7th Grade Mathematics

Expressions, Equations, and Inequalities - Unit 4a Curriculum Map March 10th – March 21st



ORANGE PUBLIC SCHOOLS OFFICE OF CURRICULUM AND INSTRUCTION OFFICE OF MATHEMATICS

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Unit Overview

In this unit, students will

- Use variables to represent quantities in a real-world or mathematical problem
- Construct simple equations and inequalities to solve problems by reasoning about the quantities
- Solve word problems involving equations
- Solve word problems involving inequalities

Enduring Understandings

- Variables can be used to represent numbers in any type mathematical problem.
- Understand the difference in an expression and an equation.
- Write and solve multi-step equations including all rational numbers.
- There are differences and similarities between equations and inequalities

Common Core Standards and Curriculum Guide

COMMON CORE STANDARDS						
7.EE.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.					
7.EE.4a	Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?					
7.EE.4b	Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p , q , and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. For example: As a salesperson, you are paid \$50 per week plus \$3 per sale. This week you want your pay to be at least \$100. Write an inequality for the number of sales you need to make, and describe the solutions.					

Curriculum Guide

Activity	Common Core Standards	Estimated Time
Common Core Modules	7.EE.4, 7.EE.4a, 7.EE.4b	9 days
Unit Assessment	All Standards	3/21
		Data Due, 3/28

Structure of the Modules

The Modules embody 3 integrated frameworks that promote the development of conceptual and problems solving skills and computational fluency. The **conceptual framework** of the Modules builds from the concrete to the pictorial to the abstract (and the constant blending of each) to help students develop a deeper understanding of mathematics. The Modules also reference a **multiple representations framework** that encourages teachers to present content in multiple modalities to support flexible thinking. These frameworks go beyond concrete representation (i.e. manipulatives) to promote the realistic representation of concepts addressed in multiple settings. Lastly, the Modules embody a '**gradual release' framework** that encourages teachers to progress from whole group to collaborative and finally to an independent practice format.

OVERVIEW

Each module begins with an overview. The overview provides the standards, goals, prerequisites, mathematical practices, and lesson progression.

INTRODUCTORY TASKS

The Introductory Tasks serve as the starting point for the referenced standard and are typically either diagnostic, prerequisite or anticipatory in nature.

GUIDED PRACTICE

Serves for additional teacher guided instruction for students who need the additional help. The tasks can be modeled with students.

COLLABORATIVE PRACTICE

Serve as small group, or partnered work. The work should promote student discourse, which allows students to make sense of problems and persevere in solving them (MP.1). Through teacher-facilitated, whole group discussion, students will have the opportunity to critique the reasoning of others (MP.3).

JOURNAL QUESTIONS

Provide the opportunity to individual, independent reflection and practice. This independent format encourages students to construct viable arguments (MP.3) and to reason abstractly/quantitatively (MP.2).

HOMEWORK

Can be used as additional in-class practice, Independent Practice, etc. This work should be reviewed and discussed. Procedural fluencies are reinforced within this section.

GOLDEN PROBLEM

The Golden Problem is a performance task that reflects an amalgamation of the skills addressed within the Module. The Golden Problem assesses the student's ability to apply the skills learned in a new and non-routine context. More than one-step; problems usually require intermediate

values before arriving at a solution (contextual applications). In the US, we see one step problems that require either recall or routine application of an algorithm.

Teaching to Multiple Representations – Review Content



Creating Equivalent Equations

a+.05a = 1.05a

Connections to the Mathematical Practices

	Make sense of problems and persevere in solving them
1	- Students solve real world problems through the application of algebraic
	concepts.
	- Students seek the meaning of a problem and look for efficient ways to represent
	and solve it. They may check their thinking by asking themselves, "What is the
	most efficient way to solve the problem?", "Does this make sense?", and "Can I
	solve the problem in a different way?"
	Reason abstractly and quantitatively
2	 Students demonstrate quantitative reasoning by representing and solving real
2	world situations using visuals, equations, inequalities and linear relationships
	into real world situations.
	Construct viable arguments and critique the reasoning of others
	 Students will discuss the differences among expressions, equations and
3	inequalities using appropriate terminology and tools/visuals.
Ũ	- Students will apply their knowledge of equations and inequalities to support their
	arguments and critique the reasoning of others while supporting their own
	position.
	Model with mathematics
4	- Students will model an understanding of expressions, equations, inequalities,
	and graphs using tools such as algebra tiles/blocks, counters, protractors,
	compasses, and visuals to represent real world situations.
	Use appropriate tools strategically
F	- Students demonstrate their ability to select and use the most appropriate tool
Э	(pencil/paper, manipulatives, calculators, etc.) while
	rewnung/evaluating/analyzing expressions, solving and representing and
	Attend to precision
	Students demonstrate precision by correctly using numbers, variables and
	- Students demonstrate precision by conectly using numbers, variables and
	correctly label units
6	- Students use precision in calculation by checking the reasonableness of their
	answers and making adjustments accordingly
	- Students will use appropriate algebraic language to describe the steps in
	rewriting expressions and solving equations.
	Look for and make use of structure
	- Students routinely seek patterns or structures to model and solve problems.
7	- Students apply properties to generate equivalent expressions (i.e. $6 + 2x = 2$ (3)
1	+ x) by distributive property) and solve equations (i.e. $2c + 3 = 15$, $2c = 12$ by
	subtraction property of equality; c=6 by division property of equality).
	Look for and express regularity in repeated reasoning
8	- In grade 7, students use repeated reasoning to understand algorithms and
	make non-analizations, about notterna

