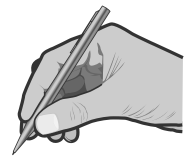
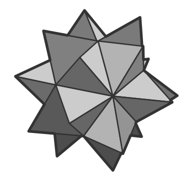
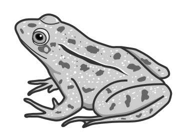
Grade 7

CRCT Study Guide







Reading
English/Language Arts
Mathematics
Science
Social Studies

Georgia
Criterion-Referenced Competency Tests

2703922-W
Updated September 2013

Chapter 3

Mathematics

By the end of Grade 7, students will understand how to apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers; solve real-life and mathematical problems using numerical and algebraic expressions and equations; use properties of operations to generate equivalent expressions; draw, construct, and describe geometrical figures and describe the relationships between them. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume; use random sampling to draw inferences about a population. Draw informal comparative inferences about two populations. Investigate chance processes and develop, use, and evaluate probability models.

The Mathematics activities focus on some of the concepts that are assessed on the Grade 7 CRCT Mathematics domains. These domains are as follows:

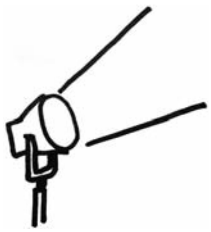
1. **Number and Operations**
2. **Geometry**
3. **Algebra**
4. **Data Analysis and Probability**

The Standards for Mathematical Practices are integrated across the four domains.

Mathematical Practices are listed with each grade's mathematical content standards to reflect the need to connect the mathematical practices to mathematical content in instruction.

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations, and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently, and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

Activities



❶ Number and Operations

Common Core Georgia Performance Standards MCC7.NS.1, MCC7.NS.2, MCC7.NS.3, and MCC7.EE.3

Within the Number and Operations domain, students apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers and solve real-life and mathematical problems using numerical and algebraic expressions and equations.

– Students will use the commutative, associative, and distributive properties to simplify and solve expressions.

Review the commutative, associative, and distributive properties.

Commutative – Change the order, e.g., $5 \times 9 \times 6 = 5 \times 6 \times 9$
Associative – Change the grouping, e.g., $(5 \times 9) \times 6 = 5 \times (9 \times 6)$
Distributive – Distribute a common factor, e.g., $(5 \times 9) + (5 \times 6) = 5(9 + 6)$

Give students expressions such as the ones below and challenge them to use at least one of the properties to make the expression easier to solve.

$1.5 \times 0.7 \times 4$ (Could use commutative to change to $1.5 \times 4 \times 0.7$ so multiplying 6×0.7 instead of 1.05×4.)

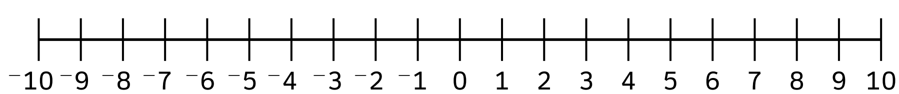
$(2.5 \times 0.6) \times 5$ (Could use associative to change to $2.5 \times (0.6 \times 5)$ so multiplying 2.5×3 instead of 1.5×5.)

$(0.09 \times 3.6) + (0.09 \times 5.4)$ (Could use distributive to change to $0.09(3.6 + 5.4)$ so multiplying 0.09×9 instead of doing two multiple digit multiplications to get $0.324 + 0.486$.)

Discuss as a class how using the properties of operations made the expressions easier to solve.

– Students will use a number line to understand subtraction as the additive inverse and to find the distance between two rational numbers.

Give each student a number line from $^{-}10$ to 10 and a set of small counters such as beans.



Use the problem $^{-}3 - (^{-}4)$ as example and show that subtracting $^{-}4$ is the same as adding its opposite; 4. Have the students follow along by placing a bean on $^{-}3$ and then deciding which way to move (subtract sign has you move to the left on the number line, but the negative in front of the 4 has you switch directions again to the right so it is the same as adding 4 to $^-3$).

