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Mathematics : Grade 8

Driving Formula Activity
Estimated Duration: 1-2 single periods

Expressions and Equations

8.EE.6. 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.

Define, evaluate, and compare functions.

8.F.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.

8.F.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. For example, the function A = s2 length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.

Use functions to model relationships between quantities.

8.F.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.

Essential Question: What are the connections between proportional relationships, lines, and linear equations?

Background Information: In this lesson, students will design and program a robot to automatically drive to a specific place in the room using a driving distance program. During the prior day's lesson, students will build a driving robot that will be used. A preloaded *Driving Formula* MIndstorms program will be available to student on iPad or computer. There will also be a cross curricular reference to ethical innovations in science.

Vocabulary:
slope
y-intercept
distance
independent variable
dependent variable
unit of measure
axis

Materials:
EV3 robot (previously built)
USB cord
laptop/iPad
tape measure
*Driving Formula Program (*Mindstorms program)
Driving Formula Activity Worksheet

Differentiation:
- Bodily kinesthetic learners - Hands on *Driving Formula Activity*
- Audio and Visual learners – Visual representation of activity in the Do Now. The observations collected throughout the activity.
- ELL/Low reader - Guided notes printed for those who require them
- Technology- Utilizing Lego Mindstorms robot kit and digital program
- Enrichment: Graphing of data collected in activity
- Extended time for those who require it
- Small groups
- Individual attention from ICT teachers and paraprofessionals
- Resource room remediation for those who require

Lesson Objectives:
Students will be able to use tape measure to determine the distance traveled by robot. Students look at tabular representations of a linear relationship and use skills to manipulate and interpolate their equations. The equation is developed from a table of data they measured. Predict an input for a desired output.

Procedure:

1. Introduce the problem at hand of the day (how can we program the robot to drive a specific distance, if we do not know the stopping distance required?) Lead a classroom discussion about the way we program distance in the robot, and how that would be helpful for a self-driving vehicle.

2. Do Now: Identify the valid measurement technique and demonstrate how to adequately measure diameter. *Reference: DFA Worksheet*

3. Measure and document diameter of EV3 wheel.

4. In small groups, direct students to input value on the brick representing number of wheel rotations, in inches, and measure how far the robot travels.

5. Circulate and motivate students to start their data collection. Asking students to describe what they are measuring, and documenting data on worksheet.

6. After performing this experiment 5 times, finding the pattern that results to create an equation. and how this will help them find the formula.

7. In small groups students are analyzing their data, trying to find a pattern to create a linear equation in the form of y=mx+b. Utilize key questions to guide and provide necessary assistance.

8. Alter equation in *Driving Formula Activity* Mindstorms program to include a y-intercept and repeat steps 4-7. (This step can be repeated multiple times to differentiate the activity based on student abilities)

Student Data Collection Directions:

Hit enter on the “Distance Formula” Program on the BRICK

Plug a number on the screen of the brick on the robot.

Hit enter and measure how far the robot goes using a measuring tape.

Put the distance AND the entered number of inches in a data table

Repeat steps 1-4 nine more times, until 5 total data points have been measured.

Assessment:

Pre-assessment: Adequate measuring skills (Do Now)

Assessment will occur during lesson and after the lesson, by gauging understanding and mastery through student responses to lesson discussion as well as their answers to the in class activity worksheets. We will wrap up by answering the objectives; reviewing in class worksheets, and having the students summarize the lesson activity.

KEY Questions:

Why does the relationship you are looking at fit into the linear relationship equation that you see here?

What does this say when you think about programing the robot to move a specific amount of inches?

Why is it important to know what an equation describes, like this one?

What if you wanted to know what to plug in to make the robot travel a distance in meters?