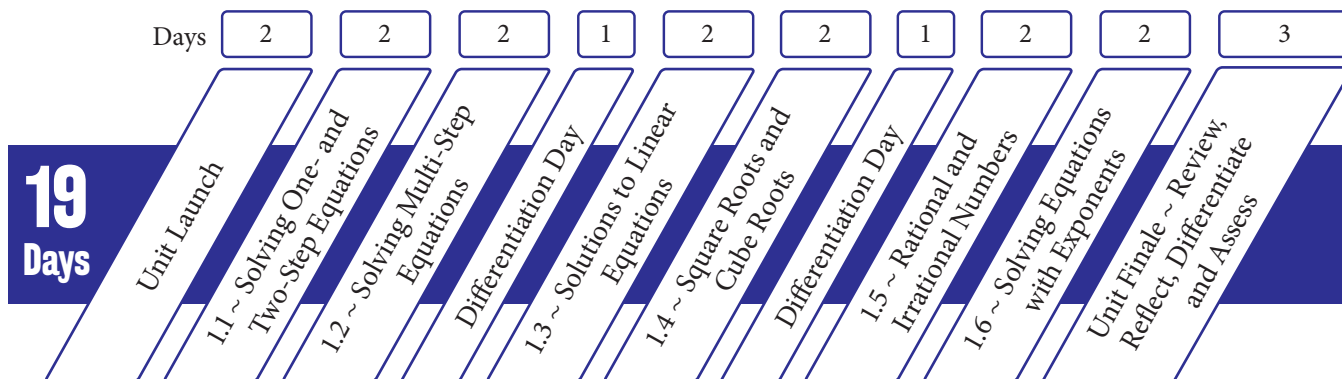


## Unit Pacing



## Standards Correlation

### Focus Content Standards

This unit incorporates Focus Standards across two domains and three clusters. Standards 8.EE.A.2 and 8.EE.C.7 introduce two major clusters for the year. While both of these standards will not reappear as Focus Standards in the remainder of the course, the rest of the standards in both clusters will be targeted in later units. Standards 8.NS.A.1 and 8.NS.A.2 comprise one supporting cluster. Standard 8.NS.A.1 will reappear as a Focus Standard in Unit 5 *Systems of Equations* when students use systems to convert repeating decimals to fractions. All standards in this unit are formatively assessed throughout the unit and summatively assessed in the unit's Test Prep, Performance Assessment and Unit Assessments.

	Lesson	1.1	1.2	1.3	1.4	1.5	1.6
<b>8.NS.A.1</b> SUPPORTING	Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.				✓	✓	
<b>8.NS.A.2</b> SUPPORTING	Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., $\pi^2$ ).				✓	✓	
<b>8.EE.A.2</b> MAJOR	Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$ , where $p$ is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.				✓		✓
<b>8.EE.C.7</b> MAJOR	Solve linear equations in one variable. a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$ , $a = a$ , or $a = b$ results (where $a$ and $b$ are different numbers). b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.	✓ 7b	✓ 7b	✓ 7a-b			

**Connecting Content Standards****8.EE.A.1, 8.EE.C.8, 8.G.C.9**

To start the course, students have the opportunity to make introductory connections to grade-level standards that will be taught later in the course. In this unit, students begin working with exponents, which will lead to deeper understanding of exponent properties (**8.EE.A.1**) later. They will solve equations formed by pairs of simultaneous linear equations (**8.EE.C.8**) and will verify their solutions using substitution. Students will apply equations with exponents to solve geometry problems, including to find the radius of a sphere (**8.G.C.9**).

**Focus Mathematical Practice Standards**

The Standards for Mathematical Practice (SMPs) are integrated throughout EdGems Math. Each lesson specifically provides implementation guidance for the SMPs in the Teacher Guide. Students also have the opportunity to identify moments in which they apply the SMPs throughout the unit using the Mathematical Practices Tracker. The SMPs can be formatively assessed during the unit Storyboards (**SMP1**) and Performance Task (**SMP2**) and summatively assessed during the Performance Assessment (**SMP7**).