Have the students use this technique to solve problems such as the following by rewriting the problem as the additive inverse and then solving.

$5 - (^-1)$
$^-6 - 3$
$8 - 9$
$^-2 - (^-7)$

Next, show that the absolute value of the difference between the two numbers is the same as the distance between them on the number line. Give the students two different numbers, such as $^-6$ and 2, and have them place a counter on each number. Have them count the number of spaces between the two numbers (8) and then subtract the two numbers $^-6 - 2 = {}^-8$ and find the absolute value (8). Have them repeat this process with other number pairs.

– Solving two-step equations can be used to convert fictional temperature units to Fahrenheit to decide when seasons occur on a different planet.

  – Euler is a planet in the Alpha Centauri system where the seasons and months have the same names as ours, but the seasons do not occur in the same months. In addition, temperatures are measured using a unit called a Galois. The equation that can be used to convert temperatures in Galois (G) to temperatures in Fahrenheit (F) is:

$$G = 194 - 4.5F$$

The temperature on Euler was measured on one day in each month and is given in the table below.

On this day...	On Euler it was...	So in Fahrenheit it was...
January 3	23°G	
February 3	50°G	
March 3	60°G	
April 3	25°G	
May 3	0°G	
June 3	−60°G	
July 3	−120°G	
August 3	−143°G	
September 3	−120°G	

On this day...	On Euler it was...	So in Fahrenheit it was...
October 3	$-100°G$	
November 3	$-75°G$	
December 3	$-4°G$	

On Euler, in which months do winter, spring, summer, and fall occur?

– To practice ordering rational numbers, students will order the value of several stocks after the first day of trading on the fictional Park City Stock Exchange (PCSE). The stocks all start the day at the same price (middle column), and the price changes over the course of the day are given in the right column:

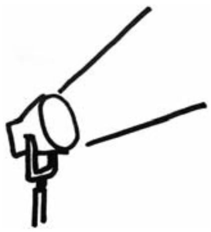
Start Price and Total Change of Stocks on the PCSE

Stock	Start Price	Change ($)
Jet Oil Co.	$10	$+2.16$
Atlantic Electric, Inc.	$10	$+2\frac{1}{4}$
Loose Leaf Book Publishers	$10	$-1\frac{1}{9}$
Pinnacle Electronics	$10	$-1\frac{1}{10}$
Pink Advertising	$10	$+2\frac{1}{6}$
Java Roasters	$10	$+\frac{1}{10}$
Old Thyme Spices	$10	$+1.09$
Millennium Software	$10	-1.11
Comfy Mattress Co.	$10	$-1\frac{1}{11}$
Shred Skis	$10	$+2.26$

After listing the stocks in order from highest price to lowest price at the end of the first day of trading, students answer these questions:

- *How did you order the numbers given in different forms?*
- *Did you find the actual price at the end of the day or just use the price increases given in the right column? If you used only the price increases, why didn't you think it was necessary to find the actual prices?*
- *Which stock fell more, Millennium Software or Comfy Mattress Co.? By how much? Write your answer in decimal form.*
- *What is the difference between the new values of Atlantic Electric, Inc. and Pinnacle Electronics? Write your answer in fraction form.*

Activities



❷ Geometry

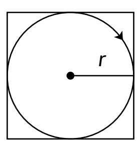
Common Core Georgia Performance Standards MCC7.G.1, MCC7.G.2, MCC7.G.3, MCC7.G.4, MCC7.G.5, and MCC7.G.6

Within the Geometry domain, students will draw, construct, and describe geometrical figures and describe the relationships between them and solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

The following activities develop skills in this domain:

– To work with the radius and area of circles, students should explore the real-world situation illustrated by the diagram below. A farmer buys a new system to water crops that uses a rotating steel arm, which sprays water over a circular area. The arm rotates around a center point of an existing square field. The arm will reach exactly to the edges of the square. The square field measures 100 feet along each edge. Students will answer the following questions:

  – *What is the length of the arm?*
  – *What is the area watered by the system?*
  – *What area of the square field will NOT be watered?*



