

# Keep on Moving! It's About the Climb

## Linear Proportionality and Representations



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<b>Grade Level</b>	7th Grade	<b>Time Frame</b>	90 minutes
<b>Subject</b>	Mathematics	<b>Duration</b>	1-2 class period(s)
<b>Course</b>	Middle School Mathematics		

### Essential Question

How are graphs, tables, and rates connected?

### Summary

This lesson is intended to introduce and reinforce how proportional relationships are displayed in graphs and tables. Students will need a basic understanding of graphing and will apply that knowledge to calculating rates based on scenarios.

### Snapshot

#### Engage

Students look at two social media posts and observe the different graphs in each.

#### Explore

Students interpret scenarios and determine if their graphical properties.

#### Explain

Students connect academic language about linear proportionality to scenarios, graphs, and justifications.

#### Extend

Students construct their own scenarios and answer keys.

#### Evaluate

Students switch scenarios and try to solve a classmate's scenario.

## Standards

*Oklahoma Academic Standards for Mathematics (Grade 7)*

**7.A.2.1:** Represent proportional relationships with tables, verbal descriptions, symbols, and graphs; translate from one representation to another. Determine and compare the unit rate (constant of proportionality, slope, or rate of change) given any of these representations.

**7.A.2.2:** Solve multi-step problems involving proportional relationships involving distance-time, percent increase or decrease, discounts, tips, unit pricing, similar figures, and other real-world and mathematical situations.

## Attachments

- [Linear-Proportions-Scenarios - Spanish.docx](#)
- [Linear-Proportions-Scenarios.docx](#)
- [Linear-Proportions.pptx](#)
- [Make-Your-Own-Scenario - Spanish.docx](#)
- [Make-Your-Own-Scenario.docx](#)

## Materials

- Lesson Slides (attached)
- Linear Proportions Scenarios (attached)
- Make Your Own Scenario (attached)

## Engage

Ask students what kind of stuff they like to follow on social media. Let them just informally share out.

### Teacher's Note: Guiding the Discussion

Don't let this get out of hand. Hone in on answers like "cute animals" or "celebrities" or "makeup tutorials" rather than specific people or explicit topics.

Display the first graph on the slide, and say that this is an Instagram account that makes funny graphs (so a cool, yet nerdy, social media account).



*This is the first graph*

Ask students:

- What is this graph telling you? Write down in your notebook EVERYTHING you think the graph is telling you.
- What does the straight line mean compared to the curved lines? Write down your thoughts in your notebook.

Allow students to share their thoughts with their neighbors after each question, but don't make a production out of it.

### Teacher's Note: Notebook?

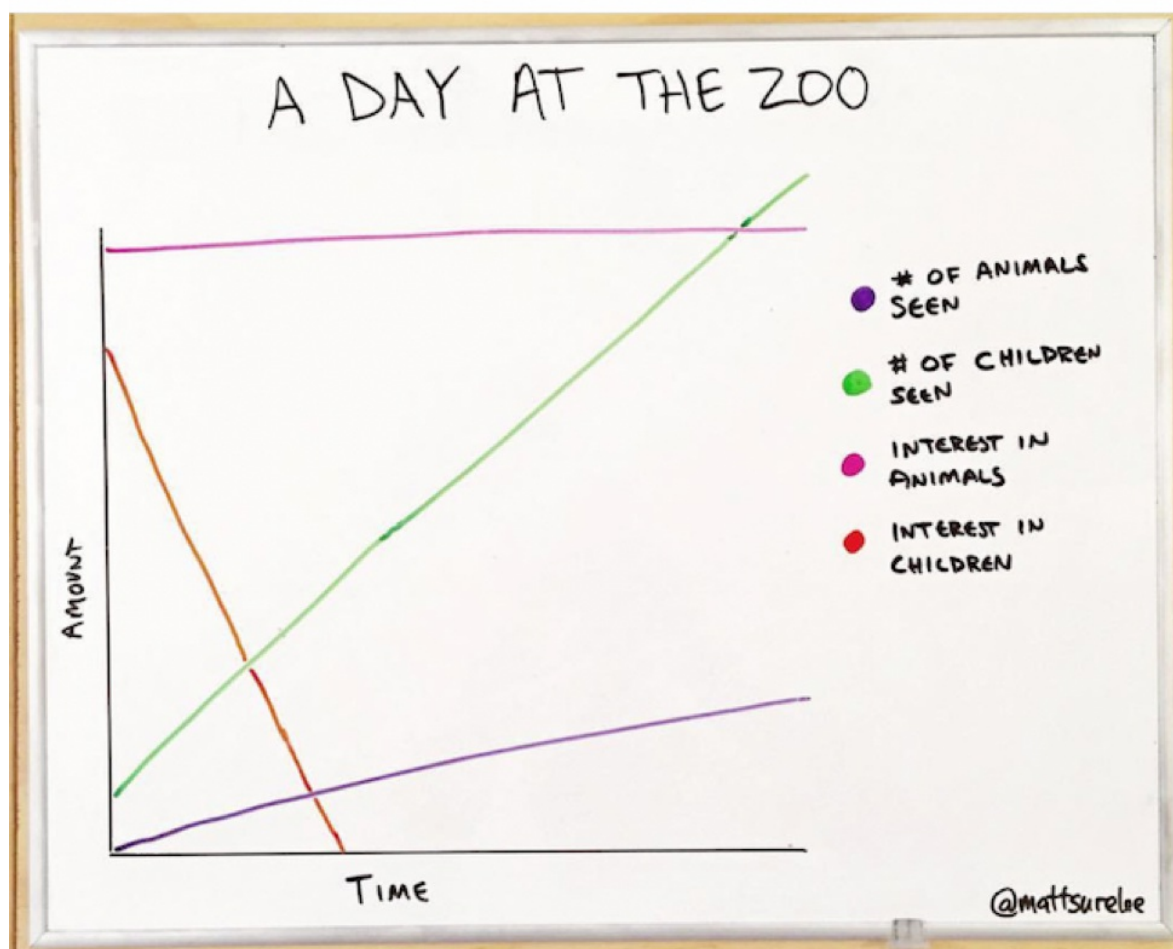
If you don't have students use an interactive notebook, you can have this happen wherever students normally take notes. Having students write out their initial brainstorming, and prompting them to revisit those notes later, is a great skill. The recommendation is for them to have an Engage or Pre-Work section just for these, and an Explore or Work section immediately afterward.

