

# Workbook page 149

Find the exact values for...

29. Determine the exact value of each trigonometric expression.

a.  $\sin 30^\circ + \cos 60^\circ$       b.  $\sin 240^\circ + \cos 225^\circ$       c.  $\cos 90^\circ + \sin 270^\circ$

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29. Determine the exact value of each trigonometric expression.

a.  $\sin 30^\circ + \cos 60^\circ$       b.  $\sin 240^\circ + \cos 225^\circ$       c.  $\cos 90^\circ + \sin 270^\circ$

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

$$= \frac{2}{2}$$

$$= 1$$

$$\begin{array}{l} \text{Q3} \quad \text{Q3} \\ \text{ref } 60^\circ \quad \text{ref } 45^\circ \\ -\frac{\sqrt{3}}{2} + -\frac{\sqrt{2}}{2} \end{array}$$

$$= -1$$

$$= \frac{-\sqrt{3}-\sqrt{2}}{2}$$

$$= 0 + -1$$

$$= -1$$

d.  $\cos 360^\circ - \cos 180^\circ$       e.  $\sin 120^\circ + \cos 135^\circ$       f.  $4 \sin 330^\circ$

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d. $\cos 360^\circ - \cos 180^\circ$	e. $\sin 120^\circ + \cos 135^\circ$	f. $4 \sin 330^\circ$
$1 - (-1)$	$\overset{Q2}{\text{ref } 60^\circ} \quad \overset{Q2}{\text{ref } 45^\circ}$	$\overset{Q4}{\text{ref } 30^\circ}$
$= 1 + 1$	$= \frac{\sqrt{3}}{2} + \frac{-\sqrt{2}}{2}$	$4\left(-\frac{1}{2}\right)$
$= 2$	$= \frac{\sqrt{3} - \sqrt{2}}{2}$	$= \frac{-4}{2}$
		$= -2$

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g. $\sin^2 30^\circ$	h. $-2 \cos 135^\circ$	i. $\cos^2 210^\circ$
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g. $\sin^2 30^\circ$	h. $-2 \cos 135^\circ$	i. $\cos^2 210^\circ$
$(\sin 30^\circ)^2$	$\overset{Q2}{\text{ref } 45^\circ}$	$\overset{Q3}{\text{ref } 30^\circ}$
$= \left(\frac{1}{2}\right)^2$	$-2\left(-\frac{\sqrt{2}}{2}\right)$	$(\cos 210^\circ)^2$
$= \frac{1}{4}$	$= \frac{2\sqrt{2}}{2}$	$\left(-\frac{\sqrt{3}}{2}\right)^2$
	$= \sqrt{2}$	$= \frac{3}{4}$

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j. $\cos 150^\circ \sin 300^\circ$	k. $\sin 270^\circ \cos 60^\circ$	l. $\cos 210^\circ \cos 135^\circ$
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j.  $\cos 150^\circ \sin 300^\circ$     k.  $\sin 270^\circ \cos 60^\circ$     l.  $\cos 210^\circ \cos 135^\circ$

$\begin{matrix} Q2 \\ \text{ref } 30^\circ \end{matrix}$      $\begin{matrix} Q4 \\ \text{ref } 60^\circ \end{matrix}$      $= (-1)\left(\frac{1}{2}\right)$      $\begin{matrix} Q3 \\ \text{ref } 30^\circ \end{matrix}$      $\begin{matrix} Q2 \\ \text{ref } 45^\circ \end{matrix}$   
 $\left(-\frac{\sqrt{3}}{2}\right)\left(-\frac{\sqrt{3}}{2}\right) = -\frac{1}{2}$      $\left(-\frac{\sqrt{3}}{2}\right)\left(-\frac{\sqrt{2}}{2}\right)$   
 $= +\frac{\sqrt{9}}{4}$      $= \frac{\sqrt{6}}{4}$   
 $= \frac{3}{4}$

m.  $\sin 315^\circ \sin 45^\circ$     n.  $4 \sin^2 150^\circ \cos(-30^\circ)$     o.  $2 \cos(-90^\circ) \sin^2(135^\circ)$

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m.  $\sin 315^\circ \sin 45^\circ$     n.  $4 \sin^2 150^\circ \cos(-30^\circ)$     o.  $2 \cos(-90^\circ) \sin^2(135^\circ)$