Lesson	1.1	1.2	1.3	1.4	1.5	1.6
Focus Math Practice	SMP5	SMP2	SMP1	SMP6	SMP3	SMP7

**Content Analysis**

In this unit, students will build upon their previous experiences with solving equations to solve many types of equations in one variable. Equation types include multi-step linear equations, including those with variables on both sides of the equals sign, and equations with a squared or cubed variable.

**Multi-Step Equations**

$$2(3x + 6) - 1 = 43$$

$$-2x + 9 = 4x - 15$$

**Equations with Exponents**

$$x^2 = 25$$

$$x = \pm\sqrt{25}$$

$$x = 5 \text{ or } -5$$

$$x^3 = 125$$

$$x = \sqrt[3]{125}$$

$$x = 5$$

In previous years, students solved equations with one solution. Through their work with the various types of equations in this unit, students will be introduced to situations in which an equation may have infinitely many solutions, two solutions or no solution at all. This new experience will pave the way for their work with systems of equations later in the course, particularly when they encounter pairs of simultaneous linear equations. For example, the equation  $10x + 4 = 5(2x + 1)$  is formed by setting two linear expressions equal to one another. When solved, the solution states that  $4 = 5$ . This is an untrue statement, indicating that the equation has no solution. Later in the course, students will come to understand that the two corresponding linear equations,  $y = 10x + 4$  and  $y = 5(2x + 1)$ , when graphed, run parallel to each other.

This unit also introduces students to irrational numbers. Students will order and compare irrational numbers using rational number approximations. This work will be expanded upon in future courses when students work with the exact forms of irrational numbers as opposed to approximations.

# Readiness Check & Learning Progression

## Readiness Check Skills

**Skill 1:** I can solve two-step equations. **8.EE.C.7.b**

**Skill 2:** I can rewrite expressions using the Distributive Property and combining like terms. **7.EE.A.1**

**Skill 3:** I can understand that a solution is a value that makes the equation true. **6.EE.B.5**

**Skill 4:** I can evaluate exponents. **6.EE.A.1, 6.EE.A.2c**

**Skill 5:** I can order and compare rational numbers. **6.NS.C.7**

## Previously, students have...

Solved one- and two-step equations.

**6.EE.B.7, 7.EE.B.4**

$$\begin{array}{r} x - 6 = 22 \\ +6 \quad +6 \\ \hline x = 28 \end{array}$$

Check the answer by substituting the answer back into the equation.

$$\begin{array}{r} 28 - 6 = 22 \\ 22 = 22 \end{array}$$

Understood, ordered, added, subtracted, multiplied and divided rational numbers and their absolute values.

**6.NS.C.7, 7.NS.A.1**

Find the value of each expression and graph each rational number on the number line.

A:  $|-3.5|$    B:  $-\left(-\frac{1}{2}\right)$    C:  $|1.5|$    D:  $-|-3|$

Wrote and evaluated whole number exponents.

**6.EE.A.1**

Write each power in expanded form and find the value.

a.  $3^2$    b.  $1^5$    c.  $4^3$

Applied properties of operations to simplify or expand linear expressions.

**7.EE.A.1**

Remember to move the operation with the term:  $-4y$

$$\begin{array}{r} 8y + (-6) + 3 - 4y \\ \hline 8y - 4y + (-6) + 3 \\ \hline 4y - 3 \end{array}$$

## In this unit, students will...

Solve multi-step linear equations in one variable.

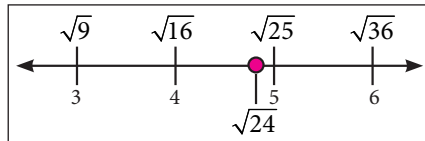
**8.EE.C.7**

$$\begin{array}{r} -2x + 9 = 4x - 15 \\ +2x \quad +2x \\ \hline 9 = 6x - 15 \\ +15 \quad +15 \\ \hline 24 = 6x \\ \frac{24}{6} = \frac{6x}{6} \\ 4 = x \end{array}$$

Check:  $-2(4) + 9 = 4(4) - 15$   
 $-8 + 9 = 16 - 15$   
 $1 = 1$

Understand what an irrational number is and compare their sizes.

**8.NS.A.1-2**



Solve equations with square or cube roots.