-	During multiple opportunities to solve and model problems, they may notice that
	a/b ÷ c/d = ad/bc and construct other examples and models that confirm their
	generalization. They extend their thinking to include complex fractions and
	rational numbers.

Vocabulary

Term	Definition
Algebraic Expression	An expression consisting of at least one variable and also consisting of numbers and operations
Coefficient	The number part of a term that includes a variable. For example, 3 is the coefficient of the term 3x.
Constant	A quantity having a fixed value that does not change or vary, such as a number. For example, 5 is the constant of $x + 5$.
Equation	A mathematical sentence formed by setting two expressions equal.
Inequality	A mathematical sentence formed by placing inequality symbol between two expressions
Term	A number, a variable, or product and a number and variable
Numerical Expression	An expression consisting of numbers and operations
Variable	A symbol, usually a letter, which is used to represent one or more numbers

Potential Student Misconceptions

- Students believe variables always represent unknowns or numbers that can vary. In truth, variables represent different things in different situations. Sometimes, there is one solution to make an equation true. In expressions (not an equality statement, a variable can represent many values). A flexible conceptualization of variables will help students see algebra as a language to be used and mastered – not as a collection of meaningless rules and procedures.
- Students have trouble interpreting the negative sign simultaneously as "minus" and "negative." Students may also struggle with operations on negative numbers, having learned procedural rules such as "two negatives cancel each other out." Memorizing the rules for operations, without sufficient understanding, only undermines students' abilities to make sense of more advanced concepts.
- Students interpret the equal sign as "the answer is." This misconception arises from students' early experiences with the equal sign in computation problems.
- When collecting like terms, students fail to relate their knowledge of the addition of constants to the collection of variables.

Extensions and Sources

Online Resources

http://www.illustrativemathematics.org/standards/k8

- Performance tasks, scoring guides

https://www.khanacademy.org/math/

- Interactive, tracks student points, objective descriptive videos, allows for hints

http://www.doe.k12.de.us/assessment/files/Math_Grade_7.pdf

 Common Core aligned assessment questions, including Next Generation Assessment Prototypes

http://www.learnzillion.com

 Videos organized by Common Core Standard presented with visual representations and student friendly language

https://www.georgiastandards.org/Common-Core/Pages/Math-6-8.aspx

- Common Core assessment resources, tasks designed for students with special needs

http://www.parcconline.org/sites/parcc/files/PARCCMCFMathematicsGRADE8_Nov2012V3_FIN AL.pdf

- PARCC Model Content Frameworks Grade 8

http://commoncoretools.files.wordpress.com/2011/04/ccss_progression_ee_2011_04_25.pdf

- Progressions of Expressions and Equations from grades 6-8

Unit Module Answers

Lesson 1 – Introductory Task

- A. Let d = number of days they are on the trip.
 - Wild Fishing Inc. : 2(200) + 2(25d) = Total Cost
 - Fisherman's Service: 2(150) + 2(30d) = Total Cost
- B. Fisherman's Service offers the better deal for a 3-day trip: \$480.00
- C. Wild Fishing Inc. Would charge them \$700 for 6 days.

Lesson 1 – Guided Practice

1. Let p = cost of one pass

- 11 + 2p = 52
 - 2p = 41
- P = 20.5 Price of one pass: \$20.50
 - rice of one pass: \$2
- 2. a) \$888.00; \$1020.00

b) Mary makes \$20 per hour for her standard 40 hour week and \$22 per hour for each hour of overtime.

- c) W = 20(40) + 22H
- d) yes
- e) \$1350.00
- 3. a. Figure 1 -- 4; Figure 2 -- 8; Figure 3 -- 12.
 - b. Multiple the figure number by "4" to get the number of cubes in that figure.
 - c.

Figure	1	2	3	4	5	6	7	8
Cubes Needed	4	8	12	16	20	24	28	32

d) 40 cubes

Lesson 1 – Collaborative Work

1. a. b.

