Unit 1: Statistics

Dear Parents/Guardians,

Unit 1 explores statistics. In Lessons 1 and 2, students look at statistical questions and determine the measures of center and spread of data sets. In Lesson 3, students construct different data displays to interpret and analyze data sets.

Measures of Center

A measure of center is a single number that attempts to describe an entire data set.

Example: Chris's math quiz scores for this semester are below.

15, 5, 13, 21, 23, 23, 18, 16, 22, 14

Measure	Explanation	Chris's Quiz Scores Example
median	Write the data values in order from least to greatest. The median is the middle value.	5, 13, 14, 15, 16, 18, 21, 22, 23, 23 The median is the value in the middle of 16 and 18. The median is 17.
mode	The data value(s) that appear(s) the most often.	The mode is 23.
mean	The arithmetic average. Add all of the data values and divide by the number of data values in the set.	5+13+14+15+16+18+21+22+23+23 = 170 170 ÷ 10 = 17 The mean is 17.

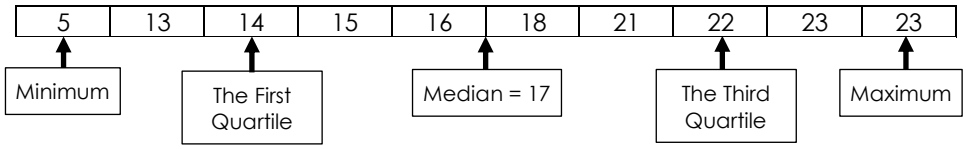
Students consider each of the measures of center and determine which measure best represents a data set.

The Five-Number Summary and Box Plots

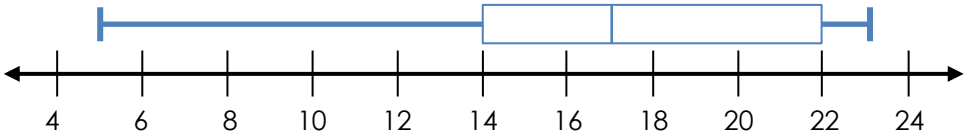
The five-number summary indicates the median and other important values that determine the variability (spread) about the median. It is always denoted in the following order:

(minimum, the first quartile, median, the third quartile, maximum)

Example: Write Chris's quiz scores in numerical order.



The five-number summary for Chris's scores is (5, 14, 17, 22, 23).
Using this summary, we can create a box plot.



Statistical Questions

A statistical question is a question where data that has the potential for variability can be collected and analyzed for the purpose of answering the question.

Statistical Question	Not a Statistical Question
How much time does the average sixth grader spend on their phone?	How much time do you spend on your phone?

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By the end of the unit, your student should know…

- How to determine measures of center and spread for a data set [Lessons 1.1, 1.2]
- How to determine if a question is a statistical question or not [Lessons 1.1, 1.2, 1.3]
- How to construct, describe and interpret data displays [Lessons 1.3]

Additional Resources

- For definitions and additional notes please refer to Student Resources at the end of the unit.
- For more information on mean, median, and mode: https://bit.ly/3d5MIAQ
- For determining the five-number summary: https://youtu.be/omOSu7_Z22o
- For more on creating box-plots: https://bit.ly/2Aut8fi
- For more on statistical questions: https://youtu.be/xj95mYTl9MY

Unit 2: Factors and Multiples

Dear Parents/Guardians,

Unit 2 begins by reviewing prime numbers, composite numbers and factors. In Lesson 1, students explore factors as dimensions of rectangles and through the Factor Game. They determine the greatest common factor (GCF) of two natural numbers and apply the GCF to simplifying fractions. In Lesson 2, students explore multiples in the Product Game. They determine the least common multiple (LCM) of two natural numbers and apply the LCM to adding and subtracting fractions. In Lesson 3, students learn other strategies for determining the GCF and LCM of two natural numbers and solve problems in context.

Finding the Greatest Common Factor (GCF)

Students determine the greatest common factor of two natural numbers by listing all of the factors for each number and finding the greatest factor they share.

Example: Find the GCF of 32 and 40.

Factors of 32	1, 2, 4, 8, 16, 32
Factors of 40	1, 2, 4, 5, 8, 10, 20, 40

Common Factors of 32 and 40: 1, 3, 4, 8
Greatest Common Factor (GCF) of 32 and 40: 8

Finding the Least Common Multiple (LCM)

Students determine the least common multiple of two natural numbers by listing several multiples of each number and finding the least value they share.

