

Principles and Proportional Reasoning in Algebra

7th grade Standards

Proficiency Scale Topic 1: Integers and Rational Numbers					
Priority Cluster/State Standard: 7.NS.A: Apply and extend previous understanding of operations with fractions to add, subtract, multiply, and divide rational numbers except division by zero. • 7.NS.A.1: Add and subtract integers and other rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. (includes 7.NS.A.1a-d, see details below) • 7.NS.A.2: Multiply and divide integers and other rational numbers. (includes 7.NS.A.2a-d, see details below)					
Standard	No Evidence of Proficiency 0	Minimally Proficient 1	Partially Proficient 2	Proficient 3	Highly Proficient 4
7.NS.A.1a		Identify opposite quantities	Identify situations in which opposite quantities combine to make 0	Describe situations in which opposite quantities combine to make 0.	Interpret situations in which opposite quantities combine to make 0..
7.NS.A.1b		Identify a number and its opposite that have a sum of 0.	Recognize $p + q$ as the number located a distance $ q $ from p , in the positive or negative direction depending on whether q is positive or negative. Identify a number and its opposite that have a sum of 0 (are additive inverses).	Understand $p + q$ as the number located a distance $ q $ from p , in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world context.	Explain $p + q$ as the number located a distance $ q $ from p , in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world context. Apply this information to solve problems.
7.NS.A.1c		Identify the distance between two rational numbers on the number line as the absolute value of	Recognize subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$.	Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$.	Explain subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$.

		their difference.	Show that the distance between two rational numbers on the number line is the absolute value of their difference.	Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world context.	Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world context.
7.NS.A.1d		Identify properties of operations as strategies to add rational numbers.	Identify properties of operations as strategies to add and subtract rational numbers.	Apply properties of operations as strategies to add and subtract rational numbers.	Explain properties of operations as strategies to add and subtract rational numbers.
7.NS.A.2a		Recognize that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Identify products of rational numbers by describing real-world context.	Identify that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world context.	Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world context.	Explain that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by explaining their real-world context.
7.NS.A.2b		Recognize that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are	Identify that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with nonzero divisor) is a rational number. If p and q are	Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are	Explain that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are

		integers, then $-(p/q) = (-p)/q = p/(-q)$.	integers, then $-(p/q) = (-p)/q = p/(-q)$. Identify quotients of rational numbers by describing real-world context.	integers, then $-(p/q) = (-p)/q = p/(-q)$. Apply quotients of rational numbers by describing real-world context.	integers, then $-(p/q) = (-p)/q = p/(-q)$. C Interpret quotients of rational numbers by describing real-world context.
7.NS.A.2c		Use properties of operations as strategies to multiply and divide rational numbers.	Apply properties of operations as strategies to multiply and divide rational numbers.	Apply properties of operations as strategies to multiply and divide rational numbers in a real world context .	Multiply and divide rational numbers
7.NS.A.2d		Identify decimal form of a rational number	Convert a rational number to decimal form using long division; know that the decimal form of a rational number terminates in 0's or eventually repeats.	Understand how to convert a rational number to decimal form using long division; know that the decimal form of a rational number terminates in 0's or eventually repeats.	Explain how to convert a rational number to decimal form using long division; explain that the decimal form of a rational number terminates in 0's or eventually repeats.

Proficiency Scale

Topic 2: Analyze and Use Proportional Relationships

Priority Cluster/State Standard:

7.RP.A.: Analyze proportional relationships and use them to solve mathematical problems and problems in real-world context.

- **7.RP.A.1:** Compute unit rates associated with ratios involving both simple and complex fractions, including ratios of quantities measured in like or different units.
- **7.RP.A.2:** Recognize and represent proportional relationships between quantities. **(includes 7.RP.A.2a-d, see details below)**
- **7.RP.A.3:** Use proportional relationships to solve multi-step ratio and percent problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).