$\begin{matrix} Q4 \\ \text{ref } 45^\circ \end{matrix}$      $\begin{matrix} Q2 \\ \text{ref } 30^\circ \end{matrix}$      $\begin{matrix} Q4 \\ \text{ref } 30^\circ \end{matrix}$      $\begin{matrix} Q2 \\ \text{ref } 45^\circ \end{matrix}$   
 $\left(-\frac{\sqrt{2}}{2}\right)\left(\frac{\sqrt{2}}{2}\right)$      $4(\sin 150^\circ)^2 (\cos 330^\circ)$      $2(0)\left(\frac{\sqrt{2}}{2}\right)^2$   
 $= -\frac{\sqrt{4}}{4}$      $4\left(\frac{1}{2}\right)^2 \left(\frac{\sqrt{3}}{2}\right)$      $= 0\left(\frac{2}{4}\right)$   
 $= -\frac{2}{4}$      $= \frac{4}{1}\left(\frac{1}{4}\right)\left(\frac{\sqrt{3}}{2}\right)$      $= 0$   
 $= -\frac{1}{2}$      $= \frac{4\sqrt{3}}{8}$   
 $= \frac{\sqrt{3}}{2}$

p.  $\sin^2 30^\circ + \cos^2 30^\circ$     q.  $\sin^2 45^\circ + \cos^2 45^\circ$     r.  $1 - \sin^2 120^\circ$

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p.  $\sin^2 30^\circ + \cos^2 30^\circ$     q.  $\sin^2 45^\circ + \cos^2 45^\circ$     r.  $1 - \sin^2 120^\circ$

$(\sin 30^\circ)^2 + (\cos 30^\circ)^2$      $(\sin 45^\circ)^2 + (\cos 45^\circ)^2$      $1 - (\sin 120^\circ)^2$

$(\frac{1}{2})^2 + (\frac{\sqrt{3}}{2})^2$      $(\frac{\sqrt{2}}{2})^2 + (\frac{\sqrt{2}}{2})^2$      $1 - (\frac{\sqrt{3}}{2})^2$

$= \frac{1}{4} + \frac{3}{4}$      $= \frac{2}{4} + \frac{2}{4}$      $1 - \frac{3}{4}$

$= \frac{4}{4}$      $= \frac{4}{4}$      $= \frac{1}{4}$

$= 1$      $= 1$      $= \frac{1}{4}$

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s.  $\sin 60^\circ \cos 135^\circ + \cos 330^\circ \sin 210^\circ$     t.  $2 \cos^2 240^\circ - \cos(-180^\circ) \sin 30^\circ$

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s.  $\sin 60^\circ \cos 135^\circ + \cos 330^\circ \sin 210^\circ$     t.  $2 \cos^2 240^\circ - \cos(-180^\circ) \sin 30^\circ$

$(\frac{\sqrt{3}}{2})(-\frac{\sqrt{2}}{2}) + (\frac{\sqrt{3}}{2})(\frac{1}{2})$      $2(\cos 240^\circ)^2 - \cos 180^\circ \sin 30^\circ$

$-\frac{\sqrt{6}}{4} + \frac{\sqrt{3}}{4}$      $2(-\frac{1}{2})^2 - (-1)(\frac{1}{2})$

$= \frac{-\sqrt{6} + \sqrt{3}}{4}$      $2(\frac{1}{4}) + \frac{1}{2}$

$\frac{2}{4} + \frac{1}{2}$

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

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30. Determine the exact value of each trigonometric expression.

a.  $\frac{\sin 30^\circ}{\cos 240^\circ}$     b.  $\frac{\sin 120^\circ}{\cos 330^\circ}$     c.  $\frac{\sin 135^\circ}{\cos 210^\circ}$

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30. Determine the exact value of each trigonometric expression.

a.  $\frac{\sin 30^\circ}{\cos 240^\circ}$   
 93 ref 60°  
 $\frac{\frac{1}{2}}{-\frac{\sqrt{2}}{2}} = -1$

b.  $\frac{\sin 120^\circ}{\cos 330^\circ}$   
 92 ref 60  
 94 ref 30  
 $\frac{\frac{\sqrt{3}}{2}}{\frac{\sqrt{3}}{2}} = 1$

c.  $\frac{\sin 135^\circ}{\cos 210^\circ}$   
 92 ref 45°  
 93 ref 30°  
 $\frac{\frac{\sqrt{2}}{2}}{-\frac{\sqrt{3}}{2}} = \frac{\sqrt{2}}{2} \div \frac{-\sqrt{3}}{2}$   
 $= \frac{\sqrt{2}}{2} \times \frac{2}{-\sqrt{3}} = \frac{2\sqrt{2}}{-2\sqrt{3}} = -\frac{\sqrt{2}}{\sqrt{3}} = -\frac{\sqrt{2} \cdot \sqrt{3}}{\sqrt{3} \cdot \sqrt{3}} = -\frac{\sqrt{6}}{3}$

