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Khan Academy is a free, online, educational community which offers lessons, videos, and so much more in a variety of subjects. Many students use Khan Academy as a supplemental resource to learn and reinforce their math skills. Each topic has a group of videos and exercises to help explain what it is and how to do it, like a teacher would in a classroom. These exercises reflect what is taught in the videos and can be done as many times as you'd like.

USING KHAN ACADEMY

To start learning and find what you're looking for, check the playlist below and then search for things in the **search bar** of Khan Academy. When you search for something, you will notice that it could reference a Video (represented by ▶ on the playlist) or a Skill (represented by ★ on the playlist). So if you're looking to learn how to add and subtract negative numbers, you can search for the video "Adding numbers with different signs" (which is 5 minutes and 33 seconds long); make sure when you find it that it brings you to a video. If you then want to practice exercises relating to this topic, you can then search for "Adding and subtracting negative numbers" which is an exercise set with 3-5 problems in it.

"What to Search" is what you type in the search bar. What you are looking for is written exactly as shown here and is case-sensitive; remember that a ▶ symbol means "Video" and a ★ symbol means "Skill".

Topics	What to Search
<p>-Fractional Exponents & Radicals</p> $\sqrt{16} \quad 8^{\frac{1}{3}} \quad 5\sqrt{20}$ $3\sqrt{7} - \sqrt{28} \quad \frac{3 + \sqrt{5}}{1 - \sqrt{5}}$	<ul style="list-style-type: none"> ▶ Introduction to rational exponents (4:59) ▶ How to rewrite a radical expression as a single exponential term (example) (4:01) ★ Understanding fractional exponents ▶ Simplifying radicals (9:44) ▶ Simplifying square roots (5:35) ★ Simplifying square roots ★ Simplifying square roots 2 ▶ Adding and simplifying radicals (7:56) ★ Adding and subtracting radicals ▶ Multiply and simplify a radical expression 2 (3:07) ▶ How to rationalize a denominator (10:17)
<p>-Radical Equations</p> $\sqrt{5x^2 - 8} = 2x$	<ul style="list-style-type: none"> ▶ Solving radical equations (3:10) ▶ Solving radical equations 3 (4:21) ★ Radical equations
<p>-Imaginary Number i</p> $(9 + 2i)(8 - 3i) \quad i^2 = -1$	<ul style="list-style-type: none"> ▶ Introduction to i and imaginary numbers (5:19) ★ Adding and subtracting complex numbers ▶ Multiplying complex numbers (5:31) ★ Multiplying complex numbers ▶ Dividing complex numbers (4:57) ★ Dividing complex numbers
<p>-The Quadratic Formula</p> $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	<ul style="list-style-type: none"> ▶ How to use the quadratic formula (16:31) ★ Using the quadratic formula
<p>-Completing the Square</p> $x^2 + 2x = 8 \text{ using } \left(\frac{b}{2}\right)^2$	<ul style="list-style-type: none"> ▶ Solving quadratic equations by completing the square (14:05) ★ Solving quadratics by completing the square 1

-Parabolas (Vertex, Intercepts, Minimum, Maximum)

$$\text{Standard Form Formula } x = \frac{-b}{2a}$$

-Pythagorean Theorem

$$a^2 + b^2 = c^2$$

-Sine, Cosine, Tangent, and their Reciprocals

$$\sin \theta = \frac{\textit{opposite}}{\textit{hypotenuse}}$$

$$\cos \theta = \frac{\textit{adjacent}}{\textit{hypotenuse}}$$

$$\tan \theta = \frac{\textit{opposite}}{\textit{adjacent}}$$

-Radians \leftrightarrow Degrees & Quadrants

$$s = r\theta \quad \pi = 180^\circ \quad 2\pi = 360^\circ$$

$$\frac{3\pi}{4} = 135^\circ \quad -55^\circ = -\frac{11\pi}{36}$$

- ▶ [Finding the vertex of a parabola example](#) (5:39)
- ★ [Vertex of a parabola](#)
- ▶ [Graphing a parabola in vertex form](#) (3:16)
- ★ [Graphing parabolas in vertex form](#)
- ▶ [Multiple examples graphing parabolas using roots and vertices](#) (16:04)
- ★ [Graphing parabolas in standard form](#)

- ▶ [The Pythagorean theorem intro](#) (10:45)
- ▶ [Pythagorean theorem 1](#) (4:32)
- ★ [Pythagorean theorem](#)

- ▶ [Basic trigonometry](#) (9:16)
- ▶ [Example: Using soh cah toa](#) (4:04)
- ★ [Trigonometry 0.5](#)
- ▶ [Basic trigonometry II](#) (12:11)
- ★ [Trigonometry 1](#)
- ▶ [Secant \(sec\), cosecant \(csc\) and cotangent \(cot\) example](#) (4:43)
- ★ [Reciprocal trig functions](#)

- ▶ [Introduction to radians](#) (10:50)
- ▶ [Rotation by radians and quadrants](#) (3:50)
- ▶ [Example: Converting degrees to radians](#) (7:01)
- ▶ [Example: Converting radians to degrees](#) (3:19)
- ★ [Degrees to radians](#)
- ★ [Radians on the unit circle](#)
- ▶ [Finding arc length from radian angle measure](#) (2:38)
- ▶ [Example: Radian measure and arc length](#) (3:29)
- ★ [Radians and arc length](#)
- ▶ [Unit circle manipulative](#) (1:45)
- ★ [Unit circle intuition](#)
- ▶ [Example: Calculator to evaluate inverse trig function](#) (3:27)
- ★ [Evaluating inverse trig functions](#)
- ★ [Inverse trig word problems](#)

