7th Grade Mathematics

Expressions and Equations

Unit 3 Curriculum Map: January 19th – March 11th

ORANGE PUBLIC SCHOOLS

OFFICE OF CURRICULUM AND INSTRUCTION

OFFICE OF MATHEMATICS

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Unit Overview

In this unit, students will ….

- Recognize problem situations in which two variables have a linear relationship
- Identify and describe the patterns of change between the independent and dependent variables for linear relationships represented by tables, graphs, equations, or contextual settings
- Construct tables, graphs, and symbolic equations that represent linear relationships
- Identify the rate of change between two variables and the *x*- and *y*-intercepts from graphs, tables, and equations that represent linear relationships
- Translate information about linear relationships given in a contextual setting, a table, a graph, or an equation to one of the other forms
- Write equations that represent linear relationships given specific pieces of information, and describe what information the variables and numbers represent
- Make a connection between slope as a ratio of vertical distance to horizontal distance between two points on a line and the rate of change between two variables that have a linear relationship
- Recognize that $y=mx$ represents a proportional relationship
- Solve problems and make decisions about linear relationships using information given in tables, graphs, and equations
- Understand that the equality sign indicates that two expressions are equivalent
- Recognize that the equation $y=mx+b$ represents a linear relationship and means that $mx+b$ is an expression equivalent to y
- Recognize that linear equations in one unknown, $k=mx+b$ or $y=m(t)+b$, where k, t, m, and b are constant numbers, are special cases of the equation $y=mx+b$
- Recognize that finding the missing value of one of the variables in a linear relationship, $y=mx+b$, is the same as finding a missing coordinate of a point (x, y)that lies on the graph of the relationship

- Solve linear equations in one variable using symbolic methods, tables, and graphs
- Recognize that a linear inequality in one unknown is associated with a linear equation
- Solve linear inequalities using graphs or symbolic reasoning
- Show that two expressions are equivalent
- Write and interpret equivalent expressions

CMP Pacing Guide

Activity	Common Core Standards	Estimated Time
Unit 3 Diagnostic Assessment	6.EE.1, 6.EE.2, 6.EE.3, 6.EE.4, 6.EE.6, 6.EE.7, 6.EE.8, 6.EE.9	1 Block
Module 3 Topic A (EngageNY) Lesson 1	7.EE.A.1	1 Block
Module 3 Topic A (EngageNY) Lesson 2	7.EE.A.1	1 Block
Module 3 Topic A (EngageNY) Lesson 3	7.EE.A.1, 7.EE.A.2	1Block
Module 3 Topic A (EngageNY) Lesson 4	7.EE.A.1, 7.EE.A.2	1 Block
Module 3 Topic A (EngageNY) Lesson 6	7.EE.A.1, 7.EE.A.2	1 Block
Unit 3 Performance Task 1	7.EE.A.1	½ Block
Moving Straight Ahead (CMP3) Investigation 1	7.EE.B.4, 7.EE.B.4a	3 Blocks
Assessment: Unit 3 Check Up 1 (CMP3)	7.RP.A.2c, 7.EE.B.4,7.EE.B.4a	½ Block
Unit 3 Assessment 1	7.EE.A.1, 7.EE.A.2,	1 Block
Moving Straight Ahead (CMP3) Investigation 2	7.RP.A.2c , 7.EE.B.3, 7.EE.B.4,7.EE.B.4a	2 ½ Blocks
Assessment: Unit 3 Partner Quiz (CMP3)	7.EE.B.3, 7.EE.B.4,7.EE.B.4a	½ Block
Moving Straight Ahead (CMP3) Investigation 3	7.EE.A.1, 7.EE.A.2, 7.EE.B.3, 7.EE.B.4,7.EE.B.4a, 7.EE.B.4b	4 ½ Blocks
Unit 3 Performance Task 2	7.EE.B.3	1 Block
Assessment: Unit 3 Check Up 2 (CMP3)	7.EE.A.1, 7.EE.A.2, 7.EE.B.3, 7.EE.B.4,7.EE.B.4a, 7.EE.B.4b	½ Block
Moving Straight Ahead (CMP3) Investigation 4.1 and 4.2	7.EE.A.1, 7.EE.A.2, 7.EE.B.3, 7.EE.B.4,7.EE.B.4a	2 Blocks
Unit 3 Performance Task 3	7.EE.B.4	1 Block
Unit 3 Assessment 2	7.EE.B.3, 7.EE.B.4,7.EE.B.4a	1 Block
Total Time		**24 Blocks**

