Georgia Milestones
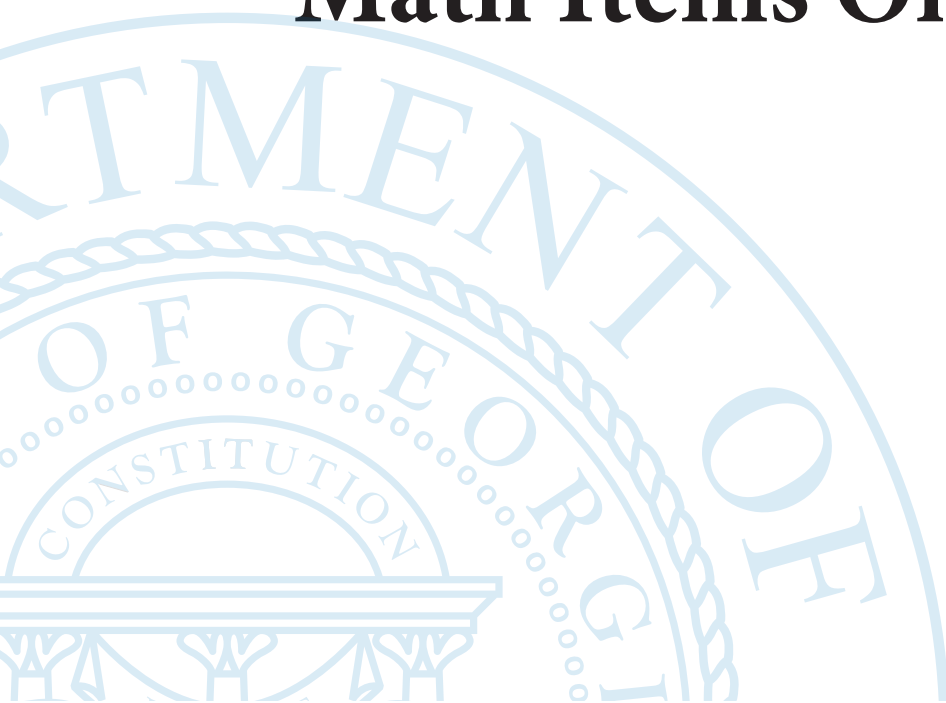## Assessment System

Study/Resource Guide
for Students and Parents

Grade 7
Math Items Only

The Study/Resource Guides are intended to serve as a resource for parents and students. They contain practice questions and learning activities for each content area. The standards identified in the Study/Resource Guides address a sampling of the state-mandated content standards.

For the purposes of day-to-day classroom instruction, teachers should consult the wide array of resources that can be found at www.georgiastandards.org.
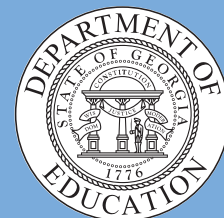
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THE GEORGIA MILESTONES ASSESSMENT SYSTEM

Dear Student,

This **Georgia Milestones Grade 7 Study/Resource Guide for Students and Parents** is intended as a resource for parents and students. It contains sample questions and helpful activities to give you an idea of what test questions look like on Georgia Milestones and what the Grade 7 End-of-Grade (EOG) assessment covers.

These sample questions are fully explained and will tell you why each answer is either correct or incorrect.

Get ready—open this guide—and get started!

HOW TO USE THIS GUIDE

Let's get started!

❋ **Get it together!**
- This guide
- Pen or pencil
- Highlighter
- Paper

❋ **Gather materials**
- Classroom notebooks
- Textbooks

❋ **Study space**
- Find a comfortable place to sit.
- Use good lighting.
- Time to focus—no TV, games, or phones!

❋ **Study time**
- Set aside some time after school.
- Set a goal—how long are you going to study?
- Remember—you cannot do this all at one time.
- Study a little at a time, every day.

❋ **Study buddy**
- Work with a friend, sister, brother, parent—anyone who can help!
- Ask questions—it is better to ask now and get answers.
- Make sure you know what you need to do—read the directions before you start.
- Ask your teacher if you need help.

❋ **Test-taking help**
- Read each question and all of the answer choices carefully.
- Be neat—use scratch paper.
- Check your work!

Georgia Milestones Grade 7 EOG Study/Resource Guide for Students and Parents

PREPARING FOR TAKING TESTS

Getting ready!

Here are some ideas to think about before you take a test.

- Get plenty of rest and eat right. Take care of your body and your mind will do the rest.

- If you are worried about a test, don't be. Talk with a teacher, parent, or friend about what is expected of you.

- Review the things you have learned all year long. Feel good about it.

- Remember that a test is just one look at what you know. Your class work, projects, and other tests will also show your teachers how much you have learned throughout the year.

Try your best!

OVERVIEW OF THE END-OF-GRADE ASSESSMENT

What is on the End-of-Grade Assessment?
✱ **English Language Arts (ELA)**
✱ **Mathematics**
✱ **Science**
✱ **Social Studies**

TYPES OF ITEMS
✱ **Selected-response items**—also called multiple-choice
- English Language Arts (ELA), Mathematics, Science, and Social Studies
- There is a question, problem, or statement that is followed by four answer choices.
- There is only ONE right answer, so read EACH answer choice carefully.
- Start by eliminating the answers that you know are wrong.
- Then look for the answer that is the BEST choice.

✱ **Constructed-response items**
- English Language Arts (ELA) and Mathematics only
- There is a question, problem, or statement but no answer choices.
- You have to write your answer or work out a problem.
- Read the question carefully and think about what you are asked to do.
- In English Language Arts (ELA), go back to the passage to look for details and information.
- You will be scored on accuracy and how well you support your answer with evidence.

✱ **Extended constructed-response items**
- English Language Arts (ELA) and Mathematics only
- These are similar to the constructed-response items.
- Sometimes they have more than one part, or they require a longer answer.
- Check that you have answered all parts of the question.

✱ **Extended writing prompt**
- English Language Arts (ELA) only
- There is a question, problem, or statement.
- You may be asked to do more than one thing.
- In English Language Arts (ELA), you will be asked to read two passages and then write an essay.
- You will be scored on how well you answer the question and the quality of your writing.
- Organize your ideas clearly.
- Use correct grammar, punctuation, and spelling.
- Support your answer with evidence from the text.

DEPTH OF KNOWLEDGE

Test questions are designed with a Depth of Knowledge (DOK) level in mind. As you go from Level 1 to Level 4, the questions get more and more challenging. They take more thinking and reasoning to answer. You may have experienced these types of questions in your classroom as your teachers find ways to challenge you each day.

A Level 1 item may not require as much thinking as a Level 4 item—but that does not mean it's easy.

A Level 4 item may have more than one part or ask you to write something.

Here is some information to help you understand just what a DOK level really is.

Level 1 (Recall of Information)

* Identify, list, or define something.
* Questions may start with *who, what, when*, and *where*.
* Recall facts, terms, or identify information.

Level 2 (Basic Reasoning)

* Think about things—it is more than just remembering something.
* Describe or explain something.
* Answer the questions "how" or "why."

Level 3 (Complex Reasoning)

* Go beyond explaining or describing "how and why."
* Explain or justify your answers.
* Give reasons and evidence for your response.
* Make connections and explain a concept or a "big idea."

Level 4 (Extended Reasoning)

* Complex thinking required!
* Plan, investigate, or apply a deeper understanding.
* These items will take more time to write.
* Connect and relate ideas.
* Show evidence by doing a task, creating a product, or writing a response.

Depth of Knowledge

Level 1—Recall of Information	
Level 1 asks you to identify, list, or define. You may be asked to recall *who, what, when*, and *where*. You may also be asked to recall facts and terms or identify information in documents, quotations, maps, charts, tables, graphs, or illustrations. Items that ask you to "describe" and/or "explain" could be Level 1 or Level 2. A Level 1 item requires that you just recall, recite, or repeat information.	
Skills Demonstrated	**Question Cues**
• Make observations • Recall information • Recognize formulas, properties, patterns, processes • Know vocabulary, definitions • Know basic concepts • Perform one-step processes • Translate from one representation to another • Identify relationships	• Tell who, what, when, or where • Find • List • Define • Identify; label; name • Choose; select • Compute; estimate • Express as • Read from data displays • Order

Level 2—Basic Reasoning	
Level 2 includes some thinking that goes beyond recalling or repeating a response. A Level 2 "describe" and/or "explain" item would require that you go beyond a description or explanation of information to describe and/or explain a result or "how" or "why."	
Skills Demonstrated	**Question Cues**
• Apply learned information to abstract and real-life situations • Use methods, concepts, and theories in abstract and real-life situations • Perform multi-step processes • Solve problems using required skills or knowledge (requires more than habitual response) • Make a decision about how to proceed • Identify and organize components of a whole • Extend patterns • Identify/describe cause and effect • Recognize unstated assumptions; make inferences • Interpret facts • Compare or contrast simple concepts/ideas	• Apply • Calculate; solve • Complete • Describe • Explain how; demonstrate • Construct data displays • Construct; draw • Analyze • Extend • Connect • Classify • Arrange • Compare; contrast

Level 3—Complex Reasoning

Level 3 requires reasoning, using evidence, and thinking on a higher level than Level 1 and Level 2. You will go beyond explaining or describing "how and why" to justifying the "how and why" through reasons and evidence. Level 3 items often involve making connections across time and place to explain a concept or a "big idea."

