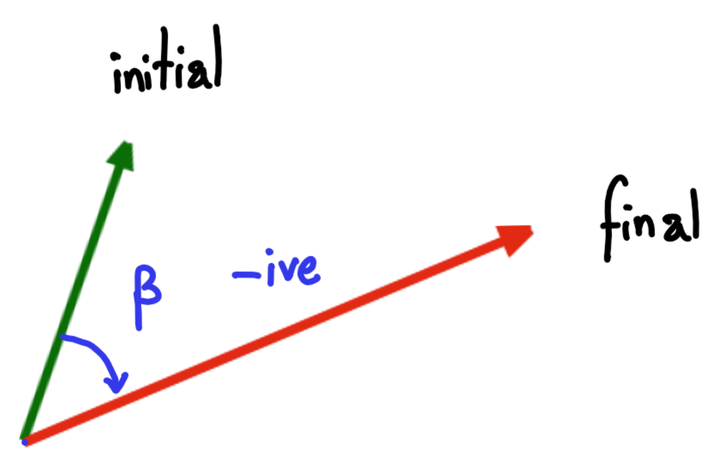
Metron measurement.

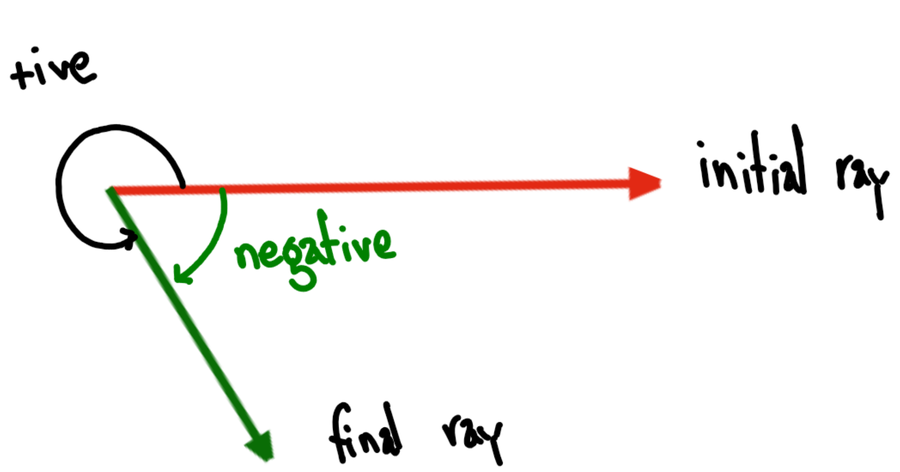


triangle.



$\alpha, \beta, \gamma, \vartheta, \phi, \psi$

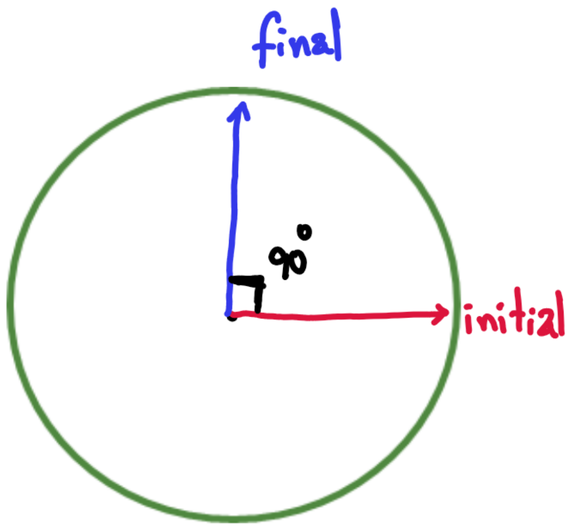




How to measure an angle?

Sexagesimal System (Degree, Minute, Second).