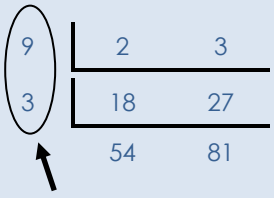
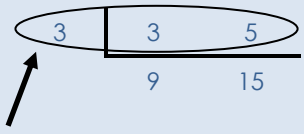
Example: Find the LCM of 32 and 40.

Multiples of 32	32, 64, 96, 128, 160, 192, 224, 256, 288, 320…
Multiples of 40	40, 80, 120, 160, 200, 240, 280, 320…

Listed Common Multiples of 32 and 40: 160 and 320
Least Common Multiple (LCM) of 32 and 40: 160

Using Factor Ladders for GCF and LCM

Students explore factor ladders as an alternative strategy for determining the GCF and LCM of two natural numbers.

Determine the GCF of 54 and 81.	**Determine the LCM of 9 and 15.**
Divide both numbers by a common factor. Continue until 1 is the only common factor.  Common factors: 9 and 3 GCF of 54 and 81: $9 \times 3 = 27$	Divide both numbers by a common factor. Continue until 1 is the only common factor.  Multiply the common factors with the remaining factors. Common factor: 3 Remaining factors: 3 and 5 LCM of 9 and 15: $3 \times 3 \times 5 = 45$

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By the end of the unit, your student should know…

- How to find the greatest common factor (GCF) of two numbers [Lesson 2.1]
- How to find the least common multiple (LCM) of two numbers [Lesson 2.2]
- How to apply the GCF and the LCM in fraction arithmetic [Lessons 2.1, 2.2]
- How to solve problems in context using the GCF or the LCM [Lesson 2.3]

Additional Resources

- For definitions and additional notes please refer to Student Resources at the end of the unit.
- For determining the GCF by listing factors: https://bit.ly/3e4LOkh
- For determining the LCM by listing multiples: https://youtu.be/7twRSmgcrLM
- For determining the GCF using the ladder method: https://youtu.be/myJraeUdGNI
- For determining the LCM using the ladder method: https://youtu.be/b6qehkDuioQ

Unit 3: Ratio Representations

Dear Parents/Guardians,

A major works of grade 6 starts in Unit 3 with an introduction to ratios and proportional reasoning. In Lesson 1, students explore ratios in different contexts and represent ratios with tables and tape diagrams. Lesson 2 continues the exploration of ratios using tables and looking at equivalent ratios. In Lesson 3, students construct double number lines and use them to solve ratio problems. In Lesson 4, we use ratio reasoning and the different representations to convert between units of measurement.

Ratios and Tape Diagrams

A ratio is a pair of nonnegative numbers in a specific order. We use a colon to represent ratio language such as "to," "for every," or "per."

Example: The ratio of cats to dogs at the pet show was 3 to 5.
The ratio of cats to dogs is 3 : 5. The ratio of cats to total animals is 3 : 8.
The ratio of dogs to cats is 5 : 3. The ratio of dogs to total animals is 5 : 8.

Tape diagrams are one way to represent ratios. Tape diagrams are always made of connected rectangles in which the parts represent the same amount.

Example: The ratio of cats to dogs at the pet show was 3 : 5. If there are 24 cats in the pet show, how many dogs were there?
The ratio of cats to dogs can be represented as:

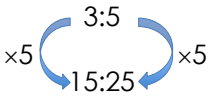
c	c	c	d	d	d	d	d
3(8) = 24			5(8) = 40				

3 rectangles represent 24 cats. Since 24 ÷ 3 = 8, each rectangle represents 8 pets.
5 rectangles represent the number of dogs. Since 5 × 8 = 40, there are 40 dogs in the pet show.

Equivalent Ratios

Two ratios are equivalent if each number in the ratio is obtained by multiplying by the same positive number.

Example: Are 3 : 5 and 15 : 25 equivalent ratios?

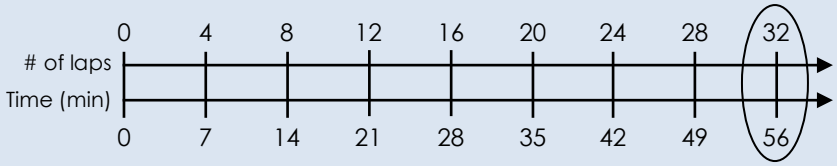


Since each number in the ratio is multiplied by 5, 15 : 25 is an equivalent ratio to 3 : 5.