Skills Demonstrated	Question Cues
- Solve an open-ended problem with more than one correct answer - Create a pattern - Generalize from given facts - Relate knowledge from several sources - Draw conclusions - Make predictions - Translate knowledge into new contexts - Compare and discriminate between ideas - Assess value of methods, concepts, theories, processes, and formulas - Make choices based on a reasoned argument - Verify the value of evidence, information, numbers, and data	- Plan; prepare - Predict - Create; design - Ask "what if?" questions - Generalize - Justify; explain why; support; convince - Assess - Rank; grade - Test; judge - Recommend - Select - Conclude

Level 4—Extended Reasoning

Level 4 requires the complex reasoning of Level 3 with the addition of planning, investigating, applying deeper understanding, and/or developing that will require a longer period of time. You may be asked to connect and relate ideas and concepts *within* the content area or *among* content areas in order to be at this highest level. The Level 4 items would be a show of evidence—through a task, a product, or an extended response—that the higher level demands have been met.

Skills Demonstrated	Question Cues
- Analyze and synthesize information from multiple sources - Examine and explain alternative perspectives across a variety of sources - Describe and illustrate how common themes are found across texts from different cultures - Apply mathematical models to illuminate a problem or situation - Design a mathematical model to inform and solve a practical or abstract situation - Combine and synthesize ideas into new concepts	- Design - Connect - Synthesize - Apply concepts - Critique - Analyze - Create - Prove

MATHEMATICS

DESCRIPTION OF TEST FORMAT AND ORGANIZATION

The Grade 7 Mathematics EOG assessment consists of a total of 73 items.

You will answer a variety of item types on the test. Some of the items are selected-response (multiple-choice), which means you choose the correct answer from four choices. Some items will ask you to write your response.

The test will be given in two sections.

- You may have up to 85 minutes per section to complete Sections 1 and 2.
- The test will take about 120 to 170 minutes.

CONTENT

The Grade 7 Mathematics EOG assessment will measure the Grade 7 standards that are described at www.georgiastandards.org.

The content of the assessment covers standards that are reported under these domains:

- Ratios and Proportional Relationships
- The Number System
- Expressions and Equations
- Geometry
- Statistics and Probability

ITEM TYPES

The Mathematics portion of the Grade 7 EOG assessment consists of selected-response (multiple-choice) items, constructed-response items, and extended constructed-response items.

MATHEMATICS DEPTH OF KNOWLEDGE EXAMPLE ITEMS

Example items that represent applicable DOK levels of the Mathematics assessment are provided for you on the following pages. The items and explanations of what is expected of you to answer them will help you prepare for the test.

All example and sample items contained in this guide are the property of the Georgia Department of Education.

Example Item 1

DOK Level 1: This is a DOK level 1 item because it requires students to recall information about the order of operations.

Mathematics Grade 7 Content Domain II: Expressions and Equations

Standard: MGSE7.EE.3. Solve multistep, real-life, and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals) by applying properties of operations as strategies to calculate with numbers, converting between forms as appropriate, and assessing the reasonableness of answers using mental computation and estimation strategies.

For example:

- *If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50.*
- *If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.*

Simplify.

$(2)(18) \div (-2 + 5)(-1)$

A. −13
B. −12
C. 12
D. 13

Correct Answer: B

Explanation of Correct Answer: The correct answer is choice (B) −12. The order of operations was followed with the operations inside grouping symbols being completed first, followed by multiplying/dividing (left to right). Choice (A) is incorrect because after the expression inside the parentheses was evaluated, an incorrect quotient was calculated: $36 \div 3 \neq 13$. Choice (C) is incorrect because the −1 part of the expression was not applied or was applied incorrectly. Choice (D) is incorrect because the entire problem was worked left to right without regard to the order of operations.

Example Item 2

DOK Level 2: This is a DOK level 2 item because it assesses basic reasoning. Students must solve a problem demonstrating their understanding of multiplication of rational numbers.

Mathematics Grade 7 Content Domain I: The Number System

Standard: MGSE7.NS.2a. Apply and extend previous understandings of multiplication and division of fractions to multiply and divide rational numbers.

A football team loses 5 yards on each of 3 consecutive plays.

Part A: What signed number represents the team's total loss of yards on the 3 plays?

_____

Part B: Explain how you found your answer.

_____

_____

Scoring Rubric

Points	Description

2	The response achieves the following:
	• Response demonstrates a complete understanding of multiplication and division of rational numbers.
	• Give 2 points for Part A AND Part B correct.
	   • Response is correct and complete.
	   • Response shows application of a reasonable and relevant strategy.
	• Mathematical ideas are expressed coherently through a clear, complete, logical, and fully developed response using words, calculations, and/or symbols as appropriate.

1	The response achieves the following:
	• Response demonstrates a partial understanding of multiplication and division of rational numbers.
	• Give 1 point for Part A OR Part B correct.
	   • Response is mostly correct but contains either a computation error or an unclear or incomplete explanation.
	   • Response shows application of a relevant strategy, though it may be only partially applied or it may remain unexplained.
	• Mathematical ideas are expressed only partially using words, calculations, and/or symbols as appropriate.

0	The response achieves the following:
	• The response demonstrates limited to no understanding of multiplication and division of rational numbers.
	   • Response is incorrect.
	   • Response shows no application of a strategy.
	• Mathematical ideas cannot be interpreted or lack sufficient evidence to support even a limited understanding.

Exemplar Response

Points Awarded	Sample Response
2	Part A: –15 yards *(OR minus 15 yards OR negative 15 yards)* Part B: I multiplied 3 times negative 5. I used a number line to show the multiplication by starting at 0 and moving 5 places to the left 3 times.
1	Part A: –15 yards *(OR minus 15 yards OR negative 15 yards)* Part B: I multiplied.
0	*Response is irrelevant, inappropriate, or not provided.*

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Example Item 3

DOK Level 3: This is a DOK level 3 item that assesses application of reasoning. Students have to apply their knowledge of calculating percentages to solve problems and explain the processes they used.

Mathematics Grade 7 Content Domain III: Ratios and Proportional Relationships

Standard: MGSE7.RP.3. Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, and fees.

The selling price of a house dropped from $250,000 to $210,000 over a period of 5 years.

Part A: By what percent did the selling price decrease?

_____ %

Part B: Explain how you found your answer.

Part C: By what percent does the price need to increase in order to return to its original value of $250,000?

_____ %

Part D: Explain how you found your answer.

Scoring Rubric

Points	Description

4	The response achieves the following:
	• The response demonstrates a complete understanding of using proportional relationships to solve multi-step percent problems.
	• Give 4 points for four parts answered correctly.
	  • Response is correct and complete.
	  • Response shows application of a reasonable and relevant strategy.
	• Mathematical ideas are expressed coherently through a clear, complete, logical, and fully developed response using words, calculations, and/or symbols as appropriate.

3	The response achieves the following:
	• The response demonstrates a nearly complete understanding of using proportional relationships to solve multi-step percent problems.
	• Give 3 points for three parts answered correctly.
	  • Response is mostly correct but contains either a computation error or an unclear or incomplete explanation.
	  • Response shows application of a relevant strategy, though it may be only partially applied or it may remain unexplained.
	• Mathematical ideas are expressed only partially using words, calculations, and/or symbols as appropriate.

2	The response achieves the following:
	• The response demonstrates a partial understanding of using proportional relationships to solve multi-step percent problems.
	• Give 2 points for two parts answered correctly.
	  • Response is only partially correct.
	  • Response shows application of a relevant strategy, though it may be only partially applied or remain unexplained.
	• Mathematical ideas are expressed only partially using words, calculations, and/or symbols as appropriate.

1	The response achieves the following:
	• The response demonstrates a minimal understanding of using proportional relationships to solve multi-step percent problems.
	• Give 1 point for one part answered correctly.
	  • Response is only partially correct.
	  • Response shows incomplete or inaccurate application of a relevant strategy.
	• Mathematical ideas are expressed only partially using words, calculations, and/or symbols as appropriate.

0	The response achieves the following:
	• The response demonstrates limited to no understanding of using proportional relationships to solve multi-step percent problems.
	  • Response is incorrect.
	  • Response shows no application of a strategy.
	• Mathematical ideas cannot be interpreted or lack sufficient evidence to support even a limited understanding.

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Exemplar Response

| Points Awarded	Sample Response
4	Part A: 16 Part B: I subtracted the new price from the original price and divided the difference by the original price. Then I multiplied the decimal product by 100 and removed the negative sign to write the percent decrease. Part C: approximately 19 Part D: I divided the difference in the two prices by the new price. Then I multiplied the decimal product by 100 to write the percent increase.
3	The student correctly answers three out of the four parts.
2	The student correctly answers two out of the four parts.
1	The student correctly answers one of the four parts.
0	*Response is irrelevant, inappropriate, or not provided.*

MATHEMATICS CONTENT DESCRIPTION AND ADDITIONAL SAMPLE ITEMS

In this section, you will find information about what to study in order to prepare for the Grade 7 Mathematics EOG assessment. This includes key terms and important vocabulary words. This section also contains practice questions, with an explanation of the correct answers, and activities that you can do on your own or with your classmates or family to prepare for the test.

All example and sample items contained in this guide are the property of the Georgia Department of Education.