Major Work Supporting Content Additional Content

Pacing Calendar

JANUARY						
Sunday	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**
					1 **New Year** **District Closed**	**2**
3	**4**	**5**	**6**	**7**	**8**	**9**
10	**11**	**12**	**13**	**14**	**15**	**16**
17	**18** **MLK** **District Closed**	**19** **Unit 3: Expressions & Equations** ***Unit 3 Diagnostic***	**20**	**21**	**22**	**23**
24	**25**	**26**	**27** 12:30 pm Student Dismissal	**28** 12:30 pm Student Dismissal ***Performance Task 1 Due***	**29**	**30**
31						

FEBRUARY

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	**2**	**3** ***Assessment: Check Up 1***	**4** ***Assessment: Unit 3 Assessment 1***	**5**	**6**
7	**8**	**9** **12:30 pm Student Dismissal**	**10** ***Assessment: Partner Quiz***	**11**	**12**	**13**
14	**15** **Winter Recess** **District Closed**	**16** **Winter Recess** **District Closed**	**17** **Winter Recess** **District Closed**	**18** **Winter Recess** **District Closed**	**19** **Winter Recess** **District Closed**	**20**
21	**22**	**23**	**24**	**25** ***Performance Task 2 Due***	**26** ***Assessment: Check Up 2***	**27**
28	**29**					

March

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2 ***Performance Task 3 Due***	3	4 ***Assessment: Unit 3 Assessment 2***	5
6	7 **Solidify Unit 2 Concepts**	8 **Solidify Unit 2 Concepts**	9 **Solidify Unit 2 Concepts**	10 **Solidify Unit 2 Concepts**	11 **Solidify Unit 2 Concepts**	12
13	14	15	16	17	18	19
20	21	22	23	24	25 **Good Friday** **District Closed**	26
27	28	29	30	31		

Unit 3 Math Background

The goal of this Unit is to develop student understanding of linear functions and equations. A relationship between two variables is a *function* if each value of one variable (the independent variable) is related to exactly one value of the second variable (the dependent variable). If for each unit change in the independent variable *x* there is a constant change in the dependent variable *y*, the relationship is a *linear function*.

Throughout *Moving Straight Ahead*, students use tables, graphs, and equations to represent and explore linear functions. The pattern relating two variables in a linear function can be represented with an equation in the form $y=mx+b$. The coefficient m of the independent variable x indicates the constant *rate of change* of the dependent variable y and the *slope* of the straight-line graph of the function. The constant term b is the y-coordinate of the point $(0, b)$ where the graph of the linear function intersects the y-axis. It is called the *y-intercept* of the graph. Understanding of those key linear function concepts—rate of change, slope, and y-intercept—is developed through exploration of their meaning in specific problem contexts and the patterns in context-free examples.

When a problem involving linear functions requires finding a value of x that corresponds to a specified value of y, the task is to solve a linear equation in the form $k=mx+b$. Problems in this Unit also develop the understanding and skills students need for success in such equation solving tasks. Students will learn how to inspect tables and graphs of the function $y=mx+b$ to find the required solutions. They will also learn how to use informal and symbolic algebraic reasoning for the same tasks.

The Common Core State Standards for Mathematics reserve introduction of the term *function* until Grade 8. Thus, throughout this Grade 7 Unit, we talk only about *linear relationships* between variables. The term *linear function* will be introduced early in CMP Grade 8 and used throughout that course. Linear relationships will be compared and contrasted with the different patterns of change produced by inverse variation, exponential functions, quadratic functions, and polynomials of higher degree.

