

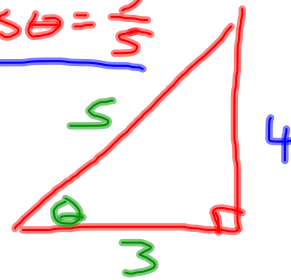
A  
20

$$\sin\left(2\cos^{-1}\frac{3}{5}\right)$$

$$\begin{aligned} \sin 2\theta &= 2 \sin\theta \cos\theta \\ &= 2\left(\frac{4}{5}\right)\left(\frac{3}{5}\right) \\ &= \frac{24}{25} \end{aligned}$$

$$\cos^{-1}\frac{3}{5} = \theta$$

$$\cos\theta = \frac{3}{5}$$



$$\sin\theta = \frac{4}{5}$$

A  
24

$$\cos\frac{\theta}{2} = \sqrt{\frac{1+\cos\theta}{2}}$$

(+) since  $7.5^\circ$  is in I

$$\cos 7.5^\circ = \sqrt{\frac{1+\cos 15^\circ}{2}}$$

$$\theta = 15^\circ \quad \frac{15^\circ}{2} = 7.5^\circ$$

$$\theta' = 30^\circ \quad \frac{30^\circ}{2} = 15^\circ$$

$$= \sqrt{\frac{1+\sqrt{\frac{1+\cos 30^\circ}{2}}}{2}}$$

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

$$= \sqrt{\frac{1+\sqrt{\frac{1+\frac{\sqrt{3}}{2}}{2}}}{2}} \cdot \frac{2}{2} = \sqrt{\frac{1+\sqrt{\frac{2+\sqrt{3}}{4}}}{2}}$$

$$= \sqrt{\frac{1+\frac{1}{2}\sqrt{2+\sqrt{3}}}{2}} \cdot \frac{2}{2}$$

$$= \sqrt{\frac{2+\sqrt{2+\sqrt{3}}}{4}}$$

$$= \frac{1}{2}\sqrt{2+\sqrt{2+\sqrt{3}}}$$

C  
24

$\sin 11.25^\circ$

$\sin \frac{\theta}{2} = \sqrt{\frac{1 - \cos \theta}{2}}$

$\sin 11.25^\circ = \sqrt{\frac{1 - \cos 22.5^\circ}{2}}$

$= \sqrt{\frac{1 - \sqrt{\frac{1 + \cos 45^\circ}{2}}}{2}}$

$= \sqrt{\frac{1 - \sqrt{\frac{1 + \frac{\sqrt{2}}{2}}{2}}}{2}} \cdot \frac{2}{2} = \sqrt{\frac{1 - \sqrt{\frac{2 + \sqrt{2}}{4}}}{2}}$

$11.25^\circ$  is in I  
so  $\oplus$

$\theta = 22.5^\circ \quad \frac{22.5^\circ}{2} = 11.25^\circ$

$\theta' = 45^\circ \quad \frac{45^\circ}{2} = 22.5^\circ$

$\cos 45^\circ = \frac{\sqrt{2}}{2}$

C  
20

$\tan(2 \sin^{-1} \frac{15}{17})$

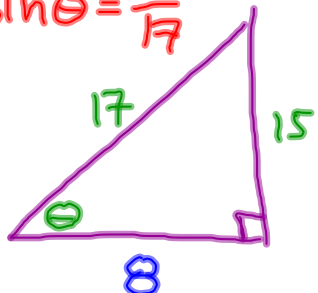
$\tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$

$= \frac{2(\frac{15}{8})}{1 - (\frac{15}{8})^2}$

$= \frac{30}{8} = \frac{30}{8} \cdot \frac{8}{8} = \frac{30 \cdot 8}{8 \cdot 8} = \frac{240}{64} = \frac{240}{161}$

$\sin^{-1}(\frac{15}{17}) = \theta$

$\sin \theta = \frac{15}{17}$



$\frac{64}{64} \cdot \frac{225}{64} = \frac{30}{8} \cdot \frac{64}{64} = \frac{240}{161}$