1. In this question we use the exchange rate $180^\circ = \pi$ radians.

(a) $240 \times \frac{\pi}{180} = \frac{4\pi}{3}; \quad \frac{\pi}{10}; \quad 4\pi$.

(b) $180^\circ/12 = 15^\circ; \quad 4 \times 180^\circ/5 = 144^\circ; \quad 9 \times 180^\circ/4 = 405^\circ$.

2. (a) The three angles add up to $180^\circ$, so angle $C = 180^\circ - 35^\circ - 90^\circ = 55^\circ$.

Next, $BC = AC \sin 35^\circ = 13 \sin 35^\circ$, and $AB = AC \cos 35^\circ = 13 \cos 35^\circ$.

(b) The three angles add up to $\pi$ (radians), so angle $C = \pi - \frac{3\pi}{8} - \frac{\pi}{2} = \frac{\pi}{8}$.

Next, $BC/AC = \sin \frac{3\pi}{8}$, so $AC = BC/\sin \frac{3\pi}{8} = 5/\sin \frac{3\pi}{8}$ cm; also $BC/AB = \tan \frac{3\pi}{8}$, so $AB = BC/\tan \frac{3\pi}{8} = 5/\tan \frac{3\pi}{8}$ cm.

3. (a) If $(x, y)$ is on the unit circle, then $x = \cos \theta = \sqrt{3}/2$ and $y = \sin \theta$, so $x^2 + y^2 = 1$ and $y^2 = 1/4$ or $y = \pm 1/2$.

The solutions between 0 and $2\pi$ are therefore $\theta = 30^\circ = \pi/6$ radians, and $\theta = 2\pi - \pi/6 = 11\pi/6$ (see the diagram, where the marked angle is $\pi/6$ radians, or $30^\circ$).

We get two further solutions, on adding $2\pi$, namely $\theta = 13\pi/6$ and $\theta = 23\pi/6$.

(b) We now have $y = \sin \theta = -\frac{1}{2}$ and so $x = \cos \theta = \pm \sqrt{3}/2$, giving $\theta = -5\pi/6$ (the marked angle is $210^\circ$ or $7\pi/6$) and $\theta = -\pi/6$, bearing in mind that we only accept solutions in the range from $-\pi$ to $+\pi$.

(c) We now have $y/x = -1$, so, since $x^2 + y^2 = 1$ we get $2x^2 = 1$ and $x = \pm 1/\sqrt{2}, y = \mp 1/\sqrt{2}$. There are two solutions between 0 and $2\pi$, namely at $\theta = 135^\circ = 3\pi/4$ (the marked angle is $135^\circ$), and at $\theta = 7\pi/4$.

![Figure 1: Diagrams for 3(a), (b) and (c)]](image-url)