CONTENT DESCRIPTION

- Apply and extend understanding of multiplication and division
- Divide fractions by fractions
- Compute fluently with multi-digit numbers and rational numbers
- Find common factors and multiples
- Apply and extend understandings of algebraic expressions
- Reason and solve one-variable equations and inequalities
- Analyze quantitative relationships between dependent and independent variables
- Understand ratio, area, surface area, and volume
- Develop understanding of statistical variability
- Summarize and describe distributions
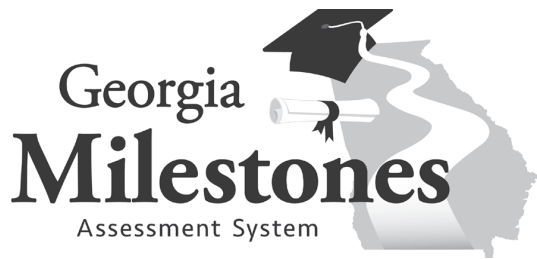
Mathematics
Formula Sheet

You can find mathematics formula sheets on the Georgia Milestones webpage at http://www.gadoe.org/Curriculum-Instruction-and-Assessment/Assessment/Pages/Georgia-Milestones-Assessment-System.aspx.

Look under "EOG Resources."

Unit 1: Operations with Rational Numbers

In this unit, you will work with rational numbers, use a number line to add and subtract rational numbers, and learn about absolute value and additive and multiplicative inverses. You will convert rational numbers to decimals using long division. You will use the four operations to solve problems with rational numbers.

KEY TERMS

Rational number: A number that can be made by dividing two **integers** or whole numbers. Rational numbers can be displayed as a point on a number line or coordinate plane. (NS.1)

Add and **subtract** rational numbers by representing the problem on a **number line** or utilizing colored counters. (NS.1)

Addition of rational numbers is finding the location of a sum. To complete this process, plot the first addend on the number line. Then, move the distance, or absolute value, of the second addend. The sign of the addend will determine which direction to move. If the number has a negative sign, move towards the negative numbers. For example, $3 + -4 = -1$ by starting at 3 and moving a distance of 4 in a negative direction. (NS.1b)

Absolute value: The distance between the given number and zero on a number line. For example, $|-5| = 5$. (NS.1b, NS.1c)

Opposite numbers: Two numbers that have the same absolute value. (NS.1)

Subtraction of rational numbers can also be represented as adding the **additive inverse** of the number. For example, $4 - 8$ can also be represented as $4 + (-8)$. (NS.1c)

Additive inverse: Two numbers that when added have a sum of zero. (NS.1c)

Use the **properties of operations** to **multiply** and **divide** rational numbers. Integers can be divided, as long as the divisor is not equal to 1. (NS.2)

Rules for multiplying signed numbers specify that two positive numbers or two negative numbers that are multiplied will have a positive product. The product of one positive number and one negative number will be negative. (NS.2a)

Multiplicative inverse: Two numbers that when multiplied have a product of 1.

A rational number can be converted to a **decimal** using **long division**. A rational number will be represented by a repeating decimal or a terminating decimal. (NS.2d)

Repeating decimal: A decimal number with a digit or groups of digits that repeats. The decimal continues without an end. (NS.2d)

Terminating decimal: A decimal number that has a specific amount of digits, a decimal number with an end. (NS.2d)

Use the **four operations** to solve problems with rational numbers. These problems may represent real-world situations or be mathematical. (NS.3)

Important Tips

- ✎ A negative number represents the **opposite** location on the number line as a positive number. For example, –2 is the opposite of 2.
- ✎ The opposite of the opposite of a number is the number itself. For example, – (–2) is equal to 2.

Sample Items 1–4

Item 1

John and Kamira are playing a game. John's score (*J*) and Kamira's score (*K*) after round 1 are shown on the number line.
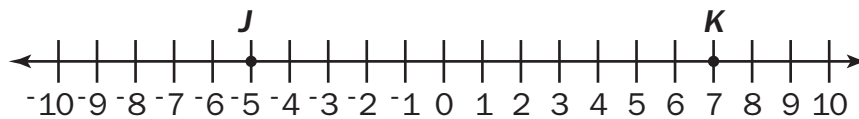
The score recorded at the end of the first round is 2. What could this score represent?

A. The sum of John's score and Kamira's score.

B. The difference between John's score and Kamira's score.

C. The absolute value of the difference of John's score and Kamira's score.

D. The sum of the absolute value of John's score and the absolute value of Kamira's score.

Item 2

What is the value of $4.2(46 - 65)$?

A. −798

B. −79.8

C. 79.8

D. 798

Item 3

What is the product?

−8(7 − 3.2)

A. −59.2
B. −30.4
C.   30.4
D.   52.8

Item 4

During one week, Sheila made several changes to her bank account. She made four withdrawals of $40 each from an ATM. She also used her check card for a $156 purchase. Then she deposited her paycheck of $375.

By how much did the amount in her bank account change during that week?

A. $59 increase
B. $59 decrease
C. $691 increase
D. $691 decrease

Unit 2: Expressions and Equations

In this unit, you will use properties of operations to add, subtract, or rewrite linear expressions with rational coefficients in different forms. You will use estimation and variables to represent unknown numbers. You will work with inequalities and use a coordinate plane to graph solutions to an inequality.

KEY TERMS

Use **Properties of Operations** to **add**, **subtract**, or rewrite linear expressions with rational **coefficients** in different forms.

- **Distributive property** multiplies a factor that is outside of a set of parentheses with each addend within the parentheses to solve.
- **Commutative property** allows for addends in an addition equation or factors in a multiplication equation to be moved or placed in a different order while solving.
- **Associative property** allows for addends in addition equations or factors in multiplication equations to be grouped together into different pairs while solving.
- **Identity property** allows for 0 to be added or 1 to be multiplied by any number and the number remains the same.
- **Inverse property** allows a number to be added to the opposite number for a sum of zero. Also, a number multiplied by the reciprocal fraction has a product of 1. (EE.1)

Coefficient: A number multiplied by a variable. (EE.1)

Expressions can be written in different forms while representing the same value. Use the information provided in the problem to determine the most beneficial form to use such as written or numerical. (EE.2) Rational numbers can be written as **whole numbers**, **fractions**, **decimals**, or **percents** and be changed between forms depending on the problem being solved. (EE.3)

Estimation can be used to arrive at an approximate solution to a problem. When solving using strategies based on the properties of operations, compare the solution to the estimate. Use this comparison to determine if the solution to the problem is **reasonable**. (EE.3)

A **variable** in an equation or inequality represents an **unknown number** or a number in a given set of numbers. (EE.4)

Equation: A grouping of numbers, variables, and operations with an **equal sign**. The solution to an equation is a specific number that makes the equation true. (EE.4a)

Algebraic solution: Solve a problem by using the relationship between numbers including variables, setting up equations, and utilizing inverse relationships. (EE.4a)

Arithmetic solution: Solve a problem using the four operations on the given numbers. (EE.4a)

Inequality: A grouping of numbers, variables, and operations with an **inequality symbol** such as $<$, $>$, $\leq$, and $\geq$. The solution for an inequality is a set of numbers or multiple numbers that make the inequality true. (EE.4b)

Use a **coordinate plane** to **graph** the solutions to an inequality. (EE.4b)

Important Tips

- ✎ An equal sign (=) represents that the two sides of the equation have the same value.
- ✎ Variables are used to represent unknown numbers in an equation. A specific letter can be used to represent several different numbers in different equations.
- ✎ The coefficient relates to the variable it is paired with. The value of $2n + 3$ is $n + n + 3$ and is determined based on the value of n. If $n = 5$, then $2n + 3$ has a value of $10 + 3$.
- ✎ A variable listed alone is the same as having a coefficient of 1. For example, $3x - x$ is the same as $3x - 1x$ for a total of $2x$.

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Sample Items 5–8

Item 5

Consider the expression $6r - r + 8(15 - r) + 23 - 6$.

Part A: Is $-3r + 137$ equivalent to the given expression?

_____

Part B: Explain how you determined whether the expressions are or are not equivalent.

_____

_____

Item 6

Which expression is equivalent to $-7(y - 2)$?

A. $-7y - 2$
B. $-7y + 2$
C. $-7y - 14$
D. $-7y + 14$

Item 7

Julie works Sunday, Monday, and Wednesday for 10 hours each day. On Tuesday, Thursday, and Friday, she works 7 hours each day. She does not work on Saturday. Her weekly total earnings are $612.

Part A: What is her hourly rate of pay?

$_____

Part B: Julie's manager proposes a new pay rate. The manager says Julie can get paid twice her hourly rate for working any hours over 8 in a day. What would be her weekly earnings using this method of payment? Explain how you found her total earnings using this method.

$_____

Part C: Julie thinks she can earn more money if she is paid $1\frac{1}{2}$ times her hourly rate for any hours over 40 in her weekly total. Which method of payment, Julie's or her manager's, would give Julie higher weekly earnings? Explain your reasoning.

Item 8

The sum of a number, n, and 8 is multiplied by −4, and the result is −12.

What is the number?

A. $n = -5$
B. $n = 1$
C. $n = 5$
D. $n = 11$

Georgia Milestones Grade 7 EOG Study/Resource Guide for Students and Parents

Unit 3: Ratios and Proportional Relationships

In this unit, you will use ratios and proportions with fractions, decimals, and percents. You will set up proportions and create scale drawings using scale factors.

