



# An At-Home Guide for Families

7<sup>th</sup> Grade Mathematics in North Carolina Public Schools

## Course Outline

### **At the end of the course, my child will know...**

- how to create and use ratios and unit rates from proportional relationships using tables, graphs, equations, and words.
- how to calculate and use percent for real-world problems.
- how to use a scale factor to create a scale drawing and to find lengths and areas for the scale drawing.
- how to add, subtract, multiply, and divide positive and negative fractions and use to solve real-world problems.
- how to develop a probability model to represent an event and use a probability model to find theoretical and experimental probabilities.
- how to write expressions in different forms using the distributive property, combining like terms using addition or subtraction, or factor the greatest common factor.
- how to solve equations and inequalities with multiple steps and interpret the solution in real-world problems.
- how to determine if three lengths create a triangle and classify triangles as acute, obtuse or right triangles.
- how to determine if angles are supplementary, complementary, adjacent and/or vertical and use to help solve problems.
- how to calculate the radius, diameter, circumference, and area of a circle to solve problems.
- how to calculate the area and perimeter of two-dimensional objects, including composite figures with triangles, trapezoids, rectangles, and parallelograms.
- how to calculate the volume and surface area of prisms, pyramids, or objects composed of cubes, pyramids, and right prisms.
- how to determine if a random sample is a good representation of a group of similar items or events and use to make a prediction about that group of similar items or events.
- how to calculate and explain the mean, median, mean absolute deviation, range, and interquartile range for a data set.
- how to calculate and explain the mean, median, mean absolute deviation, range, and interquartile range for a data set and use to compare two groups of similar items or events.

### **Curious what the specific standards are for 7th Grade Math in North Carolina?**

Check out the [North Carolina Standard Course of Study](#) to learn more. Looking for additional explanations about what students should be able to do at the end of this course? Check out [NC DPI's unpacked contents document](#) aligned to the course standards.



# Key Vocabulary

Visual	Term	Definition
$\begin{array}{cc} \text{Factor} & \text{Factor} \\ \downarrow & \downarrow \\ 3 \cdot 5 = 15 \end{array}$	<b>Factor</b>	A value that can be multiplied to get another value.
$\begin{array}{c} 3 \cdot 5 = 15 \\ \uparrow \\ \text{Product} \end{array}$	<b>Product</b>	The answer to a multiplication problem.
$2(x + 5) = 2 \cdot x + 2 \cdot 5$	<b>Distributive Property</b>	Multiplication of a sum by multiplying each term separately.
$\frac{1}{3}$	<b>Ratio</b>	A way of comparing values. It shows how much we have of one thing compared to another thing.
$\frac{2}{3} = \frac{8}{12}$	<b>Proportional Relationship</b>	Two ratios that are equivalent.
<p>Scale Factor = 2</p>	<b>Scale Factor</b>	The number used as the multiplier for a scaling.
\$3.25 per gallon	<b>Rate</b>	A comparison of two related quantities.
\$3.25 per gallon	<b>Unit Rate</b>	A rate in which values are compared for every one of something else.
	<b>Number line</b>	A visual tool which shows location of numbers that can also be used to complete computation.
	<b>Ordered Pairs</b>	Two numbers written a certain way written in parentheses, such as (x,y). The first value represents the horizontal value, and the second value represents the vertical value of a single point on a coordinate plane from the origin.
$\frac{2}{3} \rightarrow \frac{3}{2}$	<b>Reciprocal</b>	The flipping of a fraction.
+ and - x and ÷	<b>Inverse Operations</b>	The opposite operation.
$\begin{array}{ccc} \text{Term} & \text{Term} & \text{Term} \\ \downarrow & \downarrow & \downarrow \\ 3x & + & 5 - 8x \end{array}$	<b>Term</b>	A number, variable, or a combination of both separated by addition or subtraction.
$\begin{array}{ccc} 3x & + & 5 - 8x \\ \swarrow & & \searrow \\ & \text{Like Terms} & \end{array}$	<b>Like Terms</b>	Terms that have the same variable raised to the same power.