$6^\circ 15' 30''$



1 circle (anti-clock) = 360°

1 rotation = 360° ✓

$\frac{1}{2}$ rotation = 180°

$\frac{1}{4}$ rotation = 90°

$1^\circ = 60'$

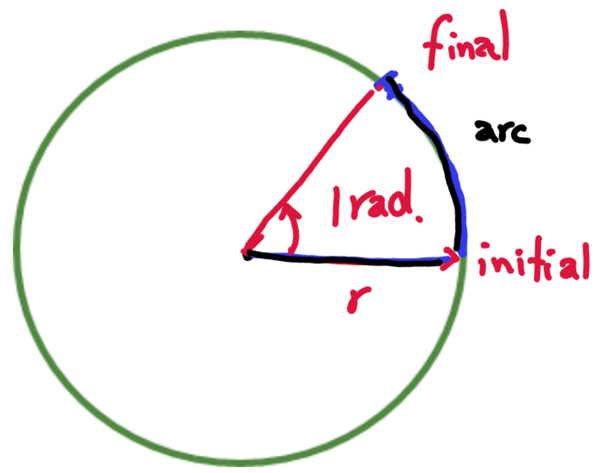
$1' = 60''$

$1^\circ = 60' = (60 \times 60)'' = 3600''$.

For videos, visit

Suppose Math.

Circular System (Radian).



Radian is the measure of the angle subtended at the center of the circle by an arc, whose length is equal to the radius of circle.

1 rotation = 2π rad. ✓

$360^\circ = 2\pi$ rad.

$1^\circ = \frac{2\pi}{360^\circ}$ rad

$1^\circ = \frac{\pi}{180}$ rad.

$\frac{360^\circ}{2\pi} = 1$ rad

$\frac{180^\circ}{\pi} = 1$ rad. ✓

Q1 Express the following sexagesimal measures of angles in radians.

Sexagesimal (° ′ ″)

① Degree

② $\times \frac{\pi}{180}$

(i) 30°

$= \cancel{30} \times \frac{\pi}{\cancel{180}_{6}}$ rad.

$= \frac{\pi}{6}$ rad.

(ii) 45°

$= \cancel{45} \times \frac{\pi}{\cancel{180}_{4}}$ rad

$= \frac{\pi}{4}$ rad.

(iii) 60°

$= \cancel{60} \times \frac{\pi}{\cancel{180}_{3}}$ rad. $= \frac{\pi}{3}$ rad

(iv) 75°

$= \cancel{75}^{5} \times \frac{\pi}{\cancel{180}_{\cancel{36}_{12}}}$ rad $= \frac{5\pi}{12}$ rad.

(v) 90°

$= \cancel{90} \times \frac{\pi}{\cancel{180}_{2}}$ rad $= \frac{\pi}{2}$ rad.

(vi) 105°

$= \cancel{105}^{7} \times \frac{\pi}{\cancel{180}_{\cancel{36}_{12}}}$ rad $= \frac{7\pi}{12}$ rad.

(vii) 120°

$= \cancel{120}_{2} \times \frac{\pi}{\cancel{180}_{3}}$ rad $= \frac{2\pi}{3}$ rad.

(viii) 135°

$= \cancel{135} \times \frac{\pi}{\cancel{180}_{\cancel{36}_{\cancel{12}_{4}}}}$ rad $= \frac{3\pi}{4}$ rad.

(ix) 150°

$= \cancel{150}^{5} \times \frac{\pi}{\cancel{180}_{6}}$ rad $= \frac{5\pi}{6}$ rad.

(x) $10^\circ\ 15'$

$1^\circ = 60'$

$\frac{1}{60}^\circ = 1'$

$= 10^\circ + 15'$

$= 10^\circ + \left(\frac{\cancel{15}}{\cancel{60}_{4}}\right)^\circ$

$= 10^\circ + \left(\frac{1}{4}\right)^\circ = 10^\circ + \frac{1}{4}^\circ$

$= \frac{40+1}{4} = \frac{41}{4}^\circ$

$= \frac{41}{4} \times \frac{\pi}{180}$ rad

$= \frac{41\pi}{720}$ rad.

(xi) $35^\circ 20'$

$= 35^\circ + 20'$

$= 35^\circ + \left(\frac{20}{60}\right)^\circ = 35^\circ + \frac{1}{3}^\circ$

$= \frac{105+1}{3}^\circ = \frac{106}{3}^\circ$

$= \frac{\overset{53}{\cancel{106}}}{3} \times \frac{\pi}{\underset{90}{\cancel{180}}}$ rad

$= \frac{53\pi}{270}$ rad.