KEY TERMS

Use given information, including a ratio of fractional measurements, to determine the unit rate. For example, the ratio $\frac{1}{2}$ feet in $\frac{1}{6}$ seconds has a unit rate of $\frac{1/2}{1/6}$ or 3 feet per second. (RP.1)

Ratio: Describes the relationship between two quantities and can be written as a **fraction**, **decimal**, or **percent**. (RP.1)

Unit rate: A ratio that has a number related to 1. For example, there is a ratio of red cars to blue cars of 2 to 1 or $\frac{2}{1}$. (RP.1)

Proportion: An equation that shows two ratios as being equivalent. (RP.2)

A proportional relationship will change by the same value over time. This value, the **constant of proportionality**, is represented by the value of the ratio (k) between y and x as $y = kx$. (RP.2)

A proportional relationship is identified using a **graph**, **table**, or **equation**. A graph of a proportional relationship will show a straight line that extends through the origin (0, 0). It can also be represented in an equation that relates two numbers or variables with the unit rate of change. For example, $y = 3x$ shows that the value of y is proportional to the value of 1 using the unit rate of 3 to 1. (RP.2)

Solve **ratio** and **percent** problems using proportional relationships including interest rates, tax, and percent increase or decrease. For example, a tree height increased from 100 inches to 120 inches. The percent of increase is $\frac{20}{100}$ or 20%. (RP.3)

Percent: A part-to-whole ratio that has a number related to 100. It can be written as a fraction with the denominator of 100 or using the symbol %. (RP.3)

Scale drawings: A drawing or geometric figure can change size using a **scale factor**, or ratio between the sets of measurements. For example, a 4-inch line that is decreased by a scale factor of $\frac{1}{2}$ will be changed to 2 inches.

A scale factor can be used to increase or decrease the size of a geometric figure.

Important Tips

- ✎ The constant of proportionality is the unit rate.
- ✎ A ratio can be represented using fractions, decimals, or percents. These forms can be used interchangeably because the value of the ratio does not change, only the form that is used to write the value.
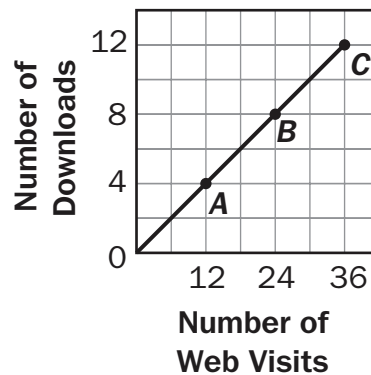
Sample Items 9–12

Item 9

The average rate of hair growth is 2.5 centimeters every 2 months.

At that rate, how many months will it take to grow 22.5 centimeters of hair?

A. 9 months

B. $11\frac{1}{4}$ months

C. 18 months

D. $28\frac{1}{8}$ months

Item 10

Consider the graph.

What does point *A* represent on this graph?

A. When there are 12 web visits, there are 4 downloads.
B. When there are 12 downloads, there are 4 web visits.
C. As the number of web visits increases by 12, the number of downloads decreases by 4.
D. As the number of web visits decreases by 12, the number of downloads increases by 4.

Item 11

During cooking, chicken loses 10% of its weight due to water loss. In order to obtain 1,170 grams of cooked chicken, how many grams of uncooked chicken must be used?

A. 1,053 grams
B. 1,287 grams
C. 1,300 grams
D. 1,340 grams

Item 12

A satellite is 18 meters wide. A model of it was built with a scale of 1 centimeter : 3 meters. How wide is the model?

A. 6 meters
B. 6 centimeters
C. 54 meters
D. 54 centimeters

Unit 4: Geometry

In this unit, you will work on geometry. You will use rulers and protractors to draw and measure geometric shapes, and in particular, angles, parallel lines, perpendicular lines, number of sides, length of sides, and the vertex. You will describe plane shapes and two- and three-dimensional figures. You will study circles, angles, area, surface area, and volume.

KEY TERMS

Use **rulers** and **protractors** as tools to draw geometric shapes given specific conditions including:

- **Angles:** The measure of the portion of a circle within two rays.
- **Parallel lines:** Two lines that are always an equal distance apart.
- **Perpendicular lines:** Two lines that intersect at a 90° angle.
- **Number of sides:** How many lines are used to create the figure.
- **Length of sides:** Measurement of the length of each line.
- **Vertex:** The point where two lines of the figure meet. (G.2)

Describe the faces of a **three-dimensional** figure by slicing the figure into **plane shapes** and describing the **attributes** of the **two-dimensional** face. (G.3)

Circle:
- **Area:** The square units needed to cover a circle can be found by multiplying the square of the **radius** by **pi**. $A = \pi r^2$
- **Circumference:** The distance around the circle, found by multiplying the **diameter** by **pi**. $C = \pi d$ (G.4)

Find the measure of an unknown angle using:

- **Supplementary angles:** Two angles that have a sum of 180°.
- **Complimentary angles:** Two angles that have a sum of 90°.
- **Vertical angles:** Nonadjacent angles that are formed by intersecting lines, opposite angles.
- **Adjacent angles:** Two angles that share 1 side and 1 vertex. (G.5)

Find the **area**, **surface area**, and **volume** of two-dimensional and three-dimensional figures by decomposing the figures into triangles, quadrilaterals, polygons, cubes, and right rectangular prisms. (G.6)

Area: The number of square units used to cover a two-dimensional figure without gaps or overlaps.

- Rectangle: Multiply the length and width of the rectangle. $A = lw$
- Triangle: Multiply the height and base of the triangle, then divide by 2. $A = \frac{1}{2}bh$ (G.6)

Surface area: The total area of each face of a three-dimensional figure. (G.6)

Volume: The amount of space the shape takes up in three dimensions: length, width, and height. A solid figure can be packed with equally sized cubes without gaps or overlaps. (G.6)

The volume of a right rectangular prism can be determined using two formulas.

- *lwh* multiplies the **length**, **width**, and **height** of the figure to find the cubic units of volume.
- *Bh* finds the **area of the base** using the width and length, and then multiplies it by the **height** of the figure to find the cubic units of volume. (G.6)

Important Tips

- ✍ In triangles the height must be measured from the highest point and be perpendicular to the base.
- ✍ The radius is half of the diameter, or half the distance across a circle.
- ✍ The ratio of the circumference to the diameter is pi, which can be represented in equations as 3.14.

Sample Items 13–16

Item 13

A bicycle training wheel has a radius of 3 inches. The bicycle wheel has a radius of 10 inches. Approximately how much smaller, in square inches, is the area of the training wheel than the area of the regular wheel?

A. 21.98 in^2
B. 153.86 in^2
C. 285.74 in^2
D. 1,142.96 in^2

Item 14

Lequan is giving a book as a gift. She will put the book in a box and wrap it. Both the book and box are shaped like rectangular prisms with the dimensions shown in the diagrams.

Book

Empty Box
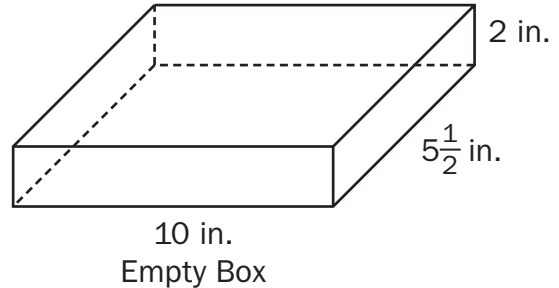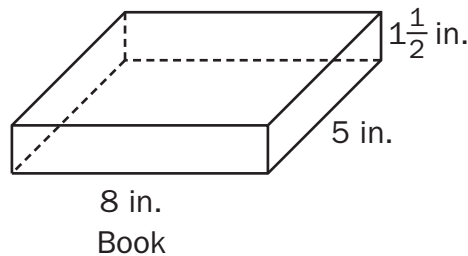
Part A: How much empty space will be in the box after Lequan puts the book inside it?

_____ cubic inches

Part B: What is the minimum amount of wrapping paper needed to completely cover the outside of the box?

_____ square inches

Item 15

Consider the diagram of supplementary angles.
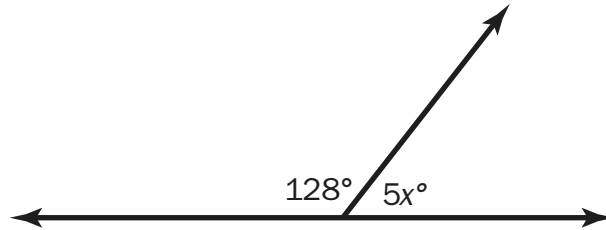
What is the value of *x*?

A. 10.4
B. 52
C. 61.6
D. 92

Item 16

Consider the figure composed of two rectangular prisms.

What is the volume of this figure?

A. 32 in^3
B. 256 in^3
C. 416 in^3
D. 7,680 in^3

Unit 5: Inferences

In this unit, you will use statistical information, gather samples, and make inferences. Samples may be random sampling or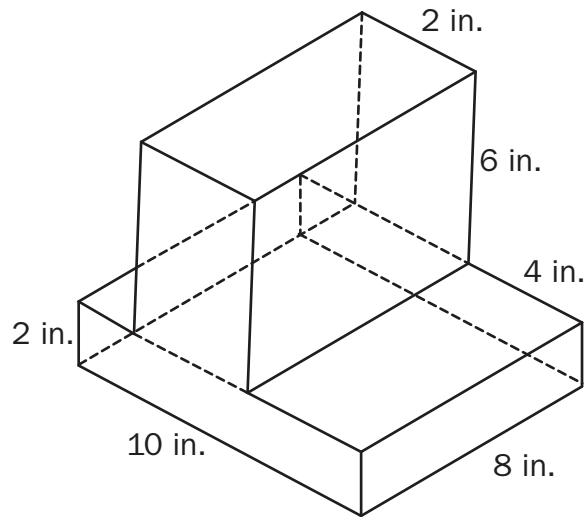 representative samples. You will use data and construct dot plots, box plots, and histograms. You will learn about distribution of data using the mean, median, and absolute deviation.

