

Function Values from the Calculator

Name: _____

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Score: _____ / 28

Q Quick Review

Most trig values aren't "nice" special-angle answers – they're irrational decimals you have to approximate. That's what the calculator is for. Three rules will save you most of the points:

1) Match the mode to the unit. If the angle has a degree symbol (45° , 1.2°), the calculator must be in *degree mode*. If the angle is just a number (1 , $\pi/4$, 2.2), it's in radians – use *radian mode*. This is the single most common source of wrong answers. Check the small DEG/RAD indicator before every trig calculation.

2) Round only at the end. Carry the calculator's full precision through every intermediate step and round just the final answer to the required precision. Rounding mid-problem compounds error.

3) Sanity-check the result. For acute angles, \sin and \cos stay between 0 and 1. \tan is between 0 and 1 for acute angles less than 45° , and greater than 1 for angles between 45° and 90° . If you got $\sin 30^\circ \approx -0.99$, you're in radian mode by mistake.

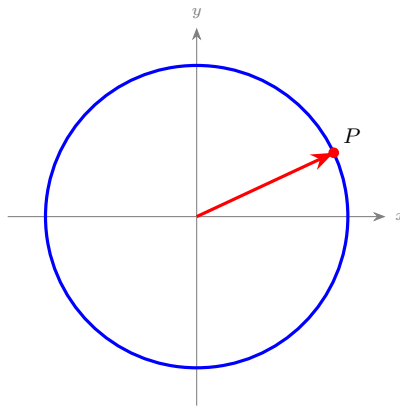
Inverse trig. Buttons labeled \sin^{-1} , \cos^{-1} , \tan^{-1} (sometimes \arcsin , \arccos , \arctan) give the *principal value* – one specific angle in a standard range. For \sin^{-1} , that range is $[-90^\circ, 90^\circ]$; for \cos^{-1} it's $[0^\circ, 180^\circ]$; for \tan^{-1} it's $(-90^\circ, 90^\circ)$. If your problem expects a different quadrant, you'll need to adjust.

Common slips. Mode mismatch (calculator in radian mode with a degree angle). Treating the calculator answer as exact (it's a decimal approximation). Forgetting that $\sin^{-1}(\text{value})$ returns an angle, not a ratio.

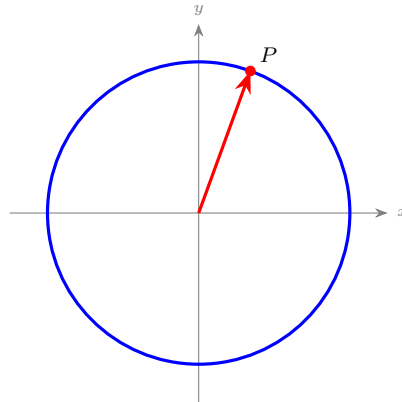
PRACTICE

Use a calculator (degree mode for $^\circ$ angles, radian mode otherwise). Round to the precision shown.

1. Find $\sin \theta$ for the angle $\theta = 25^\circ$ drawn below (four decimals). _____



2. Find $\cos \theta$ for the angle $\theta = 70^\circ$ drawn below (four decimals). _____



3. $\tan 50^\circ$ (four decimals). _____

4. $\sin 1$ radian (four decimals). _____

5. $\sin^{-1}(0.7)$ in degrees (one decimal). _____

6. $\cos 38^\circ$ (four decimals). _____

7. $\sin 22^\circ$ (four decimals). _____

8. $\cos 67^\circ$ (four decimals). _____

9. $\tan 78^\circ$ (four decimals). _____

10. $\sin\left(\frac{\pi}{5}\right)$ (four decimals). _____

11. $\cos 2$ radians (four decimals). _____

12. $\tan^{-1}(2.5)$ in degrees (one decimal). _____

13. $\cos^{-1}(0.3)$ in degrees (one decimal). _____

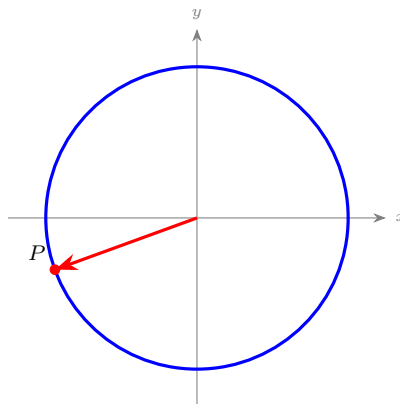
14. $\sin 100^\circ$ (four decimals). _____

