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KENTUCKY CENTER FOR MATHEMATICS

Let's Do Math with KCM- Middle Grades

Visualizing Proportions

Welcome!

Your host

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Kentucky Center for Mathematics

- KCM seeks to advance the knowledge and practice of effective mathematics teaching and learning, encompassing early childhood through adult education.
- KCM provides and develops statewide leadership, facilitate professional learning experiences, and cultivate innovation with the aim of improving mathematics education, practice and policy.

KCM Yearly Numbers

29 math courses taught

73 cohorts of teachers

Over 1000 KY teachers attending

Over 182 days of math professional learning

Over $150,000 of math materials directly in the hands of teachers

109 school districts

300 KY schools

100 principals trained

>5000 students impacted

KCM Annual Math Conference national prominence

Closing the achievement gap for our KY math students.

Math Achievement Fund intervention students (3000) had an average of 10 percentile points gained as a direct result of KCM trained math interventionists.

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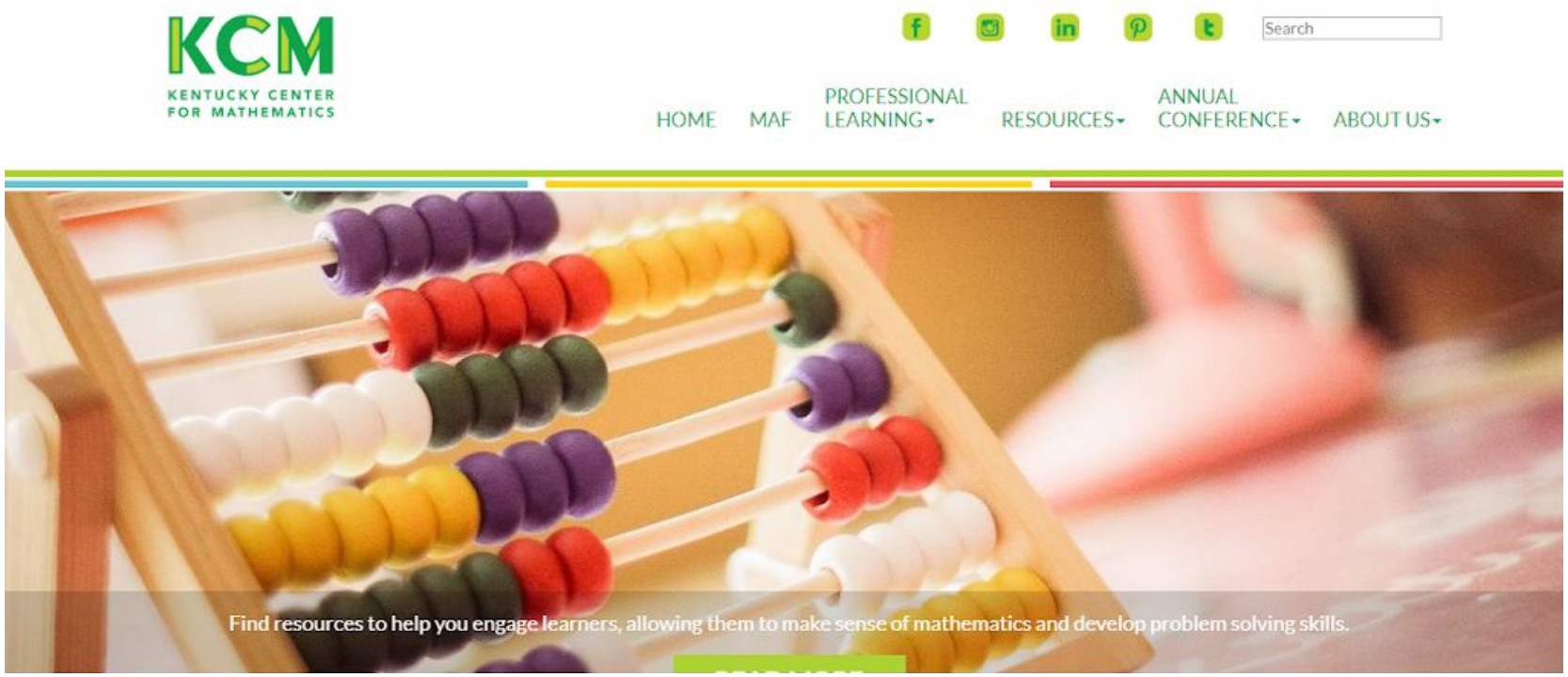
Visit Our Website