KEY TERMS

Statistical information on a large population can be gathered using a sample of the **population**. (SP.1)

Representative sample: A part of the population used to gather information, representing the entire population. (SP.1)

Random sampling: Allows individuals from each group within a population to be represented in the sample set. (SP.1)

Use the **data** collected from a sampling of the population to make **inferences** on the entire population. (SP.2)

Inference: A conclusion, estimate, or prediction based on data. (SP.2)

Assess the distribution of two sets of numerical data visually using **dot plots**, **box plots**, or **histograms**. For example, the median weight of watermelons is 5 pounds more than the median weight of apples. (SP.3)

Distribution of data can be described using:

- **Center:** The one number that summarizes data by giving the middle or center value. This can be measured using the **mean** if the data are symmetrical or **median** if the data are skewed.
- **Interquartile range:** The range, or difference, in values of the first and third quartiles. (SP.3)
- **Mean:** The "average" or "fair share" value for the data. The mean is also the balance point of the corresponding data distribution. (SP.4)
- **Median:** The value for which half the numbers are larger and half are smaller. If there are two middle numbers, the median is the arithmetic mean of the two middle numbers. (SP.4)
- **Range:** A measure of spread for a set of data. To find the range, subtract the smallest value from the largest value in a set of data. (SP.4)
- **Skewed data:** When a set of data is not symmetrical it can be skewed, meaning it tends to have a long tail on the left or right side. (SP.3)
- **Spread:** The one number that summarizes the variation in the data. This can be measured by the **range** or **interquartile range**.
- **Overall shape:** The **frequency** of data and any data that are **skewed** to the left or right. (SP.3)

Use the distribution of numerical data on two different populations to make **inferences that compare** the two populations. (SP.4)

Important Tip

- ✍ A sample of the population must represent all groups within that population in order for generalizations on the population to be made. For example, a sample of populations of dogs must include individuals from many different breeds. The data would be invalid if the sample only included larger breed dogs, such as Labradors.

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Sample Items 17–20

Item 17

A gym teacher at Jackson High School wants the school to have a new team sport: soccer, lacrosse, or rugby. She will take a survey to determine which of those sports most students prefer. Which population would provide a random sampling for the gym teacher to use?

A. all students at the school who are sixteen years old
B. all students who buy lunch at the school on Friday
C. half of the students who play on team sports at the school
D. every third student arriving at school

Item 18

Listed below are the quiz scores for randomly selected students in two seventh-grade classes.

Class A: 99, 75, 84, 70, 86, 80
Class B: 85, 83, 87, 90, 85, 82

Part A: Based on the samples, which class generally has higher quiz scores?

_____

Part B: Use measures of center and/or variability to justify your answer.

_____

Item 19

Consider the two box plots.

Plot F
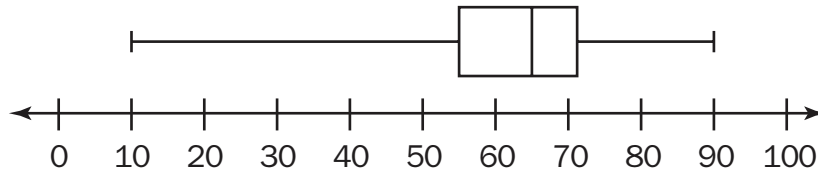
Plot H
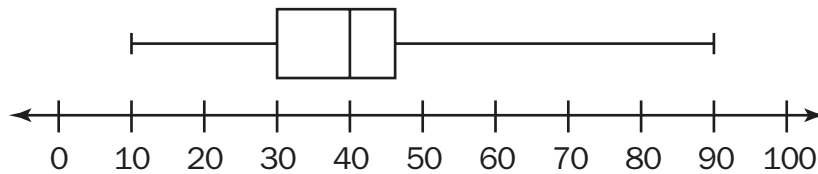
Which statement is TRUE?

A. Plot F has a greater range than Plot H.
B. Each plot has more than 25% of the data greater than 50.
C. The median of Plot F is greater than the median of Plot H.
D. The spread between the upper and lower quartiles on both graphs is 10.

Item 20

Use the dot plots to answer the questions.

Plot A
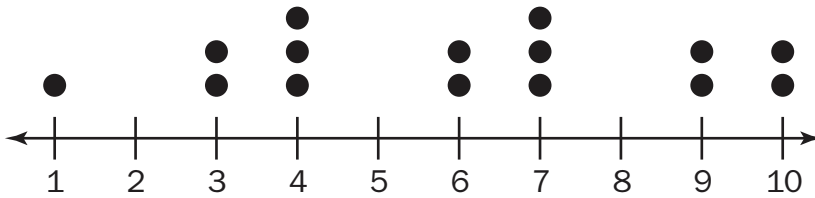
Plot B
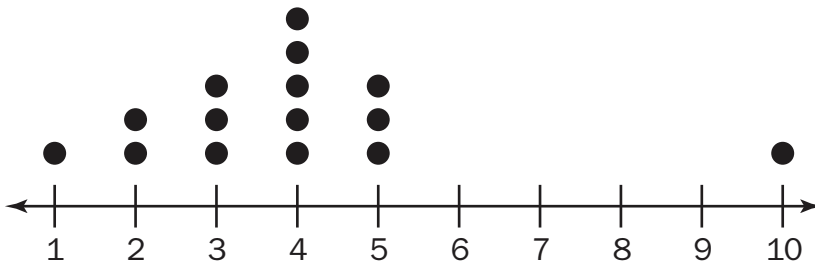
Part A: What is the difference between the medians of Plot A and Plot B? Explain how you found your answer.

Part B: Which plot has the greater mean? Explain how you found your answer.

Unit 6: Probability

In this unit, you will work with probability and frequency models. You will find the probability of compound and mutually exclusive events. You will work with simulations and tree diagrams.

KEY TERMS

Probability: The chance that an event will occur expressed as a number between 0 and 1. A small number represents a small likelihood that an event will occur. (SP.5)

Estimate the **probability** of an event occurring by collecting **data** on the frequency of the event occurring. (SP.6)

Probability model: Includes the probability for each possible individual outcome, showing the total probability of all outcomes is 1. (SP.7)

Experimental probability: the **probability** of an event occurring when an experiment was conducted. (SP.7)

Theoretical probability: the likeliness of an event happening based on all the possible outcomes. (SP.7)

Compare the **frequency** of events from a **model** with actual observed occurrences. Explain why the information from the model and actual events are similar or different. (SP.7)

The probability of a **compound event** occurring is found by combining the probability of each **mutually exclusive** event. (SP.8)

Compound events: A combination of more than one simple event. (SP.8)

Sample space: A set of all possible outcomes for an event or combination of events. (SP.8)

Represent the **sample space** of a **compound event** using models such as lists, tables, **simulations**, and **tree diagrams**. (SP.8)

Tree diagram: A visual model that sequentially lists all possible outcomes for an event. (SP.8)

Simulation: A model used to answer questions where chance is involved; it is used to generate frequencies for compound events. (SP.8c)

Important Tips

- ✎ An event with a probability of $\frac{1}{2}$ has an event that is neither likely nor unlikely. It has an equal chance of occurring or not occurring.
- ✎ Chance or probability is not affected by the outcome of a previous event.
- ✎ The sum of the probability for each outcome in a situation will equal 1. For example, a coin flipped has a $\frac{1}{2}$ probability of landing heads up or a $\frac{1}{2}$ probability of landing tails up.

Sample Items 21–24

Item 21

A bag contains 14 blue marbles and 14 purple marbles.

What is the likelihood of randomly drawing a purple marble?

A. certain
B. likely
C. neither unlikely nor likely
D. not likely

Item 22

A number cube with faces numbered 1 to 6 is rolled 15 times.

In theory, how many times would you expect to roll a number less than 5?

A. 2.5
B. 5
C. 10
D. 12.5

Item 23

The table shows the results of randomly selecting colored marbles from a bag 40 times. The marble was returned to the bag after each selection.

	Purple	Green	Blue	White	Pink
Number of Times Selected	16	8	6	9	1

Based on these results, what is the expected probability of randomly selecting a green marble from the bag in one attempt?

A. 0.125
B. 0.20
C. 0.80
D. 1.0

Item 24

The six sides of a number cube are labeled 1, 2, 3, 4, 5, and 6. You flip a coin and roll the number cube. In theory, what is the probability that the coin lands on heads and you roll a number greater than 4?

A. $\frac{1}{12}$

B. $\frac{1}{6}$

C. $\frac{1}{3}$

D. $\frac{1}{2}$

MATHEMATICS ADDITIONAL SAMPLE ITEM KEYS

Item	Standard/ Element	DOK Level	Correct Answer	Explanation
1	MGSE7.NS.1b	1	C	The correct answer is choice (A) The sum of John's score and Kamira's score. The number 2 was correctly identified as the sum of their scores. Choice (B) is incorrect because the incorrect sign was used for John's score before it was subtracted from Kamira's score. Choice (C) is incorrect because the scores were added together using the opposite sign. Choice (D) is incorrect because the scores were added before taking the absolute value.
2	MGSE7.NS.2a	1	B	The correct answer is choice (B) −79.8 because the difference, −19, is multiplied by 4.2. Choice (A) is incorrect because the decimal was not used when multiplying. Choice (C) is incorrect because the integers in the parentheses were reversed, resulting in +19 multiplied by 4.2. Choice (D) is incorrect because the integers in the parentheses were reversed and the decimal was not used when multiplying.
3	MGSE7.NS.2a	1	B	The correct answer is choice (B) −30.4. Use the Distributive Property: $-8(7) + 8(3.2) = -30.4$ or the order of operations: $-8(3.8) = -30.4$. Choice (A) ignores the parentheses: $-8(7) - 3.2$. Choice (C) is incorrect because the product of a positive and negative is negative. Choice (D) ignores the parentheses and the rules for multiplying signed numbers.
4	MGSE7.NS.3	2	A	The correct answer is choice (A) $59 increase. The integer rules for multiplying, adding, and subtracting were performed accurately. Choice (B) is incorrect because the amounts of the withdrawals and the purchase were added together as positive numbers and subtracted from the amount of the paycheck deposit, which was treated as a negative. Choice (C) is incorrect because the operations were performed with all the numbers being positive. Choice (D) is incorrect because the operations were performed with all negative numbers.
5	MCC7EE1	2	N/A	See scoring rubric and sample response beginning on page 107.

