

3 の倍数の角度の三角比の値

θ	$\sin \theta$	$\cos \theta$	$\tan \theta$
0°	0	1	0
$3^\circ = 18^\circ - 15^\circ$	$\frac{1}{16}\{-\sqrt{2}-\sqrt{6}+\sqrt{10}+\sqrt{30}-2(-1+\sqrt{3})\sqrt{5+\sqrt{5}}\}$	$\frac{1}{16}\{\sqrt{2}-\sqrt{6}-\sqrt{10}+\sqrt{30}+2(1+\sqrt{3})\sqrt{5+\sqrt{5}}\}$	$\frac{1}{2}\{4-3\sqrt{3}+2\sqrt{5}-\sqrt{15}+(-7+4\sqrt{3}-3\sqrt{5}+2\sqrt{15})\sqrt{5-2\sqrt{5}}\}$
$6^\circ = 36^\circ - 30^\circ$	$\frac{1}{8}(-1-\sqrt{5}+\sqrt{30-6\sqrt{5}})$	$\frac{1}{8}(\sqrt{3}+\sqrt{15}+\sqrt{10-2\sqrt{5}})$	$\sqrt{7-2\sqrt{5}-2\sqrt{15-6\sqrt{5}}}$
$9^\circ = 54^\circ - 45^\circ$	$\frac{1}{8}(\sqrt{2}+\sqrt{10}-2\sqrt{5-\sqrt{5}})$	$\frac{1}{8}(\sqrt{2}+\sqrt{10}+2\sqrt{5-\sqrt{5}})$	$1+\sqrt{5}-\sqrt{5+2\sqrt{5}}$
$12^\circ = 30^\circ - 18^\circ$	$\frac{1}{8}(\sqrt{3}-\sqrt{15}+\sqrt{10+2\sqrt{5}})$	$\frac{1}{8}(-1+\sqrt{5}+\sqrt{30+6\sqrt{5}})$	$\frac{1}{8}\{5\sqrt{3}-\sqrt{15}+(4-4\sqrt{5})\sqrt{5-2\sqrt{5}}+(-\sqrt{3}+\sqrt{15})\sqrt{9-4\sqrt{5}}\}$
15°	$\frac{\sqrt{6}-\sqrt{2}}{4}$	$\frac{\sqrt{6}+\sqrt{2}}{4}$	$2-\sqrt{3}$
18°	$\frac{\sqrt{5}-1}{4}$	$\frac{\sqrt{10+2\sqrt{5}}}{4}$	$\frac{\sqrt{25-10\sqrt{5}}}{5}$
$21^\circ = 36^\circ - 15^\circ$	$\frac{1}{16}\{\sqrt{2}-\sqrt{6}+\sqrt{10}-\sqrt{30}+2(1+\sqrt{3})\sqrt{5-\sqrt{5}}\}$	$\frac{1}{16}\{\sqrt{2}+\sqrt{6}+\sqrt{10}+\sqrt{30}+2(-1+\sqrt{3})\sqrt{5-\sqrt{5}}\}$	$\frac{1}{2}\{-4-3\sqrt{3}+2\sqrt{5}+\sqrt{15}+(1+2\sqrt{3}-\sqrt{5})\sqrt{5-2\sqrt{5}}\}$