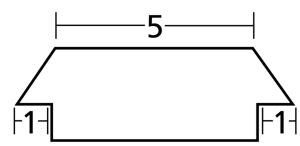
– To establish the relationship between the circumference of a circle, its diameter, and pi, discuss the way a bicycle odometer works. Explain that a bicycle odometer measures how far a bike has traveled by counting how many times the wheel goes around. Thinking of the common measurements of a circle (radius, diameter, circumference), students will describe which measurement represents how far the bike has moved when the wheel has gone around exactly once. Since different bikes have different tire sizes, the odometer has to be set up for the proper tire size or its measurements will be wrong. Discuss why this is the case. Next, give students a chart with columns for *Diameter, Radius, Circumference,* $\frac{\textit{Diameter}}{\textit{Radius}}$, and $\frac{\textit{Circumference}}{\textit{Diameter}}$. Students will fill out the chart for each of the following common diameters of bicycle tires: 16 in., 20 in., 24 in., 26 in., and 27 in. Students will describe what pattern they see when the diameter is divided by the radius. Repeat for the circumference divided by the diameter.

– To work with measurements of circles, students should gather circumference measurements of common objects using string. They will first brainstorm several circular objects in their surroundings for which they are able to measure circumference using string, such as a tire, lampshade, frying pan, clock, or trash can. Students will explain why it might be difficult to measure the radius or diameter of an object (e.g., hard to pinpoint the center, cannot measure inside a solid, etc.). Give students expressions they can use to find the diameter and radius once they have measured the circumference:

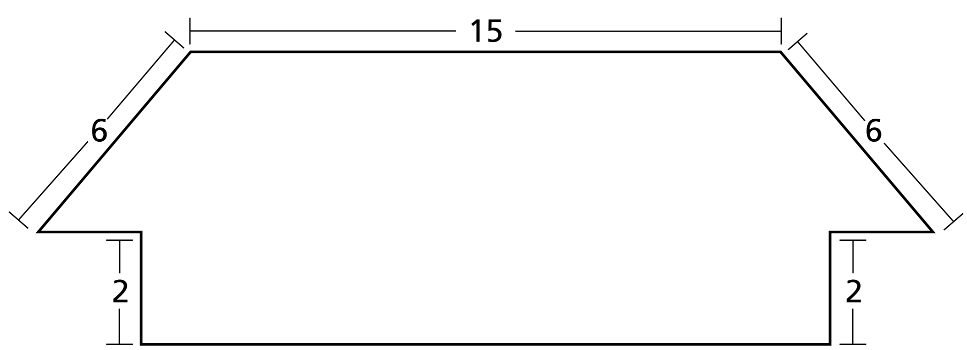
  $d = C \div \pi$, where d = diameter, C = circumference, and $\pi \approx 3.14$
  $r = d \div 2$, where r = radius and d = diameter

  Students will substitute the values for C they measured and find the values for the diameter and radius. They should create a table to record the circumference, diameter, and radius of each object.

– Scale drawings are a geometric concept that links ratios and proportion with objects in the real world. An example of this can be found in scaled drawings of a house.

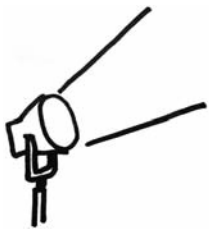


Scale Drawing



  Students should first find the corresponding sides in the two figures, then calculate the ratio of corresponding sides using given lengths. Finally, they should find any missing lengths of sides, using the ratio of corresponding sides for both figures.

Activities



❸ Algebra

Common Core Georgia Performance Standards MCC7.EE.1, MCC7.EE.2, MCC7.EE.4, MCC7.RP.1, MCC7.RP.2, and MCC7.RP.3

The Algebra domain addresses students' ability to use properties of operations to generate equivalent expressions and solve real-life and mathematical problems using numerical and algebraic expressions and equations.