www.kentuckymathematics.org



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Today's Goal

Let's Do Math together

To share tasks and resources that:

- Promote reasoning and problem solving
- Allow for multiple entry points
- Encourage students to play with mathematical ideas
- Can be used when remote teaching

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Today's Agenda

- What's the research?
- Review content standard
- Let's see & do math
  - Mr. Short & Mr. Tall
  - Marcellus the Giant
- Ratio Tables
- KCM here to support teachers
- #BetterTogether #TeamKCM

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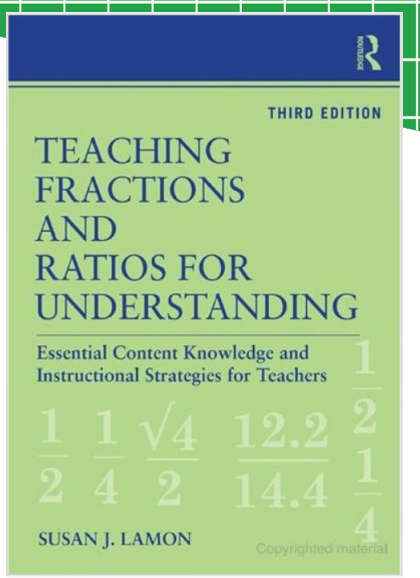
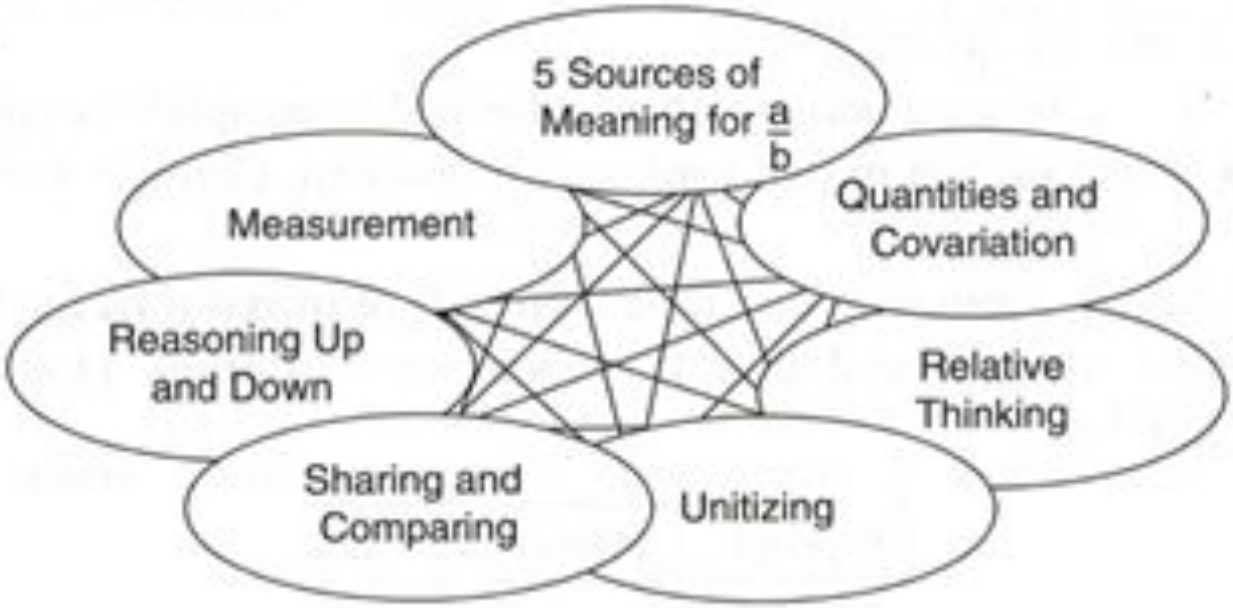
Research