(xii) $75^\circ 6' 30''$

$= 75^\circ + 6' + 30''$

$= 75^\circ + \left(\frac{6}{\underset{10}{\cancel{60}}}\right)^\circ + \left(\frac{30}{\underset{120}{\cancel{3600}}}\right)^\circ$

$= 75^\circ + \frac{1}{10}^\circ + \frac{1}{120}^\circ$

$= \frac{75(120)+12+1}{120}^\circ = \frac{9000+13}{120}^\circ$

$= \frac{9013}{120}^\circ$

$= \frac{9013}{120} \times \frac{\pi}{180}$ rad

$= \frac{9013\pi}{21600}$ rad.

(xiii) $120' 40''$

$= 120' + 40''$

$= \frac{2\cancel{120}}{\cancel{60}}^\circ + \frac{4\cancel{0}}{\cancel{3600}}^\circ$
90

$= 2^\circ + \frac{1}{90}^\circ = \frac{180+1}{90}^\circ$

$= \frac{181}{90}^\circ$

$= \frac{181}{90} \times \frac{\pi}{180}$ rad

$= \frac{181\pi}{16200}$ rad

(xiv) $154^\circ 20''$

$= 154^\circ + 20''$

$= 154^\circ + \frac{2\cancel{0}}{\underset{180}{\cancel{3600}}}^\circ = 154^\circ + \frac{1}{180}^\circ$

$= \frac{180(154)+1}{180}^\circ = \frac{27721}{180}^\circ$

$= \frac{27721}{180} \times \frac{\pi}{180}$ rad

$= \frac{27721\pi}{32400}$ rad.

(xv) 0°

$= 0 \times \frac{\pi}{180}$ rad

$= 0$ rad.

(xvi) $3''$

$= \frac{\cancel{3}^{1}}{\cancel{3600}_{1200}}^\circ = \frac{1}{1200}^\circ$

$= \frac{1}{1200} \times \frac{\pi}{180}$ rad

$= \frac{\pi}{216000}$ rad.

(2) Radian $\longrightarrow$ Sexagesimal (° ′ ″).

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

(i) $\frac{\pi}{8}$ rad.

$= \frac{\cancel{\pi}}{\cancel{8}_{4_2}} \times \frac{\overset{45}{\cancel{90}}}{\cancel{\pi}}^\circ = \frac{45}{2}^\circ$

$= 22.5^\circ$

$= 22^\circ + 0.5^\circ$

$= 22^\circ + (0.5 \times 60)'$

$= 22^\circ + 30' = 22^\circ 30'$.

(ii) $\frac{\pi}{6}$ rad

$= \frac{\cancel{\pi}}{\cancel{6}} \times \frac{\overset{30}{\cancel{180}}}{\cancel{\pi}}^\circ$

$= 30^\circ$

(iii) $\frac{\pi}{4}$ rad

$= \frac{\cancel{\pi}}{\cancel{4}} \times \frac{\overset{45}{\cancel{180}}}{\cancel{\pi}}^\circ$

$= 45^\circ$

(iv) $\frac{\pi}{3}$ rad

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

(v) $\frac{\pi}{2}$ rad

$= \frac{\cancel{\pi}}{\cancel{2}} \times \frac{\overset{90}{\cancel{180}}}{\cancel{\pi}}^\circ = 90^\circ$

(vi) $\frac{2\pi}{3}$ rad

$= \frac{\cancel{2\pi}}{\cancel{3}} \times \frac{\overset{60}{\cancel{180}}}{\cancel{\pi}}^\circ = 120^\circ$

(vii) $\frac{3\pi}{4}$ rad

$= \frac{\cancel{3\pi}}{\cancel{4}} \times \frac{\overset{45}{\cancel{180}}}{\cancel{\pi}}^\circ = 135^\circ$

(viii) $\frac{5\pi}{6}$ rad

$= \frac{\cancel{5\pi}}{\cancel{6}} \times \frac{\overset{30}{\cancel{180}}}{\cancel{\pi}}^\circ$

$= 150^\circ$.