

Worksheet 14 KEY - The Unit Circle: Sine and Cosine (§6.2)

1. $\cos(0) = 1, \sin(0) = 0$
2. $\cos\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}, \sin\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}$
3. $\cos\left(\frac{\pi}{3}\right) = \frac{1}{2}, \sin\left(\frac{\pi}{3}\right) = \frac{\sqrt{3}}{2}$
4. $\cos\left(\frac{\pi}{2}\right) = 0, \sin\left(\frac{\pi}{2}\right) = 1$
5. $\cos\left(\frac{2\pi}{3}\right) = -\frac{1}{2}, \sin\left(\frac{2\pi}{3}\right) = \frac{\sqrt{3}}{2}$
6. $\cos\left(\frac{3\pi}{4}\right) = -\frac{\sqrt{2}}{2}, \sin\left(\frac{3\pi}{4}\right) = \frac{\sqrt{2}}{2}$
7. $\cos(\pi) = -1, \sin(\pi) = 0$
8. $\cos\left(\frac{7\pi}{6}\right) = -\frac{\sqrt{3}}{2}, \sin\left(\frac{7\pi}{6}\right) = -\frac{1}{2}$
9. $\cos\left(\frac{5\pi}{4}\right) = -\frac{\sqrt{2}}{2}, \sin\left(\frac{5\pi}{4}\right) = -\frac{\sqrt{2}}{2}$
10. $\cos\left(\frac{4\pi}{3}\right) = -\frac{1}{2}, \sin\left(\frac{4\pi}{3}\right) = -\frac{\sqrt{3}}{2}$
11. $\cos\left(\frac{3\pi}{2}\right) = 0, \sin\left(\frac{3\pi}{2}\right) = -1$
12. $\cos\left(\frac{5\pi}{3}\right) = \frac{1}{2}, \sin\left(\frac{5\pi}{3}\right) = -\frac{\sqrt{3}}{2}$
13. $\cos\left(\frac{7\pi}{4}\right) = \frac{\sqrt{2}}{2}, \sin\left(\frac{7\pi}{4}\right) = -\frac{\sqrt{2}}{2}$
14. $\cos\left(\frac{23\pi}{6}\right) = \frac{\sqrt{3}}{2}, \sin\left(\frac{23\pi}{6}\right) = -\frac{1}{2}$
15. $\cos\left(-\frac{13\pi}{2}\right) = 0, \sin\left(-\frac{13\pi}{2}\right) = -1$
16. $\cos\left(-\frac{43\pi}{6}\right) = -\frac{\sqrt{3}}{2}, \sin\left(-\frac{43\pi}{6}\right) = \frac{1}{2}$
17. $\cos\left(-\frac{3\pi}{4}\right) = -\frac{\sqrt{2}}{2}, \sin\left(-\frac{3\pi}{4}\right) = -\frac{\sqrt{2}}{2}$
18. $\cos\left(-\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}, \sin\left(-\frac{\pi}{6}\right) = -\frac{1}{2}$
19. $\cos\left(\frac{10\pi}{3}\right) = -\frac{1}{2}, \sin\left(\frac{10\pi}{3}\right) = -\frac{\sqrt{3}}{2}$
20. $\cos(117\pi) = -1, \sin(117\pi) = 0$
21. If $\sin(\theta) = -\frac{7}{25}$ with θ in Quadrant IV, then $\cos(\theta) = \frac{24}{25}$.
22. If $\cos(\theta) = \frac{4}{9}$ with θ in Quadrant I, then $\sin(\theta) = \frac{\sqrt{65}}{9}$.
23. If $\sin(\theta) = \frac{5}{13}$ with θ in Quadrant II, then $\cos(\theta) = -\frac{12}{13}$.
24. If $\cos(\theta) = -\frac{2}{11}$ with θ in Quadrant III, then $\sin(\theta) = -\frac{\sqrt{117}}{11}$.
25. If $\sin(\theta) = -\frac{2}{3}$ with θ in Quadrant III, then $\cos(\theta) = -\frac{\sqrt{5}}{3}$.
26. If $\cos(\theta) = \frac{28}{53}$ with θ in Quadrant IV, then $\sin(\theta) = -\frac{45}{53}$.