Standard	No Evidence of Proficiency 0	Minimally Proficient 1	Partially Proficient 2	Proficient 3	Highly Proficient 4
7.RP.A.1		Identify unit rates associated with ratios involving simple fractions , including ratios of quantities measured in like units .	Compute unit rates associated with ratios involving simple fractions , including ratios of quantities measured in like units .	Compute unit rates with ratios involving both simple and complex fractions, including ratios of quantities measured in like or different units.	Interpret unit rates associated with ratios involving both simple and complex fractions , including ratios of quantities measured in like or different units .
7.RP.A.2a		Identify two quantities in a proportional relationship	Decide whether two quantities are in a proportional relationship.	Decide whether two quantities are in a proportional relationship (e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin).	Explain whether two quantities are in a proportional relationship (e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin).
7.RP.A.2b		Identify the constant of proportionality (unit rate) in tables, graphs OR equations.	Identify the constant of proportionality (unit rate) in tables, graphs, AND equations.	Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and describe	Interpret the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and explain proportional

				proportional relationships.	relationships.
7.RP.A.2c		Identify equations to represent proportional relationships.	Represent proportional relationships by equations.	Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p , the relationship between the total cost and the number of items can be expressed as $t = pn$.	Represent and explain proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p , the relationship between the total cost and the number of items can be expressed as $t = pn$.
7.RP.A.2d		Identify a point (x, y) on the graph of a proportional relationship	Identify what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0, 0)$ and $(1, r)$ where r is the unit rate.	Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0, 0)$ and $(1, r)$ where r is the unit rate.	Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0, 0)$ and $(1, r)$ where r is the unit rate, and apply this information to solve problems.
7.RP.A.3		Identify proportional relationships to solve one-step ratio and percent mathematical problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).	Use proportional relationships to solve one-step ratio and percent problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).	Use proportional relationships to solve multi-step ratio and percent problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).	Interpret proportional relationships when solving multi-step ratio and percent problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).

Proficiency Scale
Topic 3: Analyze and Solve Percent Problems

Priority Cluster/State Standard:

7.RP.A.: Analyze proportional relationships and use them to solve mathematical problems and problems in real-world context.

- **7.RP.A.2:** Recognize and represent proportional relationships between quantities.
 - c. Represent proportional relationships by equations. *For example, if total cost t is proportional to the number n of items purchased at a constant price p , the relationship between the total cost and the number of items can be expressed as $t = pn$.*
- **7.RP.A.3:** Use proportional relationships to solve multi-step ratio and percent problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).

Standard	No Evidence of Proficiency 0	Minimally Proficient 1	Partially Proficient 2	Proficient 3	Highly Proficient 4
7.RP.A.2c		Identify equations to represent proportional relationships.	Represent proportional relationships by equations.	Represent and solve proportional relationships by equations.	Apply proportional relationships by equations.
7.RP.A.3		Use proportional relationships to solve one-step ratio problems.	Use proportional relationships to solve one-step ratio and percent problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).	Use proportional relationships to <u>solve multi-step</u> ratio and percent problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).	Interpret proportional relationships when solving multi-step ratio and percent problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).

Proficiency Scale

Topic 4: Generate Equivalent Expressions

Priority Cluster/State Standard:

7.EE.A: Use properties of operations to generate equivalent expressions.

- **7.EE.A.1:** Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
- **7.EE.A.2:** Rewrite an expression in different forms, and understand the relationship between the different forms and their meanings in a problem context. *For example, $a + 0.05a = 1.05a$ means that "increase by 5%" is the same as "multiply by 1.05."*

7.EE.B: Solve mathematical problems and problems in real-world context using numerical and algebraic expressions and equations.

- **7.EE.B.3:** Solve multi-step mathematical problems and problems in real-world context posed with positive and negative rational numbers in any form. Convert between forms as appropriate and assess the reasonableness of answers.
- **7.EE.B.4:** Use variables to represent quantities in mathematical problems and problems in real-world context, and construct simple equations and inequalities to solve problems.
 - a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.

Standard	No Evidence of Proficiency 0	Minimally Proficient 1	Partially Proficient 2	Proficient 3	Highly Proficient 4
7.EE.A.1		Identify properties of operations used to add, subtract, factor, and expand linear expressions with integer coefficients.	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with integer coefficients.	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients and interpret the meaning in a real-world context.
7.EE.A.2		Identify an expression in different forms.	Identify an expression in different forms, and understand the relationship between the different forms and their meanings in a problem context. For example, $a + 0.05a = 1.05a$ means that "increase by 5%" is the same as "multiply by 1.05."	Rewrite an expression in different forms, and understand the relationship between the different forms and their meanings in a problem context. For example, $a + 0.05a = 1.05a$ means that "increase by 5%" is the same as "multiply by 1.05."	Rewrite an expression in different forms, and explain the relationship between the different forms and their meanings in a problem context. For example, $a + 0.05a = 1.05a$ means that "increase by 5%" is the same as "multiply by 1.05."