The following activities develop skills in this domain:

- To use variables for unknown quantities in algebraic expressions, students should explore real-life situations that can be expressed mathematically, for instance, the relative age of siblings. Say Ali is 9 years old and Bart is 13. That means that Bart is 4 years older than Ali, which can be expressed as: $n + 4$, where n is Ali's age. Similarly, if Bart's allowance is twice as much as Ali's plus another $5, the expression $2x + 5$, where x is Ali's allowance, would represent Bart's allowance. Brainstorm with students to come up with more examples.

- Students will investigate simple algebraic expressions by solving application problems. Offer students the following scenario: The Camping Club is planning a series of camping trips. The club will provide equipment and organize transportation. Participants must bring enough food and water for the trip and be prepared to carry a backpack with all necessary equipment and food. The club would like to develop formulas to provide members an easy way to figure out how much weight they will need to carry for each trip. Consider the following to create the formulas:

  - Trips between April 15 and September 15 will use warm-weather gear (lighter tent and sleeping bag), which weighs 21 lbs, including the backpack.
  - Trips between September 16 and April 14 will use cold-weather gear (heavier tent and sleeping bag), which weighs 27 lbs, including the backpack.
  - Students should plan to bring 1.75 lbs of food per day (water will be filtered along the way).
  - Trips longer than 4 days will require an extra 7 lbs of gear (extra fuel for cooking and more cooking gear).

  Formulas should allow members to figure out how much weight they will need to carry depending on when the trip occurs and how long it lasts. Students will use the formulas they create to determine how much weight each camper will be carrying at the start of each of the following trips:

  - Second week of August—Black Rock Mountain State Park—2-day trip
  - First week of September—Unicoi State Park—3-day trip

– Third week of November—Fort Mountain State Park—4-day trip
– First week of December—Vogel State Park—7-day trip

– Finding and using percents is a frequently used algebraic skill. For a real-world application of this concept, students should imagine they are running a music store and calculate a variety of discounts, taxes, percent increases, and percent decreases. Students will use the following information to answer the questions.

  – A CD costs $16.50. *How much will it cost if you are given a 14% discount?*
  – A customer is buying a portable CD player that costs $65.00, and the state tax is 5%. *How much does the customer owe?*
  – Your sales were $4,500 in July and $4,650 in August. *By what percent did your sales increase from July to August?*
  – Your costs were $4,650 in August and $2,940 in September. *By what percent did your costs decrease from August to September?*

– Understanding when to use proportions, how to set up proportion equations, and how to solve proportion equations are important skills in Grade 7. Students should practice these steps with the following activity.

  – Students should estimate the height of the school flagpole.
  – Students should stand a meter stick on the ground and measure the length of the shadow it casts.
  – While the flagpole is much higher than the meter stick, the proportion between the flagpole (f) and its shadow (fs) and the proportion between the meter stick (m) and its shadow (ms) are the same.
  – Students should use this concept to create the equation $\frac{f}{fs} = \frac{m}{ms}$.
  – The unknown variable in the equation is the flagpole (f).
  – Student should solve for the length of the flagpole (f).

– Most 7th graders are likely to be familiar with percentage discounts given at department store sales. Students will relate this real-world topic to writing, evaluating, and solving equations using one variable.

McMurphy's Third-Annual Sidewalk Sale

Item	Percentage Discount	Sale Price	Original Price
Sandals	15%	$38.25	
T-shirts — plain	30%		
T-shirts — printed	10%		
Year-end Denim Collection — 5 pairs of jeans	25%		

Using the information in this chart from a store's sidewalk sale, students will be able to complete the following questions. Recording their answers in the chart when applicable will aid them in solving later questions.

- Using equations with one variable, describe two ways that the original price for the sandals can be determined.
- During the store's sale, a pair of sandals before taxes cost $38.25. Write an equation that represents this. Then solve to determine the original price.
- A person decides to buy a pair of sandals and a Denim Collection. If she had purchased them before the sale, she would have paid $189.00 before taxes. Using the answer from question two, write equations that allow you to solve for the sale price and the original price of the Denim Collection. Then determine the total price she would have paid for the two items during the sale.
- The original price for printed T-shirts is $5.00 more than the original price for plain T-shirts. A student wants to buy two of each type of T-shirt at the sale price. Write an equation that represents this using only one variable.
- During the sale, the final price for the items in No. 4 comes to approximately $58.00. What are the original prices and sale prices of each type of T-shirt?