$24^\circ = 54^\circ - 30^\circ$	$\frac{1}{8}(\sqrt{3}+\sqrt{15}-\sqrt{10-2\sqrt{5}})$	$\frac{1}{8}(1+\sqrt{5}+\sqrt{30-6\sqrt{5}})$	$\frac{1}{8}\{-5\sqrt{3}-\sqrt{15}+(4+4\sqrt{5})\sqrt{5+2\sqrt{5}}-(\sqrt{3}+\sqrt{15})\sqrt{9+4\sqrt{5}}\}$
$27^\circ = 45^\circ - 18^\circ$	$\frac{1}{8}(\sqrt{2}-\sqrt{10}+2\sqrt{5+\sqrt{5}})$	$\frac{1}{8}(-\sqrt{2}+\sqrt{5}+2\sqrt{5+\sqrt{5}})$	$-1+\sqrt{5}-\sqrt{5-2\sqrt{5}}$
30°	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{3}}{3}$
$33^\circ = 18^\circ + 15^\circ$	$\frac{1}{16}\{-\sqrt{2}-\sqrt{6}+\sqrt{10}+\sqrt{30}+2(-1+\sqrt{3})\sqrt{5+\sqrt{5}}\}$	$\frac{1}{16}\{-\sqrt{2}+\sqrt{6}+\sqrt{10}-\sqrt{30}+2(1+\sqrt{3})\sqrt{5+\sqrt{5}}\}$	$\frac{1}{2}\{-4+3\sqrt{3}-2\sqrt{5}+\sqrt{15}+(-7+4\sqrt{3}-3\sqrt{5}+2\sqrt{15})\sqrt{5-2\sqrt{5}}\}$
36°	$\frac{\sqrt{10-2\sqrt{5}}}{4}$	$\frac{\sqrt{5}+1}{4}$	$\sqrt{5-2\sqrt{5}}$
$39^\circ = 54^\circ - 15^\circ$	$\frac{1}{16}\{\sqrt{2}+\sqrt{6}+\sqrt{10}+\sqrt{30}-2(-1+\sqrt{3})\sqrt{5-\sqrt{5}}\}$	$\frac{1}{16}\{-\sqrt{2}+\sqrt{6}-\sqrt{10}+\sqrt{30}+2(1+\sqrt{3})\sqrt{5-\sqrt{5}}\}$	$\frac{1}{2}\{4-3\sqrt{3}-2\sqrt{5}+\sqrt{15}+(7-4\sqrt{3}-3\sqrt{5}+2\sqrt{15})\sqrt{5+2\sqrt{5}}\}$
$42^\circ = 60^\circ - 18^\circ$	$\frac{1}{8}(1-\sqrt{5}+\sqrt{30+6\sqrt{5}})$	$\frac{1}{8}(-\sqrt{3}+\sqrt{15}+\sqrt{10+2\sqrt{5}})$	$\sqrt{7+2\sqrt{5}-2\sqrt{15+6\sqrt{5}}}$
45°	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	1
$48^\circ = 30^\circ + 18^\circ$	$\frac{1}{8}(-\sqrt{3}+\sqrt{15}+\sqrt{10+2\sqrt{5}})$	$\frac{1}{8}(1-\sqrt{5}+\sqrt{30+6\sqrt{5}})$	$\frac{1}{8}\{5\sqrt{3}-\sqrt{15}+(-4+4\sqrt{5})\sqrt{5-2\sqrt{5}}+(-\sqrt{3}+\sqrt{15})\sqrt{9-4\sqrt{5}}\}$