7.EE.B.3		Solve multi-step mathematical problems and problems in real-world context posed with positive and negative rational numbers in one form.	Solve multi-step mathematical problems and problems in real-world context posed with positive and negative rational numbers in any form. Convert between forms as appropriate.	Solve multi-step mathematical problems and problems in realworld context posed with positive and negative rational numbers in any form. Convert between forms as appropriate and assess the reasonableness of answers.	Create problems with a real-world context given multi-step equations with positive and negative rational numbers. Convert between forms as appropriate and interpret the reasonableness of answers.
7.EE.B.4a		Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are integers.	Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are integers. Solve equations of these forms <u>fluently</u>.	Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms <u>fluently</u>. Compare an algebraic solution to an arithmetic solution, <u>identifying the sequence of the operations</u> used in each approach.	Solve real-world problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms <u>fluently</u>. Compare an algebraic solution to an arithmetic solution, <u>explaining the sequence of the operations</u> used in each approach.

Proficiency Scale

Topic 5: Solve Problems Using Equations and Inequalities

Priority Cluster/State Standard:

7.EE.B: Solve mathematical problems and problems in real-world context using numerical and algebraic expressions and equations.

- **7.EE.B.3: Solve multi-step mathematical problems and problems** in real-world context posed with positive and negative rational numbers in any form. Convert between forms as appropriate and assess the reasonableness of answers. *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 per hour.*
- **7.EE.B.4:** Use variables to represent quantities in mathematical problems and problems in real-world context, and construct simple equations and inequalities to solve problems.
 - a. Solve word problems leading to equations of the form $px+q=r$ and $p(x+q)=r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.
 - b. Solve word problems leading to inequalities of the form $px+q>r$ or $px+q<r$, where p , q , and r are rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.

Standard	No Evidence of Proficiency 0	Minimally Proficient 1	Partially Proficient 2	Proficient 3	Highly Proficient 4
7.EE.B.3		Solve multi-step mathematical problems and problems in real-world context posed with positive and negative rational numbers in one form.	Solve multi-step mathematical problems and problems in real-world context posed with positive and negative rational numbers in any form. Convert between forms as appropriate.	Solve multi-step mathematical problems and problems in real-world context posed with positive and negative rational numbers in any form. Convert between forms as appropriate and assess the reasonableness of answers.	Create problems with a real-world context given multi-step equations with positive and negative rational numbers. Convert between forms as appropriate and interpret the reasonableness of answers.
7.EE.B.4a		Solve word problems leading to equations of the form $px+q=r$ and $p(x+q)=r$, where p , q , and r are integers.	Solve word problems leading to equations of the form $px+q=r$ and $p(x+q)=r$, where p , q , and r are integers . Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the	Solve word problems leading to equations of the form $px+q=r$ and $p(x+q)=r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution,	Solve real-world problems leading to equations of the form $px+q=r$ and $p(x+q)=r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution,

			sequence of the operations used in each approach.	identifying the sequence of the operations used in each approach.	explaining the sequence of the operations used in each approach.
7.EE.B.4b		Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p , q , and r are integers.	Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p , q , and r are rational numbers. Graph the solution set of the inequality.	Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p , q , and r are rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.	Solve real-world problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p , q , and r are rational numbers. Graph the solution set of the inequality and explain it in the context of the problem.

Proficiency Scale
Topic 8: Solve Problems Involving Geometry

Priority Cluster/State Standard:

7.G.B: Solve mathematical problems and problems in real-world context involving angle measure, area, surface area, and volume.

