Unit 7: Functions

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Week 27**
Length: **4 weeks**
Status: **Published**

Unit Overview

This unit will utilize concepts and skills from the "Linear Relationships" unit and will focus on functions. Students will begin this unit by learning the meaning of domain, range, and functions. They will be able to identify functions and will also be able to provide examples and non-examples of them. Then, students will learn how to represent functions in various ways by using a table, graph, and an equation. They will be able to identify functions as being linear or non-linear when given a table, graph, or equation. Students will compare functions and their properties, such as their rates of change and initial values. Students will be able to analyze and construct piecewise functions in order to qualitatively describe the relationship between two quantities. Finally, students will end the unit by studying scatter plots. They will create scatter plots, describe the correlation, construct lines of best fit, and write the equations for lines of best fit.

Standards

MA.8.EE.B.6	Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.
MA.8.F.A.1	Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
MA.8.F.A.2	Compare properties (e.g. rate of change, intercepts, domain and range) of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
MA.8.F.A.3	Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.
MA.8.F.B.4	Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.
MA.8.F.B.5	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Essential Questions

- How can one recognize linear relationships?
- How can seeing the graph of a linear relationship be used to describe and explain real-world situations?
- How can recognizing patterns of change assist in decision making?

Application of Knowledge: Students will know that...

- a function is a rule in which each input value produces exactly one output value.
- a line of best fit is a straight line drawn through the center of a group of data points on a scatter plot.
- a piecewise function is a function that contains a sequence of intervals.
- a scatter plot can have a positive correlation, negative correlation, or no correlation.
- a scatter plot is utilized to recognize relationships between two quantities.
- functions can be represented in the form of a table, graph, or equation.
- linear relationships have constant rates of change, produce graphs of straight lines, and have equations of the form $y = mx + b$.
- non-linear relationships do not have constant rates of change, produce graphs that are curved, and have equations that contain a variable to a power or a variable in a denominator of a fraction.
- the domain is the set of all input values.
- the range is the set of all output values.
- the vertical line test can be used to identify whether or not a graph is a function.

Application of Skills: Students will be able to...

- analyze and describe qualitatively each interval of a piecewise function.
- compare the properties of multiple functions such as rate of change and initial value.
- construct lines of best fit and write their equations.
- create piecewise functions based on a given qualitative description.
- create scatter plots and describe the correlation.
- define a function as being linear or non-linear.
- identify functions and their domain and range.
- represent functions by using a table, graph, or equation.

Assessments

- Do-Nows: These daily assessments will be used to check for prior knowledge and to determine mastery of particular topics. If needed, remediation will be completed on an as needed basis.
- Communicator practice: This will be used as a quick whole-class assessment tool to check for complete comprehension.
- Exit Tickets: These will be used to measure student understanding of the lesson and assist in determining whether remediation is needed for the topic.
- Practice using IXL
- Line of Best Fit Activity: This can be used as a formative assessment (see description below).
- Pattern Project (see description below)
- Mid-Unit Quiz
- Unit Test

- Information from this unit will be included on a locally developed, mid-year or end of year benchmark assessment that may take the form of a test, performance based project, or other summative assessment.

Suggested Activities

- Grade 8 Digits Topics 7, 8, 14, and 15 Launches
- Student-centered SMART Board lessons: including interactive coordinate graphs for creating scatter plots and lines of best fit and interactive lines for the vertical line test for identifying functions
- Review games using Communicators
- Pattern Project: This is a teacher-generated activity in which students will use the website www.visualpatterns.org and identify one linear and one non-linear pattern. For each pattern, students will draw and explain the patterne, draw the next two steps in the pattern, create a table of values, create a graph, explain whether the pattern is linear or non-linear, and write the equation for a linear pattern.
- Line of Best Fit Activity: This is a teacher-generated activity in which students will discover whether there is a relationship between a person's height and shoe size. Students will measure the height and feet of their classmates. Ten students will then be selected to share their height and the length of their foot. The class will graph these points and determine whether or not there is a relationship. When they see that there is, they will construct a line of best fit and write the equation of the line.

Activities to Differentiate Instruction

Differentiation for special education:

- General modifications may include:
    - Modifications & accommodations as listed in the student's IEP
    - Assign a peer to help keep student on task
    - Modified or reduced assignments
    - Reduce length of assignment for different mode of delivery
    - Increase one-to-one time
    - Working contract between you and student at risk
    - Prioritize tasks
    - Think in concrete terms and provide hands-on-tasks
    - Position student near helping peer or have quick access to teacher
    - Anticipate where needs will be
    - Break tests down in smaller increments

- Content specific modifications may include:
    - Provide personal handout for integer rules
    - Provide personal handout with steps for writing equations in slope-intercept form when given two points
    - Use different color highlighters to highlight each interval on the graphs of piecewise functions

- Round answers for slope of the lines of best fit to the nearest whole number to assist in solving for the y-intercept
- Provide completed problems for practice work and homework

Differentiation for ELL's:

- General modifications may include:
  - Strategy groups
  - Teacher conferences
  - Graphic organizers
  - Modification plan
  - Collaboration with ELL Teacher

- Content specific vocabulary important for ELL students to understand include: linear, non-linear, x-values, y-values, vertical, table, graph, equation, interval, slope, relationship

Differentiation to extend learning for gifted students may include:

- Provide problems involving function notation and function composition
- Do not round off answers for slope for lines of best fit when answers do not come out to whole numbers
- Eliminate multiple choice options for questions involving writing equations for line of best fit

Technology Integration

- iPads or Chromebooks as appropriate to the activity.
- Online learning components including use of the Digits digital textbook and resources.
- Teacher integration of the SMART board to facilitate active student engagement throughout the course of the lesson.
- Software or online programs that teachers may use to create students materials or generate problems such as Kuta software.
- Additional practice provided through the use of IXL.

Integrated/Cross-Disciplinary Instruction

- **ELA:** Practice formulating complete and grammatically correct responses to open-ended questions.
- **Science:** Utilizing scientific data when constructing scatter to determine relationships, including comparing the height and foot length of students to discover the relationship of body proportions

Resources

- Digits student access and support: www.MyMathUniverse.com
- Digits teacher materials and support: www.pearsonrealize.com
- IXL: www.ixl.com
- SMART Exchange: http://exchange.smarttech.com/index.html#tab=0
- SMART Board lessons
- Coordinate graph worksheets
- Visual Patterns website: http://www.visualpatterns.org
- Punchline/Pizzazz worksheets (self-correcting)
- Kuta software generated worksheets

21st Century Skills

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.