Double Number Lines

A double number line is two parallel number lines depicting corresponding values of a ratio for easy comparison.

Example: Lilia can swim 4 laps in 7 minutes. At this rate, how many minutes will it take her to swim 32 laps?



Notice that each ratio on the double number line is an equivalent ratio to the original 4 : 7. At this rate, Lilia can swim 32 laps in 56 minutes.

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By the end of the unit, your student should know…

- What a ratio is and use ratio language and notation [Lesson 3.1]
- How to represent and solve problems involving ratios using tables, tape diagrams, and double number lines [Lessons 3.1, 3.2, 3.3]
- How to use ratio reasoning to convert measurement units to solve problems in context [Lesson 3.4]

Additional Resources

- For definitions and additional notes please refer to Student Resources at the end of the unit.
- For an introduction to ratios and ratio notation: https://bit.ly/37BzF3U
- For using tape diagrams to solve problems: https://youtu.be/c6Pa34wRVEk
- Solving rate problems with double number lines: https://bit.ly/2Y4Y1Qo
- For measurement conversions: https://bit.ly/2MZKJ17

Unit 4: Division

Dear Parents/Guardians,

Unit 4 explores division. In Lesson 1, students divide whole numbers in different ways and solve problems in context. Lesson 2 revisits decimal division through rate problems. Lessons 3 and 4 explore multiple methods for dividing fractions. Due to space limitations, the examples on this page are focused on non-traditional methods.

The "Chunking Method" for Division

The "chunking method" is an alternative to the standard algorithm.

Step 1: Make a multiplication bank that may be useful for the problem.
Step 2: Select a fact from the bank that is less than or equal to the dividend and record.
Step 3: Subtract and repeat Steps 2 and 3 until the remainder is less than the divisor.

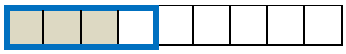
$405 \div 15 = 27$

Multiplication Bank	
$15 \times 1 = 15$	$15 \times 10 = 150$
$15 \times 2 = 30$	$15 \times 20 = 300$
$15 \times 3 = 45$	$15 \times 30 = 450$
$15 \times 4 = 60$	$15 \times 40 = 600$

$15\overline{)405}$	
-300	20
105	
-60	4
45	
-45	3
0	27 groups of 15.

Fraction Division

Students divide fractions using pictures, the divide across rule, and the standard algorithm of multiplying by the reciprocal.

Expression	$\frac{6}{8} \div \frac{3}{8}$	$\frac{1}{3} \div \frac{4}{9}$
Picture	How many $\frac{3}{8}$ are in $\frac{6}{8}$?  There are 2 of the $\frac{3}{8}$ in $\frac{6}{8}$.	It is helpful to rename the fractions using a common denominator. $\frac{3}{9} \div \frac{4}{9}$  There is $\frac{3}{9}$ of $\frac{4}{9}$ in $\frac{3}{9}$.
Divide Across	$\frac{6}{8} \div \frac{3}{8} = \frac{2}{1} = 2$	$\frac{3}{9} \div \frac{4}{9}$ $\frac{3 \div 4}{9 \div 9} = \frac{\frac{3}{4}}{1} = \frac{3}{4}$
Multiply by the Reciprocal	$\frac{6}{8} \times \frac{8}{3} = \frac{48}{24} = 2$	$\frac{1}{3} \times \frac{9}{4} = \frac{9}{12} = \frac{3}{4}$

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By the end of the unit, your student should know…

- How to solve whole number division problems by "chunking" [Lesson 4.1]
- How to solve whole number division problems using the standard algorithm [Lesson 4.1]
- How to solve rate problems involving whole numbers, fractions and decimals [Lesson 4.2]
- How to represent division of fractions with a picture [Lesson 4.3]
- How to use the divide across rule for dividing fractions [Lesson 4.3]
- How to use the multiply by the reciprocal rule for dividing fractions [Lesson 4.4]

Additional Resources

- For definitions and additional notes please refer to Student Resources at the end of the unit.
- For dividing whole numbers using the standard algorithm: https://youtu.be/4yp5v64XuRc
- For dividing whole numbers by decimals: https://bit.ly/2UO89e6
- For dividing decimals by decimals: https://bit.ly/3ft69zU
- For dividing fractions by multiplying by the reciprocal: https://bit.ly/3e7UJkJ