- **7.G.B.4:** Understand and use the formulas for the area and circumference of a circle to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

Standard	No Evidence of Proficiency 0	Minimally Proficient 1	Partially Proficient 2	Proficient 3	Highly Proficient 4
7.G.B.4		Identify the area and circumference of a circle to solve problems.	Understand and use the formulas for the area and circumference of a circle to solve problems	Understand and use the formulas for the area and circumference of a circle to solve problems; and explain the relationship between the circumference and area of a circle.	Understand and use the formulas for the area and circumference of a circle to solve problems and interpret the solution; apply the relationship between the circumference and area of a circle to solve problems.

Proficiency Scale
Topic 6: Use Sampling to Draw Inferences About Populations

Priority Cluster/State Standard:

7.SP.B: Draw informal comparative inferences about two populations.

- **7.SP.B.3:** Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.
- **7.SP.B.4:** Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.

Standard	No Evidence of Proficiency 0	Minimally Proficient 1	Partially Proficient 2	Proficient 3	Highly Proficient 4
7.SP.B.3		Compare the degree of visual overlap of two numerical data distributions with similar variabilities	Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities.	Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.	Interpret the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.
7.SP.B.4		Identify measures of center and measures of variability for numerical data from random samples for two populations.	Use measures of center and measures of variability for numerical data from random samples to identify informal comparative inferences about two populations.	Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.	Interpret measures of center and measures of variability for numerical data from random samples to draw comparative inferences about two populations.

Proficiency Scale Topic 7: Probability
<i>Priority Cluster/State Standard:</i> No priority standards for this topic.

Topic 1: Integers and Rational Numbers

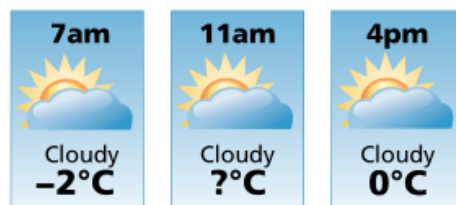
Examples for Proficient Level (3):

7.NS.A.1a, Lesson 1-1

Samuel has \$20 in his savings account before he makes a deposit of \$160. After 2 weeks, he withdraws \$160. How did Samuel's savings account balance change?

7.NS.A.1b, Lesson 1-1

One winter morning, the temperature was -2°C . By 11:00 A.M., the temperature had decreased by 3° . At 4:00 P.M., the temperature reached 0°C . What integer represents the temperature change from 11:00 A.M. to 4:00 P.M.?

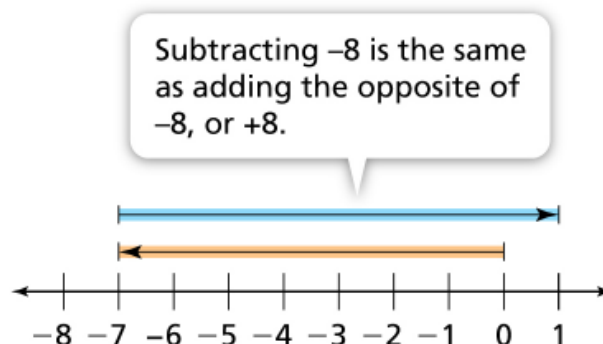


7.NS.A.1c, Lesson 1-4

Find $-7 - (-8)$.

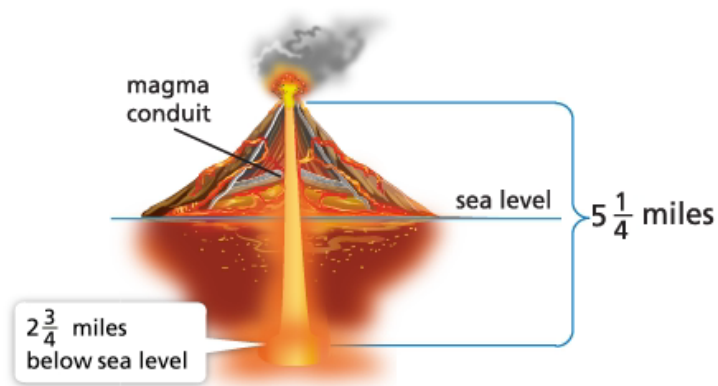
Write $-7 - (-8)$ as an equivalent addition expression, then add.

$$-7 + (8)$$



7.NS.A.1d, Lesson 1-5

Lava flows from an active volcano's magma reservoir located below sea level through the magma conduit. How far is the summit of the volcano from sea level?



