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Quiz – September 14, 2004

The the value of

$$\sin\left[\arccos(\tfrac{3}{5}) + \arccos(\tfrac{5}{13})\right].$$

Answer: We see that

$$\sin\left[\arccos(\tfrac{3}{5}) + \arccos(\tfrac{5}{13})\right]$$

$$= \sin(\arccos(\tfrac{3}{5}))\cos(\arccos(\tfrac{5}{13})) + \cos(\arccos(\tfrac{3}{5}))\sin(\arccos(\tfrac{5}{13})).$$

It is clear that $\cos(\arccos(\frac{5}{13})) = \frac{5}{13}$ and $\cos(\arccos(\frac{3}{5}))$. Draw a triangle to see that $\sin(\arccos(\frac{3}{5})) = \frac{4}{5}$. Draw another triangle to see that $\sin(\arccos(\frac{5}{13})) = \frac{12}{13}$. It follows that the answer is

$$(\tfrac{4}{5})(\tfrac{5}{13}) + (\tfrac{3}{5})(\tfrac{12}{13}) = \boxed{\tfrac{56}{65}.}$$