

Official SAT Practice

Lesson Plans

for Teachers by Teachers

LESSON 16 (2 OF 2 FOR ADDITIONAL TOPICS IN MATH)

Coordinate Geometry; Trigonometry and Radians; Complex Numbers

Subscore: [Additional Topics in Math](#)

Focus: Using coordinate geometry, trigonometry and radians, and complex numbers

Objectives:

Students will

- use the coordinate plane and equations of lines and circles to describe figures.
- create the equation of a circle given the figure or use the structure of a given equation to determine a property of a figure in the coordinate plane.
- apply the definitions of right triangle trigonometry.
- evaluate trigonometric functions at benchmark angle measures.
- answer questions on the arithmetic of complex numbers.

Before the Lesson:

- Review the Teacher Notes.
- Make sure that students have access to Official SAT[®] Practice during class if completing the main activity.
- Make sure you have a way to share the example problems with students if completing the alternate activity.

Partner Work | 40 minutes

- Have students complete the Basic and Harder Examples for “Circle theorems,” “Circle equations,” and “Right triangle trigonometry,” “Angles, arc lengths, and trig functions,” and “Complex numbers,” in Official SAT Practice on Khan Academy®.
 - ◆ Remind students to pause the video as soon as they can see the problem. Once students have worked through the problem, have them watch the video to check their work.

Teacher Notes

- The videos from these sections add up to about 30 minutes. Encourage students to discuss their solutions and questions for each problem prior to watching the video.

Alternative Activity: Classwork and Discussion (as time allows)

- Have students complete the Example Problems below and then discuss them in small groups or as a class. Review terms and definitions, as needed (see Teacher Notes below).

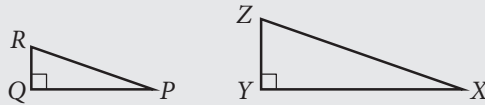
$$x^2 + (y + 1)^2 = 4$$

The graph of the equation above in the xy -plane is a circle. If the center of this circle is translated 1 unit up and the radius is increased by 1, which of the following is an equation of the resulting circle?

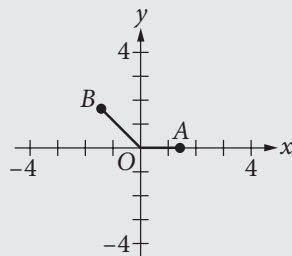
- A) $x^2 + y^2 = 5$
- B) $x^2 + y^2 = 9$
- C) $x^2 + (y + 2)^2 = 5$
- D) $x^2 + (y + 2)^2 = 9$

$$x^2 + 8x + y^2 - 6y = 24$$

The graph of the equation above in the xy -plane is a circle. What is the radius of the circle?



In the figure above, right triangle PQR is similar to right triangle XYZ , with vertices P , Q , and R corresponding to vertices X , Y , and Z , respectively. If $\cos R = 0.263$, what is the value of $\cos Z$?



In the figure above, the coordinates of point B are $(-\sqrt{2}, \sqrt{2})$. What is the measure, in radians, of angle AOB ?

- A) $\frac{\pi}{4}$
- B) $\frac{\pi}{2}$
- C) $\frac{3\pi}{4}$
- D) $\frac{5\pi}{4}$

$$\sin(x) = \cos(K - x)$$

In the equation above, the angle measures are in radians and K is a constant. Which of the following could be the value of K ?

- A) 0
- B) $\frac{\pi}{4}$
- C) $\frac{\pi}{2}$
- D) π

In the complex number system, which of the following is equal to $\frac{1+i}{1-i}$?
(Note: $i = \sqrt{-1}$)

- A) i
- B) $2i$
- C) $-1 + i$
- D) $1 + i$

Teacher Notes

- See Examples 7–12 pages 250–256 in [Chapter 19 of the SAT Study Guide for Students](#) for answers and explanations.

Homework | 20 minutes

- This set of practice problems may take more than 20 minutes. Have students complete practice problems in Official SAT Practice on Khan Academy in these skill areas as time allows:
 - ♦ Circle theorems
 - ♦ Circle equations
 - ♦ Right triangle trigonometry
 - ♦ Angles, arc lengths, and trig functions
 - ♦ Complex numbers
- Encourage students to move on to the higher skill level once they successfully complete the problems in their current skill level and can “level up.”
- Remind students to view the Tips and Strategies tab in Official SAT Practice on Khan Academy for information on how to prepare for test day.