Teachers will provide students with one or both of the following real-world scaffolding applications as a culmination of the activity:

- Show students quick ways to figure out sale prices in their minds. For example, at a 25% off sale, divide the original price by 4 to find out how much you'll be saving.
- Have students practice figuring out how much to tip at restaurants using both algebraic equations and mental math (for example, 15%, 18%, and 20% tips).

- To increase awareness of how to represent proportional relationships by equations and understanding and depicting their graphs, students will consider the following two situations, make tables, graph the results, and answer the questions.

Scenario 1

- You have invited all your friends to your birthday party, and every friend who is coming will bring 4 cookies. How many cookies will there be at your party if 1 friend comes? How many cookies will there be if 2 friends come? Make a table for the number of cookies at your party if up to 6 friends attend. Using your results in the table, develop a general rule for finding the number of cookies, y, at your party for any number of friends that come, x. Graph the ordered pairs. Does your general rule work with the results on your graph? What happens to the number of cookies at your party as the number of guests goes up? Use your rule to write an equation for finding the number of cookies.

Scenario 2

- You buy a box of 30 cookies for your birthday party and invite all of your friends. How many cookies will each person get if there is only 1 guest? How many cookies will each person get if there are 2 guests? Make a table for the number of cookies each person gets if the number of guests is 3, 4, 5, 6, 10, and 15. Using your results in the table, develop a general rule for finding the number of cookies per person, *y*, at your party for any number of friends that come, *x*. Graph the ordered pairs. Does your general rule work with the results on your graph? What happens to the number of cookies each person can have as the number of guests increases? Use your rule to write an equation for finding the number of cookies.

Students will then describe in their own words the difference between the results in Scenario 1 and Scenario 2. Have the students compare the equations they wrote for each scenario and the graphs. Students should discuss how they are similar and how they are different. Use questioning to guide students' thinking.

Activities

❹ Data Analysis and Probability

Common Core Georgia Performance Standards MCC7.SP.1, MCC7.SP.2, MCC7.SP.3, MCC7.SP.4, MCC7.SP.5, MCC7.SP.6, MCC7.SP.7, and MCC7.SP.8

Within the Data Analysis and Probability domain, students use random sampling to draw inferences about a population and draw informal comparative inferences about two populations. They will investigate chance processes and develop, use, and evaluate probability models.

The following activities develop skills in this domain:

– Finding the likelihood of an event occurring (given that all outcomes are equally likely) is a key skill in determining probability. To develop this skill, students should determine the probabilities of choosing a red shirt in the following situation:

Step One: A drawer starts with only 1 red shirt.
Step Two: 4 red shirts and 5 white shirts are added.
Step Three: 3 red shirts and 3 white shirts are added.
Step Four: 3 red shirts and no white shirts are added.
Step Five: No red shirts and 3 white shirts are added.

Students should explain in their own words:

– *What the probability of 1 in Step One means*
– *What the probability of $\frac{1}{2}$ in Step Two means*
– *Why the probability of choosing a red shirt did not change in Step Three*
– *Why the probability of choosing a red shirt increased in Step Four*
– *Why the probability of choosing a red shirt decreased in Step Five*

– Samples are used to estimate answers to real-life questions in all levels of statistical analysis. To understand how sampling works, students should estimate the percentage of vowels in this passage of *The Declaration of Independence*, using the percentage of vowels in:

