Spirit Lesson 2

Lesson Title: It's a Drag
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Algebra Topic: Linear Functions
Grade Level: Upper Elementary
Cartoon Idea: Robot Dragster

Lesson Outline:

Content:

- Measurement and construction of whole number/ decimal number lines
- Measurement of time
- Creation of data tables and graphs
- Plotting ordered pairs on coordinate graph
- Algebraic equations
- Motion

Context:

- Create a 'drag strip' (number line) divided into four equal parts
- Label the following points: 'Start, Finish, Checkpoints 1, 2, & 3.
- The robot travels the 'drag strip' crossing 'Checkpoints 1,2,3 and Finish'
- Measure and record the time the robot crosses each point
- Create a table to show information
- Write an equation and that can be used to calculate times on longer courses
- Use table to make an x/y graph showing the slope
- Repeat the process with other robots
- Compare slopes

Activity Description:

Student groups of 2-3 create and label a drag strip that is divided into fourths. (ex: a 200 cm line, Checkpoint 1 labeled at 50 cm, 2 at 100 cm, 3 at 150 cm, and Finish at 200 cm).

One student drives the robot past each checkpoint on the 'drag strip' while another student measures and records the time when the robot passes each point.

Groups will use the times to make a data table and coordinate graph showing the slope. Students identify the equation that can be used to calculate times for longer courses.

The activity can be repeated with one or more other kinds of robots. Compare the slopes of all the robots' times.

Standards:

Math: A1, B1, B2, B3, E1, E3

Science: A1, B1, E1

Technology: B4, D3

Material List:
2-4 Different types of robots that can travel at constant speeds

Meter Sticks	Pencils
Fine-tipped markers	Data Table
Masking Tape	Graph Paper
Stopwatches	Colored Pencils

Asking Questions (It's a Drag!)

Summary: Students are asked how to set up a robot drag race.

Outline:

- Show a video clip of a drag race.
- Discuss the components: cars, straight course, distance, speed, time
- Ask questions to generate thinking to create a robotic drag race (course, materials, process, data collection, etc.)

Activity:

Students will view a video clip of a drag race followed by a discussion to generate interest and initiate thinking about creating a robot drag strip activity.

Questions	Possible Answers
How could we design a drag race for the classroom robots?	Make a straight line on the floor. Mark 'start and finish' lines. Put a robot on 'start', time how much time it takes to finish the course, compare with other robots
How can the progress of the robot on the drag strip be measured?	Use a stopwatch to measure the time it takes the robot to pass marked points and to complete the course.
How would the robot drag race be similar to a car drag race? What would be some differences?	Similar- Straight track, the time it takes to travel the track is measured, start & finish points. Differences- speed; cars accelerate, robot may move at a constant speed
How could we organize and show the results of the robot drag race?	Make a table, graph

Image Idea: Picture of a car racing on a drag strip
Video Link: Drag Race
http://www.challengevideos.com/2008/08_NCC/08_NCC_Bracket_tt.wmv

Exploring Concepts (It's a Drag!)

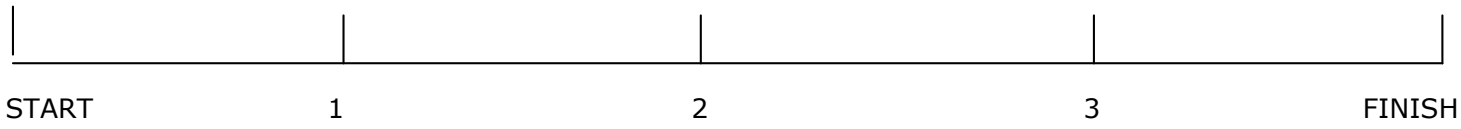
Summary: Students will time various robots' progression at four points on a straight lined course.

Outline:

- Students measure and mark a straight line on the floor that can easily be divided into fourths.
- Mark the fourths: 'Start, Checkpoints 1,2, 3, and Finish'
- One student drives the robot to from 'Start to Finish'
- Other students measure the record the time the robot passes each point
- Repeat until all robots have finished the course

Activity:

In groups of 3, students will make a 'drag strip' by measuring a straight line on the floor with masking tape. Divide the line into fourths and mark 'Start, Checkpoint 1, 2, 3, and Finish'.



One student places a robot on the 'Start' line and begins to drive it to the 'Finish' line. As the robot moves along the straight line, another student uses a stopwatch to time the progress of the robot at each checkpoint and the finish line. The third student will record the time the robot crosses each mark.

