

1. (a) $75^\circ = 75 \cdot \frac{\pi}{180} \text{ rad} = \frac{75\pi}{180} \text{ rad} = \frac{5\pi}{12} \text{ rad}$
 1. (b) $\frac{2\pi}{3} \text{ rad} = \frac{2\pi}{3} \cdot \frac{180^\circ}{\pi} = \frac{360^\circ}{3} = 120^\circ$
 2. Given that $0 < \theta < 180$ and $\sin \theta = \frac{24}{25}$, find:
 (a) $\cos \theta$

$$\begin{aligned} \cos \theta &= \pm \sqrt{1 - \sin^2 \theta} \\ &= \pm \sqrt{1 - \left(\frac{24}{25}\right)^2} \\ &= \pm \sqrt{1 - \left(\frac{576}{625}\right)} \\ &= \pm \sqrt{1 - 0.9216} \\ &= \pm \sqrt{0.0784} \\ &= \pm 0.28 \end{aligned}$$

(b) $\sin 2\theta$

$$\begin{aligned} \sin 2\theta &= 2 \sin \theta \cos \theta \\ &= \pm 2 \left(\frac{24}{25}\right) (0.28) \\ &= \pm 0.5376 \end{aligned}$$

(c) $\cos 2\theta$

$$\begin{aligned} \cos 2\theta &= \cos^2 \theta - \sin^2 \theta \\ &= \pm \left(0.28^2 - \left(\frac{24}{25}\right)^2\right) \\ &= \pm (0.0784 - 0.9216) \\ &= \pm 0.8432 \end{aligned}$$

(d) $\sin \frac{\theta}{2}$

$$\begin{aligned} \sin \frac{\theta}{2} &= \pm \sqrt{\frac{1 - \cos \theta}{2}} \\ &= \pm \sqrt{\frac{1 - 0.28}{2}} \\ &= \pm \sqrt{\frac{0.72}{2}} \\ &= \pm \sqrt{0.36} \\ &= \pm 0.6 \end{aligned}$$

$$(e) \cos \frac{\theta}{2}$$

$$\begin{aligned} \cos \frac{\theta}{2} &= \pm \sqrt{\frac{1 + \cos \theta}{2}} \\ &= \pm \sqrt{\frac{1 + 0.28}{2}} \\ &= \pm \sqrt{\frac{1.28}{2}} \\ &= \pm \sqrt{0.64} \\ &= \pm 0.8 \end{aligned}$$

3. A triangle has sides of length 5, 7, and 8. Use the law of cosines to find the angle opposite the side of length 7 to the nearest degree. (ref. p 349)

$$a = 5, b = 7, c = 8$$

Solve for the largest angle first.

Angle C:

$$\begin{aligned} \cos C &= \frac{a^2 + b^2 - c^2}{2ab} \\ &= \frac{5^2 + 7^2 - 8^2}{2 \cdot 5 \cdot 7} \\ &= \frac{1}{7} \\ C &= \arccos\left(\frac{1}{7}\right) \\ &= 1.42745 \\ &= 1.42745 \cdot \left(\frac{180}{\pi}\right) \\ &= 81.787^\circ \end{aligned}$$

Solve for the smallest angle next.

Angle A:

$$\begin{aligned} \cos A &= \frac{b^2 + c^2 - a^2}{2bc} \\ &= \frac{7^2 + 8^2 - 5^2}{2 \cdot 7 \cdot 8} \\ &= \frac{11}{14} \\ A &= \arccos \frac{11}{14} \\ &= 0.66695 \end{aligned}$$

$$0.66695 \cdot \frac{180}{\pi}$$

$$38.213^\circ$$

Solve for angle B.

$$B = 180^\circ - A - C$$

$$180^\circ - 81.787^\circ - 38.213^\circ$$

$$60^\circ$$