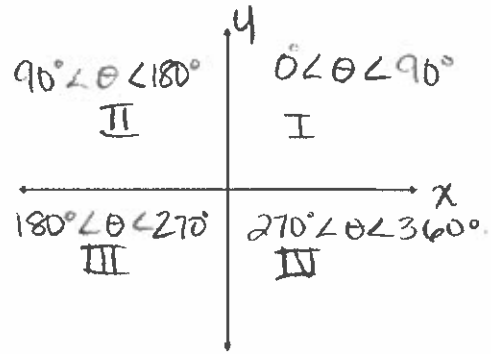
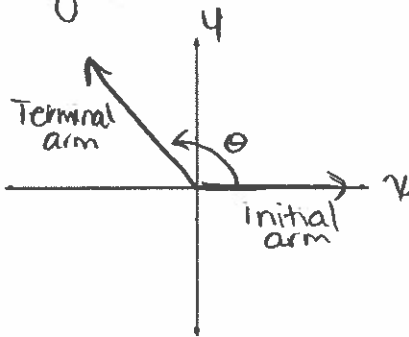


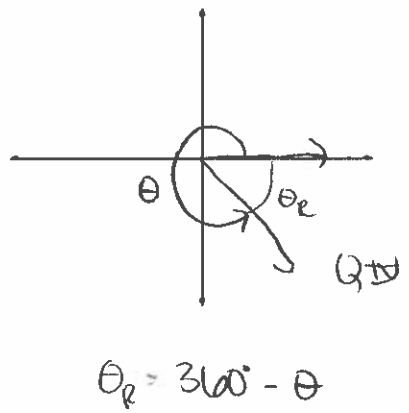
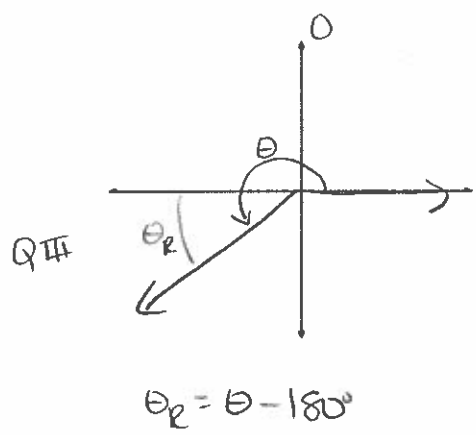
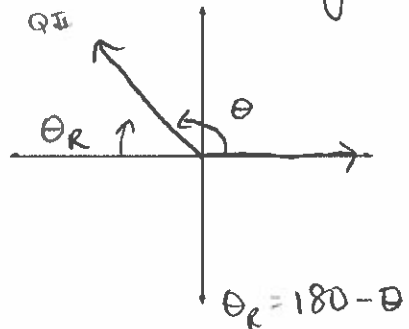
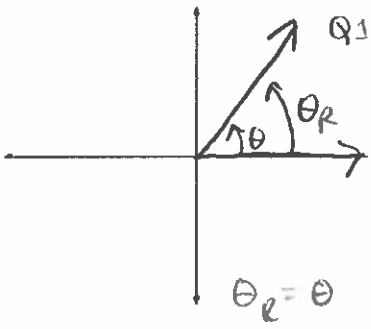
Initial arm: the arm of an angle in standard position that lies on the x-axis

Terminal arm: the arm of an angle in standard position that meets the initial arm at the origin to form an angle

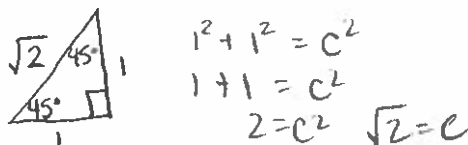
Angle in Standard position: the position of an angle when its initial arm is on the positive x-axis and its vertex is at the origin



Reference angle: the acute angle whose vertex is the origin and whose arms are the terminal arm of the angle and the x-axis



Special Right Triangles



We can determine exact values (radicals or fractions) of trigonometric ratios.

