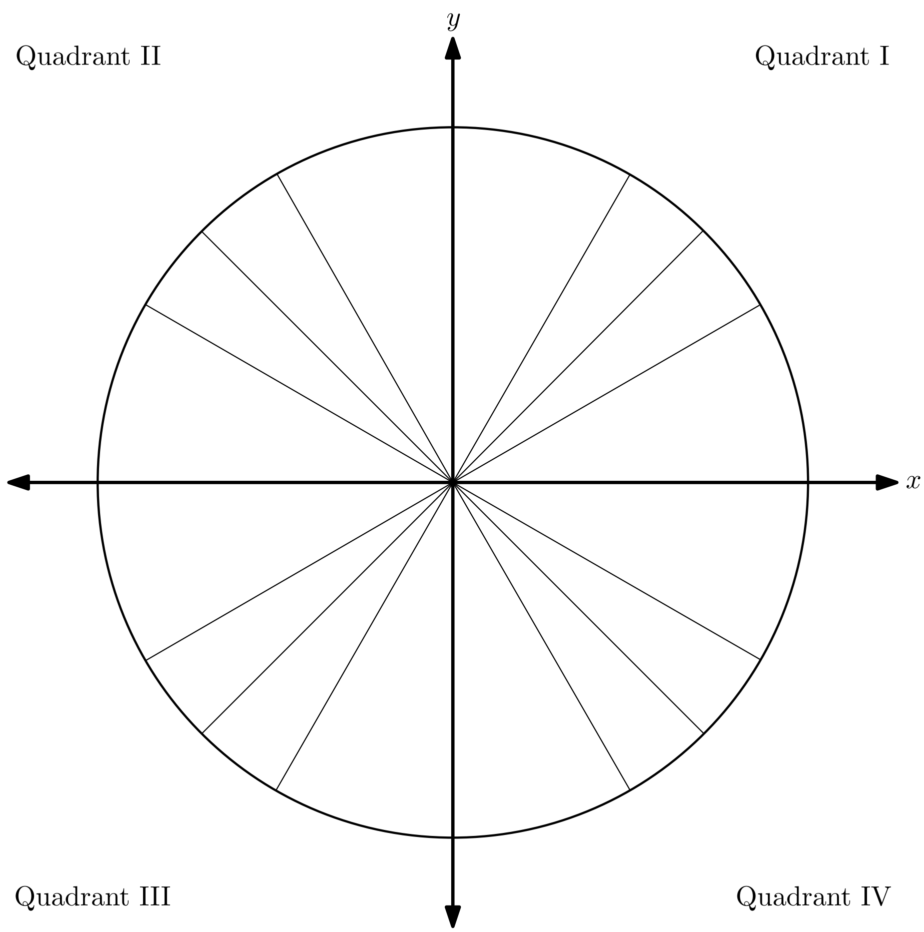
Blank Unit Circle

The unit circle is defined as $x^2 + y^2 = 1$, which is a circle with radius 1, centered at the origin $(0, 0)$. It is used in trigonometry to simplify finding values of trig functions. An empty unit circle is below with markings to be filled in:



Practice Problems

1. Find the radian value of $120°$.
2. Find the coordinates corresponding to the radian value $\frac{7\pi}{6}$.
3. Find all angles θ between 0 and 2π such that $|\sin\theta| = \frac{\sqrt{3}}{2}$.
4. In which quadrants is $\tan\theta$ positive?

Solutions

1. $$120° \cdot \frac{\pi}{180°} = \boxed{\frac{2\pi}{3}}$$

2. We wish to find the x-coordinate $\cos\frac{7\pi}{6}$ and the y-coordinate $\sin\frac{7\pi}{6}$. First note that
$$\pi < \frac{7\pi}{6} < \frac{3\pi}{2}$$
so the angle lies in quadrant III. In quadrant III both x- and y-coordinates are negative. The reference angle of $\frac{7\pi}{6}$ is
$$\frac{7\pi}{6} - \pi = \frac{\pi}{6}$$
Therefore, the coordinates are
$$\left(\cos\frac{7\pi}{6}, \sin\frac{7\pi}{6}\right) = \left(-\cos\frac{\pi}{6}, -\sin\frac{\pi}{6}\right) = \boxed{\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)}$$

3. If
$$|\sin\theta| = \frac{\sqrt{3}}{2}$$
then if θ' is the reference angle, then
$$\sin\theta' = \frac{\sqrt{3}}{2}$$
Since θ' is less than $\frac{\pi}{2}$, we can use the $30 - 60 - 90$ right triangle to see that
$$\theta' = \frac{\pi}{3}$$

The value of θ in quadrant II is

$$\pi - \theta' = \pi - \frac{\pi}{3} = \frac{2\pi}{3}$$

The value of θ in quadrant III is

$$\pi + \theta' = \pi + \frac{\pi}{3} = \frac{4\pi}{3}$$

The value of θ in quadrant IV is

$$2\pi - \theta' = 2\pi - \frac{\pi}{3} = \frac{5\pi}{3}$$

Thus, all the angles are

$$\boxed{\frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}}$$

4. Since

$$\tan\theta = \frac{\sin\theta}{\cos\theta}$$

$\tan\theta$ is positive only if both $\sin\theta$ and $\cos\theta$ are positive or both $\sin\theta$ and $\cos\theta$ are negative. $\sin\theta$ and $\cos\theta$ represent y- and x-coordinates. Both x- and y-coordinates are positive in quadrant I and both are negative in quadrant III. Therefore, $\tan\theta$ is positive in quadrants I and III. Note that $\tan\theta$ is 0 if $\sin\theta = 0$, which happens on the x-axis. In addition, $\tan\theta$ is undefined if $\cos\theta = 0$. which happens on the y-axis.