Repeat the activity for each classroom robot. If only one robot it available, adaptations can be made to the robot (ex: add weight, change wheels, drive backwards) and it can be timed on the course again.

Video Idea: Clip of robot 'racing' on the drag strip with a student timing the progress at each checkpoint.

Organizing Learning (It's a Drag!)

Summary: – Students use the time data to create X/Y tables with equations and a coordinate graph to show and compare slopes.

Outline:

- Organize the times each robot passed the checkpoints and finish line in a data table for each robot tested
- Write and use an equation to calculate times the robots would cross checkpoints on a longer course
- Use the data table to construct a coordinate graph showing the slopes for each robot timed

Activity:

Students organize the time information from each of the robots' drag race in a data table. (see sample chart and Data Worksheet). Each group will develop an equation that will be used to calculate times at other checkpoints along the same course and a longer one.

Student groups will use a piece of graph paper to create a coordinate graph to plot the slopes for each robot drag race. Plot the ordered pairs for each race by using a different color for each robot.

Sample Chart:

X checkpoints	Equation Y=2X	Y time in seconds	Ordered Pair
0 (start)	Y= 2 (0)	0	(0,0)
1	Y= 2 (1)	2	(0,2)
2	Y= 2 (2)	4	(0,4)
3	Y= 2 (3)	6	(0,6)
4 (finish)	Y= 3 (4)	8	(0,8)

Understanding Learning (It's a Drag!)

Summary: Groups hand in their completed Data Worksheet for group assessment and each student completes an Individual Assessment Sheet to show their understanding of:

- using an X/Y data chart to organize information,
- creating a coordinate graph to show and compare slopes
- creating and using an algebraic equation to make probable predictions

Outline:

Group: Collect and assess each group's Data Worksheet and Coordinate Graph for:

- organization
- clarity
- accuracy

Observe participation as each group completes the activities.

Individual: Use Individual Worksheet to assess each student's understanding of

- making and using an algebraic equation to predict times for other checkpoints
- using an X/Y Data Chart to solve problems
- creating a coordinate graph to show slope

Activity:

Each group will hand in their completed Data Worksheet(s) and Coordinate Graph to be assessed on: Organization, Clarity and Accuracy of information. Participation can be observed as groups are completing the activities.

Each student will complete an Individual Assessment sheet that will be assessed on his/her ability to

- accuracy complete the data chart,
- understand and correctly in make an algebraic equation to use to solve problems
- use data to accurately make a coordinate graph showing slope

It’s a Drag
Data Table

Robot _____

X	Equation	Y	Ordered Pair

Robot _____

X	Equation	Y	Ordered Pair

It's a Drag
Problem-Solving Worksheet

Directions: Use the formulas from two of the robot races on the Data Worksheet to calculate the times each robot would be at the following checkpoints if the 'drag strip' is twice as long and more checkpoints are added.

Robot _____

X	Equation	Y	Ordered Pair
1.5			
2.5			
3.5			
5			
6			
7.5			
Finish			

Robot _____

X	Equation	Y	Ordered Pair
1.5			
2.5			
3.5			
5			
6			
7.5			
Finish			

It's a Drag
Individual Assessment

Robots Flash and Lightning completed a drag race. Use the information below to figure out the equations that can be used to find the missing times. Complete the data tables for each robot.

Robot: Flash

X checkpoints	Equation (3.5) X = Y	Y seconds	Ordered Pair
1	3.5 (1) = 3.5	3.5	(1, 3.5)
2	3.5 (2) = 7	7	(2, 7)
3	3.5 (3) = 10.5	10.5	(3, 10.5)
4 (finish)	3.5 (4)= 14	14	(4, 14)

Robot: Lightning

X checkpoints	Equation (4) X = Y	Y seconds	Ordered Pair
1	4 (1) = 4	4	(1, 4)
2	4 (2) = 8	8	(2, 8)
3	4 (3) = 12	12	(3, 12)
4 (finish)	4 (4) = 16	16	(4, 16)

Which robot won the race? (Flash _____) How much faster did he run the course? (2 seconds _____)

If the course was twice as long, what would be the finishing times for:
Flash 28 seconds_____ Lightning 32 seconds_____

Create a coordinate graph on a piece of graph paper to show slopes for Flash and Lightning.
slopes)

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