$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$$

$$\sin 45 = \frac{1}{\sqrt{2}}$$

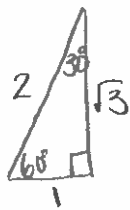
$$\cos 45 = \frac{1}{\sqrt{2}}$$

$$\tan 45 = \frac{1}{1} = 1$$

$$\sin 60 = \frac{\sqrt{3}}{2}$$

$$\cos 60 = \frac{1}{2}$$

$$\tan 60 = \frac{\sqrt{3}}{1} = \sqrt{3}$$

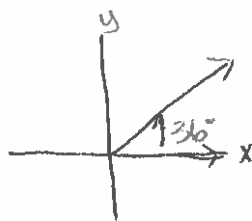


$$\sin 30 = \frac{1}{2}$$

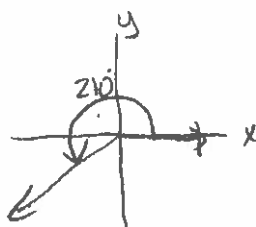
$$\cos 30 = \frac{\sqrt{3}}{2}$$

$$\tan 30 = \frac{1}{\sqrt{3}}$$

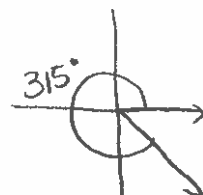
Ex 1) Sketch each angle in standard position for $0^\circ \leq \theta \leq 360^\circ$. State the quadrant in which the terminal arm lies.

a) 36° 

Quadrant I

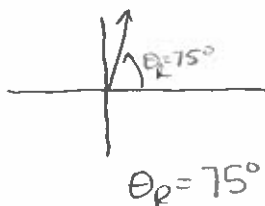
b) 210° 

Quadrant III

c) 315° 

Quadrant IV

Ex 2) Determine the reference angle θ_R for each angle θ . Sketch θ in standard position and label the reference angle θ_R .

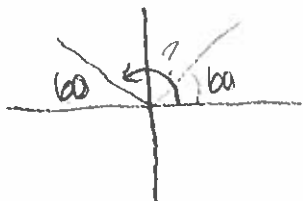
a) $\theta = 75^\circ$ b) $\theta = 240^\circ$ 

$$\begin{aligned} \theta_R &= \theta - 180^\circ \\ &= 240 - 180 \\ \theta_R &= 60^\circ \end{aligned}$$

Ex 3) Determine the angle in standard position when an angle of 60° is reflected

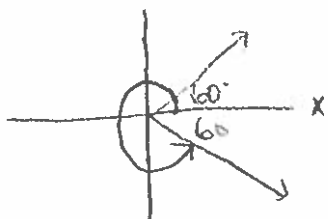
a) In the y-axis

$$180 - 60 = 120^\circ$$



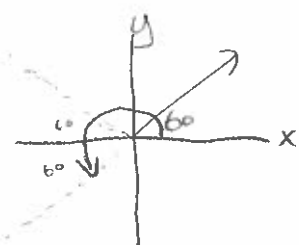
b) In the x-axis

$$360 - 60 = 300^\circ$$



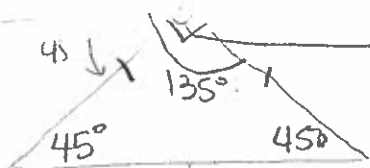
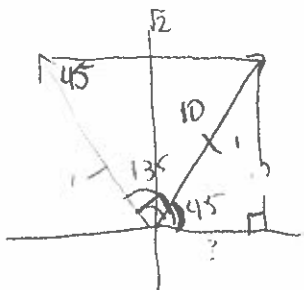
c) In the y-axis and then in the x-axis

$$180 + 60 = 240^\circ$$



Ex 4) The tempo is adjusted so that the arm of the metronome swings from 45° to 135° . What exact horizontal distance does the tip of the arm travel in one beat?

The arm of a metronome is 10 cm long.



$$135^\circ - 45^\circ = 90^\circ$$

$$\sin 45 = \frac{x}{10}$$

$$\frac{1}{\sqrt{2}} = \frac{x}{10}$$

$$10 \div \sqrt{2} = \frac{10}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{10\sqrt{2}}{2}$$

$$\boxed{5\sqrt{2}}$$