Unit 5: Percent

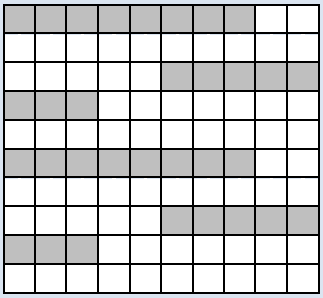
Dear Parents/Guardians,

In Unit 5, students explore percent. In Lesson 1, students use visuals and procedures to change a fraction to a decimal and a percent. In Lesson 2, students find the percent of a number using sense-making and procedural methods. In Lesson 3, they revisit double number lines to solve more complex percent problems.

Percent

Since percent means parts per hundred, a 10 x 10 grid is a helpful picture for converting between a fraction, a decimal and a percent.

Example: What percent is represented by $\frac{8}{25}$?



Students might determine the percent by shading 8 of every 25 squares four times to see:

$$\frac{8}{25} = \frac{32}{100} \text{ or } 32\%.$$

Or they may use the "big one" computation:

$$\frac{8}{25} \times \frac{4}{4} = \frac{32}{100} \text{ or } 32\%.$$

Chunking to Find Percent of a Number

Students use a predominantly mental "chunking" procedure to find the percent of a number when the values are "friendly."

Example: Find 15% of \$80.

Amount of \$	Find 100%	Find 10%	Find 5%
\$80	\$80	\$8	\$4
\$80	100% is always the whole amount	10% is $\frac{1}{10}$ of 100% Find $\frac{1}{10}$ of \$80 to get 10%. $\frac{\$80}{10} = \$8$	5% is $\frac{1}{2}$ of 10% Find $\frac{1}{2}$ of \$8 to get 5%. $\frac{\$8}{2} = \$4$

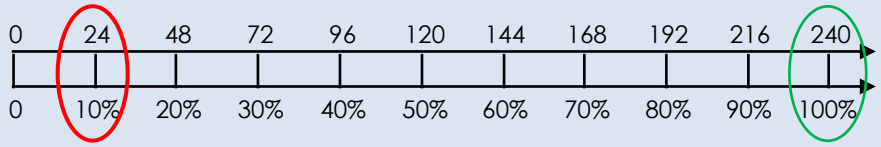
One way to use chunking to find 15% of \$80:

15% of \$80 = 10% of \$80 + 5% of \$80.
15% of \$80 = \$8 + \$4 =\$12.

Using Double Number Lines in Percent Problems

Students revisit double number lines to find the missing values in percent problems.

Example: 24 is 10% of what number?



One of the lines represents percent, and is numbered from 0% to 100% in increments of 10%. If the other line is also split into 10 equal parts, we know that 24 lines up with 10%. We can count up by 24's to find the total amount, which is 240.

Another method is to recognize that 10(10%) = 100%, so 10(24) = 240.

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By the end of the unit, your student should know…

- Percent means parts per hundred [Lesson 5.1]
- How to convert between fractions, decimals, and percent representations [Lessons 5.1, 5.2]
- How to find a percent of a number using a variety of methods [Lessons 5.2, 5.3]

Additional Resources

- For definitions and additional notes please refer to Student Resources at the end of the unit.
- To convert between fractions, decimals and percent: https://youtu.be/wwg052FC_Zw
- To convert from a percent to a fraction or decimal: https://bit.ly/2Y5Njcc
- To find the percent of a number using double number lines: https://youtu.be/2NYSq_i1i3Q and https://youtu.be/1rhiXeCekyk
- Finding percent of a number using symbolic notation: https://bit.ly/2zHhygm

Unit 6: Expressions

Dear Parents/Guardians,

Unit 6 introduces students to expressions using meaningful contexts. In Lesson 1, students use the GCF and the distributive property to rewrite numerical expressions. In Lesson 2, they explore algebraic expressions using a pizza shop menu. In Lesson 3, students write algebraic and numerical expressions in words, numbers and symbols.

Rewriting Numerical Expressions

Students rewrite numerical expressions using both the distributive property and the greatest common factor (GCF). This is in preparation for evaluating variable expressions and solving equations.

The distributive property states that $a(b + c) = ab + ac$ and $(a + b)c = ac + bc$ for any numbers a, b, and c.