-Law of Sines and Cosines

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$b^2 = a^2 + c^2 - 2ac \cos B$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$

-Graphing Sin and Cos

$$y = A \sin Bx \quad y = A \cos Bx$$

$$\text{Amplitude} = |A|$$

$$\text{Period} = \frac{2\pi}{B}$$

- ▶ [Law of sines](#) (5:57)
- ▶ [Law of sines for missing angle](#) (5:33)
- ★ [Law of sines](#)
- ▶ [Law of cosines](#) (4:37)
- ▶ [Law of cosines to determine grade](#) (6:40)
- ★ [Law of cosines](#)

- ▶ [Midline, amplitude and period of a function](#) (4:57)
- ▶ [Example: Amplitude and period](#) (8:20)
- ▶ [Example: Amplitude and period transformations](#) (12:51)
- ▶ [Example: Amplitude and period cosine transformations](#) (10:42)
- ▶ [Example: Figure out the trig function](#) (6:30)
- ★ [Graphs of sine and cosine](#)

-Manipulation of Trigonometric and Pythagorean Identities

$$\tan \theta = \frac{\sin \theta}{\cos \theta} \quad \cot \theta = \frac{\cos \theta}{\sin \theta}$$

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$1 + \cot^2 \theta = \csc^2 \theta$$

$$1 + \tan^2 \theta = \sec^2 \theta$$

- ▶ [Examples using Pythagorean identities to simplify trigonometric expressions](#) (3:06)
- ★ [Manipulating trig expressions with pythagorean identities](#)

Sample Exam for Algebra & Trigonometry MATH 110

1. **Simplify:** $\sqrt{\frac{49}{144}}$

2. **Simplify:** $125^{\frac{2}{3}}$

3. **Simplify:** $8^{\frac{-1}{3}}$

4. **Simplify:** $3\sqrt{7} - \sqrt{28}$

5. **Simplify:** $\sqrt{45} + \sqrt{5} + \sqrt{20}$

6. **Simplify:** $-\sqrt{27} - 2\sqrt{12} + 5\sqrt{48}$

7. **Rationalize:** $\frac{1 - \sqrt{5}}{3 + \sqrt{5}}$

8. **Solve:** $\sqrt{5x^2 - 8} = 2x$

9. **Solve:** $x = 4 + \sqrt{2x - 5}$

10. **Solve:** $\sqrt{x + 2} - 2 = x$

11. **Simplify:** $(4-3i)(7+i)$

12. **Rationalize:** $\frac{2+\sqrt{-3}}{1-\sqrt{-3}}$

13. **Use the Quadratic Formula to solve:** $2x^2 + 6x + 3 = 0$

14. **Use the Quadratic Formula to solve:** $x^2 + 4x + 5 = 0$

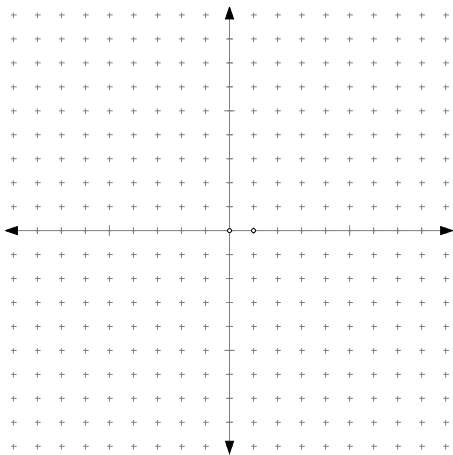
15. **Complete the Square:** $x^2 + 2x = 8$

16. **Complete the Square:** $x^2 - 8x + 2 = 0$

17. **Find the Vertex:** $-2x^2 + 16x - 35$

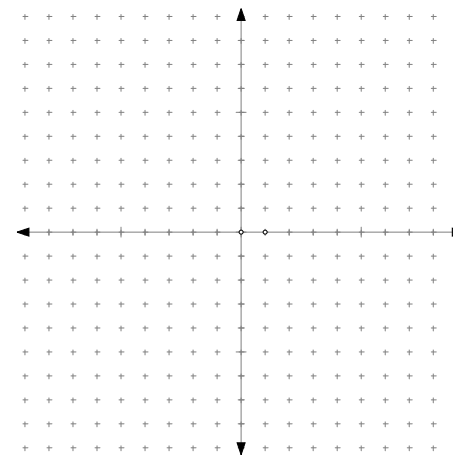
18. **Graph. Find the Vertex, y-intercept, x-intercept(s):**

$$y = -(x - 4)^2 + 9$$



19. **Graph. Find the Vertex, y-intercept, x-intercept(s):**

$$y = x^2 - 6x + 8$$



20. Use the Pythagorean Theorem to solve for x:

21. Write the ratios for following trigonometric functions:

$$\sin \theta = \qquad \qquad \qquad \csc \theta =$$

$$\cos \theta = \qquad \qquad \qquad \sec \theta =$$

$$\tan \theta = \qquad \qquad \qquad \cot \theta =$$

22. Convert to degrees: $\frac{2\pi}{5}$

23. Convert to radians: 225°

24. Solve the right triangle; round all angles to the nearest degree:

25. **Solve the triangle using the Law of Sines to start:**

26. **Solve the triangle using the Law of Cosines to start :**

27. **Graph one period of:** $y = \sin 2x$

28. **Graph one period of:** $y = -3\cos\frac{1}{2}x$

29. **Simplify:** $\tan^2 \theta \cos^2 \theta + \sin^2 \theta \cot^2 \theta$

30. **Simplify:** $\frac{\tan \theta}{\sec \theta} - \frac{1}{\csc \theta}$