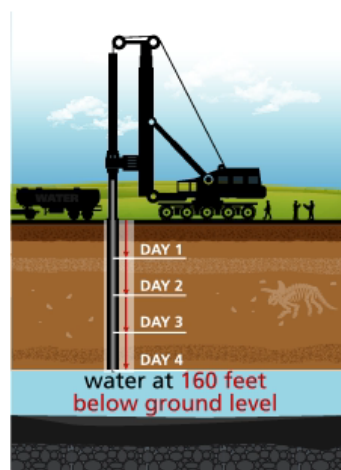
7.NS.A.2a, Lesson 1-6

Represent $2 \cdot (-3)$ on the number line.



7.NS.A.2b, Lesson 1-8

A machine drill is used to access water under the ground. If the machine drills the same distance each day, what is the change in the location of the bottom of the hole each day?



7.NS.A.2c, Lesson 1-10

Kevin played a trivia game. Each correct answer is worth $2\frac{1}{4}$ points, and each incorrect answer is worth $-\frac{1}{2}$ point. What was Kevin's score?



7.NS.A.2.d, Lesson 1-2

Explain whether each of the following is a rational number.

a. -6.382

The decimal terminates, so this is a rational number.

b. 1.539981

The digits 8 and 1 repeat infinitely, so this is a rational number.

c. $0.43524982\dots$

The decimal does not terminate and the digits do not repeat, so this is **NOT** a rational number.

Topic 2: Analyze and Use Proportional Relationships

Examples for Proficient Level (3):

7.RP.A1, Lesson 2-1

Nathan and Dan were both hired as lifeguards for the summer. They receive their paychecks for the first week. Who earns more per hour?

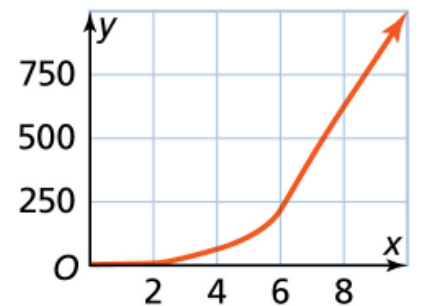
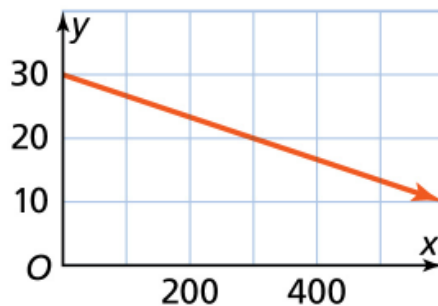
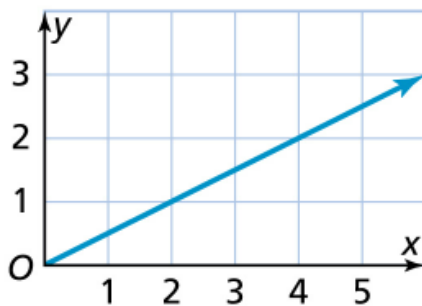
LIFEGUARD SERVICES INC. EARNINGS STATEMENT	
EMPLOYEE	Nathan Smith
HOURS	5
TOTAL EARNINGS	\$46.25

LIFEGUARD SERVICES INC. EARNINGS STATEMENT	
EMPLOYEE	Dan Jones
HOURS	9
TOTAL EARNINGS	\$78.75

7.RP.A.2a, Lesson 2-5

Explain why each graph does or does not show a proportional relationship.

Click on each graph for more information.



7.RP.A.2b, Lesson 2-4

Maria made two batches of fruit punch. The table at the right shows how many quarts of juice she used for each batch. Write an equation that relates the proportional quantities.

Apple Juice (x)	Grape Juice (y)	Grape Juice (y) / Apple Juice (x)
5	8	
10	16	

Convince Me! How does the equation change if the amount of grape juice is the independent variable, x , and the amount of apple juice is the dependent variable, y ?

The constant of proportionality is .

An equation that represents this proportional relationship is $y =$ x .