**8.EE.A.2**

$$\begin{array}{r} x^2 - 21 = 28 \\ +21 \quad +21 \\ \hline x^2 = 49 \\ \sqrt{x^2} = \pm\sqrt{49} \\ x = \pm 7 \end{array}$$

$7 \cdot 7 = 49$   
 and  
 $(-7)(-7) = 49$

## In the future, students will...

Create equations and inequalities and use them to solve problems.

**HS.A-CED.A.1**

The word 'is' often means = in math.

$$\begin{array}{r} 3x \\ 3x + 8 = 29 \\ -8 \quad -8 \\ \hline 3x = 21 \\ \frac{3x}{3} = \frac{21}{3} \\ x = 7 \end{array}$$

Solve multi-step inequalities and quadratics in one variable.

**HS.A-REI.B.3-4**

$$\begin{array}{r} -6 \geq \frac{x}{2} - 4 \\ +4 \quad +4 \\ \hline -2 \geq \frac{x}{2} \\ 2(-2) \geq \frac{x}{2}(2) \\ -4 \geq x \end{array}$$

Read this inequality from right to left, starting at the variable.

Solve systems of linear equations.

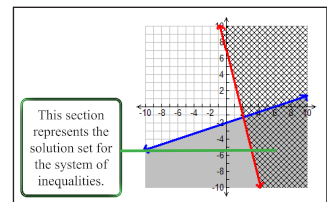
**HS.A-REI.C.6**

This equation was chosen since the variables did not have coefficients; either equation could have been used.

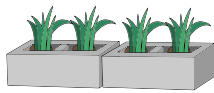
$$\begin{array}{r} x + y = 15 \\ -y - y \\ \hline x = 1.5 - y \\ 4x + 5y = 10 \\ 4(1.5 - y) + 5y = 10 \\ 6 - 4y + 5y = 10 \\ 6 + y = 10 \\ -6 \quad -6 \\ \hline y = 4 \\ x = 1.5 - 4 \\ x = -2.5 \end{array}$$

Graph solutions to linear inequalities and systems of linear inequalities in two variables.

**HS.A-REI.D.12**



## Storyboards



In this series of Storyboards, students will solve equations in the context of completing “Do It Yourself” (DIY) projects. Students will make sense of problems and persevere in solving them (**SMP1**) as they explore changing quantities in solving multi-step equations (**8.EE.C.7**) and solving equations with exponents (**8.EE.A.2**), while considering all of the aspects of planning for a DIY project.

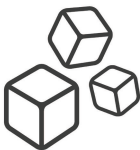
Storyboard	Learning Outcome
Storyboard Launch	Consider pros and cons of “Do It Yourself” projects
Lesson 1.1 Storyboard	Write and solve an equation
Lesson 1.2 Storyboard	Write and solve an equation
Lesson 1.3 Storyboard	Write and solve equations
Lesson 1.4 Storyboard	Interpret solutions of an equation
Lesson 1.5 Storyboard	Solve equations with exponents
Lesson 1.6 Storyboard	Solve an equation with exponents
Storyboard Finale	Select and solve an equation

## Performance Task



In “Coffee Shop Mural,” students will solve equations to determine the sizes and prices of possible murals. Students will reason abstractly and quantitatively (**SMP2**) as they explore changing quantities using multi-step equations and square roots (**8.EE.A.2**, **8.EE.C.7**, **8.NS.A.1-2**), to explore how designs and budgets impact each other.

## Performance Assessment



In this Performance Assessment, students will use equations to explore the volume, surface area and dimensions of various cubes and rectangular prisms. Students will look for and make use of structure (**SMP7**) and take wholes apart or put parts together as they write and solve equations (**8.EE.C.7**). Students will use their knowledge of roots and exponent equations (**8.EE.A.2**, **8.NS.A.1-2**) to deepen their understanding of the connections between geometry, rational numbers and irrational numbers.

## Fluency Boards

Target Skill	Standard(s)
Unit 1 Target Skill 1: Add and subtract integers	<b>7.NS.A.1</b>
Unit 1 Target Skill 2: Multiply and divide integers	<b>7.NS.A.2</b>