Core ideas for developing **rational number understanding** and **proportional reasoning**

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Teaching Fractions and Ratios for Understanding,third edition by Susan Lamon (page 10) .

Proportional Reasoning

- Refers to “the ability to scale up and down in appropriate situations and to supply justifications for assertions made about relationships in situations involving simple direct proportions and inverse proportions” (Lamon, 2012)

- Reasoning up and down in situations where there is a constant relationship between two quantities that are linked and varying together

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Standard

- KY.7.RP.2

KY.7.RP.2 Recognize and represent proportional relationships between quantities. a. Decide whether two quantities represent a proportional relationship. b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams and verbal descriptions of proportional relationships. c. Represent proportional relationships by equations. d. Explain what a point *(x, y)* on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, *r)* where *r* is the unit rate. **MP.1, MP.2, MP.3**	a. Students test for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. b. Students understand finding the unit rate in a table or graph is equivalent to the constant of proportionality in an equation or verbal description. KY.8.F.2 KY.8.F.4 Coherence KY.6.RP.3a →KY.7.RP.2b →KY.8.EE.6 c. If total cost *t* is proportional to the number n of items purchased at a constant price *p*, the relationship between the total cost and the number of items can be expressed as $t = pn$. Coherence KY.7.RP.2c → KY.8.EE.5 d. Students describe points (*x, y*) in terms of the labels of the *x*- and *y*-axes; students understand in a proportional relationship (0, 0) is a valid point and (1, *r*) represents the unit rate and the constant of proportionality for the relationship between the quantities.

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Standard

KY.7.RP.2

Recognize and represent proportional relationships between quantities.

a. Decide whether two quantities represent a proportional relationship

d. Explain what a point (x,y) on the graph of a proportional relationship means in terms of the situation

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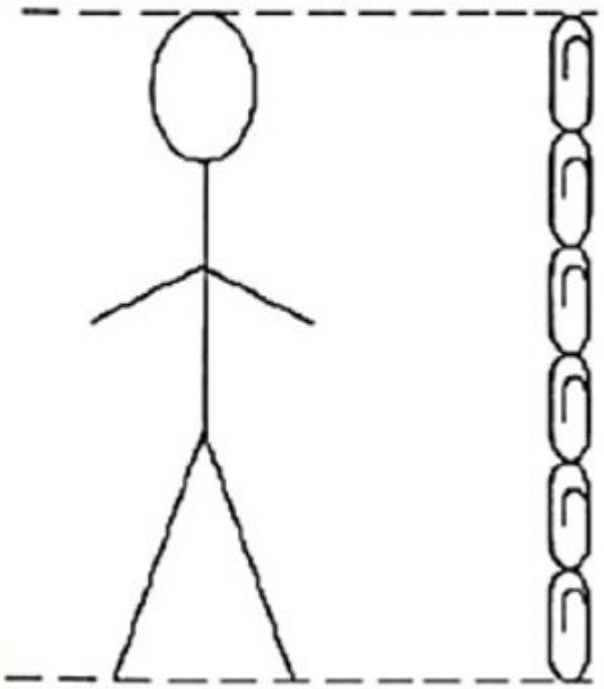
Mr. Short and Mr. Tall



Here is a picture of Mr. Short. When you measure his height in paperclips, he is 6 paperclips tall.

When you measure his height in buttons, he is 4 buttons tall.