PARCC Assessment Evidence Statements

CCSS	Evidence Statement	Clarification	Math Practices	Calculator?
7.EE.1	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	i) Tasks may involve issues of strategy, e.g., by providing a factored expression such as $y(3+ +x$ $k)$ and a fully expanded expression $3y$ xy $ky+ +$, and requiring students to produce or identify a new expression equivalent to both (such as $y(3+ +x)$ yk). ii) Tasks are not limited to integer coefficients.	7	No
7.EE.2	Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *For example*, $a+ 0.05a=1.05a$ *means that* "*increase by* 5%" *is the same as* "*multiply by* 1.05."	None	7	No
7.EE.4a-1	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. a. 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.	i) Comparison of an algebraic solution to an arithmetic solution is not assessed here; this aspect of standard 7.EE.4a may be assessed on the Grade 7 PBA.	1,2,6,7	No
7.EE.4a-2	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. a. Fluently solve equations of the form $px+ =qr$ and p x $q(+ =) r$, where p, q, and r are specific rational numbers.	i) Each task requires students to solve two equations (one of each of the given two forms). Only the answer is required. ii) Fluency is assessed implicitly by requiring the student to solve two equations. Tasks are not timed. iii) Comparison of an algebraic solution to an arithmetic solution is not assessed here; this aspect of standard 7.EE.4a may be assessed on the Grade 7 PBA.	6, 7	No

7.EE.4b	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. b. 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*.	None	1,2,5,6,7	No

Connections to the Mathematical Practices

1	Make sense of problems and persevere in solving them
	- 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?” - Students analyze givens, constraints, relationships, and goals - Students might rely on using concrete objects or pictures to help conceptualize and solve a problem - Students continually ask themselves, "Does this make sense?"
2	Reason abstractly and quantitatively
	- Students demonstrate quantitative reasoning by representing and solving real world situations using visuals, equations, inequalities and linear relationships into real world situations. - Students decontextualize and conceptualize problems involving units and shapes - Students reason abstractly in Problem 1.3 (Moving Straight Ahead) when they represent linear relationships using equations and then examine the effect of adding a constant to the equation. They reason quantitatively as they show understanding of the meaning of the quantities involved and conclude that adding a constant does not affect the constant rate of change.
3	Construct viable arguments and critique the reasoning of others
	- Students will discuss the differences among expressions, equations and inequalities using appropriate terminology and tools/visuals. - Students will apply their knowledge of equations and inequalities to support their arguments and critique the reasoning of others while supporting their own position. - They justify their conclusions, communicate them to others, and respond to the arguments of others - Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments - Students construct arguments when they solve the pictorial equations in Problem 3.2(Moving Straight Ahead). They justify the steps they took to their classmates, and they evaluate the processes of other students who used different methods.
4	Model with mathematics
	- 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. - 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. - Student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another - Students model with mathematics in the Unit Project (Moving Straight Ahead) when they use a linear equation to find the amount of water dripping from a faucet. They will see that, while the linear model is a good approximation for this situation, factors such as measurement error have an impact on the accuracy of the model.

5	Use appropriate tools strategically
	- Students demonstrate their ability to select and use the most appropriate tool (pencil/paper, manipulatives, calculators, protractors, etc.) while rewriting/evaluating/analyzing expressions, solving and representing and analyzing linear relationships. - Students use tools that might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software - Students are able to use technological tools to explore and deepen their understanding of concepts - Students begin Investigation 3(Moving Straight Ahead) by using methods familiar to them—tables and graphs—to solve equations. Some students may use paper and pencil to construct their tables and graphs, and others may use graphing calculators. - By Problem 3.4(Moving Straight Ahead), students have transitioned to using symbolic methods to solve equations, employing paper and pencil to record their steps and strategies.
6	Attend to precision
	- Students demonstrate precision by correctly using numbers, variables and symbols to represent expressions, equations and linear relationships, and correctly label units. - 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. - Students demonstrate precision by correctly using numbers, variables and symbols to represent expressions, equations and linear relationships, and correctly label units. - 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 - Students use precise definitions when they finally connect the three models they have used to represent linear relationships. In Problem 2.4(Moving Straight Ahead), they use the definition of a solution of an equation clearly and apply the meaning of the solution to tables, graphs, and equations in order to solve problems.
7	Look for and make use of structure
	- Students routinely seek patterns or structures to model and solve problems. - Students apply properties to generate equivalent expressions (i.e. $6 + 2x = 2 (3 + x)$ 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). - Students recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. - In Problem 4.3(Moving Straight Ahead), students analyze the structure of equations of groups of lines. They also look for patterns in the graphs of these groups of lines.

