

**Official SAT Practice**

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# Lesson Plans

for Teachers by Teachers

LESSON 11 (1 OF 4 FOR PASSPORT TO ADVANCED MATH)

## Operations with Polynomials and Rewriting Expressions; Quadratic Functions and Equations

**Subscore:** [Passport to Advanced Math](#)

**Focus:** Adding, subtracting, and multiplying polynomials and building quadratic functions

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### Objectives:

Students will

- add, subtract, and multiply polynomials.
- build quadratic functions and write equations to represent a context.

### Before the Lesson:

- Review Chapter 18 of the *SAT Study Guide for Students*.
- Preview the Teacher Notes.
- Make sure students have access to Official SAT<sup>®</sup> Practice during class.
- Make sure you have a way to share the example problems with students.

**Partner Work | 40 minutes**

Have students complete the Basic and Harder Examples for “Operations with polynomials,” “Operations with rational expressions,” “Structure in expressions,” and “Solving quadratic equations,” 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 four sections add up to about 25 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 in small group or as a class. Review terms and definitions, as needed (see Teacher Notes below).

1.  $(x^2 + bx - 2)(x + 3) = x^3 + 6x^2 + 7x - 6$

In the equation above,  $b$  is a constant. If the equation is true for all values of  $x$ , what is the value of  $b$ ?

- A. 2
- B. 3
- C. 7
- D. 9

2. Which of the following is equivalent to  $16s^4 - 4t^2$ ?

- A.  $4(s^2 - t)(4s^2 + t)$
- B.  $4(4s^2 - t)(s^2 + t)$
- C.  $4(2s^2 - t)(2s^2 + t)$
- D.  $(8s^2 - 2t)(8s^2 + 2t)$

3.  $y^5 - 2y^4 - cxy + 6x$

In the polynomial above,  $c$  is a constant. If the polynomial is divisible by  $y - 2$ , what is the value of  $c$ ?

4. A car is traveling at  $x$  feet per second. The driver sees a red light ahead, and after 1.5 seconds reaction time, the driver applies the brake. After the brake is applied, the car takes  $x/24$  seconds to stop, during which time the average speed of the car is  $x/2$  feet per second. If the car travels 165 feet from the time the driver saw the red light to the time it comes to a complete stop, which of the following equations can be used to find the value of  $x$ ?

- A.  $x^2 + 48x - 3,960 = 0$
- B.  $x^2 + 48x - 7,920 = 0$
- C.  $x^2 + 72x - 3,960 = 0$
- D.  $x^2 + 72x - 7,920 = 0$

5. What are the solutions  $x$  of  $x^2 - 3 = x$ ?

A)  $\frac{-1 \pm \sqrt{11}}{2}$

B)  $\frac{-1 \pm \sqrt{13}}{2}$

C)  $\frac{1 \pm \sqrt{11}}{2}$

D)  $\frac{1 \pm \sqrt{13}}{2}$

6. If  $x > 0$  and  $2x^2 + 3x - 2 = 0$ , what is the value of  $x$ ?

7. What is the sum of the solutions of  $(2x - 1)^2 = (x + 2)^2$ ?

## Teacher Notes

- See Examples 1–7 on pages 228–231 in [Chapter 18 of the SAT Study Guide for Students](#) for answers and explanations.
- Passport to Advanced Math questions require a high comfort level working with quadratic equations and expressions, including foiling and factoring. Recognizing classic quadratics such as  $x^2 - y^2 = (x - y)(x + y)$  can also improve students' speed and accuracy.
- Example 4 requires careful translation of a word problem into an algebraic equation. Remind students that it pays to be deliberate and methodical when translating word problems into equations on the SAT.
- The SAT Math Test may ask students to solve a quadratic equation. Students need to be prepared to use the appropriate method and should practice using the various methods (below) until they are comfortable with all of them.
  - ♦ Factoring
  - ♦ Completing the square
  - ♦ Quadratic formula
  - ♦ Using a calculator (if permitted)
- The quadratic formula states that the solutions  $x$  of the equation  $ax^2 + bx + c = 0$  are  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ .
- Remind students to pay close attention to all of the details in the question. In Example 6,  $x$  can equal  $1/2$  or  $-2$ , but since the question states that  $x > 0$ , the value of  $x$  must be  $1/2$ .

**Wrap-Up: For your term book | 5 minutes**

- Polynomial
- Quadratic Formula
- Factoring
- Completing the Square

**Homework | 20 minutes**

- Complete practice problems in Official SAT Practice on Khan Academy in these skill areas:
  - ◆ Operations with polynomials
  - ◆ Operations with rational expressions
  - ◆ Structure in expressions
  - ◆ Solving quadratic equations
- 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.”