Item	Standard/ Element	DOK Level	Correct Answer	Explanation
6	MGSE7.EE.1	2	D	The correct answer is choice (D) −7y + 14 because the Distributive Property and the rules for multiplying integers are correctly used. Choice (A) is incorrect because the Distributive Property and the rules for multiplying integers were not used. Choice (B) is incorrect because the Distributive Property was not used, even though the rules for multiplying integers were. Choice (C) is incorrect because the rules for multiplying integers were not used, but the Distributive Property was used.
7	MGSE7.EE.3	3	N/A	See scoring rubric and sample response beginning on page 109.
8	MGSE7.EE.4a	2	A	The correct answer is choice (A) $n = −5$ because the equation was correctly set up as $−4(n + 8) = −12$, and both the Distributive Property and the rules for multiplying integers were correctly used to solve. Choice (B) is incorrect because the −4 was not distributed to the 8 and the sign of 8 was negative, which resulted in an incorrect equation being solved correctly. Choice (C) is incorrect because the −4 was not distributed to the 8, which resulted in an incorrect equation being solved correctly. Choice (D) is incorrect because the sign of 8 was a negative, which resulted in an incorrect equation being solved correctly.
9	MGSE7.RP.3	1	C	The correct answer is choice (C) 18 months because the proportion $\frac{2.5 \text{ cm}}{2 \text{ mo}} = \frac{22.5 \text{ cm}}{x \text{ mo}}$ was set up and solved correctly. Choice (A) is incorrect because it is the result of dividing 22.5 by 2.5. Choice (B) is incorrect because it is the result of dividing 22.5 by 2. Choice (D) is incorrect because it is the result of setting up and solving the incorrect proportion $\frac{2 \text{ mo}}{2.5 \text{ cm}} = \frac{22.5 \text{ cm}}{x \text{ mo}}$.

Item	Standard/ Element	DOK Level	Correct Answer	Explanation
10	MGSE7.RP.2d	2	A	The correct answer is choice (A) When there are 12 web visits, there are 4 downloads. Each point (*x, y*) on the graph represents (*number of web visits, number of downloads*). So the point (12, 4) represents the fact that when there are 12 web visits, there are 4 downloads. Choice (B) is incorrect because it reverses the meaning of the coordinates. Choices (C) and (D) are both incorrect because a single point does not represent the slope/rate of change, and both values are increasing: As the number of web visits increases, the number of downloads increases.
11	MGSE7.RP.3	2	C	The correct answer is choice (C) 1,300 grams. It is found by dividing 1,170 by 0.90. Choice (A) is incorrect because it is the result of multiplying 0.9 and 1,170. Choice (B) is incorrect because it is the result of multiplying 1.1 and 1,170. Choice (D) is incorrect because it is the result of adding 10% of 1,170 to 1,170.
12	MGSE7.G.1	2	B	The correct answer is choice (B) 6 centimeters because the proportion $\frac{1 \text{ cm}}{3 \text{ m}} = \frac{x \text{ cm}}{18 \text{ m}}$ was set up and solved correctly. Choice (A) is incorrect because the wrong unit label is used. Choice (C) is incorrect because the scale was not applied correctly, and the wrong unit label is used. Choice (D) is incorrect because the scale was not applied correctly.
13	MGSE7.G.4	2	C	The correct answer is choice (C) 285.74 in^2 because the area of the wheel is 314 square inches and the area of the training wheel is 28.26 square inches, resulting in a difference of 285.74 square inches. Choice (A) is incorrect because the radius of each wheel was not squared in the area formula. Choice (B) is incorrect because the difference of the radii was computed first and then substituted into the area formula. Choice (D) is incorrect because the diameter of each wheel was used and substituted into the formula.
14	MGSE7.G.6	3	N/A	See scoring rubric and sample response on page 112.

Item	Standard/ Element	DOK Level	Correct Answer	Explanation
15	MGSE7.G.5	2	A	The correct answer is choice (A) 10.4 because $(180 − 128) ÷ 5 = x$. Choice (B) is incorrect because $(180 − 128)$ was not divided by 5 to find x. Choice (C) is incorrect because the angle measure of 128 was added to 180 and then divided by 5. Choice (D) is incorrect because it is the solution to $128 − (180 ÷ 5)$.
16	MGSE7.G.6	2	B	The correct answer is choice (B) 256 in^3 because the shape was divided into two rectangular prisms and the volume of each was added together. Choice (A) is incorrect because all the given measurements were added together. Choice (C) is incorrect because the wrong dimensions ($10 \cdot 8 \cdot 4$) were used to find the base volume. Choice (D) is incorrect because all the given dimensions were multiplied together.
17	MGSE7.SP.1	2	D	The correct answer is choice (D) every third student arriving at school. This correct choice will result in the most random sample. Choice (A) is incorrect because it excludes most students in several grades. Choice (B) is incorrect because it is not a random sample—all students in the population do not have an equal chance of being selected. Choice (C) is incorrect because it is not a random sample— it excludes students who do not play on teams.
18	MGSE7.SP.4	2	N/A	See scoring rubric and sample response on page 113.
19	MGSE7.SP.3	2	C	The correct answer is choice (C) The median of Plot F is greater than the median of Plot H. The median of Plot F is 65, which is greater than the median of Plot H, which is 40. Choice (A) is incorrect because both plots have a range of 80. Choice (B) is incorrect because Plot H has less than 25% of its data greater than 50. Choice (D) is incorrect because the lower quartile of Plot F is 55 and the upper quartile is about 70, which is a spread of 15. Plot H has a lower quartile of 30 and an upper quartile of about 45, which is a spread of 15.
20	MGSE7.SP.4	2	N/A	See scoring rubric and sample response beginning on page 114.

Item	Standard/ Element	DOK Level	Correct Answer	Explanation
21	MGSE7.SP.5	2	C	The correct answer is choice (C) neither unlikely nor likely. The number of each color of marbles is equal, so each color is equally likely to be chosen. Choice (A) is incorrect because there is more than one color of marbles. Choice (B) is incorrect because the number of purple marbles is not greater than the number of blue marbles. Choice (D) is incorrect because the number of purple marbles is not less than the number of blue marbles.
22	MGSE7.SP.6	2	C	The correct answer is choice (C) 10. For each roll, there is a 4 out of 6 chance of rolling a number less than 5, and $\frac{4}{6} \cdot 15 = \frac{60}{6} = 10$. Choice (A) is incorrect because it includes the chances of rolling a number more than 5. Choice (B) is incorrect because it includes rolling a 5 or more. Choice (D) is incorrect because it includes rolling a 5 or less.
23	MGSE7.SP.7b	1	B	The correct answer is choice (B) 0.20 because there are 8 green marbles, and 8 ÷ 40 = 0.20. Choice (A) is incorrect because it is the probability of picking 1 green marble out of 8 total selections. Choice (C) is incorrect because it is the probability that the marble is not green. Choice (D) is incorrect because it is the probability that a marble of any color will be selected.
24	MGSE7.SP.8a	2	B	The correct answer is choice (B) $\frac{1}{6}$ because there are 12 possible outcomes: {H1, H2, H3, H4, H5, H6, T1, T2, T3, T4, T5, T6} and 2 of those outcomes are heads and greater than 4: {T5, T6}. Therefore the probability is $\frac{2}{12} = \frac{1}{6}$. Choice (A) is incorrect because there are 2 ways to get heads and a number greater than 4, not 1 way. Choice (C) is incorrect because it is the probability of getting a number greater than 4. Choice (D) is incorrect because it includes H4 in the count of favorable outcomes; it is also the probability of getting heads.

MATHEMATICS SAMPLE SCORING RUBRICS AND EXEMPLAR RESPONSES

Item 5

Scoring Rubric

Points	Description
2	The response achieves the following: • Response demonstrates a complete understanding of applying properties of operations to simplify expressions with rational coefficients. • Give 2 points for the correct answer and explanation. • Response is correct and complete. • Response shows application of a reasonable and relevant strategy. • Mathematical ideas are expressed coherently through a clear, complete, logical, and fully developed response using words, calculations, and/or symbols as appropriate.
1	The response achieves the following: • Response demonstrates a partial understanding of applying properties of operations to simplify expressions with rational coefficients. • Give 1 point for the correct answer but an incorrect explanation, or for an incorrect answer but a correct explanation of that incorrect answer. • Response is mostly correct but contains either a computation error or an unclear or incomplete explanation. • Response shows application of a relevant strategy, though it may be only partially applied or it may remain unexplained. • Mathematical ideas are expressed only partially using words, calculations, and/or symbols as appropriate.
0	The response achieves the following: • The response demonstrates limited to no understanding of applying properties of operations to simplify expressions with rational coefficients. • Response is incorrect. • Response shows no application of a strategy. • Mathematical ideas cannot be interpreted or lack sufficient evidence to support even a limited understanding.