8	Look for and express regularity in repeated reasoning
	- In grade 7, students use repeated reasoning to understand algorithms and make generalizations about patterns. - 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. - As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results. - Students express regularity in repeated reasoning when they notice that the coefficient of the independent variable in a linear relationship determines the steepness of the line in Problem 1.3(Moving Straight Ahead).

Vocabulary

Term	Definition
Algebraic Expression	An expression consisting of at least one variable and also consisting of numbers and operations
Angle Ruler	An angle ruler is a tool with two transparent arms, linked by a rivet that allows them to swing apart to form angles of various sizes. One arm is marked with a circular ruler showing degree measures from 0◦ to 360◦. A goniometer is one type of angle ruler.
Coefficient	The number part of a term that includes a variable. For example, 3 is the coefficient of the term 3x.
Cone	A three-dimensional shape with a circular base and a vertex opposite the base.
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.
Circumference	The distance around (or perimeter of) a circle. It takes slightly more than three diameters to match the circumference of a circle. More formally, the circumference of a circle is pi (π) times the diameter of the circle.
Complimentary Angles	Complementary angles are a pair of angles whose measures add to 90◦.
Cylinder	A three-dimensional shape with two opposite faces that are parallel and congruent circles. The side (lateral surface) is a rectangle that is “wrapped around” the circular faces at the ends.
Degree	A unit of measure of angles is also equal to 1360 of a complete circle. The angle below measures about 1 degree (1◦); 360 of these would just fit around a point and fill in a complete circle; 90 of them make a right angle.
Dependent Variable	One of the two variables in a relationship. Its value depends upon or is determined by the other variable called the *independent variable*.
Diameter	A segment that goes from one point on a circle through the center of the circle to another point on the circle. Also, diameter is used to indicate the length of this segment. In this circle, segment AB is a diameter.
Equation	A mathematical sentence formed by setting two expressions equal.
Exterior Angles	An angle at a vertex of a polygon where the sides of the angle are one side of the polygon and the extension of the other side meeting at the vertex. In the pentagons below, angles a, b, c, d, e, f, g, h, i, and j are exterior angles.
Independent Variable	One of the two variables in a relationship. Its value determines the value of the other variable called the dependent variable.
Inequality	*A mathematical sentence formed by placing inequality symbol between two expressions*

Interior Angles	The angle inside a polygon formed by two adjacent sides of the polygon. In the pentagon below, a, b, c, d, and e are interior angles.
Numerical Expression	An expression consisting of numbers and operations
Parallel Lines	Lines in a plane that never meet. The opposite sides of a regular hexagon are parallel.
Polygon	A shape formed by three or more line segments, called sides. Each segment meets exactly two other segments, but only at their endpoints.
Protractor	A protractor is a type of semi-circular ruler with scale measured in degrees. The degree measures on a protractor are listed both in ascending and descending order to measure angles regardless of their orientation.
Pyramid	A three-dimensional shape with one polygonal base and lateral faces that are all triangles that meet at a vertex opposite the base.
Radius	A radius of a circle is the distance from the center of the circle to any point on the circle.
Rectangle	A parallelogram with all right angles. Squares are a special type of rectangle.
Reflectional Symmetry	A type of symmetry where one half is the reflection of the other half. You could fold the image and have both halves match exactly.
Regular Polygon	A polygon that has all of its sides equal and all of its angles equal. The hexagon below is regular, but the other hexagon is not regular, because its sides and its angles are not equal.
Regular Prism	A prism whose bases are regular polygons.
Right Angle	An angle that measures 90◦. A rectangle has four right angles.
Right Triangle	A prism whose vertical faces are rectangles. The bases are congruent polygons.
Slope	The slope is the ratio of the vertical change to the horizontal change between any two points on the line.
Sphere	A three-dimensional shape whose surface consists of all the points that are a given distance from the center of the shape.
Term	A number, a variable, or product and a number and variable
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.