– The first line
– The first two lines
– The first four lines

T	H	E		D	E	C	L	A	R	A	T	I	O	N		O	F		I
N	D	E	P	E	N	D	E	N	C	E	:	W	H	E	N		I	N	
T	H	E		C	O	U	R	S	E		O	F		H	U	M	A	N	
E	V	E	N	T	S		I	T		B	E	C	O	M	E	S		N	E
C	E	S	S	A	R	Y		F	O	R		O	N	E		P	E	O	P
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W	I	T	H		A	N	O	T	H	E	R		A	N	D		T	O	
A	S	S	U	M	E		A	M	O	N	G		T	H	E		P	O	W
E	R	S		O	F		T	H	E		E	A	R	T	H	,		T	H
E		S	E	P	A	R	A	T	E		A	N	D		E	Q	U	A	L
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S		O	F		M	A	N	K	I	N	D		R	E	Q	U	I	R	E
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P	A	R	A	T	I	O	N	—	T	.	J	E	F	F	E	R	S	O	N

Students should explain, in their own words, why it makes sense that the estimate should get closer to the true percentage as the number of lines sampled increases.

– Students will create tree diagrams to represent compound events, and use them to identify the outcomes.

You are ordering a breakfast combo and have two choices to make:

– You get a bagel with either butter or cream cheese.
– You get either juice or tea.

Make a tree diagram to show the different breakfast combinations you can choose, and then fill in the blanks to finish the following sentence:

There were _____ drink options for each of _____ bagel options, which gave a total of _____ options.

You order juice and have two choices to make:

– You can have orange, apple, or tomato juice.
– You can have small, medium, or large.

Make a tree diagram to show the different choices you can make for size and kind of juice. Then fill in the blanks to finish the following sentence:

There were _____ juice options and _____ size options, which gave a total of _____ options.

At lunch you order a sandwich and have three choices to make:

– You can have either ham or turkey.
– You can have either cheddar cheese or Swiss cheese.
– You can have either mustard or mayonnaise.

Make a tree diagram to show the different combinations you can choose. Then fill in the blanks to finish the following sentence:

There were _____ meat options, _____ cheese options, and _____ condiment options, which gave a total of _____ options.

At dinner you order the daily special and have three choices to make:

– You can have corn, steamed spinach, or carrots.
– You can have French fries, mashed potatoes, or a baked potato.
– You can have chicken, steak, or ham.

Make a tree diagram to show the different dinner combinations you have to choose from, and then fill in the blanks to finish the following sentence:

There were _____ vegetable options, _____ potato options, and _____ meat options, which gave a total of _____ options.

Students should be able to explain how they used their tree diagrams to find the number of options.

– Calculating probabilities of independent events may be used in predicting different kinds of weather for tomorrow based on this forecast:

> *We have a 60% chance of sunshine, a 20% chance of clouds, and a 20% chance of rain. The temperature should be in the low 80s, with a 10% chance of being between 75 and 80 degrees, an 80% chance of being between 80 and 85 degrees, and a 10% chance of being between 85 and 90 degrees.*

Students will assume that the temperature probabilities and the probabilities of sun/cloud/rain are independent and use them to find the probability that tomorrow's weather will be:

1 77 degrees and sunny
2 87 degrees and rainy
3 81 degrees and cloudy

Finally, students choose three weather conditions (a combination of temperature and sun, cloud, rain) that they think will have different probabilities of occurring than those above. Students should use the individual probabilities to explain why they think the compound probability will be different. Then they should find the actual probability.

Practice Quiz

1 **Dottie needs to learn a total of 24 vocabulary words. She has learned 75% of the words.**

How many of her vocabulary words did she learn so far?

A 3
B 6
C 18
D 21

2 **Carlos made a scale model of his house. The actual width is 30 feet, and the actual length is 45 feet.**

If the model has a width of 6 inches, what is the length of his model?

A 4 inches
B 5 inches
C 7 inches
D 9 inches

3 **A student randomly chooses one pen from a box containing 1 black, 3 red, and 6 blue pens.**

What is the probability that the student chooses a blue pen?

A $\frac{1}{6}$

B $\frac{4}{6}$

C $\frac{6}{10}$

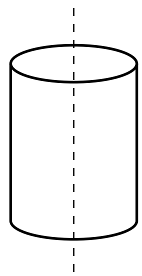
D $\frac{6}{4}$

4 **Tammy is 2 years older than twice the age of her brother. The sum of their ages is 17.**

If *x* represents the age of her brother, which equation represents this situation?