Rewrite 7(12) using the distributive property. Then simplify.	Rewrite 70 + 14 as a product using the GCF and the distributive property.
7(12) = 7(10 + 2) = 7(10) + 7(2) = 70 + 14 = 84	70 + 14 The GCF is 7. Divide 70 and 14 by 7 to factor. 7(10 + 2)

Order of Operations (For Simplifying Expressions)

Step 1: Simplify expressions that are grouped (i.e., ( ), [ ], or a fraction bar).
Step 2: Simplify expressions with exponents.
Step 3: Perform multiplication and division from **left** to **right**.
Step 4: Perform addition and subtraction from **left** to **right**.

Example	**$10 + 32 \div (5 - 1)^2 \bullet 8$**
First, simplify within the grouping symbols.	$10 + 32 \div (5 - 1)^2 \bullet 8$
Second, simplify terms with exponents.	$= 10 + 32 \div 4^2 \bullet 8$
Third, perform multiplication and division.	
Since the division comes first, divide.	$= 10 + 32 \div 16 \bullet 8$
Then Multiply.	$= 10 + 2 \bullet 8$
Fourth, perform addition to find the value.	$= 10 + 16 = 26$

Variable Expressions

Students represent the costs of menu items as variables. They write and evaluate orders from the menu using the distributive property and order of operations.

Cost of Menu Items	Menu Order	Expression Representing Cost of Order
Pizza (by the slice) Cheese (c) $1.00 Pepperoni (p) $1.50 Drinks Small (s) $0.75 Medium (m) $1.25 Large (L) $1.75	*I'd like two slices of cheese, a slice of pepperoni, two small drinks, and another slice of cheese.*	$2c + p + 2s + c$ $= 3c + p + 2s$ $= 3(1.00) + 1.50 + 2(0.75)$ $= 3.00 + 1.50 + 1.50 = \$6.00$
	I'd like 4 orders of a slice of cheese pizza and a medium drink.	$4(c + m)$ $= 4(1.00 + 1.25)$ $= 4(1.00) + 4(1.25)$ $= 4.00 + 5.00 = \$9.00$

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By the end of the unit, your student should know…

- How to apply the distributive property to rewrite expressions [Lesson 6.1]
- How to simplify expressions containing exponents [Lesson 6.1]
- How to simplify expressions using order of operations [Lesson 6.1]
- How to use variables in expressions [Lesson 6.2]
- How to simplify and evaluate variable expressions [Lesson 6.2]
- How to translate between verbal, numerical, and algebraic expressions [Lesson 6.3]

Additional Resources

- For definitions and additional notes please refer to section 6.5.
- Whole Numbers: https://bit.ly/3ecB2ll
- Exponents and Order of Operations: https://bit.ly/2CfaRCZ
- Simplifying Expressions: https://bit.ly/2C9g9jl

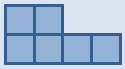
Unit 7: Inputs and Outputs

Dear Parents/Guardians,

A major goal of Unit 7 is to explore the connections between algebra and proportional reasoning. In Lesson 1, visual patterns lead to generating tables, graphs, and equations. Students learn about dependent and independent variables and identify them within each representation. In Lesson 2, students compare prices of similar items using tables, double number lines, graphs, and equations. In Lesson 3, students identify the unit rate in tables, graphs, and equations; and solve rate problems using their representations of choice.

Visual Patterns

Students explore "tile patterns," predicting how they will grow in order to describe the sequence.

Step #	Step 1	Step 2	Step 3	Step 4
Picture				
# of tiles	3	4	5	6

Students see that the pattern may be described as the number of tiles is equal to the step number plus two. Algebraically, for step number n, the number of tiles is $n + 2$.

Analyzing Tables, Graphs, and Words

Students describe how "tile patterns" grow using pictures, words, tables, graphs, and input-output rules.

Example: Aaron and Ben are going to school. Aaron rides his bike at a rate of 8 miles per hour. It takes Ben 5 minutes to go half a mile on his skateboard. If each boy continues at his rate of speed, who is moving faster?

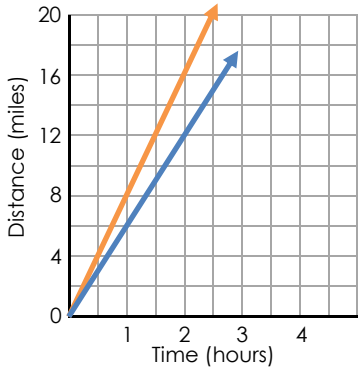
Table

Students create a table using the given rate as a starting point.