51° =36° +15°	$\frac{1}{16}\{-\sqrt{2}+\sqrt{6}-\sqrt{10}+\sqrt{30}+2(1+\sqrt{3})\sqrt{5-\sqrt{5}}\}$	$\frac{1}{16}\{\sqrt{2}+\sqrt{6}+\sqrt{10}+\sqrt{30}-2(-1+\sqrt{3})\sqrt{5-\sqrt{5}}\}$	$\frac{1}{2}\{4+3\sqrt{3}-2\sqrt{5}-\sqrt{15}+(1+2\sqrt{3}-\sqrt{5})\sqrt{5-2\sqrt{5}}\}$
54°	$\frac{\sqrt{5}+1}{4}$	$\frac{\sqrt{10-2\sqrt{5}}}{4}$	$\frac{\sqrt{25+10\sqrt{5}}}{5}$
57° =72° -15°	$\frac{1}{16}\{-\sqrt{2}+\sqrt{6}+\sqrt{10}-\sqrt{30}+2(1+\sqrt{3})\sqrt{5+\sqrt{5}}\}$	$\frac{1}{16}\{-\sqrt{2}-\sqrt{6}+\sqrt{10}+\sqrt{30}+2(-1+\sqrt{3})\sqrt{5+\sqrt{5}}\}$	$\frac{1}{2}\{-4-3\sqrt{3}-2\sqrt{5}-\sqrt{15}+(1+2\sqrt{3}+\sqrt{5})\sqrt{5+2\sqrt{5}}\}$
60°	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$
63° =45° +18°	$\frac{1}{8}(-\sqrt{2}+\sqrt{10}+2\sqrt{5+\sqrt{5}})$	$\frac{1}{8}(\sqrt{2}-\sqrt{10}+2\sqrt{5+\sqrt{5}})$	$-1+\sqrt{5}+\sqrt{5-2\sqrt{5}}$
66° =36° +30°	$\frac{1}{8}(1+\sqrt{5}+\sqrt{30-6\sqrt{5}})$	$\frac{1}{8}(\sqrt{3}+\sqrt{15}-\sqrt{10-2\sqrt{5}})$	$\sqrt{7-2\sqrt{5}+2\sqrt{15-6\sqrt{5}}}$
69° =54° +15°	$\frac{1}{16}\{\sqrt{2}+\sqrt{6}+\sqrt{10}+\sqrt{30}+2(-1+\sqrt{3})\sqrt{5-\sqrt{5}}\}$	$\frac{1}{16}\{\sqrt{2}-\sqrt{6}+\sqrt{10}-\sqrt{30}+2(1+\sqrt{3})\sqrt{5-\sqrt{5}}\}$	$\frac{1}{2}\{-4+3\sqrt{3}+2\sqrt{5}-\sqrt{15}+(7-4\sqrt{3}-3\sqrt{5}+2\sqrt{15})\sqrt{5+2\sqrt{5}}\}$
72°	$\frac{\sqrt{10+2\sqrt{5}}}{4}$	$\frac{\sqrt{5}-1}{4}$	$\sqrt{5+2\sqrt{5}}$
75°	$\frac{\sqrt{6}+\sqrt{2}}{4}$	$\frac{\sqrt{6}-\sqrt{2}}{4}$	$2+\sqrt{3}$
78° =60° +18°	$\frac{1}{8}(-1+\sqrt{5}+\sqrt{30+6\sqrt{5}})$	$\frac{1}{8}(\sqrt{3}-\sqrt{15}+\sqrt{10+2\sqrt{5}})$	$\frac{1}{8}\{5\sqrt{3}+3\sqrt{15}+(12+4\sqrt{5})\sqrt{5-2\sqrt{5}}+(3\sqrt{3}+\sqrt{15})\sqrt{9-4\sqrt{5}}\}$
81° =45° +36°	$\frac{1}{8}(\sqrt{2}+\sqrt{10}+2\sqrt{5-\sqrt{5}})$	$\frac{1}{8}(\sqrt{2}+\sqrt{10}-2\sqrt{5-\sqrt{5}})$	$1+\sqrt{5}+\sqrt{5+2\sqrt{5}}$
84° =54° +30°	$\frac{1}{8}(\sqrt{3}+\sqrt{15}+\sqrt{10-2\sqrt{5}})$	$\frac{1}{8}(-1-\sqrt{5}+\sqrt{30-6\sqrt{5}})$	$\frac{1}{8}\{5\sqrt{3}+\sqrt{15}+(4+4\sqrt{5})\sqrt{5+2\sqrt{5}}+(\sqrt{3}+\sqrt{15})\sqrt{9+4\sqrt{5}}\}$
87° =72° +15°	$\frac{1}{16}\{\sqrt{2}-\sqrt{6}-\sqrt{10}+\sqrt{30}+2(1+\sqrt{3})\sqrt{5+\sqrt{5}}\}$	$\frac{1}{16}\{-\sqrt{2}-\sqrt{6}+\sqrt{10}+\sqrt{30}-2(-1+\sqrt{3})\sqrt{5+\sqrt{5}}\}$	$\frac{1}{2}\{4+3\sqrt{3}+2\sqrt{5}+\sqrt{15}+(1+2\sqrt{3}+\sqrt{5})\sqrt{5+2\sqrt{5}}\}$
90°	1	0	∞

(2012/6/15 時岡)

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