7.RP.A.2c, Lesson 2-6

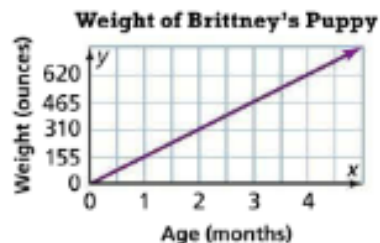
Marco needs to buy some cat food. At the nearest store, 3 bags of cat food cost \$15.75. How much would Marco spend on 5 bags of cat food?

7.RP.A.2d, Lesson 2-6

Make Sense and Persevere The weights of Michael's and Brittney's new puppies are shown in the table and graph. Whose dog gains weight more quickly? Explain.  MP.1

Weight of Michael's Puppy

Age (months)	1	2	3
Weight (pounds)	8.6	17.2	25.8



7.RP.A.3, Lesson 2-6

EXAMPLE 1



Use Proportional Reasoning to Solve a Problem

Scan for
Multimedia



The ratio of collectible cards DeShawn owns to cards that Stephanie owns is 5:2. Stephanie has 36 cards. How will the ratio of DeShawn's cards to Stephanie's cards change if they both sell half their cards? Explain.

Make Sense and Persevere

How can you use proportional reasoning to compare the quantities of cards?  MP.1

DeShawn's Cards



Stephanie's Cards



Topic 3: Analyze and Solve Percent Problems

Examples for Proficient Level (3):

7.RP.A.2c, Lesson 3-2

EXAMPLE 2

 **Use a Proportion to Find the Part**

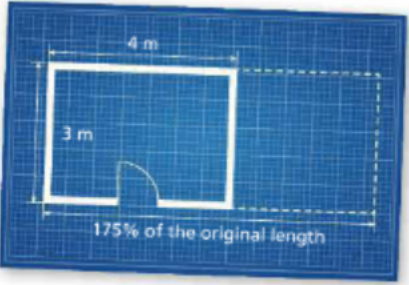
  ACTIVITY  AS

A plan to expand Megan's room will make the length of the room 175% of the current length. What will be the new length of her room?

Draw a bar diagram to represent the problem and then write a percent proportion to find the new length.

n meters

175%



7.RP.A.3, Lesson 3-4

What is the percent change in the price of a gallon of gas, to the nearest whole percent? Is it an increase or a decrease?

\$ 3.499
Price Per Gallon



\$ 3.079
Price Per Gallon

Topic 4: Generate Equivalent Expressions

Examples for Proficient Level (3):

7.EE.A.1, Lesson 4-4

Use the Distributive Property to expand the expression $x(-2 - 0.5y)$.

EXAMPLE 2



Factor Expressions with Negative Coefficients



ACTIVITY



ASSESS

Rodrigo and Jordan each factor the expression $-2x - 6$. Who factored the expression correctly?

Rodrigo uses a positive common factor, 2, to factor the expression.

2 is a common factor of $-2x$ and -6 .



$$2(-x - 3) = -2x - 6$$

Jordan uses a negative common factor, -2 , to factor the expression.

-2 is a common factor of $-2x$ and -6 .

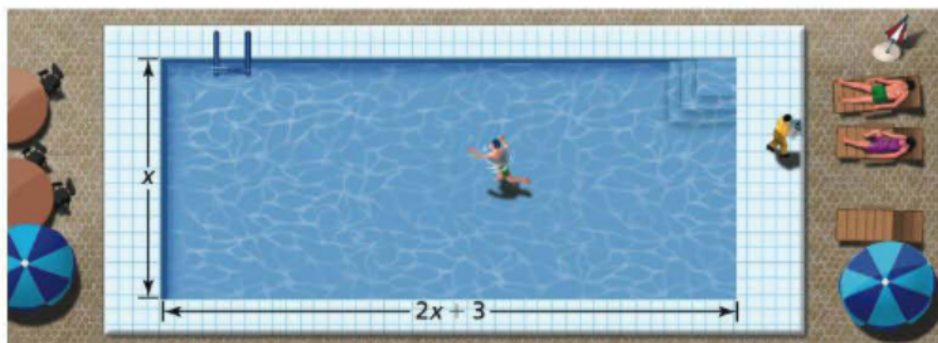


$$-2(x + 3) = -2x - 6$$

7.EE.A.2, Lesson 4-5

15. Higher Order Thinking

A hotel manager is adding a tile border around the hotel's rectangular pool. Let x represent the width of the pool, in feet. The length is 3 more than 2 times the width, as shown. Write two expressions that give the perimeter of the pool.