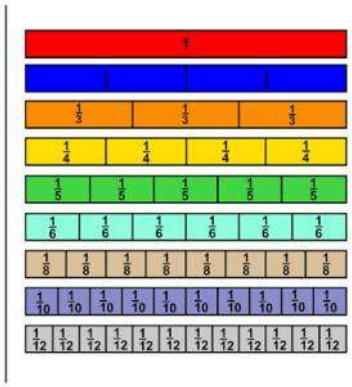
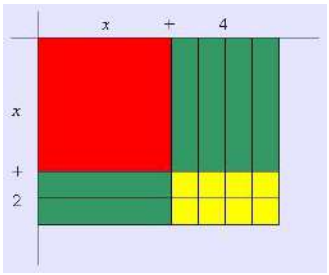
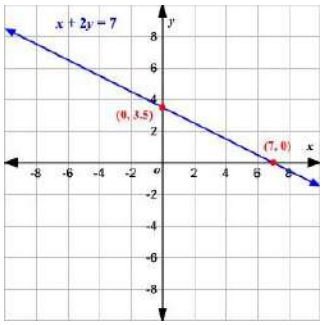
- Students may think that percentages cannot be greater than 100, not realizing that one whole equals 100%.

- When adding and subtracting fractions with unlike denominators, students may have trouble rewriting the fractions as equivalent fractions with a common denominator. This process is especially challenging when the fractions include variables. Students have difficulty identifying the common denominators and then rewriting the fraction or problem. Use models to explain what a denominator represents to help students understand the process.

- Students overgeneralize specific formulas and rules to apply to all shapes.

- Students simply apply a formula but do not understand concepts fully and cannot articulate. For example, the area of a triangle is ½ the area of a rectangle with height and width dimensions identical to the height and base dimensions of the triangle.

Teaching Multiple Representations

CONCRETE REPRESENTATIONS	
Bar Model	
Algebra Tiles	
PICTORIAL REPRESENTATIONS	
Graphic organizers I.e. tables, input/output charts, etc.	CARPET CLEANER RENTAL Number of Hours / Cost: 1 $16; 2 $22; 3 $28; 4 $34; 5 ?; 6 ? Input (days) / Output ($): 1 15; 2 20; 4 30; 6 40; 9 55; 11 65
Graphing	

Pan Balance	

ABSTRACT REPRESENTATIONS

Simplifying Expressions/Combining Like Terms

Generating an Equation *a+.05a=1.05a*

Properties of Operations: Commutative, Associative, Distributive

Order of Operations

Standard algorithms for addition, subtraction, multiplication, and division

	Word Phrases	Expression
+	• a number plus 5 • add 5 to a number • sum of a number and 5 • 5 more than a number • a number increased by 5	$n + 5$
−	•a number minus 11 • subtract 11 from a number • difference of a number and 11 • 11 less than a number • a number decreased by 11	$x - 11$
×	• 3 times a number • 3 multiplied by a number • product of 3 and a number	$3m$
÷	• a number divided by 7 • 7 divided into a number • quotient of a number and 7	$\frac{a}{7}$ or $a \div 7$

Unit Assessment Framework

Unit 3 Assessment Framework				
Assessment	**CCSS**	**Estimated Time**	**Format**	**Graded ?**
Unit 3 Diagnostic Assessment (Beginning of Unit)	7.EE.A.1, 7.EE.A.2, 7.EE.B.3, 7.EE.B.4,7.EE.B.4a, 7.EE.B.4b	1 Block	Individual	No
Unit 3 Check Up 1 (After Investigation 1) *Moving Straight Ahead*	7.EE.B.3, 7.EE.B.4,7.EE.B.4a	½ Block	Individual	Yes
Unit 3 Assessment 1 (After Check Up 1) *Model Curriculum*	7.EE.A.1, 7.EE.A.2	1 Block	Individual	Yes
Unit 3: Partner Quiz (After Investigation 2) *Moving Straight Ahead*	7.EE.B.3, 7.EE.B.4,7.EE.B.4a	½ Block	Group	Yes
Unit 3 Check Up 2 (After Investigation 3) *Moving Straight Ahead*	7.EE.A.1, 7.EE.A.2, 7.EE.B.3, 7.EE.B.4,7.EE.B.4a, 7.EE.B.4b	½ Block	Individual or Group	Yes
Unit 3 Assessment 2 (Conclusion of Unit) *Model Curriculum*	7.EE.A.1, 7.EE.A.2, 7.EE.B.3, 7.EE.B.4,7.EE.B.4a, 7.EE.B.4b	1 Block	Individual	Yes

Unit Assessment Framework (continued)