If you have time, show the next graph on the next slide. (If you don't have time, just move on.)



mattsurelee 

L.A. Zoo



*This example is harder since they are all straight lines. However, this graph is closer to addressing the standard. So, make time if possible.*

## Explore

Pass out the worksheet with a variety of scenarios written out. Tell students their job is to see if the scenario could be graphed as a straight line, and what characteristics the line would have, and how they would figure out how to graph that line.

### **Teacher's Note: Different Scales for Different Folks**

Keep in mind you will probably need to provide scaffolding with scaling for units while graphing.

While students work through the scenarios, walk around and help as needed.

### **Teacher's Note: Individual or Group Work?**

Groups are great, but so is individual work time. Just decide what students need so they feel good about the task. If you pick working together, probably restrict it to just pairs.

## Explain

Once students are done, walk through each scenario and ask if it could be graphed as a straight line or not. Have students “vote” either way, and for the first few, have them talk out their process on how to graph out the scenario.

### Teacher’s Note: Just a Few

Just have students talk through the first few because, hopefully, the same logic path was used for every problem. At some point, the talk aloud would become repetitive, which is when the talk aloud portion ends and we just reveal the correct answers.

Tell students that there is academic math language for what we just did, and they’re going to write the following words down.

### Teacher’s Note: Taking Notes

Be very explicit of what is written down in notes and what isn’t. The only way students learn how to take notes is if we teach them how to take notes.

Display slide 12 with the following words and definitions:

Point to *rate*; explain that this is probably how they figured out how to correctly graph the scenarios. Walk them through how to write out the rate of the first linear scenario, and then have them go back through and write out the rates of the other linear scenario.

Wrap up this section by asking “Why did we not write a rate for the non-linear scenarios?” If students struggle with this, point out that we can’t write one rate for non-linear (or even piecewise linear scenarios) to help them get to the idea that a simple rate will always be a line, and nonlinear has a lot of different rates in one graph.

## Extend

Ask students if there is a situation in their life that could have a constant rate to it. Pass out the handout that will help them map out and graph their personal scenario. This includes a section to write out the scenario like a narrative, a table to put their data points in, a blank for the rate (with units!), and a graph for them to chart it out.

### **Teacher's Note: Modes of Graphing**

To be more like the Engage graphs, let them use the dry-erase coordinate planes if you have them. If you don't have them, don't stress! You could use the handout, poster paper, Desmos, etc.

# Evaluate

Have students cut up their handout along the dotted lines separating all the components of their scenario. Group students in groups of four or five, and mix all of their pieces together in the center.

Then, have the groups try to match all pieces together successfully.

## **Teacher's Note: The Joy of Learning**

Yeah, of course students can just match handwriting or the scissor cuts, but where's the fun in that?? Let them know that you understand they could take a shortcut, but that isn't helping with their learning compared to if they actually try.

## **Teacher's Note: Taking a Grade?**

If you'd like a grade, assessing correct, full completion of their individual scenarios could work, or you could add on an exit ticket of a new scenario (that you'd need to make) if you want something more. There was a lot of practice in this lesson, and just leaving it with students' putting together one another's scenarios is a happy way to end the class.



## Resources