Ready, Set, Go!

Calculating the Speed of Our Bearded Dragon

Lesson Overview

As a part of our study of forces and motion, students will use our bearded dragon, Darwin, to practice calculating speed. They will measure the distance and time it takes for him to move. They will analyze distance/time graphs to describe the motion of various objects, including Darwin! This lesson integrates science and ELA is intended for 5th grade, but it could be adapted for other grade levels to meet your needs. The lesson will be completed over several days.

Learning Objectives

Ohio's Learning Standards: Grade 5 Science

Strand: Physical Science (PS)

Topic: Light, Sound and Motion

Content Statement: The amount of change in movement of an object is based on the mass of the object and the amount of force exerted. Movement can be measured by speed. The speed of an object is calculated by determining the distance traveled in a period of time.

English Language Arts: Grade 5

Conventions of Standard English:

CCSS.ELA-LITERACY.L.5.1

Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

CCSS.ELA-LITERACY.L.5.2
Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

Lesson Materials

Meter sticks, stopwatches, calculators, task cards, student worksheets, SMART board or other screen to show videos and images, computers with internet access, paper, coloring supplies…and a bearded dragon!

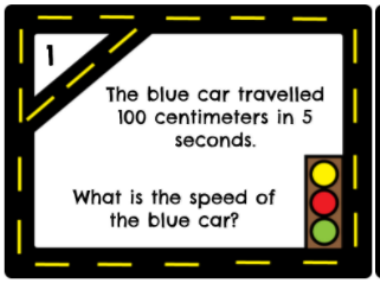
Prior Learning Experiences & Background Knowledge

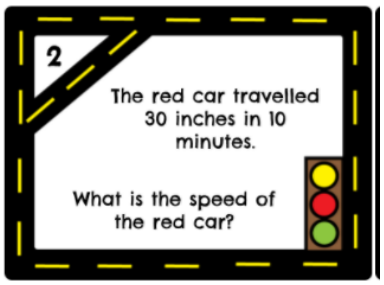
Students have learned about inertia and Newton's First Law of Motion. They understand that a force is a push or a pull, and forces cause changes in an object's motion. Students have learned the formula for calculating speed (distance ÷ time). We solved speed problems on the SMART board together.

Lesson Plan

Part 1:

Students will practice calculating speed with simple word problems on task cards. One task card will be on each desk. Students will solve one problem at a time. They will record their answers on their answer sheets. Students will move to the next task card when the teacher rings the chime/bell. *Students who need a multiplication chart or calculator can use them for this activity. After all students have solved all speed problems, go over the answers.





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Part 2:

Students have seen Darwin run in his tank, and they have seen him run after superworms. He gets around quickly, but how fast does he actually run?

Students will work in small groups (3-5) to determine Darwin's speed. They will use the following lab sheet to record their measurements and calculations. *I will bring Darwin to each group. I will hold him until they are ready. While students are waiting for Darwin and I to come to their group, they will calculate the speed of the toy car and fill in their lab sheet.

Name _____ Ready, Set, Go! Lab: Calculating Speed

Directions:

1. Check that the stopwatch reads zero. Practice starting and stopping the stopwatch.
2. Once team member will put a piece of tape on the floor where Darwin starts (by the tip of his tail).
3. One team member will start the stopwatch once Darwin starts running.
4. Stop the stopwatch when Darwin stops moving. Record the time in the table below.
5. Measure the distance Darwin traveled and record the distance in the table. *Measure to the tip of his tail.
6. Calculate the speed. Divide the distance by the time. Record the speed in the table.
7. Repeat this process for all three trials.
8. Calculate the average of the speeds. (Round to the nearest tenth.)

Bearded Dragon	Distance (cm)	Time (sec)	Speed (cm/sec)
Trial 1			
Trial 2			
Trial 3			

https://docs.google.com/document/d/1mGlmVoblDwzsGqNJAzRrQ3qweqsdzlEBNALbLQDPBoA/edit?usp=sharing

Question: What was Darwin's average speed? _____

*You will repeat the same experiment as above, but this time roll the car down the ramp.

Car	Distance (cm)	Time (sec)	Speed (cm/sec)
Trial 1			
Trial 2			
Trial 3			

Questions: What was the average speed of the car? _____

Which had the faster speed: Darwin or the car? _____

Part 3:

Students will analyze distance/time graphs. They will learn how the slope of the line can help them describe the object's motion and speed.

1. Review: Darwin speed problems. Students will read word problems about Darwin's motion. They will calculate his speed, and record answers on their paper. An example is below:

> Darwin spotted a delicious hornworm across the room. The hornworm moved slowly, and Darwin ran quickly to eat it. He ran 30 centimeters in 2 seconds.
>
> What was Darwin's speed?