Unit 3 Performance Assessment Framework				
Assessment	**CCSS**	**Estimated Time**	**Format**	**Graded ?**
Unit 3 Performance Task 1 (Late January) *Miles to Kilometers*	7.EE.A.2	½ Block	Group	Yes; Rubric
Unit 3 Performance Task 2 (Late February) *Toy Store*	7.EE.B.3	1 Block	Individual With Interview Opportunity	Yes; Rubric
Unit 3 Performance Task 3 (Early March) *Music Online*	7.EE.B.4	1 Block	Individual With Interview Opportunity	Yes; Rubric
Unit 3 Performance Task Option 1 (optional)	7.EE.B.3	Teacher Discretion	Teacher Discretion	Yes, if administered
Unit 3 Performance Task Option 2 (optional)	7.EE.B.3, 7.RP.A.3	Teacher Discretion	Teacher Discretion	Yes, if administered
Unit 3 Performance Task Option 3 (optional)	6.EE.B.7, 7.RP.A.3, 7.EE.B.3, 6.RP.A.3	Teacher Discretion	Teacher Discretion	Yes, if administered

Performance Tasks

Unit 3 Performance Task 1

Miles to Kilometers (7.EE.A.1)

The students in Mr. Sanchez's class are converting distances measured in miles to kilometers. To estimate the number of kilometers, Abby takes the number of miles, doubles it, and then subtracts 20% of the result. Renato first divides the number of miles by 5, and then multiplies the result by 8.

a. Write an algebraic expression for each method.

b. Use your answer to part (a) to decide if the two methods give the same answer.

Solution

a. Abby's method starts by doubling m, giving 2m. She than takes 20% of the result, which can be written as 0.2(2m). Finally she subtracts this from 2m, giving
   2m – (0.2)2m

   Renaldo's method starts by dividing *m* by 5, giving $m \div 5 = \frac{m}{5}$, and then multiplying the result by 8, giving $8\left(\frac{m}{5}\right)$

b. Abby's method can be simplified as follows:
   $2m - (0.2)2m = 2m - 0.4m = 1.6m$

   Renaldo's method can be simplified as follows:
   $8\left(\frac{m}{5}\right) = \frac{8}{1} \times \frac{1}{5} \times \frac{m}{1} = \frac{8 \times 1 \times m}{1 \times 5 \times 1} = \frac{8m}{5} = 1.6m$

   Hence, both methods give the same answer, which is $1.6m$

Unit 3 Performance Task 1 PLD Rubric

SOLUTION

- **Student indicates the expressions, 2m – (0.2)2m and $m \div 5 = \frac{m}{5}$, and explains how they derived the expressions**
- **Student simplifies both expressions by writing every step and then indicates 1.6m for both expressions.**
- **Student refers to 1.6m and indicates that both expressions are equivalent..**

Level 5: Distinguished Command	Level 4: Strong Command	Level 3: Moderate Command	Level 2: Partial Command	Level 1: No Command
Clearly constructs and communicates a complete response based on concrete referents provided in the prompt or constructed by the student such as diagrams that are connected to a written (symbolic) method, number line diagrams or coordinate plane diagrams, including: • a logical approach based on a conjecture and/or stated assumptions • a logical and complete progression of steps • complete justification of a conclusion with minor computational error.	Clearly constructs and communicates a complete response based on concrete referents provided in the prompt or constructed by the student such as diagrams that are connected to a written (symbolic) method, number line diagrams or coordinate plane diagrams, including: • a logical approach based on a conjecture and/or stated assumptions • a logical and complete progression of steps • complete justification of a conclusionwith minor conceptual error	Constructs and communicates a complete response based on concrete referents provided in the prompt or constructed by the student such as diagrams that are connected to a written (symbolic) method, number line diagrams or coordinate plane diagrams, including: • a logical, but incomplete, progression of steps • minor calculation errors • partial justification of a conclusion	Constructs and communicates an incomplete response based on concrete referents provided in the prompt such as: diagrams, number line diagrams or coordinate plane diagrams, which may include: • a faulty approach based on a conjecture and/or stated assumptions • An illogical and incomplete progression of steps • major calculation errors • partial justification of a conclusion	The student shows no work or justification.

Unit 3 Performance Task 2

Toy Store (7.EE.B.3)

Brenda's toy shop sells toy trains.

A *size 1* set is just an engine, a *size 2* has an engine and 1 carriage, a *size 3* has an engine and 2 carriages and so on.