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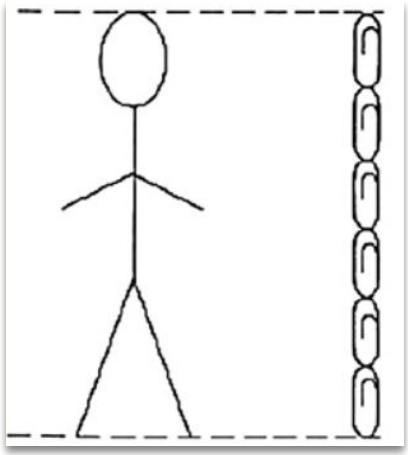
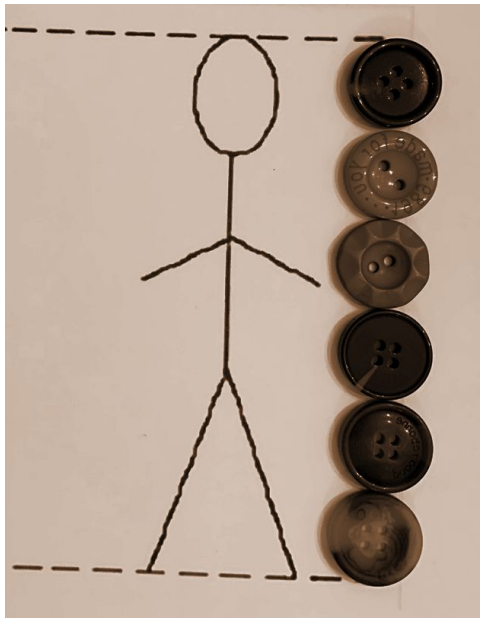
Mr. Short and Mr. Tall



Mr. Short has a friend named Mr. Tall. When you measure Mr. Tall in buttons he is six buttons tall.



What would Mr. Tall's height be if you measured it in paperclips?

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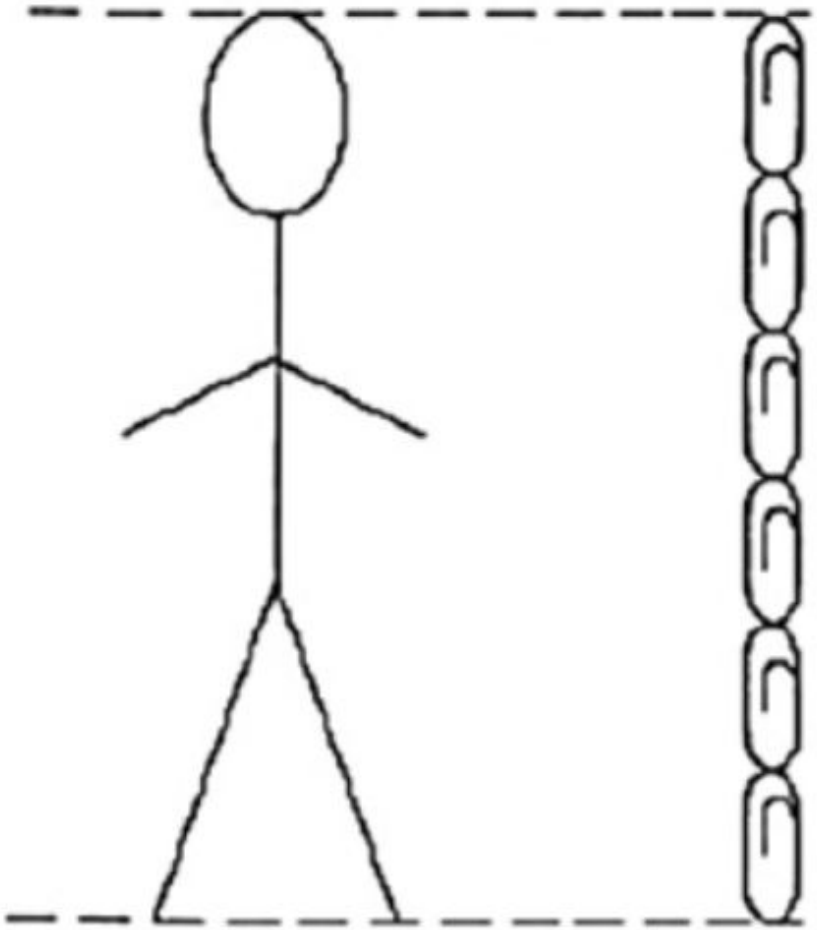
Mr. Short and Mr. Tall