7.EE.B.3, Lesson 4-1

The expression $9.99d + 12.99c$ can be used to find the total cost of d pounds of almonds and c pounds of cashews. How much does it cost to buy $1\frac{1}{2}$ pounds of almonds and $2\frac{1}{2}$ pounds of cashews?

Evaluate the expression for the given values.

Total cost
of almonds

Total cost
of cashews



7.EE.B.4a, Lesson 4-1

7. The expression $-120 + 13m$ represents a submarine that began at a depth of 120 feet below sea level and ascended at a rate of 13 feet per minute. What was the depth of the submarine after 6 minutes?

Topic 5: Solve Problems Using Equations and Inequalities

Examples for Proficient Level (3):

7.EE.B.3, 3-ACT Math Lesson

3-ACT MATH ▶▶▶

3-Act Mathematical Modeling: Digital Downloads

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Common Core Content Standards
7.EE.B.3, 7.EE.B.4
Mathematical Practices
MP.4, MP.5

7.EE.B.4a, Lesson 5-1

EXAMPLE 3 Interpret Quantities and Operations in Equations

Claire bought 8 tickets for a total cost of \$104. She had used a coupon code to get \$3 off each ticket. Let x be the original cost of each ticket. Which of the following equations correctly represents the situation?

$3(x - 8) = 104$	Total cost	$8x - 3 = 104$	Total cost	$8(x - 3) = 104$	Total cost
$\underbrace{3(x - 8)}_{\$3 \text{ discount times the difference of 8 tickets and the cost per ticket}}$		$\underbrace{8x - 3}_{8 \text{ tickets times the cost per ticket minus a total discount of } \$3}$		$\underbrace{8(x - 3)}_{8 \text{ tickets times the difference of the cost per ticket and } \$3}$	

The equation $8(x - 3) = 104$ represents this situation.

EXAMPLE 3**Compare Algebraic and Arithmetic Solutions**

The number of trumpet players is 2 more than $\frac{1}{4}$ of the entire band. How many students are in the band?

An algebraic and an arithmetic solution are shown to find b , the total number of students in the band.

Algebraic Solution

$$\frac{1}{4}b + 2 = 18$$

$$\frac{1}{4}b + 2 - 2 = 18 - 2$$

Subtract 2.

$$\frac{1}{4}b = 16$$

$$\frac{4}{1} \cdot \frac{1}{4}b = \frac{4}{1} \cdot 16$$

Multiply by 4.

$$b = 64$$

Arithmetic Solution

$$4 \cdot (18 - 2)$$

$$4 \cdot (16)$$

$$64$$

18 students play the trumpet in the band.



So, there are 64 students in the band.

EXAMPLE 2**Solve Inequalities Using Division by a Negative Value**

Solve the inequality $-3.4m \leq 17$. Then graph the solution.

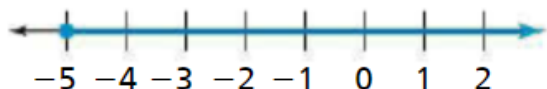
$$-3.4m \leq 17$$

$$\frac{-3.4m}{-3.4} \geq \frac{17}{-3.4}$$

Use the inverse relationship between multiplication and division and the *Division Property of Inequality* to isolate the variable.

$$m \geq -5$$

Dividing by a negative value reverses the inequality symbol.

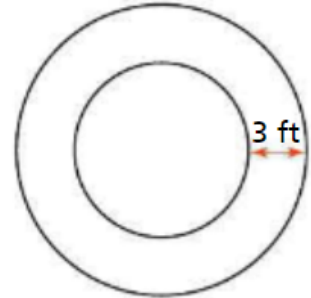


Topic 8: Solve Problems Involving Geometry

Examples for Proficient Level (3):

7.G.B.4, Lesson 8-5

- 13. Make Sense and Persevere** The circumference of the inner circle is 44 feet. The distance between the inner circle and the outer circle is 3 feet. By how many feet is the circumference of the outer circle greater than the circumference of the inner circle? Use $\frac{22}{7}$ for π . Round to the nearest hundredth of a foot. © MP.1