Aaron's Rate	
Time (hours)	Distance (miles)
1	8
$\frac{1}{2}$	4
2	16
3	24
4	32
5	40

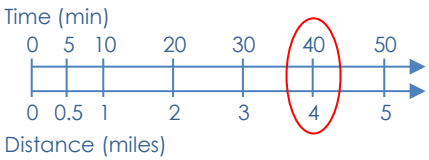
Graph

Students create a graph. The independent variable is time and the dependent variable is distance.



Double Number Line

Students create a double number line to represent the data. Note that Ben's time is measured in minutes, not hours.



Aaron's graph is steeper than Ben's, because he is covering more distance over any given time. We can say that Aaron is moving at a faster rate.

We can also compare their speeds at 4 miles on the table and double number line.

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By the end of the unit, your student should know…

- How to describe visual patterns verbally, as a sequence of numbers in a table, in a graph, and using input-output rules (equations) [Lesson 7.1]
- The difference between dependent and independent variables and how they are related [Lesson 7.1]
- How to use tables of numbers, double number lines, graphs, equations, unit rates, and words to compare similar situations [Lessons 7.2, 7.3]
- How to identify unit rates in tables, graphs and equations and use rates to solve problems in context [Lesson 7.3]

Additional Resources

- For definitions and additional notes please refer to section 7.5.
- For an example on independent and dependent variables: https://bit.ly/30UXl1N
- For an example on graphing independent and dependent variables: https://bit.ly/2CllTFQ
- For comparing rates and unit rates graphically: https://youtu.be/BdStUDXHT6s

Unit 8: Solving Equations

Dear Parents/Guardians,

Unit 8 introduces students to solving equations using meaningful contexts. In Lesson 1, students use mobiles and revisit Nonna's pizza shop menu to write and solve equations. In Lesson 2, they relate equations and inequalities to balance scales and revisit tape diagrams to build and solve equations. In Lesson 3, students solve equations using all four operations.

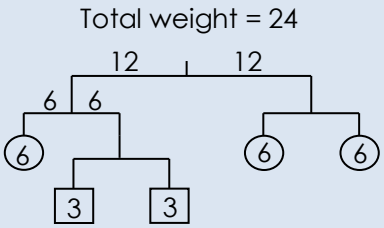
Mobiles and Balance

Students relate equations to balanced mobiles, determining values that maintain the mobile's balance (and maintain equality within the equation).

- A horizontal bar represents balance so there must be equal weight on both sides.
- Same shapes must have the same weight. Different shapes must have different weights.

The mobile on the right can be expressed as

$$6 + 3 + 3 = 6 + 6$$
$$12 = 12$$



Nonna's Pizza Menu and Solving Equations

Students revisit Nonna's Pizza Menu from Unit 6 to solve equations to determine missing items. Recall that the variables used in the equations represent the prices of the menu items.

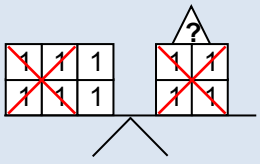
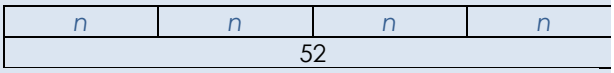
NONNA's PIZZA MENU					
Pizza			**Drinks**		
Cheese slice	(*c*)	$1.00	Small drink	(*s*)	$0.75
Pepperoni slice	(*p*)	$1.50	Medium drink	(*m*)	$1.25
			Large drink	(*L*)	$2.00

$p +$ ☐ $= \$2.75$
$\$1.50 +$ ☐ $= \$2.75$
☐ $= \$1.25$

The missing item is a medium drink.

Strategies for Solving Equations

Students solve equations using a variety of methods.

Mental Math Students think about what value is needed to make the equation *true*.	$x + 5 = 12$ Think, "*What must I add to 5 to make 12?*" Since 7 + 5 = 12, the value of x is 7. $x = 7$
Balance Scales Students will use triangles to represent the unknown (the variable) and squares for each unit of 1. They determine the value of the triangle to maintain balance.	$6 = x + 4$ We can remove 4 squares of 1 from each side of the scale and maintain balance. The triangle must have a value of 2.  $x = 2$
Tape Diagrams Students revisit tape diagrams to solve equations.	$4n = 52$  Each section for n must be the same. Since there are 4 sections of n, divide 52 by 4 to find out that $n = 13$.