A $2x + 2 = 17$
B $2(x + 2) = 17$
C $x + 2(x + 2) = 17$
D $x + (2x + 2) = 17$

5 **Look at the cylinder.**



The cylinder is sliced in half, as shown by the dotted line.

Which shape is the cross section that is formed?

A circle
B cone
C rectangle
D sphere

6 **Eva transports tents across a lake using a boat that can hold a maximum of 1,000 pounds. Eva weighs 100 pounds, and each tent weighs 50 pounds. The inequality below can be used to find the number of tents, *t*, the boat can hold with Eva onboard.**

$\mathbf{50}t + \mathbf{100} \leq \mathbf{1{,}000}$

What is the maximum number of tents the boat can hold with Eva onboard?

A 17
B 18
C 19
D 22

7 **Bryan bought $3\frac{1}{4}$ pounds of peaches and $4\frac{3}{8}$ pounds of mangos. He paid $0.89 a pound for the peaches and $1.26 a pound for the mangos.**

How much more did Bryan pay for the mangos than the peaches? Round your answer to the nearest cent.

A $2.62
B $2.73
C $5.51
D $8.40

8 **Which decimal is equivalent to $\frac{5}{6}$?**

A 0.82
B $0.8\overline{3}$
C $1.1\overline{6}$
D 1.20

9 **The total amount of money, *m*, earned by washing cars at a school fund raiser is proportional to the number of cars, *c*, washed at a constant price, *p*.**

Which equation represents this relationship?

A $m = c + p$

B $m = c - p$

C $m = \frac{c}{p}$

D $m = cp$

10 **A bakery sells chocolate, vanilla, and strawberry cakes. All of the cakes are filled with either fruit or cream AND topped with either glaze or powdered sugar.**

How many different types of cakes does the bakery sell?

A 7
B 9
C 12
D 24

Solutions

Number	Correct Answer	Explanation
1	**C**	*Use proportional relationships to solve multistep ratio and percent problems. (MCC7.RP.3)* The correct answer is **Choice (C) 18.** To find the answer, write a proportion: $\frac{x}{24} = \frac{75}{100}$. To make the problem easier to solve, reduce $\frac{75}{100}$ to $\frac{3}{4}$. Solve $\frac{x}{24} = \frac{3}{4}$ by multiplying the numerator and denominator by 6: $\left(\frac{3}{4}\right)\left(\frac{6}{6}\right) = \frac{18}{24}$, so $x = 18$. Alternatively, find $\frac{3}{4}$ of 24: $\left(\frac{3}{4}\right)\left(\frac{24}{1}\right) = \frac{72}{4} = 18$. Choice (A) is incorrect, and it seems to indicate a combination of misreading and calculation error. Choice (B) is incorrect, because 6 is the number of words she has *not* learned, and suggests the student misread the problem. Choice (D) is incorrect: 21 is not 75% of 24 and would seem to indicate a calculation error.
2	**D**	*Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. (MCC7.G.1)* The correct answer is **Choice (D) 9 inches.** Use a proportion to solve the problem: $\frac{30}{45} = \frac{6}{x}$. To make the problem easier to solve, reduce $\frac{30}{45}$ to $\frac{2}{3}$. Then multiply each side by $3x$ to get $2x = 18$. Divide both sides by 2 to get $x = 9$. Choice (A) is incorrect and is the result of setting up the proportion incorrectly as $\frac{30}{45} = \frac{x}{6}$. Choice (B) is incorrect because it is the scale factor used, not the length of the model. Choice (C) is incorrect and is the result of estimating 45 divided by the given value of 6.
3	**C**	*Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. (MCC7.SP.7a)* The correct answer is **Choice (C)** $\mathbf{\frac{6}{10}}$**.** There are a total of 10 pens and 6 of them are blue. Choice (A) is incorrect because it shows 1 blue pen chosen from the 6 blue pens. Choice (B) is incorrect because it shows the portion of non-blue pens to blue pens. Choice (D) is incorrect because it shows the ratio of blue pens to non-blue pens.