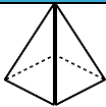
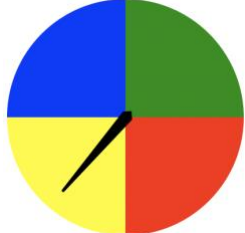


























Visual	Term	Definition
<p>Expression    Expression</p> <p>↓                ↓</p> <p><math>2x - 7 = 25</math></p> <p><math>2x - 7 = 25</math></p> <p>Equation</p>	<b>Expression</b>	Terms that are added or subtracted together.
<p><math>2x - 7 = 25</math></p> <p>Equation</p>	<b>Equation</b>	Two expressions that are said to be equivalent.
	<b>Acute Triangle</b>	A triangle with all angles less than 90 degrees.
	<b>Obtuse Triangle</b>	A triangle with one angle more than 90 degrees.
	<b>Right Triangle</b>	A triangle with one 90-degree angle.
<p><math>8 + 5 &gt; 11</math></p>	<b>Triangle Inequality Theorem</b>	The sum of the two shorter sides of a triangle must be more than the longest side to form a triangle.
	<b>Adjacent angles</b>	Two angles that have a common vertex and side.
	<b>Complementary Angles</b>	Two angles whose sum is 90 degrees.
	<b>Supplementary Angles</b>	Two angles whose sum is 180 degrees.
	<b>Straight angles</b>	Two supplementary angles that form a straight line.
	<b>Vertical angles</b>	Opposite angles formed by intersecting lines that share a vertex. Vertical angles are congruent (same measure).
	<b>Perpendicular</b>	Two lines that intersect at 90 degrees.
	<b>Circle</b>	Made out of all the points that are the same distance from a given point.



Visual	Term	Definition
	<b>Radius</b>	A line segment that goes from the center to the edge of a circle. A radius can go in any direction. Every radius of the circle is the same length.
	<b>Diameter</b>	A line segment that goes from one edge of a circle to the other and passes through the center. A diameter can go in any direction. Every diameter of the circle is the same length.
	<b>Circumference</b>	The distance around the circle. If the circle has radius $r$ then the circumference is $2\pi r$ .
$\pi = \frac{\text{Circumference}}{\text{diameter}}$	<b>Pi</b>	A proportional relationship between the diameter and circumference of any circle.
	<b>Quadrilaterals</b>	A two-dimensional, four-sided figure.
	<b>Trapezoid</b>	A two-dimensional, four-sided figure with only one pair of opposite, parallel sides.
	<b>Parallelogram</b>	A two-dimensional, four-sided figure with two pairs of opposite, parallel sides.
	<b>Rectangle</b>	A two-dimensional, four-sided figure in which every angle is a 90-degree angle
	<b>Right Prism</b>	A solid object with two polygon bases and perpendicular faces.
	<b>Rectangular Prism</b>	A solid object, with two rectangular ends (bases) connected by rectangular faces.
	<b>Triangular Prism</b>	A solid object, with two triangular ends (bases) connected by rectangular faces.
	<b>Cubes</b>	A solid object with all square faces.



Visual	Term	Definition												
	<b>Pyramid</b>	A solid object with triangular faces that meet at the top (apex) and the bottom (base) is a polygon.												
	<b>Chance Experiment</b>	A repeatable procedure with a set of possible results.												
Spinning can land on blue, green, red, or yellow.	<b>Sample Space</b>	All the outcomes of an experiment.												
Spinning Yellow = $\frac{1}{4}$	<b>Probability</b>	How likely something is going to happen.												
Each color has $\frac{1}{4}$ chance.	<b>Equally likely</b>	Each possible outcome from an experiment has the same chance of occurring.												
Spinning purple.	<b>Impossible Event</b>	Zero chance of occurring.												
<i>Drawing a Club from a deck of cards is <math>\frac{13}{52}</math> or <math>\frac{1}{4}</math>.</i>	<b>Theoretical Probability</b>	What is expected to happen.												
<table border="0" data-bbox="203 1081 430 1249"> <tr> <td>H hearts</td> <td></td> <td></td> </tr> <tr> <td>Spades</td> <td></td> <td></td> </tr> <tr> <td>Diamonds</td> <td></td> <td></td> </tr> <tr> <td>Clubs</td> <td></td> <td></td> </tr> </table>	H hearts			Spades			Diamonds			Clubs			<b>Frequency of an Event</b>	How often an event occurs in an experiment.
H hearts														
Spades														
Diamonds														
Clubs														
$Club = \frac{14}{60} = \frac{7}{30}$	<b>Experimental Probability</b>	The probability based on what happens during an experiment.												
23, 29 Mean = 26  $\frac{ 23 - 26  +  28 - 26 }{2}$ $= \frac{6 + 1 + 6}{3}$ $= 4.33 = MAD$	<b>Mean Absolute Deviation</b>	The average distance of each data point from the mean. Abbreviated as MAD.												