15. $\tan 15^\circ$ (four decimals). _____

16. $\sec 40^\circ$ (four decimals). _____

17. $\csc 25^\circ$ (four decimals). _____

18. Find $\sin \theta$ for the angle $\theta = 200^\circ$ drawn below (four decimals). _____



19. $\cos\left(\frac{2\pi}{7}\right)$ (four decimals). _____



20. $\sin^{-1}(0.42)$ in degrees (one decimal). _____

◆ **Word Problems**

21. A wire is attached to the top of a 30-foot pole and makes an angle of 63° with the ground. Find the length of the wire. Round to the nearest tenth of a foot. _____

22. From a building, an observer sees a parked car at an angle of depression of 18° . The building is 60 feet tall. How far is the car from the base of the building? Round to the nearest foot. _____

23. A right triangle has legs 7 and 24. Find the acute angle opposite the longer leg, to the nearest tenth of a degree. _____

24. A satellite dish is tilted so that its angle of elevation toward a satellite is 42.5° . If a signal beam reaches a height of 250 feet at the satellite directly above the receiver point, how far horizontally is the dish from that receiver point? Round to the nearest foot. _____

Additional Practice

25. Find $\sin \theta$ if opposite = 5, hypotenuse = 13. _____

26. Find $\cos \theta$ if adjacent = 12, hypotenuse = 13. _____

27. Find $\tan \theta$ if opposite = 7, adjacent = 4. _____

28. Find $\sin 30^\circ$. _____



Answer Keys

- | | |
|--------------------------|--------------------------|
| 1. ≈ 0.4226 | 13. $\approx 72.5^\circ$ |
| 2. ≈ 0.3420 | 14. ≈ 0.9848 |
| 3. ≈ 1.1918 | 15. ≈ 0.2679 |
| 4. ≈ 0.8415 | 16. ≈ 1.3054 |
| 5. $\approx 44.4^\circ$ | 17. ≈ 2.3662 |
| 6. ≈ 0.7880 | 18. ≈ -0.3420 |
| 7. ≈ 0.3746 | 19. ≈ 0.6235 |
| 8. ≈ 0.3907 | 20. $\approx 24.8^\circ$ |
| 9. ≈ 4.7046 | 21. ≈ 33.7 ft |
| 10. ≈ 0.5878 | 22. ≈ 185 ft |
| 11. ≈ -0.4161 | 23. $\approx 73.7^\circ$ |
| 12. $\approx 68.2^\circ$ | 24. ≈ 273 ft |

Additional Practice Answers

- | | |
|---------------------|-------------------|
| 25. $\frac{5}{13}$ | 27. $\frac{7}{4}$ |
| 26. $\frac{12}{13}$ | 28. $\frac{1}{2}$ |

Additional Practice: Answers for all numbered items, including the added practice, are shown in the grid above.

