DEAR PARENTS,

In Unit 2, students collect like terms from one or both sides of an equation using algebra tiles. They solve a variety of equations that have either zero, one, or infinitely many solutions. Students analyze equations, tables, and linear graphs to compare proportional relationships by interpreting unit rates; they expand their knowledge of unit rate, also called the constant of proportionality, to make connections to the slope of a line. After relating the slope of a line with the unit rate in proportional relationships, students extend their understanding of linear equations in the form of $y = mx$ to include equations with non-zero $y$-intercepts. They graph a line from an equation in the form of $y = mx + b$ and interpret the meaning of $m$ and $b$ in linear equations.

In Unit 2, students will...

- Write and solve multi-step equations with variables on both sides.
- Determine the number of solutions to an equation.
- Relate unit rate (the constant of proportionality) to the slope of a line in a proportional relationship.
- Find the $y$-intercept of a graph and explain what it means.
- Derive the equation $y = mx + b$ for linear non-proportional relationships.

In Unit 3, students differentiate between a relation and a function. A relation may be defined as a set of ordered pairs, while a function is a relation in which each input, $x$, has exactly one output, $y$. Students identify functions through different representations, including graphs, arrow diagrams (maps), tables and equations as they investigate linear and non-linear functions. Then students compare linear and non-linear functions by analyzing their rate of change and initial value. They realize that a constant rate of change leads to a linear function. Now that students have analyzed different functions, they write the equations of linear functions from tables, graphs, and equations in the form $y = mx + b$.

In Unit 3, students will...

- Identify functions through different representations including graphs, maps, tables and equations.
- Compare linear and nonlinear functions as well as proportional and non-proportional functions.

We in the Anne Arundel County middle school mathematics office require effective teaching that engages students in meaningful learning through individual and collaborative experiences that promote their ability to make sense of the mathematical ideas and reason mathematically. All students can learn mathematics at high levels, and with your support at home, we hope to achieve that with your child.

Thank you for your continued support.

The Middle School Mathematics Office
IMPORTANT CONCEPTS

Unit 2
- To solve a linear equation that has variables on both sides of an equation, use the inverse operations to move all variable terms to one side of the equation and constant terms to the other; then, isolate the variable.
- Equations with one variable can have zero, one or infinitely many solutions.
- Slope is a measure of the steepness of a line and is equal to the rate of change between quantities.
- In proportional relationships, slope is the same as the unit rate and the constant of proportionality.
- The slope–intercept form for a linear equation, \( y = mx + b \), gives information to sketch a graph of a line. It indicates that the point \((0, b)\) is on the graph of the line and shows the slope of the line, \(m\).

Unit 3
- A function is a relation in which each input or \(x\)–value, has exactly one output, or \(y\)–value.
- The graph of a linear function is a straight line; the graph of a non-linear function is not a straight line.
- A function that represents a linear relationship between two quantities can be represented by an equation written in the form \(y = mx + b\). The slope, \(m\), and the \(y\)–intercept, \(b\), can be interpreted in the context of a given problem.

REAL WORLD CONNECTION

**Distance** – When taking a trip, a driver can determine the distance a car travels as a function of speed and time.

If the car travels at a constant rate of speed, how long will it take to drive from Annapolis to Philadelphia (about 130 miles)?

**Construction** – When designing stairs for homes and public spaces, the building code dictates the rise and run (slope) for safety purposes. Wheelchair ramps must also follow slope specification guidelines.

How steep is the staircase planned for a new office building?

VOCABULARY

Unit 2
- **Slope** of a line is the ratio of \( \frac{\text{rise}}{\text{run}} \) or \( \frac{\text{the change in } y}{\text{the change in } x} \); it is also called the steepness of a line.
- **Y–intercept** is the \(y\)–coordinate of the point where the line crosses the \(y\)–axis.
- **Slope–intercept form** is the equation \(y = mx + b\) where \(m\), is the rate of change, or slope, and \(b\) is the initial value, or the \(y\)–intercept.

Unit 3
- **Relation** is any set of ordered pairs.
- **Function** is a relation when each input is assigned exactly one output.
- **Linear function** is when the graph of a function is a straight line while a **non–linear function** is when the graph of a function is not a straight line.
Bar Diagrams

A math teacher challenged his class to find the number of miles he rode his bike on Thursday. The total number of miles he rode on Monday through Wednesday is the same as the total number of miles he rode on Thursday through Saturday. How many miles did he ride on Thursday?

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
</tr>
</thead>
<tbody>
<tr>
<td>4x + 3</td>
<td>x</td>
<td>x + 7</td>
<td>x + 7</td>
<td>x + 7</td>
<td></td>
</tr>
</tbody>
</table>

\[ 4x + 3 = x + x + 7 + x + 7 \]
\[ 4x + 3 = 3x + 14 \]
\[ 4x + 3 - 3 = 3x + 14 - 3 \]
\[ 4x = 3x + 11 \]
\[ 4x - 3x = 3x - 3x + 11 \]
\[ x = 11 \]

Maps

Which map shows a function? Which map does not show function? Explain why?

REAL WORLD CONNECTION
Forensics – Forensic scientists can determine the height of people based on the length of their femurs. The height of a person is a function of the length of certain bones. Measure your femur and predict your height. How close is the predictor to your actual height?

Graphs

Graph the line \( y = \frac{3}{4}x - 2 \) using the slope and \( y \)-intercept.

Step 1: Plot the first point using the \( y \)-intercept \((0, -2)\).

Step 2: From the \( y \)-intercept, find another point using the slope. The slope is \( \frac{3}{4} \), that means go up 3 units and move to the right 4 units.

Step 3: Connect the two points to graph the line.