Official SAT Practice

Lesson Plans
for Teachers by Teachers

LESSON 15 (1 OF 2 FOR ADDITIONAL TOPICS IN MATH)

Geometry

Subscore: Additional Topics in Math

Focus: Applying understanding of key concepts in geometry

Objectives:

Students will

- use their understanding of the key concepts in the geometry of lines, angles, triangles, circles, and other geometric objects.
- find the area, surface area, or volume of an abstract figure or a real-life object.

Before the Lesson:

- ☐ Review Chapter 19 of the SAT Study Guide for Students.
- ☐ Preview the Teacher Notes to this lesson.
- ☐ 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 "Volume word problems," "Congruence and similarity," and "Right triangle word problems 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 three sections add up to about 25 minutes. Encourage students to discuss their solutions and questions for each problem prior to watching the video.

## Alternate Activity: Classwork and Discussion (as time allows)

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

In the figure above, line ℓ is parallel to line m, segment BD is perpendicular to line m, and segment AC and segment BD intersect at E. What is the length of segment AC?

In the figure above, a regular polygon with 9 sides has been divided into 9 congruent isosceles triangles by line segments drawn from the center of the polygon to its vertices. What is the value of x?


In the figure above, $\angle AXB$ and $\angle AYB$ are inscribed in the circle. Which of the following statements is true?

A) The measure of $\angle AXB$ is greater than the measure of $\angle AYB$.

B) The measure of $\angle AXB$ is less than the measure of $\angle AYB$.

C) The measure of $\angle AXB$ is equal to the measure of $\angle AYB$.

D) There is not enough information to determine the relationship between the measure of $\angle AXB$ and the measure of $\angle AYB$.
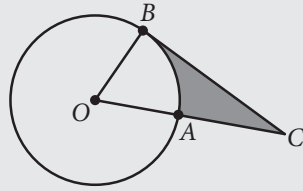
In the figure above, O is the center of the circle, segment BC is tangent to the circle at B, and A lies on segment OC. If $OB = AC = 6$, what is the area of the shaded region?

A) $18\sqrt{3} - 3\pi$

B) $18\sqrt{3} - 6\pi$

C) $36\sqrt{3} - 3\pi$

D) $36\sqrt{3} - 6\pi$
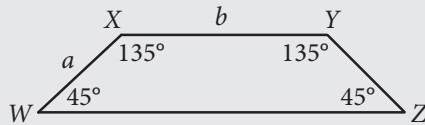
Trapezoid $WXYZ$ is shown above. How much greater is the area of this trapezoid than the area of a parallelogram with side lengths a and b and base angles of measure 45° and 135°?

A) $\frac{1}{2}a^2$

B) $\sqrt{2}a^2$

C) $\frac{1}{2}ab$

D) $\sqrt{2}ab$
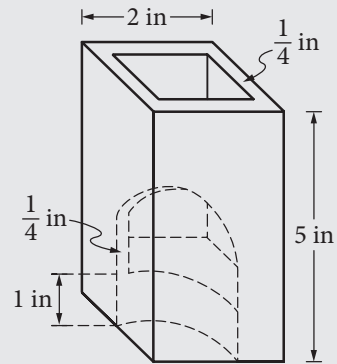
Note: Figure not drawn to scale.

A glass vase is in the shape of a rectangular prism with a square base. The figure above shows the vase with a portion cut out to show the interior dimensions. The external dimensions of the vase are height 5 inches (in), with a square base of side length 2 inches. The vase has a solid base of height 1 inch, and the sides are each $\frac{1}{4}$ inch thick. Which of the following is the volume, in cubic inches, of the glass used in the vase?

A)   6

B)   8

C)   9

D) 11

Teacher Notes

- See Examples 1–6 pages 243–249 in Chapter 19 of the *SAT Study Guide for Students* for answers and explanations. Chapter 19 includes a list of some of the Geometry-related areas that may be the focus of some questions on the SAT Math Test.

- Students do not need to memorize a large collection of geometry formulas. Many geometry formulas are provided on the SAT Math Test in the Reference section of the directions.

- Page 246 includes notations that students need to know. Students should familiarize themselves with these notations in order to avoid confusion on test day.

- For Example 1, note that a shortcut here is remembering that 5, 12, 13 is a Pythagorean triple (5 and 12 are lengths of the sides of the right triangle and 13 is the length of the hypotenuse). Another common Pythagorean triple is 3,4,5. Note how Example 1 requires the knowledge and application of numerous fundamental geometry concepts. Students should develop mastery of the fundamental concepts and practice applying them on test-like questions.

- For Example 3, at first glance, it may appear as though there is not enough information to determine the relationship between the two angle measures. One key to this question is identifying what is the same about the two angle measures. In this case, both angles intercept arc AB.

- Remind students that figures are drawn to scale on the SAT Math Test unless explicitly stated otherwise. If a question states that a figure is not drawn to scale, be careful not to make unwarranted assumptions about the figure.

- Arc length, area of a sector, and central angle area are all proportional to each other in a circle. This proportionality is written as:

$$\frac{\text{arc length}}{\text{circumference}} = \frac{\text{central angle}}{360 \text{ degrees}}$$
$$= \frac{\text{area of a sector}}{\text{area of a circle}}$$

- Students should pay close attention to detail on a question such as Example 6. Remind students to take into account the fact that the vase has a solid base of height 1 inch when subtracting the inside volume of the vase from the outside volume of the vase.

Wrap-Up: For your term book or word wall | 5 minutes

- Pythagorean theorem
- Properties of parallel and perpendicular lines
- Properties of equilateral and isosceles triangles
- Properties of trapezoids and parallelograms
- Radius, diameter, circumference
- Measure of central angles and inscribed angles
- Arc length and area of sectors
- Tangents and chords

Homework | 20 minutes

- This set of practice problems may students take more than 20 minutes. Complete practice problems in Official SAT Practice on Khan Academy in these skill areas as time allows:
  - ◆ Volume word problems
  - ◆ Congruence and similarity
  - ◆ Right triangle word problems
- 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."