Precalculus
Computing sine, cosine of a half-angle

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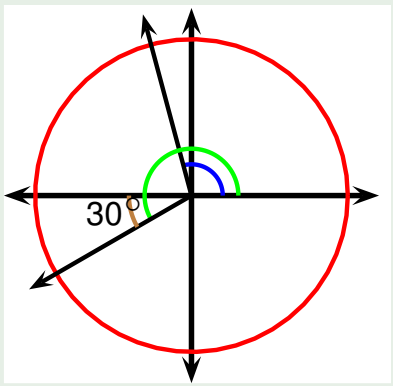
Recall the half angle formula $\cos\alpha = \pm\sqrt{\frac{1+\cos(2\alpha)}{2}}$.

Example

Using radicals, find the exact value of the trigonometric expression.



$$\begin{aligned}
\cos 105^\circ &= \pm\sqrt{\frac{1+\cos(2\cdot 105^\circ)}{2}} \qquad \Big| \cos 105^\circ < 0 \\
&= -\sqrt{\frac{1+\cos(210^\circ)}{2}} \\
&= -\sqrt{\frac{1-\cos(30^\circ)}{2}} \\
&= -\sqrt{\frac{1-\frac{\sqrt{3}}{2}}{2}} = -\sqrt{\frac{2-\sqrt{3}}{2\cdot 2}} \\
&= -\frac{\sqrt{2-\sqrt{3}}}{2}
\end{aligned}$$