27. If $\sin(\theta) = \frac{2\sqrt{5}}{5}$ and $\frac{\pi}{2} < \theta < \pi$, then $\cos(\theta) = -\frac{\sqrt{5}}{5}$.
28. If $\cos(\theta) = \frac{\sqrt{10}}{10}$ and $2\pi < \theta < \frac{5\pi}{2}$, then $\sin(\theta) = \frac{3\sqrt{10}}{10}$.
29. If $\sin(\theta) = -0.42$ and $\pi < \theta < \frac{3\pi}{2}$, then $\cos(\theta) = -\sqrt{0.8236} \approx -0.9075$.
30. If $\cos(\theta) = -0.98$ and $\frac{\pi}{2} < \theta < \pi$, then $\sin(\theta) = \sqrt{0.0396} \approx 0.1990$.
31. $\sin(\theta) = \frac{1}{2}$ when $\theta = \frac{\pi}{6} + 2\pi k$ or $\theta = \frac{5\pi}{6} + 2\pi k$ for any integer k .
32. $\cos(\theta) = -\frac{\sqrt{3}}{2}$ when $\theta = \frac{5\pi}{6} + 2\pi k$ or $\theta = \frac{7\pi}{6} + 2\pi k$ for any integer k .
33. $\sin(\theta) = 0$ when $\theta = \pi k$ for any integer k .
34. $\cos(\theta) = \frac{\sqrt{2}}{2}$ when $\theta = \frac{\pi}{4} + 2\pi k$ or $\theta = \frac{7\pi}{4} + 2\pi k$ for any integer k .
35. $\sin(\theta) = \frac{\sqrt{3}}{2}$ when $\theta = \frac{\pi}{3} + 2\pi k$ or $\theta = \frac{2\pi}{3} + 2\pi k$ for any integer k .
36. $\cos(\theta) = -1$ when $\theta = (2k + 1)\pi$ for any integer k .
37. $\sin(\theta) = -1$ when $\theta = \frac{3\pi}{2} + 2\pi k$ for any integer k .
38. $\cos(\theta) = \frac{\sqrt{3}}{2}$ when $\theta = \frac{\pi}{6} + 2\pi k$ or $\theta = \frac{11\pi}{6} + 2\pi k$ for any integer k .
39. $\cos(\theta) = -1.001$ never happens
40. $\cos(t) = 0$ when $t = \frac{\pi}{2} + \pi k$ for any integer k .
41. $\sin(t) = -\frac{\sqrt{2}}{2}$ when $t = \frac{5\pi}{4} + 2\pi k$ or $t = \frac{7\pi}{4} + 2\pi k$ for any integer k .
42. $\cos(t) = 3$ never happens.
43. $\sin(t) = -\frac{1}{2}$ when $t = \frac{7\pi}{6} + 2\pi k$ or $t = \frac{11\pi}{6} + 2\pi k$ for any integer k .
44. $\cos(t) = \frac{1}{2}$ when $t = \frac{\pi}{3} + 2\pi k$ or $t = \frac{5\pi}{3} + 2\pi k$ for any integer k .
45. $\sin(t) = -2$ never happens
46. $\cos(t) = 1$ when $t = 2\pi k$ for any integer k .

47. $\sin(t) = 1$ when $t = \frac{\pi}{2} + 2\pi k$ for any integer k .

48. $\cos(t) = -\frac{\sqrt{2}}{2}$ when $t = \frac{3\pi}{4} + 2\pi k$ or $t = \frac{5\pi}{4} + 2\pi k$ for any integer k .

49. $\sin(78.95^\circ) \approx 0.981$ 50. $\cos(-2.01) \approx -0.425$ 51. $\sin(392.994) \approx -0.291$

52. $\cos(207^\circ) \approx -0.891$ 53. $\sin(\pi^\circ) \approx 0.055$ 54. $\cos(e) \approx -0.912$

55. $\theta = 60^\circ$, $b = \frac{\sqrt{3}}{3}$, $c = \frac{2\sqrt{3}}{3}$

56. $\theta = 45^\circ$, $a = 3$, $c = 3\sqrt{2}$

57. $\alpha = 57^\circ$, $a = 8 \cos(33^\circ) \approx 6.709$, $b = 8 \sin(33^\circ) \approx 4.357$

58. $\beta = 42^\circ$, $c = \frac{6}{\sin(48^\circ)} \approx 8.074$, $a = \sqrt{c^2 - 6^2} \approx 5.402$

59. The hypotenuse has length $\frac{4}{\cos(12^\circ)} \approx 4.089$.

60. The side adjacent to θ has length $5280 \cos(78.123^\circ) \approx 1086.68$.

61. The hypotenuse has length $\frac{117.42}{\sin(59^\circ)} \approx 136.99$.

62. The side opposite θ has length $10 \sin(5^\circ) \approx 0.872$.

63. The side adjacent to θ has length $10 \cos(5^\circ) \approx 9.962$.

64. The hypotenuse has length $c = \frac{306}{\sin(37.5^\circ)} \approx 502.660$, so the side adjacent to θ has length $\sqrt{c^2 - 306^2} \approx 398.797$.

65. $\cos(\theta) = -\frac{7}{25}$, $\sin(\theta) = \frac{24}{25}$

66. $\cos(\theta) = \frac{3}{5}$, $\sin(\theta) = \frac{4}{5}$

67. $\cos(\theta) = \frac{5\sqrt{106}}{106}$, $\sin(\theta) = -\frac{9\sqrt{106}}{106}$

68. $\cos(\theta) = -\frac{2\sqrt{5}}{25}$, $\sin(\theta) = -\frac{11\sqrt{5}}{25}$