The engine has 8 wheels, 4 on each side, and each carriage has 6 wheels, 3 on each side.

The table shows the number if wheels on each size of train set.

Size of train set	1	2	3	4	5
Number of wheels	8	14			

1. Fill in the table to show how many wheels sets 3, 4 and 5 have. Explain the pattern you notice.

2. The biggest set in the shop is size 12. How many wheels does the size 12 set contain? Show how you figured it out.

3. Mick says his train set has 42 wheels. Can Mick be correct? Explain how you know.

4. The factory where the trains are made needs a rule for the number of wheels in any size set so that it can use this in its computer. Write an algebraic expression for the number of wheels in a size n set.

Solution

1.

Size	1	2	3	4	5
# of wheels	8	14	20	26	32

Number of wheel is increasing by six from the previous number of wheel.
Or
Number of wheel is six times more than the previous size plus 8 each time.

2. Student can draw and explain how many wheels are there in the 12th size

Size 12 has 11 carriers with six wheels in each so 11*6 = 66 wheels. You will have to add the 8 wheels from the engine, which will give a total of 66 + 8 = 74 wheels.

Or the student can complete the table.

Toy size	1	2	3	4	5	6	7	8	9	10	11	12
# of wheels	8	14	20	26	32	38	44	50	56	62	68	74

Or the student can write the number sentence with explanation.

Number of the carts in the current size is the same as previous size number. There are 11 carts in size 12 including the one engine.

1 engine + 11 carts ⟶ 8 wheels + 11(6wheels) ⟶ 8 + 66 = 74 wheels

3. Mike is wrong, because for size 6 you can only have 38 wheels and for size 7 you can have 44 wheels.

4. n = Toy size
   There are six wheels in each cart and eight wheels in an engine.
   Students need to relate the number carts with the toy size.
   In the Toy size 2 there is 1 cart. In the toy size 3 there are 2 carts.
   So number of carts = Toy size – 1 = n – 1
   Number of wheels = 6(n -1) + 8 or 6n +2

Unit 3 Performance Task 2 PLD Rubric

SOLUTION

- **Student creates the table and indicates that you need 20 wheels for size 3, 26 wheels for size 4, and 32 wheels for size 5. And the student explains the pattern by indicating that the number of wheels in each size going up by 6 from the previous size or the number of wheels is six times more than the previous size plus 8.**
- **Student indicates that there are 74 wheels in size 12 by drawing the model with the correct explanation or by completing the table with the correct number of wheels for each size or by writing a number sentence with an explanation.**
- **Student indicates mike is wrong by referring to the size 6 and size 7.**
- **Student indicates 6(n -1) + 8 and indicates that number of carts in in size is the same as previous size number.**

Level 5: Distinguished Command	**Level 4: Strong Command**	**Level 3: Moderate Command**	**Level 2: Partial Command**	**Level 1: No Command**
Clearly constructs and communicates a complete response based on concrete referents provided in the prompt or constructed by the student such as diagrams that are connected to a written (symbolic) method, number line diagrams or coordinate plane diagrams, including: • a logical approach based on a conjecture and/or stated assumptions • a logical and complete progression of steps • complete justification of a conclusion with minor computational error	Clearly constructs and communicates a complete response based on concrete referents provided in the prompt or constructed by the student such as diagrams that are connected to a written (symbolic) method, number line diagrams or coordinate plane diagrams, including: • a logical approach based on a conjecture and/or stated assumptions • a logical and complete progression of steps • complete justification of a conclusionwith minor conceptual error	Constructs and communicates a complete response based on concrete referents provided in the prompt or constructed by the student such as diagrams that are connected to a written (symbolic) method, number line diagrams or coordinate plane diagrams, including: • a logical, but incomplete, progression of steps • minor calculation errors • partial justification of a conclusion	Constructs and communicates an incomplete response based on concrete referents provided in the prompt such as: diagrams, number line diagrams or coordinate plane diagrams, which may include: • a faulty approach based on a conjecture and/or stated assumptions • An illogical and incomplete progression of steps • major calculation errors • partial justification of a conclusion	The student shows no work or justification.