Step-by-Step Explanations

- Degree mode. Sanity: 25° is between 0° and 30° , so the sine should be between 0 and 0.5. 0.4226 checks out.
- Degree mode. Cosine shrinks toward 0 as $\theta \rightarrow 90^\circ$, so a smaller value near 0.34 is expected.
- Degree mode. Tangent crosses 1 at 45° , so for 50° a result just above 1 makes sense.
- Radian mode (the input is unitless). For perspective, $1 \text{ rad} \approx 57.3^\circ$, so a sine near 0.84 is about right.
- Inverse sine, degree mode. (Sanity: $\sin 45^\circ \approx 0.707$, so $\sin^{-1}(0.7)$ should be just under 45° .)
- Keep the rule visible: Degree mode. (Between $\cos 30^\circ \approx 0.866$ and $\cos 45^\circ \approx 0.707$ – this checks.) That gives a quick check on the answer.
- One steady path is: Degree mode. Below $\sin 30^\circ = 0.5$, so 0.3746 fits. This is the part to check before moving on, because it keeps the answer tied to the original question.
- Set the calculator to degree mode and read $\cos 67^\circ \approx 0.3907$. Sanity: 67° is closer to 90° than to 0° , so a smallish cosine well under 0.5 is right.
- A careful way to see it: Degree mode. Tangent grows fast as $\theta \rightarrow 90^\circ$, so a big number is expected. That gives a quick check on the answer.
- Radian mode. $\frac{\pi}{5} = 36^\circ$, so this should be $\sin 36^\circ$ – between $\sin 30^\circ = 0.5$ and $\sin 45^\circ \approx 0.707$. Checks.
- Radian mode. $2 \text{ rad} \approx 114.6^\circ$, which is in Q2 where cosine is negative. A negative result is expected.
- Inverse tan, degree mode. (\arctan returns values in $(-90^\circ, 90^\circ)$); $2.5 > 1$ means the angle exceeds 45° , so $\approx 68^\circ$ fits.)
- Use the \cos^{-1} button in degree mode: $\cos^{-1}(0.3) \approx 72.5^\circ$. The output is an angle (in $[0^\circ, 180^\circ]$), not a ratio. Check: $\cos 72.5^\circ \approx 0.30$.
- Degree mode. 100° is just past 90° in Q2; sine is still positive and close to 1.
- Degree mode gives $\tan 15^\circ \approx 0.2679$. Since 15° is well below 45° (where tangent equals 1), a value under 1 is expected.
- Compute $\frac{1}{\cos 40^\circ} \approx \frac{1}{0.7660} \approx 1.3054$. (Most calculators don't have a sec button – use the reciprocal of cosine.)
- A careful way to see it: $\frac{1}{\sin 25^\circ} \approx \frac{1}{0.4226} \approx 2.3662$. This is the part to check before moving on, because it keeps the answer tied to the original question.
- Degree mode. 200° is in Q3, sine negative there. (Reference angle 20° gives $\sin 20^\circ \approx 0.342$, then negate.)
- Radian mode. $\frac{2\pi}{7} \approx 0.898 \text{ rad} \approx 51.4^\circ$, in Q1 – cosine positive and smaller than $\cos 45^\circ$.
- Use \sin^{-1} in degree mode: $\sin^{-1}(0.42) \approx 24.8^\circ$. This returns an angle in $[-90^\circ, 90^\circ]$. Sanity: $\sin 30^\circ = 0.5$, and $0.42 < 0.5$, so the angle should be just under 30° .
- The pole is opposite the 63° angle, hyp = wire length L . $\sin 63^\circ = \frac{30}{L}$, so $L = \frac{30}{\sin 63^\circ} \approx \frac{30}{0.8910} \approx 33.7$ feet. Degree mode throughout.
- Angle of depression = 18° from horizontal matches the angle of elevation from the car. Pole/building is opposite (60), ground distance is adjacent: $\tan 18^\circ = \frac{60}{d}$, so $d = \frac{60}{\tan 18^\circ} \approx \frac{60}{0.3249} \approx 185$ feet.
- Opposite the 24-leg, adjacent is the 7-leg. $\tan \theta = \frac{24}{7} \approx 3.4286$, so $\theta = \arctan 3.4286 \approx 73.74^\circ \approx 73.7^\circ$. (A 7-24-25 Pythagorean triple, by the way.)
- With angle 42.5° , height 250 opposite, horizontal distance d adjacent: $\tan 42.5^\circ = \frac{250}{d}$, so $d = \frac{250}{\tan 42.5^\circ} \approx \frac{250}{0.9163} \approx 273$ feet. (Sanity: angle just under 45° means $\tan < 1$, so $d > 250$ – matches.)



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