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Exemplar Response

Points Awarded	Sample Response
2	Part A: yes Part B: I combined like terms in the given expression. The result was the expression in Part A. I also substituted the same value for the variable into both expressions and it always resulted in the same answer.
1	Part A: yes Part B: The expressions are the same.
0	*Response is irrelevant, inappropriate, or not provided.*

Item 7

Scoring Rubric

Points	Description
4	The response achieves the following: • The response demonstrates a complete understanding of solving multi-step, real-life problems posed with rational numbers in any form. • Give 4 points for three parts answered correctly and explanations given. • Response is correct and complete. • Response shows application of a reasonable and relevant strategy. • Mathematical ideas are expressed coherently through a clear, complete, logical, and fully developed response using words, calculations, and/or symbols as appropriate.
3	The response achieves the following: • The response demonstrates a nearly complete understanding of solving multi-step, real-life problems posed with rational numbers in any form. • Give 3 points for three parts answered correctly for Parts A, B, and C but no explanation for Part B OR correct and complete Parts B and C based on a flawed answer for Part A. • Response is mostly correct but contains either a computation error or an unclear or incomplete explanation. • Response shows application of a relevant strategy, though it may be only partially applied or it may remain unexplained. • Mathematical ideas are expressed only partially using words, calculations, and/or symbols as appropriate.
2	The response achieves the following: • The response demonstrates a partial understanding of solving multi-step, real-life problems posed with rational numbers in any form. • Give 2 points for two parts answered correctly OR Parts A and B answered correctly but no explanation for Parts B and C OR Parts B and C answered correctly but not completely and based on a flawed answer in Part A. • Response is only partially correct. • Response shows application of a relevant strategy, though it may be only partially applied or remain unexplained. • Mathematical ideas are expressed only partially using words, calculations, and/or symbols as appropriate.

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Points	Description
1	The response achieves the following: • The response demonstrates a minimal understanding of solving multi-step, real-life problems posed with rational numbers in any form. • Give 1 point for one part answered correctly. • Response is only partially correct. • Response shows incomplete or inaccurate application of a relevant strategy. • Mathematical ideas are expressed only partially using words, calculations, and/or symbols as appropriate.
0	The response achieves the following: • The response demonstrates limited to no understanding of solving multi-step, real-life problems posed with rational numbers in any form. • Response is incorrect. • Response shows no application of a strategy. • Mathematical ideas cannot be interpreted or lack sufficient evidence to support even a limited understanding.

Exemplar Response

Points Awarded	Sample Response
4	Part A: 12 Part B: 684 [Manager's method] Julie works a total of 51 hours a week. On 3 days she works more than 8 hours. On each of those days, she works for 10 hours, which makes a total of 6 extra hours each week. Twice her hourly rate is 24, so she would earn 144 dollars extra each week. She would earn 12 per hour for the other 45 hours, for a total of 540 dollars. So her weekly total is the sum of 540 and 144, which is 684. Part C: Manager's method. Since Julie works 51 hours a week, then she works 11 extra hours and would earn 18 dollars per hour for each of those extra hours, for a total of 198 dollars. She would earn 12 per hour for her regular 40 hours, for a total of 480. So her weekly total is the sum of 480 and 198, which is 678.
3	The student correctly answers three out of the four parts.
2	The student correctly answers two out of the four parts.
1	The student correctly answers one of the four parts.
0	*Response is irrelevant, inappropriate, or not provided*.

Item 14

Scoring Rubric

Points	Description

2	The response achieves the following:
	• Response demonstrates a complete understanding of solving real-world problems involving volume and surface area of prisms.
	• Give 2 points for Part A AND Part B correct.
	  • Response is correct and complete.
	  • Response shows application of a reasonable and relevant strategy.
	• Mathematical ideas are expressed coherently through a clear, complete, logical, and fully developed response using words, calculations, and/or symbols as appropriate.

1	The response achieves the following:
	• Response demonstrates a partial understanding of solving real-world problems involving volume and surface area of prisms.
	• Give 1 point for Part A OR Part B correct.
	  • Response is mostly correct but contains either a computation error or an unclear or incomplete explanation.
	  • Response shows application of a relevant strategy, though it may be only partially applied or remain unexplained.
	• Mathematical ideas are expressed only partially using words, calculations, and/or symbols as appropriate.

0	The response achieves the following:
	• The response demonstrates limited to no understanding of solving real-world problems involving volume and surface area of prisms.
	  • Response is incorrect.
	  • Response shows no application of a strategy.
	• Mathematical ideas cannot be interpreted or lack sufficient evidence to support even a limited understanding.

Exemplar Response

Points Awarded	Sample Response
2	Part A: 50 Part B: 172
1	Part A: 50 Part B: No
0	*Response is irrelevant, inappropriate, or not provided.*

Item 18

Scoring Rubric

Points	Description

2	The response achieves the following:
	• Response demonstrates a complete understanding of comparing two populations using a measure of center or variability.
	• Give 2 points for the correct rate of change and the correct equation.
	   • Response is correct and complete.
	   • Response shows application of a reasonable and relevant strategy.
	• Mathematical ideas are expressed coherently through a clear, complete, logical, and fully developed response using words, calculations, and/or symbols as appropriate.

1	The response achieves the following:
	• Response demonstrates a partial understanding of comparing two populations using a measure of center or variability.
	• Give 1 point for Part A OR Part B correct, OR if Part A is correct but justification in Part B is only partially correct.
	   • Response is mostly correct but contains either a computation error or an unclear or incomplete explanation.
	   • Response shows application of a relevant strategy, though it may be only partially applied or remain unexplained.
	• Mathematical ideas are expressed only partially using words, calculations, and/or symbols as appropriate.

0	The response achieves the following:
	• The response demonstrates limited to no understanding of comparing two populations using a measure of center or variability.
	   • Response is incorrect.
	   • Response shows no application of a strategy.
	• Mathematical ideas cannot be interpreted or lack sufficient evidence to support even a limited understanding.

Exemplar Response

Points Awarded	Sample Response
2	Part A: Class B Part B: Class B has a higher mean score and a smaller range than Class A. Therefore, in general, Class B has higher scores. *Or other valid explanation*
1	Part A: Class B Part B: All Class B's scores are higher than Class A's scores.
0	*Response is irrelevant, inappropriate, or not provided.*

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Item 20

Scoring Rubric

Points	Description

2	The response achieves the following:
	• Response demonstrates a complete understanding of using measures of center to draw informal comparative inferences about two populations.
	• Give 2 points for the correct rate of change and the correct equation.
	   • Response is correct and complete.
	   • Response shows application of a reasonable and relevant strategy.
	• Mathematical ideas are expressed coherently through a clear, complete, logical, and fully developed response using words, calculations, and/or symbols as appropriate.

1	The response achieves the following:
	• Response demonstrates a partial understanding of using measures of center to draw informal comparative inferences about two populations.
	• Give 1 point for Part A OR Part B correct.
	   • Response is mostly correct but contains either a computation error or an unclear or incomplete explanation.
	   • Response shows application of a relevant strategy, though it may be only partially applied or it may remain unexplained.
	• Mathematical ideas are expressed only partially using words, calculations, and/or symbols as appropriate.

0	The response achieves the following:
	• The response demonstrates limited to no understanding of using measures of center to draw informal comparative inferences about two populations.
	   • Response is incorrect.
	   • Response shows no application of a strategy.
	• Mathematical ideas cannot be interpreted or lack sufficient evidence to support even a limited understanding.

Exemplar Response

Points Awarded	Sample Response
2	Part A: The difference is 2. To find the median, arrange the data from least to greatest, and the middle number is the median. The median of Plot A is 6 and the median of Plot B is 4, so the difference is 2. AND Part B: Plot A has the greater mean. To find the mean for each plot, I divided the sum of its data values by its number of data values. Then I compared the two means.
1	Part A: The difference is 3. To find the median, arrange the data from least to greatest, and the middle number is the median. The median of Plot A is 9 and the median of Plot B is 6, so the difference is 3. OR Part B: Plot A has the greater mean. To find the mean for each plot, I divided the sum of its data values by its number of data values. Then I compared the two means.
0	*Response is irrelevant, inappropriate, or not provided.*

Georgia Milestones

Assessment System

Grade 7

Mathematics

Item and Scoring Sampler

2015

CONSTRUCTED-RESPONSE ITEM

MGSE7.EE.2

5. The expression 14,000 – 700*x* represents the number of gallons in a swimming pool *x* hours after draining of the pool began. When the expression is equal to 0, the pool is empty.

The expression can also be written as 700(20 – *x*). Explain what the two terms, 700 and (20 – *x*), mean in the context of the volume of water in the pool. **Write your answer in the space provided on your answer document.**

_____

_____

_____

_____

_____

Scoring Guide

#5 Item Information

Standard: MGSE7.EE.2 Understand that rewriting an expression in different forms in a problem context can clarify the problem and how the quantities in it are related. For example *a* + 0.05*a* = 1.05*a* means that adding a 5% tax to a total is the same as multiplying the total by 1.05.	**Item Depth of Knowledge:** 2 Basic Application of Skill/Concept Student uses information, conceptual knowledge, and procedures.

ITEM-SPECIFIC SCORING GUIDELINE

Score Point	Description

2	Response demonstrates a complete understanding of the standard.
	
	Give 2 points for student identifying that "700" represents the rate at which the pool is being drained in gallons per hour and that "20 – x" represents the number of hours remaining until the pool is completely drained.
	
	Exemplar Response:
	        700 represents the number of gallons drained from the pool each hour. *(1 point)*
	          <u>AND</u>
	        20 – x represents the number of hours remaining until the pool is empty *(1 point)*
	          <u>OR</u>
	        Other valid response

1	Response demonstrates partial understanding of the standard. Student earns 1 point for answering 1 key element.
0	Response demonstrates limited to no understanding of the standard. Student earns 0 points because the student does not show understanding of rewriting an expression in different forms in a problem context to clarify the problem and how the quantities in it are related.