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By the end of the unit, your student should know…

- How to solve equations using substitution within a given context [Lesson 8-1]
- How to relate equations to balanced mobile puzzles and solve the puzzles as a connection to solving equations [Lessons 8-1]
- How to use "mental math" to solve equations using all four operations [Lesson 8-2, 8-3]
- How to solve equations using balance scales and tape diagrams [Lessons 8-2, 8-3]
- How to find solutions that make equations and inequalities true [Lesson 8-3]

Additional Resources

- For definitions and additional notes please refer to section 8.5.
- Solving one-step equations using scales: https://bit.ly/3hFmbbZ, https://bit.ly/2UT7EQ8
- Solving one-step addition equations symbolically: https://bit.ly/2ABVJzl
- Solving one-step division equations symbolically: https://bit.ly/2URDOLC
- Solving one-step multiplication equations symbolically: https://bit.ly/37Dbnq4

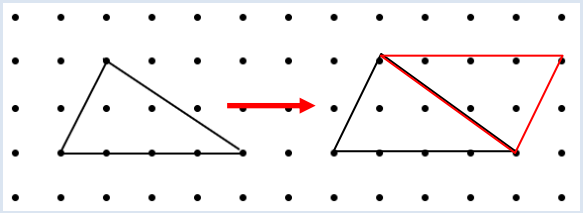
Unit 9: Area and Volume

Dear Parents/Guardians,

Unit 9 explores area and volume. In Lesson 1 students derive the formulas for finding the areas of polygons using visual models and use these formulas to solve various problems. In Lesson 2 students explore 3-D figures, draw nets of the figures, and calculate the surface area of each by finding the area of its related net. In Lesson 3 students explore volumes of rectangular prisms, focusing on prisms with fractional edge lengths.

Areas of Polygons

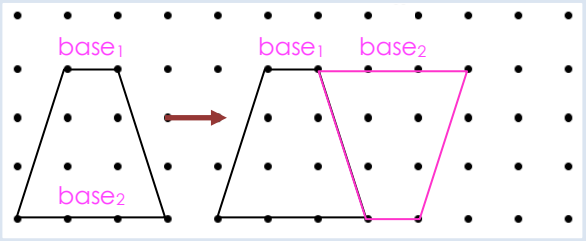
Students make copies of polygons and use a "cut-up" strategy to manipulate figures and derive area formulas for parallelograms, triangles, and trapezoids. They use the formula or the area of a rectangle to derive the area formulas for the other figures. (Please see tutorial link for deriving the area of parallelograms.) (Area = base × height or $A = b \times h$)



The area of the parallelogram (or the two triangles) is $A = b \times h$.

The area of one triangle is half of the area of the parallelogram.

$$A = \frac{1}{2}(b \times h)$$

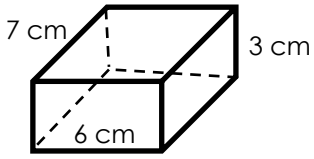


The area of the parallelogram (or the two trapezoids) is $A = b \times h$.
The area of one trapezoid is half of the area of the parallelogram.

$$A = \frac{1}{2}(\text{base}_1 + \text{base}_2) \times h$$

Surface Area of Prisms

Students create net drawings of prisms. They find the area of each polygon within the net, and find the total surface area of the prism.



Surface Area of Prism

Method 1: Add all of the net areas.

$SA = 42 + 42 + 21 + 21 + 18 + 18$

$SA = 162\ cm^2$

Method 2: Use the distributive property.

$SA = 2(42 + 21 + 18)$

$SA = 2(42) + 2(21) + 2(18)$

$SA = 162\ cm^2$

Areas of Net Polygons for Prism
(Note: Figures not drawn to scale.)