This is a picture of Mr. Short. When you measure his height in paperclips, he is 6 paper clips tall. When you measure his height in buttons, he is 4 buttons tall.

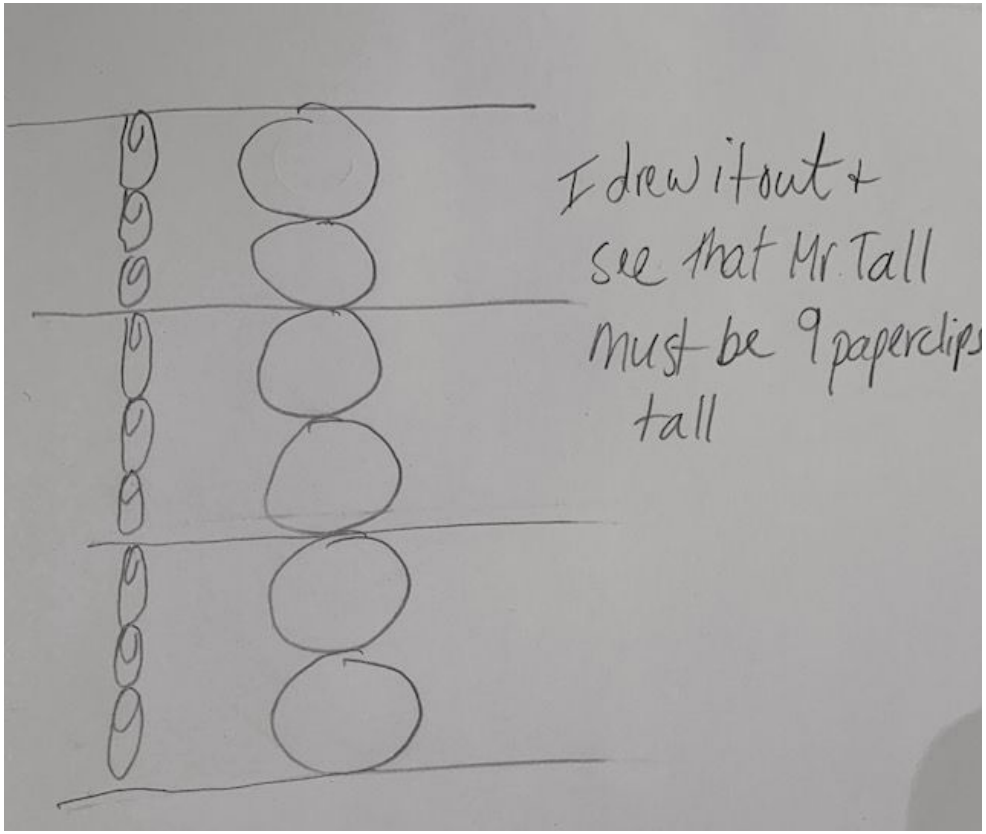
Mr. Short has a friend named Mr. Tall. When you measure Mr. Tall's height in buttons, he is 6 buttons tall. What would be Mr. Tall's height if you measured it in paper clips?

Mr. Short and Mr. Tall

Here is one student's solution to Mr. Short and Mr. Tall.

What's his strategy?

Even though he did not express a proportion symbolically, what proportion does he appear to understand?