Figure	1	2	3	4	5	6
No. of Square	es 3	4	5	6	7	8

- c. 12 squares
- d. The Number of squares in each figure is 2 greater than the number of the figure.
- 2. \$1.17 each
- 3. a) 6 cans -- \$0.30; 10 cans -- \$0.50; 12 cans -- \$0.60.
 - b) If *n* equals the number of cans returned, then the refund would be .05n
 - c) R = .05C
 - d) Yes!
 - e) \$5.00

Journal Question

Smallest number is "15"

Lesson 1 – Homework

- 1. Each banana cost \$0.22
- 2. She bought 3 packs of pencils.
- 3. The length is 21 cm.

Skill Building

1.	x + (-9) = 21 x = 30	2.	6 + m = 1 m = 1	15 3.	c + 8 c =	= 14 4. 6	24 = 1 12 = 0	2+e e
5.	$2y - 17\frac{2}{3} = 8\frac{1}{5}$ $2y = 25\frac{13}{15}$		6. 3	$x + 5\frac{4}{5} = 11$ $3x = 5\frac{11}{20}$	1 <u>6</u> 7.	$\frac{w}{4} - 3.7 = 4.63$ $\frac{w}{4} = 8.33$	38.	$3v - 18\frac{3}{5} = 13\frac{2}{3}$ $3v = 32\frac{4}{15}$
	$y = 10\frac{5}{6}$			$x = \frac{11}{19}$,	w = 33.3	2	$v = 2\frac{38}{45}$

9. 5d + 8 = -2710. 4.25c - (-35) = -1611. 5.5t + 27 = 1512. -1.3a - 21 = 705d = -354.25c = -515.5t = -12-1.3a = 91d = -7c = -12 $t = -2\frac{2}{11}$ a = -70

13. – 8.1 = 0.9a + 21.9	14. $\frac{r}{7}$ + (- 15) = - 8
- 30 = 0.9a	$\frac{r}{7} = 7$
$-33\frac{1}{3} = a$	r = 49

Lesson 2 – Introductory Task – The Fishing Trip



b. Groups 1 and 2 can safely rent a boat. Five (5) is the maximum number of people that can go in one boat.

Lesson 2 – Guided Practice

1. Let s = number of sales

$$50 + 3s \ge 100$$
$$3s \ge 50$$
$$3x \ge 16 \frac{2}{3}$$

You would need at least 17 sales in one week in order for your pay to be \$100.

2. a. p ≤ 8



b. $w \leq 900$

c. Three (3) boats are needed. Fifteen (15) people with and average weight of 135 lbs. is 1875 lbs. A boat can safely hold 900 lbs. Thus, at least 3 boats are needed.

Lesson 2 – Collaborative Work

1. Let t = the number of t-shirts she purchases.

22 + 8*t* ≤ 60

2. Let p = number of packages of peanuts that Steven buys.

 $10.81 + 10 + 0.38p \le 25$

$$0.38p \le 4.19$$

p ≤ 11.03

The maximum number of packages of peanuts that Steven can buy is 11.

Journal Question

In the second line, when using the distributive property, the solver multiplied two negatives and got a negative answer. In the second line, it should be + 2n. The answer should be: n = + 6.

Lesson 2 – Homework

1. Let p = number of packages of peanuts Shawn bought.

$$12.31 + 14 + 1.38p \le 55$$
$$1.38p \le 28.69$$

The maximum number of packages of peanuts that Shawn can buy is 20.

2.
$$\frac{1}{2}x + 3 > 2$$

 $\frac{1}{2}x > -1$
 $x > -2$

Skill Building

- 1) y + 3 > 7y > 46) $- 3x \le 9$ $x \ge -3$
- 2) c 9 < 5c < -147) $\frac{a}{-6} < 1$ a > -6
- 3) $x-3 \ge -6$ $x \ge 2$ $x \ge 10$ 8) $\frac{x}{-5} \le -2$ $x \ge 10$
- $\begin{array}{cccc} 4) & 15 \leq 3m & & 9) & \ 9m 9 < 9 \\ & 5 \leq m & & \ 9m < 18 \\ & & m > -2 \end{array}$

Lesson 3 – Golden Problem

3-Point Response

• The student correctly completes the table

n		р
1	(4 x 1) + 1	5
2	(4 x 2) + 1	9
3	(4 x 3) + 1	13

AND

- The student correctly generates the equation P = 4n+1 AND
- The student indicates that the 20th stage yields **81** pennies.
 AND
- The student indicates that the 30th stage contains 121 pennies AND
- The student indicates the n is between 35 and 36; **35 < n < 36**.

2-Point Response

- The student shows correct work but does not provide the correct answer. **OR**
- The student commits a significant error but provides a correct response based on their incorrect work with clear explanations.
 OR
- The student provides the correct response and shows correct work but fails to provide a clear explanations for each part.

1-Point Response

• The student only begins to provide a solution

0-Point Response

• The response demonstrates insufficient understanding of the problem's essential mathematical concepts. The procedures, if any, contain major errors. There may be no

explanation of the required solutions, or the explanation may not be understandable. How decisions were made may not be readily understandable.

OR

• The student shows no work or justification.