Top/bottom

Area = $\ell \times w$

$A = 7(6)$

$A = 42\ cm^2$

Sides (both)

Area = $\ell \times w$

$A = 7(3)$

$A = 21\ cm^2$

Front/back

Area = $w \times h$

$A = 6(3)$

$A = 18\ cm^2$

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By the end of the unit, your student should know…

- How to use drawings or visuals of parallelograms, triangles, and trapezoids that can be cut up and rearranged to help make sense of how their area formulas are derived [Lesson 9.1]
- The area formulas of parallelograms, triangles, and trapezoids and how to use them to solve problems in context [Lesson 9.1]
- How to distinguish between prisms and pyramids, create them using nets, find the surface area using the nets, and solve surface area problems in context [Lesson 9.2]
- How to derive the formulas for the volume of rectangular prisms, find volumes with fractional edge lengths, and solve volume problems in context [Lesson 9.3]

Additional Resources

- For definitions and additional notes please refer to section 9.5.
- For deriving the formula for finding the area of a parallelogram: https://bit.ly/2BrBbJy
- For deriving the formula for finding the volume of a rectangular prism: https://bit.ly/2YOqVTS

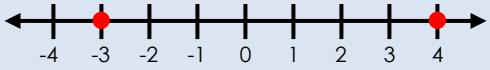
Unit 10: The Number Line and the Coordinate Plane

Dear Parents/Guardians,

Unit 10 introduces signed numbers on a number line and the coordinate plane. In Lesson 1, students represent integers on a number line and find their opposites and absolute values. Lesson 2 extends these ideas into rational numbers including fractions and decimals. In Lesson 3, students graph in all four quadrants of a coordinate plane. In Lesson 4, students graph polygons and reflect them across the *x*- axis and *y*-axis.

Extending the Number Line

Students locate rational numbers on number lines, both vertical and horizontal. Using number lines, students will compare and order rational numbers.

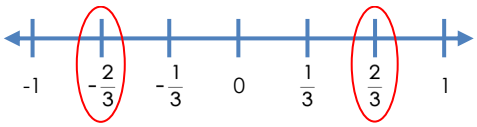


On a horizontal number line, the numbers further to the right are greater than the numbers to the left. 3 is further to the right than -4, so 3 is greater than -4.

$3 > -4$

Opposites and Absolute Value

The opposite of a number is the number on the other side of zero at the same distance from zero.



$-\frac{2}{3}$ and $\frac{2}{3}$ are opposites.

It is important to note that 0 is its own opposite.

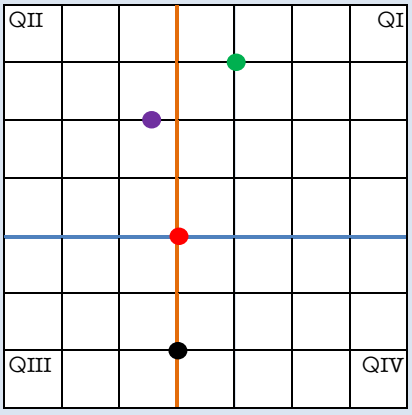
The absolute value of a number is the distance from the number to 0 on a number line. Distance is always greater than or equal to 0. We can represent the absolute value of any number x as $|x|$.

The absolute value of $-\frac{2}{3}$, expressed as $\left|-\frac{2}{3}\right|$ is $\frac{2}{3}$.

The absolute value of $\frac{2}{3}$, expressed as $\left|\frac{2}{3}\right|$ is also $\frac{2}{3}$. Opposites have the same absolute value since they are the same distance from 0 on the number line.

Graphing on the Coordinate Plane

A coordinate plane is determined by a horizontal number line (called the x-axis) and a vertical number line (called the y-axis), intersecting at the origin (0,0). There are four quadrants within the coordinate plane to help locate points.



Points are located using ordered pairs *(x,y)*.

(0,0) is located at the origin

(1,3) is located in Quadrant I (QI)

(0.5, -2) is located in Quadrant IV (QIV)

(-2,0) is located on the *y*-axis

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By the end of the unit, your student should know…

- How to represent rational numbers on a number line [Lessons 10.1, 10.2]
- How to find the opposite and absolute value of rational numbers [Lessons 10.1, 10.2]
- How to write and graph solutions to equation and inequalities on number lines [Lessons 10.1, 10.2; Please see video for additional support]
- How to scale coordinate grids and graph ordered pairs [Lessons 10.3, 10.4]
- How to draw polygons in the plane given the coordinates of the vertices [Lesson 10.4]
- How to graph figures and their reflected images across axes [Lesson 10.4]

Additional Resources

- For definitions and additional notes please refer to section 10.6.
- For graphing inequalities: https://bit.ly/3euEsH3
- For Reflections across axis: https://bit.ly/30Z4Eph