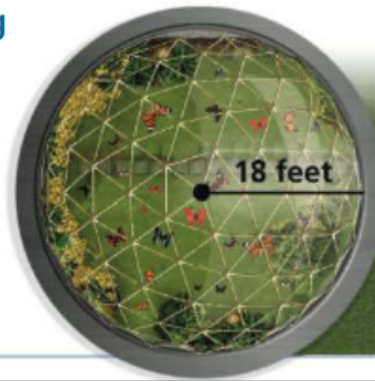


EXAMPLE 1



Solve Problems Involving the Area of a Circle

The floor of a new butterfly conservatory will be a circle with an 18-foot radius. The material for the floor will cost \$3.95 per square foot. About how much will the floor cost?



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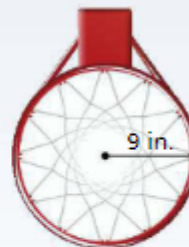
Try It!

What is the circumference of the rim of a basketball hoop with a radius of 9 inches?

First, multiply the radius by to get the diameter, inches.

Then, multiply the diameter by 3.14 (an approximation for π) to get a circumference of about inches.

Convince Me! If the diameter is doubled, what happens to the circumference? Explain.



Topic 6: Sampling to Draw Inferences About Populations

Examples for Proficient Level (3):

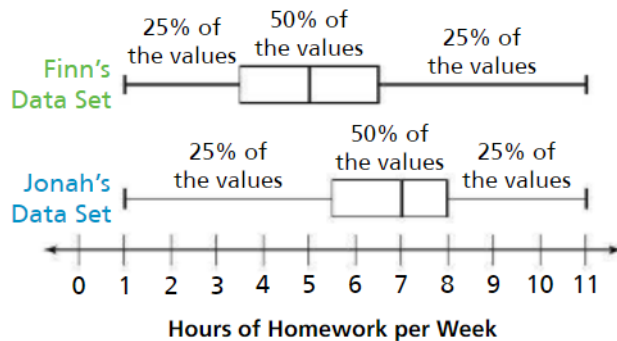
7.SP.B.3, Lesson 6-3

EXAMPLE 2



Draw Inferences Using Median and Interquartile Range

Finn and Jonah analyze the measures of center and variability of the data they collected. Do these measures support Finn's assessment of the two data sets in Example 1?



	First Quartile	Median	Third Quartile	Interquartile Range
Finn's Data Set	$3\frac{1}{2}$	5	$6\frac{1}{2}$	3
Jonah's Data Set	$5\frac{1}{2}$	7	8	$2\frac{1}{2}$

EXAMPLE 1



Use Dot Plots to Compare Populations

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Quinn collects data from a random sample of 20 seventh-grade students who participate in a youth fitness program. She compares the number of curl-ups each student completed in thirty seconds last year and this year. What can Quinn infer from her comparison of the data sets?



Number of Curl-Ups That 20 Students Completed

Last Year	20	27	21	26	22	25	23	23	26	23	24	24	25	24	22	24	23	24	21	25
This Year	21	30	22	24	29	26	28	26	30	27	27	29	27	28	25	28	25	28	29	23

7.SP.B.4, Lesson 6-4

Quinn computes the mean and mean absolute deviation (MAD) for each data set. How do these measures support Quinn's inference from the data displays?

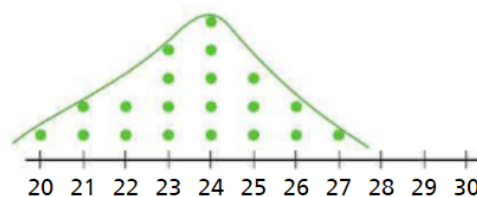
	Mean	MAD
Curl-Ups Completed Last Year	23.6	1.4
Curl-Ups Completed This Year	26.6	2.1

The mean can be used to describe the data because the data sets do not have outliers.

The mean number of curl-ups completed this year is greater than the mean number of curl-ups completed last year. This supports Quinn's inference.

The mean absolute deviation is greater for the number of

Curl-Ups Completed Last Year



Curl-Ups Completed This Year