Unit 3 Performance Task 3

Music Online (7.EE.B.4)

LaShawn wants to buy some music online. There are two plans to choose from. The first plan is a flat rate of $1.29 per download. The second plan has a membership fee of $21, and a fee of $0.99 per download. Let *x* be the number of downloads and *C* be the cost.
Plan 1: $C = 1.29x$ Plan 2: $C = 21 + 0.99x$

a. When are the costs of the two plans equal to each other? Explain.

b. What is the *y*-intercept of the line for each equation? What does it mean in this context?

c. What is the constant rate of change for each relationship? What does it mean in this context?

d. For Plan 1, how many downloads are possible if the total cost is at most $15? Explain

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Solution

a. 1.29x = 21 + 0.99x set both equations equal to each other

- 0.99x - 0.99x subtract 0.99x from both sides

0.30x = 21 Simplify

$\frac{0.30x}{0.30} = \frac{21}{0.30}$ divide both sides by 0.30

$x = \frac{21 \times 100}{0.30 \times 100} = \frac{2100}{30} = 70$ Simplify

When LaShawn purchases 70 songs, the cost will be the same for both plans.

b. Plan 1: The *y*-intercept is 0, which means there are no upfront costs and if you buy 0 songs, you pay $0. Plan 2: The *y*-intercept is 21, which means there is an upfront cost of $21 before you buy any songs.

c. Plan 1: The constant rate of change: is $1.29 per song, the coefficient of *x*.
Plan 2: The constant range of change: is $.99 per song.

d. At most means there is a limit, less than or equal to.
For plan 1 inequality will be as follows:

$1.29x \leq \$15$ Set up the inequality

$\frac{1.29x}{1.29} \leq \frac{15}{1.29}$ Divide both sides by 1.29

$x \leq \frac{15 \times 100}{1.29 \times 100}$ Multiply by100 to eliminate decimal

$x \leq \frac{1500}{129}$ Simplify

$x \leq 11.6$ Simplify

The number of songs has to be a whole number, so at the most LaShawn can by 11 songs
For parts a and d, student can also work backward by doing trial and error.

Unit 3 Performance Task 3 PLD Rubric

SOLUTION

- **Student indicates that When LaShawn purchases 70 songs, the cost will be the same for both plans and explains how they derived the number of songs.**
- **Student indicates that for plan 1: The *y*-intercept is 0, which means there is no upfront costs and if you buy 0 songs, you pay $0. For plan 2: The *y*-intercept is 21, which means there is an upfront cost of $21 before you buy any songs.**
- **Student indicates that for Plan 1: The constant rate of change: is $1.29 per song, the coefficient of *x*. For plan 2: The constant range of change: is $.99 per song.**
- **Student indicates that at the most LaShawn can by 11 songs and explains how he/she derived their answer**

Level 5: Distinguished Command	Level 4: Strong Command	Level 3: Moderate Command	Level 2: Partial Command	Level 1: No Command
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Unit 3 Performance Task Option 1

Shrinking (7.EE.3)

When working on a report for class, Catrina read that a woman over the age of 40 can lose approximately 0.06 centimeters of height per year.

a. Catrina's Aunt Nancy is 40 years old and is 5 feet 7 inches tall. Assuming her height decreases at this rate after the age of 40, about how tall will she be at age 65? (Remember that 1 inch = 2.54 centimeters.)

b. Catrina's 90-year-old grandmother is 5 feet 1 inch tall. Assuming her grandmother's height has also decreased at this rate, about how tall was she at age 40? Explain your reasoning.

Unit 3 Performance Task Option 2

Gotham City Taxis (7.EE.3, 7.RP.3)

The taxi fare in Gotham City is $2.40 for the first 12 mile and additional mileage charged at the rate $0.20 for each additional 0.1 mile. You plan to give the driver a $2 tip. How many miles can you ride for $10?

Unit 3 Performance Task Option 3

Anna in DC (6.EE.3, 6.EE.7, 7.RP.3, 7.EE.3, 6.RP.3)

Anna enjoys dinner at a restaurant in Washington, D.C., where the sales tax on meals is 10%. She leaves a 15% tip on the price of her meal before the sales tax is added, and the tax is calculated on the pre-tip amount. She spends a total of $27.50 for dinner. What is the cost of her dinner without tax or tip?

Extensions and Sources

Online Resources

http://dashweb.pearsoncmg.com

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_FINAL.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