2. Show the "Graphs Tell Stories" video. Discuss the runners' speeds throughout the race. Pause the video, so the graph is displayed on the board. Discuss how the slope of the line can help them describe the speed of each runner. (A flat, or horizontal, line means there was no motion. Time was passing, but the object's distance did not change.)
Graphs Tell Stories video: https://www.youtube.com/watch?v=yoLtHZHseKw

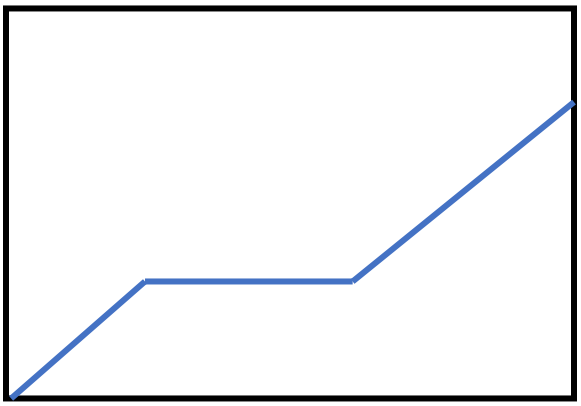
3. Analyze another distance/time graph. Display the graph on the board. Explain to the class that the graph shows Darwin's motion. Describe Darwin's motion based on the graph. Explain your thinking to the class for each segment of the graph. (A-B is Darwin moving fast/constant speed- he is running after a dubia roach running across the carpet. B-C is not moving- Darwin stopped to eat the roach. C-D is Darwin running slowly after another roach, but he is a little tired, so it is a slower/constant speed, because the slope is not as steep.) http://szalonta.hu/ske/text/G2/s3i2.png

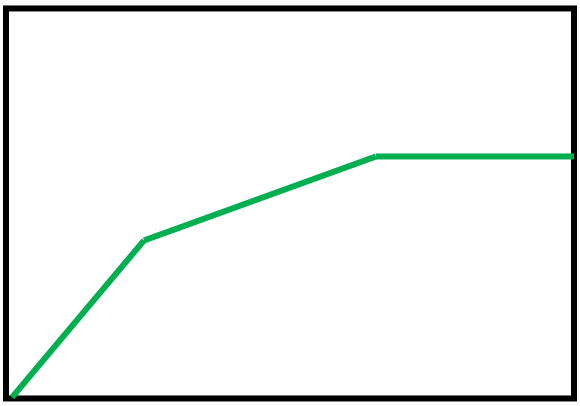
4. Show the "Calculating Speed" video. Give students a copy of the graph. After showing the video, students should review the graph and the motion of the car. They will work in their table groups and write the explanation for each segment on the paper. Go over the answers after groups have had enough time to discuss and write their answers.
   Calculating Speed video:
   https://www.youtube.com/watch?v=JZD3WlqtRyo&index=2&list=PLr4gjpKsCRiMbCwarPpeiEk04uZf5xm0W&t=2s (This video is used for the visual of the graph. It goes into detail about calculating speed from the distance-time graph, but I use it for students to see the motion of the car causes changes in the graph.)

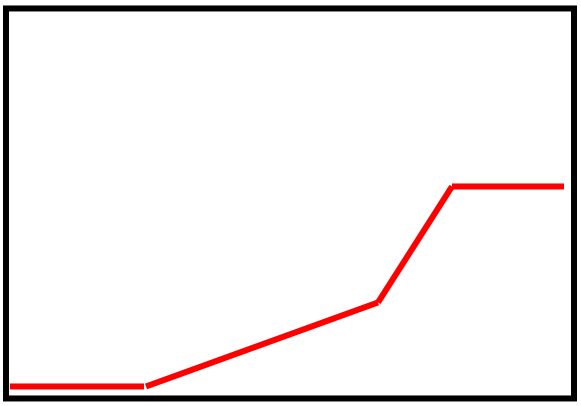
Part 4:

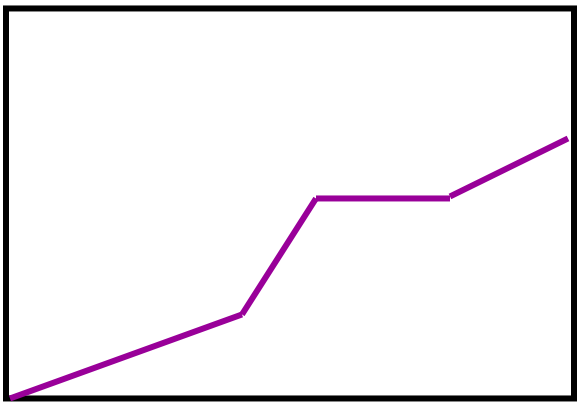
1. Display another distance/time graph on the board. Give students the chance to make up a story in their groups or with a partner based on the graph. Share stories.
   http://images.slideplayer.com/39/11026801/slides/slide_2.jpg

2. Students will get one of the following distance-time graphs. They need to write a story about Darwin using the graph. Their stories should explain the changes in Darwin's motion and speed. (Students complete this individually.)









Option 1: Students can type their story in a Google Doc. Students can add images to illustrate their story.

Option 2: Students can make a booklet out of paper. They can draw and color pictures to illustrate their story.

Option 3: Students can make a cartoon or comic.

Assessment

1. Students will be assessed on the lab and speed problems for correct calculations. They need to have the correct number and include a unit for their answers.

2. Students will also be assessed on their Darwin graph stories. Stories need to be at least 2 paragraphs long. They need to explain each distinct segment and change in motion of the graph in their story.