

Double-Angle and Half-Angle Identities

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Use a double-angle or half-angle identity to find the exact value of each expression.

1) $\cos \frac{7\pi}{8}$

2) $\sin \frac{7\pi}{8}$

3) $\sin 165^\circ$

4) $\sin 112\frac{1}{2}^\circ$

5) $\sin 15^\circ$

6) $\cos \frac{23\pi}{12}$

7) $\sin 22\frac{1}{2}^\circ$

8) $\sin -\frac{5\pi}{12}$

9) $\cos \frac{3\pi}{8}$

10) $\sin 75^\circ$

11) $\sin \theta = -\frac{8}{17}$ and $180^\circ < \theta < 270^\circ$

Find $\cos \frac{\theta}{2}$

12) $\sin \theta = -\frac{7}{25}$ and $\frac{3\pi}{2} < \theta < 2\pi$

Find $\sin 2\theta$

13) $\sin \theta = -\frac{9}{22}$ and $270^\circ < \theta < 360^\circ$

Find $\cos 2\theta$

14) $\cos \theta = \frac{4}{5}$ and $270^\circ < \theta < 360^\circ$

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15) $\cos \theta = -\frac{4}{5}$ and $-270^\circ < \theta < -180^\circ$

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16) $\cos \theta = \frac{4}{5}$ and $0 < \theta < \frac{\pi}{2}$

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Answers to Double-Angle and Half-Angle Identities

$$1) -\frac{\sqrt{2+\sqrt{2}}}{2}$$

$$5) \frac{\sqrt{6}-\sqrt{2}}{4}$$

$$9) \frac{\sqrt{2-\sqrt{2}}}{2}$$

$$13) \frac{161}{242}$$

$$2) \frac{\sqrt{2-\sqrt{2}}}{2}$$

$$6) \frac{\sqrt{6}+\sqrt{2}}{4}$$

$$10) \frac{\sqrt{6}+\sqrt{2}}{4}$$

$$14) -\frac{3\sqrt{10}}{10}$$

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$$15) -\frac{3\sqrt{10}}{10}$$

$$4) \frac{\sqrt{2+\sqrt{2}}}{2}$$

$$8) \frac{-\sqrt{6}-\sqrt{2}}{4}$$

$$12) -\frac{336}{625}$$

$$16) \frac{7}{25}$$

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$$1) -\frac{\sqrt{2+\sqrt{2}}}{2}$$

$$5) \frac{\sqrt{6}-\sqrt{2}}{4}$$

$$9) \frac{\sqrt{2}-\sqrt{2}}{2}$$

$$13) \frac{161}{242}$$

$$2) \frac{\sqrt{2}-\sqrt{2}}{2}$$

$$6) \frac{\sqrt{6}+\sqrt{2}}{4}$$

$$10) \frac{\sqrt{6}+\sqrt{2}}{4}$$

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$$3) \frac{\sqrt{6}-\sqrt{2}}{4}$$

$$7) \frac{\sqrt{2}-\sqrt{2}}{2}$$

$$11) -\frac{\sqrt{17}}{17}$$

$$15) -\frac{3\sqrt{10}}{10}$$

$$4) \frac{\sqrt{2+\sqrt{2}}}{2}$$

$$8) \frac{-\sqrt{6}-\sqrt{2}}{4}$$

$$12) -\frac{336}{625}$$

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Use a double-angle or half-angle identity to find the exact value of each expression.

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3) $\sin 165^\circ$

4) $\sin 112\frac{1}{2}^\circ$

5) $\sin 15^\circ$

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9) $\cos \frac{3\pi}{8}$

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11) $\sin \theta = -\frac{8}{17}$ and $180^\circ < \theta < 270^\circ$

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9) $\cos \frac{3\pi}{8}$

10) $\sin 75^\circ$

11) $\sin \theta = -\frac{8}{17}$ and $180^\circ < \theta < 270^\circ$

Find $\cos \frac{\theta}{2}$

12) $\sin \theta = -\frac{7}{25}$ and $\frac{3\pi}{2} < \theta < 2\pi$

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13) $\sin \theta = -\frac{9}{22}$ and $270^\circ < \theta < 360^\circ$