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d.  $\frac{\sin 30^\circ}{\sin^2 225^\circ}$       e.  $\frac{\sin 60^\circ}{\cos 30^\circ} + \frac{\cos 45^\circ}{\sin 150^\circ}$       f.  $\frac{\cos 120^\circ + \sin 30^\circ}{\sin 150^\circ}$

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d.  $\frac{\sin 30^\circ}{\sin^2 225^\circ}$   
 93 ref 45°  
 $\frac{\frac{1}{2}}{(-\frac{\sqrt{2}}{2})^2} = \frac{\frac{1}{2}}{\frac{2}{4}} = \frac{1}{2} \div \frac{1}{2} = 1$

e.  $\frac{\sin 60^\circ}{\cos 30^\circ} + \frac{\cos 45^\circ}{\sin 150^\circ}$   
 $\frac{\frac{\sqrt{3}}{2}}{\frac{\sqrt{3}}{2}} + \frac{\frac{\sqrt{2}}{2}}{\frac{1}{2}} = 1 + \frac{\sqrt{2} \times 2}{1} = 1 + \sqrt{2}$

f.  $\frac{\cos 120^\circ + \sin 30^\circ}{\sin 150^\circ}$   
 $\frac{-\frac{1}{2} + \frac{1}{2}}{\frac{1}{2}} = \frac{0}{\frac{1}{2}} = 0$

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g.  $\frac{\cos 30^\circ + \sin 270^\circ}{\sin 330^\circ}$       h.  $\frac{3 \sin 90^\circ - \cos 180^\circ}{\sin 210^\circ}$       i.  $\frac{2 \cos 180^\circ + \cos 135^\circ}{\sin 135^\circ}$

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g.  $\frac{\cos 30^\circ + \sin 270^\circ}{\sin 330^\circ}$     h.  $\frac{3 \sin 90^\circ - \cos 180^\circ}{\sin 210^\circ}$     i.  $\frac{2 \cos 180^\circ + \cos 135^\circ}{\sin 135^\circ}$

$\frac{\frac{\sqrt{3}}{2} + -1}{-\frac{1}{2}}$      $\frac{3(1) - (-1)}{-\frac{1}{2}}$      $\frac{2(-1) + (-\frac{\sqrt{2}}{2})}{\frac{\sqrt{2}}{2}}$

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

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

$= -8$      $= \frac{-4\sqrt{2} - 2}{2}$

$= -2\sqrt{2} - 1$

j.  $\frac{\sin 240^\circ - \cos^2 45^\circ}{\cos 330^\circ}$     k.  $\frac{\sin^2 60^\circ + \cos 210^\circ \sin 225^\circ}{\sin 210^\circ + \cos 0^\circ}$

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j.  $\frac{\sin 240^\circ - \cos^2 45^\circ}{\cos 330^\circ}$     k.  $\frac{\sin^2 60^\circ + \cos 210^\circ \sin 225^\circ}{\sin 210^\circ + \cos 0^\circ}$

$\frac{(-\frac{\sqrt{3}}{2}) - (\frac{\sqrt{2}}{2})^2}{\frac{\sqrt{3}}{2}}$      $\frac{(\frac{\sqrt{3}}{2})^2 + (-\frac{\sqrt{3}}{2})(-\frac{\sqrt{2}}{2})}{-\frac{1}{2} + 1}$

$\frac{(-\frac{\sqrt{3}}{2} - \frac{1}{2}) \cdot \frac{\sqrt{3}}{2}}{\frac{\sqrt{3}}{2}}$      $\frac{\frac{3}{4} + \frac{\sqrt{6}}{4}}{\frac{1}{2}} \cdot \frac{4}{4}$

$= \frac{-\sqrt{3} - 1}{\sqrt{3}}$      $= \frac{3 + \sqrt{6}}{2}$

$= -\frac{3 + \sqrt{3}}{3}$

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