STUDENT RESPONSES

MGSE7.EE.2

Response Score: 2

5. The expression 14,000 – 700*x* represents the number of gallons in a swimming pool *x* hours after draining of the pool began. When the expression is equal to 0, the pool is empty.

   The expression can also be written as 700(20 – *x*). Explain what the two terms, 700 and (20 – *x*), mean in the context of the volume of water in the pool. **Write your answer in the space provided on your answer document.**

   700 is the gallons drained each hour
   20 – x is the number of hours until the
   pool is drained

   The response demonstrates a complete understanding by providing a correct explanation of both terms of the expression 700(20 – *x*). The student shows that "700" is the number of gallons drained each hour, and that "20 – *x*" is the number of hours until the pool has been completely drained.

MGSE7.EE.2

Response Score: 1

5. The expression 14,000 – 700x represents the number of gallons in a swimming pool
    x hours after draining of the pool began. When the expression is equal to 0, the pool
    is empty.

    The expression can also be written as 700(20 – x). Explain what the two terms,
    700 and (20 – x), mean in the context of the volume of water in the pool. **Type your
    answer in the space provided.**

20-x shows the number of hours left before the pool is empty

    The response demonstrates a partial understanding by providing a correct explanation of one of the terms
    of the expression 700(20 – x). The student understands that "20 – x" is the number of hours until the pool is
    emptied but does not provide a response for what "700" represents.

MGSE7.EE.2

Response Score: 0

5. The expression 14,000 – 700*x* represents the number of gallons in a swimming pool *x* hours after draining of the pool began. When the expression is equal to 0, the pool is empty.

The expression can also be written as 700(20 – *x*). Explain what the two terms, 700 and (20 – *x*), mean in the context of the volume of water in the pool. **Type your answer in the space provided.**

> 700 is how much is in the pool to start with
>
> 20-x is the amount it has now

> The response demonstrates inadequate understanding of the concepts being measured. The student does not correctly identify what either term represents (that "700" is the volume of water drained each hour and "20 – *x*" is the number of hours until the pool is emptied completely).

CONSTRUCTED-RESPONSE ITEM

MCC7.EE.3

6. Kara has $500 in her savings account. She is going to save $75 per month and put it into her account.

Part A: How much money will be in Kara's account after 6 months? Show work or explain how you found your answer. **Type your answer in the space provided.**

Paula has $0 in her savings account. She is going to save $150 per month and put it into her account.

Part B: Write an equation to represent the amount of money, y, in Paula's savings account after x months. **Type your answer in the space provided.**

Part C: Who will have more money in her account after 6 months? Explain how you found your answer. **Type your answer in the space provided.**

Scoring Guide

#6 Item Information

Standard: MCC7.EE.3	Item Depth of Knowledge: 3
Solve multistep real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals) by applying properties of operations as strategies to calculate with numbers, converting between forms as appropriate, and assessing the reasonableness of answers using mental computation and estimation strategies. For example: • If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. • If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.	Strategic Thinking Student uses reasoning and develops a plan or sequence of steps; process has some complexity.

ITEM-SPECIFIC SCORING GUIDELINE

Score Point	Description

4	Response demonstrates a complete understanding of the standard.
	
	Give 4 points for correctly identifying that Kara will have $950 in her account after 6 months and explaining how that value was determined, providing a correct equation that represents the amount of money in Paula's account, and correctly explaining why Kara will have more money in her account after 6 months.
	
	Exemplar Response:
	    Part A: $950 (*1 point*)
	      <u>AND</u>
	    I multiplied $75 times 6 and then added $500. (*1 point*)
	    Part B: $y = 150x$ (*1 point*)
	    Part C: Kara, because Paula saves more each month but she starts with nothing. At the end of 6 months, Paula only has $900. (*1 point*)
	      <u>OR</u>
	    Other valid response

3	Response demonstrates nearly complete understanding of the standard. Student earns 3 points for answering 3 key elements.*
2	Response demonstrates partial understanding of the standard. Student earns 2 points for answering 2 key elements.*
1	Response demonstrates minimal understanding of the standard. Student earns 1 point for answering 1 key element.*
0	Response demonstrates limited to no understanding of the standard. Student earns 0 points because the student does not show understanding of solving real-world problems in the form $px + q = r$ and $px = q$.

If a student makes an error in Part A that is carried through to Part B (or subsequent parts), then the student is not penalized again for the same error.

STUDENT RESPONSES

MCC7.EE.3

Response Score: 4

6. Kara has $500 in her savings account. She is going to save $75 per month and put it into her account.

   Part A: How much money will be in Kara's account after 6 months? Show work or explain how you found your answer. **Type your answer in the space provided.**

   Paula has $0 in her savings account. She is going to save $150 per month and put it into her account.

   Part B: Write an equation to represent the amount of money, y, in Paula's savings account after x months. **Type your answer in the space provided.**

   Part C: Who will have more money in her account after 6 months? Explain how you found your answer. **Type your answer in the space provided.**

---

part a she will have $950   75x6=450   450+500=950

part b y = 150x

part c kara because paula will only have $900   150x6=900

The response demonstrates a complete understanding by providing a correct answer in Part A ($950) and Part B ($y = 150x$) and by providing a correct explanation for the amount in the account after 6 months in Part A. It also provides a correct explanation of why Kara will have more money in her account after 6 months in Part C. The student shows that Kara's account starts with a fixed amount and has a fixed amount added each month. The student shows that because Paula's account balance starts at zero, her balance is the amount of money added monthly ($150) multiplied by the number of months (x). The student uses this relationship to correctly compare the balances in the two accounts after 6 months.

MCC7.EE.3

Response Score: 3

6. Kara has $500 in her savings account. She is going to save $75 per month and put it into her account.

   Part A: How much money will be in Kara's account after 6 months? Show work or explain how you found your answer. **Type your answer in the space provided.**

   Paula has $0 in her savings account. She is going to save $150 per month and put it into her account.

   Part B: Write an equation to represent the amount of money, y, in Paula's savings account after x months. **Type your answer in the space provided.**

   Part C: Who will have more money in her account after 6 months? Explain how you found your answer. **Type your answer in the space provided.**

Kara has 950   500+75(6)=950

Y=150x

Kara will have more money than Paula

The response demonstrates a partial understanding by providing a correct answer in Part A ($950) and Part B ($y = 150x$) and by providing a correct explanation for the amount in the account after 6 months in Part A. The student shows that Kara's account starts with a fixed amount and has a fixed amount added each month. The student shows that because Paula's account balance starts at zero, her balance is the amount of money added monthly ($150) multiplied by the number of months (x). The student correctly shows that Kara will have more money in her account after 6 months but does not provide an explanation. Though the equation the student provides in Part B can be used to provide this explanation, the student did not choose to use the equation, so the response is not complete.

MCC7.EE.3

Response Score: 2

6. Kara has $500 in her savings account. She is going to save $75 per month and put it into her account.

Part A: How much money will be in Kara's account after 6 months? Show work or explain how you found your answer. **Type your answer in the space provided.**

Paula has $0 in her savings account. She is going to save $150 per month and put it into her account.

Part B: Write an equation to represent the amount of money, *y*, in Paula's savings account after *x* months. **Type your answer in the space provided.**

Part C: Who will have more money in her account after 6 months? Explain how you found your answer. **Type your answer in the space provided.**

$950

Y= 150+150/x

Kara because she has more (Paula 150+150/6 = 175)

The response demonstrates a partial understanding by providing a correct answer in Part A ($950) and by showing an appropriate comparison of the two accounts after 6 months in Part C based on an incorrect equation given in Part B. Though the equation is not correct, the student uses it to calculate the amount in Paula's account by substituting "6" for the variable "*x*." This gives $175 for Paula's account, which is less than the correct amount given in Part A for Paula's account. Because the equation is incorrect in Part C and no explanation is provided in Part A, the response demonstrates an incomplete understanding of the concepts being tested.

MCC7.EE.3

Response Score: 1

6. Kara has $500 in her savings account. She is going to save $75 per month and put it into her account.

   Part A: How much money will be in Kara's account after 6 months? Show work or explain how you found your answer. **Type your answer in the space provided.**

   Paula has $0 in her savings account. She is going to save $150 per month and put it into her account.

   Part B: Write an equation to represent the amount of money, y, in Paula's savings account after x months. **Type your answer in the space provided.**

   Part C: Who will have more money in her account after 6 months? Explain how you found your answer. **Type your answer in the space provided.**

$1050

y/150=x

Paula

The response demonstrates a minimal understanding by providing a correct equation, $y/150 = x$ in Part B. The answers provided for Part A and for Part C are incorrect, and neither part has an explanation.

MCC7.EE.3

Response Score: 0

6. Kara has $500 in her savings account. She is going to save $75 per month and put it into her account.

   Part A: How much money will be in Kara's account after 6 months? Show work or explain how you found your answer. **Type your answer in the space provided.**

   Paula has $0 in her savings account. She is going to save $150 per month and put it into her account.

   Part B: Write an equation to represent the amount of money, *y*, in Paula's savings account after *x* months. **Type your answer in the space provided.**

   Part C: Who will have more money in her account after 6 months? Explain how you found your answer. **Type your answer in the space provided.**

$450   75*6=450

150

Paula

The response demonstrates inadequate understanding of the concepts being measured. Though the student calculates the amount added during the first 6 months for Kara's account, the student does not account for the starting balance in the explanation for Part A. The response in Part B is a restatement of the amount added each month in Paula's account. No explanation is given for the selection of "Paula" as having the higher account balance.