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$$1) -\frac{\sqrt{2+\sqrt{2}}}{2}$$

$$5) \frac{\sqrt{6}-\sqrt{2}}{4}$$

$$9) \frac{\sqrt{2}-\sqrt{2}}{2}$$

$$13) \frac{161}{242}$$

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$$6) \frac{\sqrt{6}+\sqrt{2}}{4}$$

$$10) \frac{\sqrt{6}+\sqrt{2}}{4}$$

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$$7) \frac{\sqrt{2}-\sqrt{2}}{2}$$

$$11) -\frac{\sqrt{17}}{17}$$

$$15) -\frac{3\sqrt{10}}{10}$$

$$4) \frac{\sqrt{2+\sqrt{2}}}{2}$$

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$$12) -\frac{336}{625}$$

$$16) \frac{7}{25}$$

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$$16) \frac{7}{25}$$

Double-Angle and Half-Angle Identities

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Use a double-angle or half-angle identity to find the exact value of each expression.

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2) $\sin \frac{7\pi}{8}$

3) $\sin 165^\circ$

4) $\sin 112\frac{1}{2}^\circ$

5) $\sin 15^\circ$

6) $\cos \frac{23\pi}{12}$

7) $\sin 22\frac{1}{2}^\circ$

8) $\sin -\frac{5\pi}{12}$

9) $\cos \frac{3\pi}{8}$

10) $\sin 75^\circ$

11) $\sin \theta = -\frac{8}{17}$ and $180^\circ < \theta < 270^\circ$

Find $\cos \frac{\theta}{2}$

12) $\sin \theta = -\frac{7}{25}$ and $\frac{3\pi}{2} < \theta < 2\pi$

Find $\sin 2\theta$

13) $\sin \theta = -\frac{9}{22}$ and $270^\circ < \theta < 360^\circ$

Find $\cos 2\theta$

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$$13) \frac{161}{242}$$

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Answers to Double-Angle and Half-Angle Identities

$$1) -\frac{\sqrt{2+\sqrt{2}}}{2}$$

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Use a double-angle or half-angle identity to find the exact value of each expression.

1) $\cos \frac{7\pi}{8}$

2) $\sin \frac{7\pi}{8}$

3) $\sin 165^\circ$

4) $\sin 112\frac{1}{2}^\circ$

5) $\sin 15^\circ$

6) $\cos \frac{23\pi}{12}$

7) $\sin 22\frac{1}{2}^\circ$

8) $\sin -\frac{5\pi}{12}$

9) $\cos \frac{3\pi}{8}$

10) $\sin 75^\circ$

11) $\sin \theta = -\frac{8}{17}$ and $180^\circ < \theta < 270^\circ$

Find $\cos \frac{\theta}{2}$

12) $\sin \theta = -\frac{7}{25}$ and $\frac{3\pi}{2} < \theta < 2\pi$

Find $\sin 2\theta$

13) $\sin \theta = -\frac{9}{22}$ and $270^\circ < \theta < 360^\circ$

Find $\cos 2\theta$

14) $\cos \theta = \frac{4}{5}$ and $270^\circ < \theta < 360^\circ$

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15) $\cos \theta = -\frac{4}{5}$ and $-270^\circ < \theta < -180^\circ$

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Find $\cos 2\theta$

Answers to Double-Angle and Half-Angle Identities

$$1) -\frac{\sqrt{2+\sqrt{2}}}{2}$$

$$5) \frac{\sqrt{6}-\sqrt{2}}{4}$$

$$9) \frac{\sqrt{2-\sqrt{2}}}{2}$$

$$13) \frac{161}{242}$$

$$2) \frac{\sqrt{2-\sqrt{2}}}{2}$$

$$6) \frac{\sqrt{6}+\sqrt{2}}{4}$$

$$10) \frac{\sqrt{6}+\sqrt{2}}{4}$$

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