## Learning in Action: Grade Level Skills

### Examples of Grade Level Skills

**Problem:** A sketch of Savannah's room has dimensions 4.5 in by 3.25 in. If the scale is 1 in = 3 ft, what are the dimensions of Savannah's room in real-life?

**Solution:** The scale says for every 1 inch on the sketch it will be 3 feet in real-life. To convert each sketch dimension, multiply by the scale factor with the final unit on top.

$$4.5 \text{ in} \times \frac{3 \text{ ft}}{1 \text{ in}} = (4.5)(3) \text{ ft} = 13.5 \text{ ft}$$

$$3.25 \text{ in} \times \frac{3 \text{ ft}}{1 \text{ in}} = (3.25)(3) \text{ ft} = 9.75 \text{ ft}$$

Thus, Savannah's room in real-life is **13.5 feet by 9.75 feet.**

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**Problem:** Nessie is using a color spinner to decide what color balloon to hang around a door.



What is the theoretical probability of the spinner landing on yellow?

**Solution:** The theoretical probability is what we predict will happen. In-other-words, no trials or experiments have been conducted yet. Nessie is using a color spinner that is divided into 8 equal spaces with four colors on the spinner.

This question wants to know the theoretical probability of landing on yellow. Because there are two yellow spaces, this means there are two chances for landing on a yellow. The theoretical probability will be as follows:

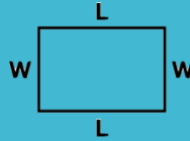
$$\frac{\text{Yellow Spaces}}{\text{All Spaces}} = \frac{2}{8} = \frac{1}{4}$$

Therefore, the theoretical probability of landing on yellow is **1 out of 4.**

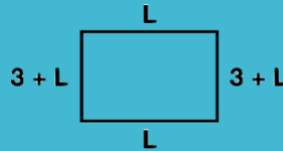


**Problem:** A rectangle has a width,  $W$ , that is 3 inches more than the length,  $L$ . Write an expression to represent the perimeter of the rectangle.

**Solution:** First, sketch a rectangle and label what is given. The length is defined as  $L$  and width as  $W$ .



The width is said to be 3 inches more than the length. 'More than' means increase. Use addition to show the increase.



Perimeter is the distance around the rectangle. To find the perimeter, add all the sides.  
 $(3 + L) + L + (3 + L) + L$

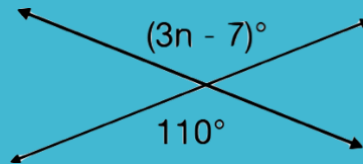
Combine like terms.

$$4L + 6$$

Therefore, the expression to represent the perimeter of the rectangle is  $4L + 6$ .

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**Problem:** In the following image, find the value of  $n$ .



**Solution:** The angles are formed by intersecting lines and are across from each other. This means the angles are vertical angles. Vertical angles are always congruent. Because they are congruent, create an equation to find the value of  $n$ .

$$\begin{aligned} 3n - 7 &= 110 \\ 3n - 7 + 7 &= 110 + 7 \\ 3n &= 117 \\ \frac{3n}{3} &= \frac{117}{3} \\ n &= 39 \end{aligned}$$

Thus, the value of  $n$  is **39**.



**Problem:** The diameter of a circle is 5 cm. What is the area of the circle? (Use  $\pi = 3.14$ .)

**Solution:**

The formula for the area of a circle is  $\pi r^2$ . The problem gives the diameter of the circle, but the formula uses the radius. The radius is half the diameter so divide the diameter by 2.

$$r = d \div 2 = 5 \div 2 = 2.5$$

Substitute the values for radius and  $r$  in the area formula and simplify.

$$\begin{aligned} A &= \pi r^2 \\ &= 3.14(2.5)^2 \\ &= 3.14(2.5)(2.5) \\ &= 7.85(2.5) \\ &= 19.625 \end{aligned}$$

Therefore, the area of the circle is **19.625 cm<sup>2</sup>**.