Number	Correct Answer	Explanation
4	**D**	*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. (MCC7.EE.4a)* The correct answer is **Choice (D) x + (2x + 2) = 17.** If x is the age of Tammy's brother, then Tammy is twice her brother's age ($2x$) plus two years, or ($2x + 2$). The sum of their ages is 17, which is represented as $x + (2x + 2) = 17$. Choice (A) is incorrect because $2x + 2$ represents only Tammy's age rather than the sum of Tammy's age and her brother's age. Choices (B) and (C) are incorrect because $2(x + 2)$ suggests a misapplication of the distributive property (placing 2 outside the parentheses) when attempting to represent Tammy's age as "2 years older than twice the age of her brother." Choice (B) also fails to represent the sum of their ages.
5	**C**	*Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids. (MCC7.G.3)* The correct answer is **Choice (C) rectangle.** If a cylinder is cut perpendicular to its circular sides, the resulting cross section is a rectangle. Choice (A) is incorrect, and is the resulting horizontal cross section of a cylinder, not the vertical cross section. Choices (B) and (D) are incorrect. A cross section of a solid is a plane figure, and cannot be another solid, such as a cone or sphere.
6	**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. (MCC7.EE.4b)* The correct answer is **Choice (B) 18.** By subtracting 100 from both sides of the inequality, it becomes $50t \leq 900$, which reduces to $t \leq 18$. Choice (A) is incorrect and results from subtracting the constant and the coefficient of t from both sides of the equation before dividing by 50 or by misreading the inequality symbol as *less than* rather than *less than or equal to.* Choice (C) is incorrect and results from mistakenly subtracting the coefficient of t, 50. Choice (D) is incorrect and results from mistakenly adding 100 to both sides of the inequality before dividing by 50.

Number	Correct Answer	Explanation
7	**A**	*Solve real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.) (MCC7.NS.3)* The correct answer is **Choice (A) $2.62.** It is the difference between the amount paid for the mangos and the peaches. The difference is found by converting the weight of each fruit to a decimal and multiplying by its cost. (Peaches = 3.25 pounds times $0.89; Mangos = 4.38 pounds times $1.26). The next step is to subtract the total cost of the peaches ($2.89) from the total cost of the mangos ($5.51) for a difference of $2.62. Choice (B) is incorrect because the fractions are incorrectly converted to decimals using the numerator for the tenth place and the denominator for the hundredth place. Choice (C) is incorrect because only the cost of the mangos is computed. Choice (D) is incorrect because the total cost of each fruit is added rather than subtracted.
8	**B**	*Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats. (MCC7.NS.2d)* The correct answer is **Choice (B)** $\mathbf{0.8\overline{3}}$ because 5 divided by 6 is $0.8\overline{3}$ in which the 3 continually repeats. Choice (A) is incorrect because instead of adding another 0 after the tenths place, the remainder is used for the hundredths place. Choice (C) is incorrect because 6 is divided into 5 one time and then the 5 subtracted from the 6 with the remainder of the division solved correctly. Choice (D) is incorrect because the denominator is divided by the numerator.
9	**D**	*Represent proportional relationships by equations. (MCC7.RP.2c)* The correct answer is **Choice (D)** $\boldsymbol{m = cp}$**,** because the relationship between the total amount of money earned and the number of cars washed can be expressed as $m = cp$. Choices (A), (B), and (C) are incorrect, because the equations do not represent proportional relationships.

Number	Correct Answer	Explanation
10	**C**	*Represent for compound events using methods such as organized lists, tables, and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event. (MCC7.SP.8b)* The correct answer is **Choice (C) 12.** Multiplication can be used to find the total number of combinations. Since there are three cake options, two filling options, and two topping options, the total number of combinations is $3 \times 2 \times 2 = 12$. Choice (A) is incorrect and results from adding the number of options together instead of multiplying them. Choices (B) and (D) are incorrect and may result from calculation error.