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**Problem:** A desk is on sale for \$125 before tax. There is a 9% sales tax for the dresser. What is the total cost for the desk after the tax is added?

**Solution:** To find the total cost, add the sales tax to the cost of the desk. Multiply the cost of the desk by the percent of sales tax to find the amount of sales tax to be paid. The sales tax is given as 9%.

First, change 9% to a decimal. Percent means out of 100.

$$9\% = 9 \cdot \frac{1}{100} = \frac{9}{100} = 0.09$$

Next, multiply the cost of the desk by sales tax as a decimal to find the dollar amount of sales tax.

$$125(0.09) = 11.25$$

This means the sales tax is \$11.25.

Add the dollar amount of sales tax to the cost of the desk to find the total cost.

$$\begin{aligned} \text{Total Cost} &= \text{Cost of Desk} + \text{Dollar Amount of Sales Tax} \\ &= 125 + 11.25 \\ &= 136.25 \end{aligned}$$

Therefore, the total cost of the desk with sales tax is **\$136.25**.





**Problem:** The following are the last 5 English test scores for Dezi.

88, 96, 92, 79, 90

What is the mean absolute deviation for Dezi's English test scores?

**Solution:**

Find the mean (or average) of Dezi's test scores.

$$\frac{88 + 96 + 92 + 74 + 90}{5} = \frac{440}{5} = 88$$

Subtract the mean from each value in the data set.

$$\begin{aligned}88 - 88 &= 0 \\96 - 88 &= 8 \\92 - 88 &= 4 \\74 - 88 &= -14 \\90 - 88 &= 2\end{aligned}$$

Add the absolute values of the previous values and divide by the number of values in the data set.

$$\frac{0 + 8 + 4 + 14 + 2}{5} = \frac{28}{5} = 5.6$$

Thus, the mean absolute deviation (MAD) is **5.6** for Dezi's English test scores.

## Resources

Links and online resources to allow you to support your child's learning.

- [Algebra Foundations, Khan Academy](#)
- [Grade 7 Mathematics, Open Up Family Resources](#)
- [Grade 7 Mathematics, Open Up Student Resources](#)
- [7<sup>th</sup> Grade Common Core Resource, Inside Mathematics at UTA](#)
- [7<sup>th</sup> Grade Math, Khan Academy](#)
- [7<sup>th</sup> Grade Math Resource, MathChimp](#)
- [7<sup>th</sup> Grade Math Resource, IXL](#)
- [Middle School Math Resource, Virtual Nerd](#)
- [Pre-Algebra Resource, Virtual Nerd](#)



## At-Home Connections

- Tell me how you solved a problem encountered in math class today.
- Tell me the greatest common factor of the expression  $5x+15$ . [*Substitute different expressions to include when the greatest common factor is 1.*]
- At the grocery store, ask to estimate the cost of the groceries before tax and then with the 2% grocery tax. Compare with the grocery receipt and discuss differences.

## Challenges to Anticipate

It is hard to watch our children struggle but this is an important part of the learning process. Be supportive and encouraging when struggles happen.

- Try the problem even if it is wrong. Learning occurs through failure.
- Ask your child to explain an example to you they understood to help build confidence. Explaining to you will help with their understanding.
- Take a short break to come back to the problem with a clear head.

The formulas for finding the circumference and area of circles are similar and easy to confuse. Visit [Virtual Nerd](#) for help with [Circumference and Area of Circles](#).

Knowing when two angles are the same measure, when two angles add to 90 or 180 degrees, or when their measures have no relationship can be challenging to keep straight. Visit [Virtual Nerd](#) for help with [angles](#).

## Communicating with Your Child's Teacher

Still feeling stuck? Reach out to your child's teacher to discuss what you can do further your child's learning. Some questions that might guide your discussion:

- What resources would you suggest I use to support my child?
- Where do you see my child struggling? What can we do together to help?
- What should my child practice at home?
- What collective message can we send together to help my child learn?

### **Need Technical Help?**

Reach out to your student's home school for technical assistance. Include the type of device (PC, Mac, Chromebook, etc.) and browser (Chrome, Firefox, Safari, etc.).