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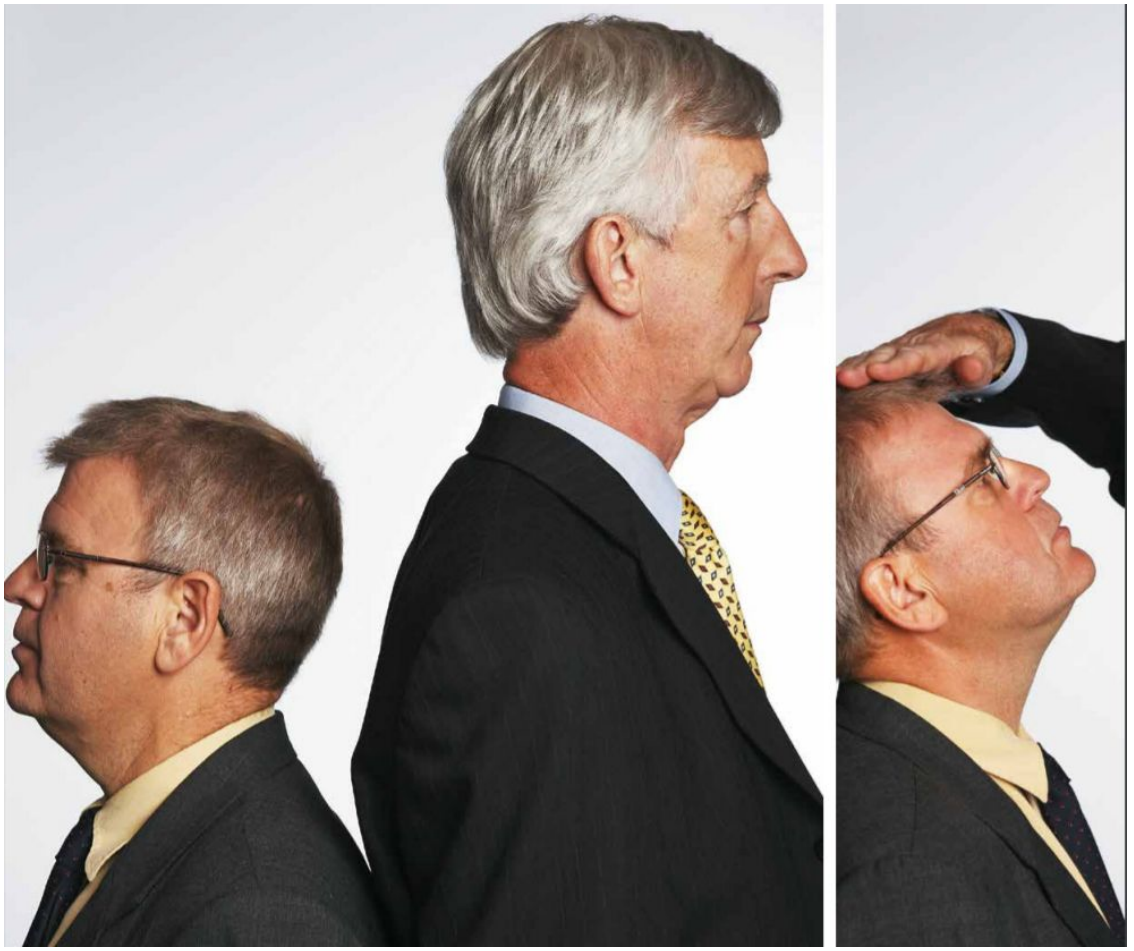
Revisiting Mr. Tall and Mr. Short

- NCTM article in handouts
- Looks at student work and reasoning



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Mr. Short and Mr. Tall

Mr. Tall's car is 15 paper clips long.
How long is his car if we measure it in buttons?

His car is 7 ½ paperclips wide. How wide is it in buttons?

Mr. Short and Mr. Tall- Ratio Table

Paper Clips	Buttons
9	6
3	
	4
15	

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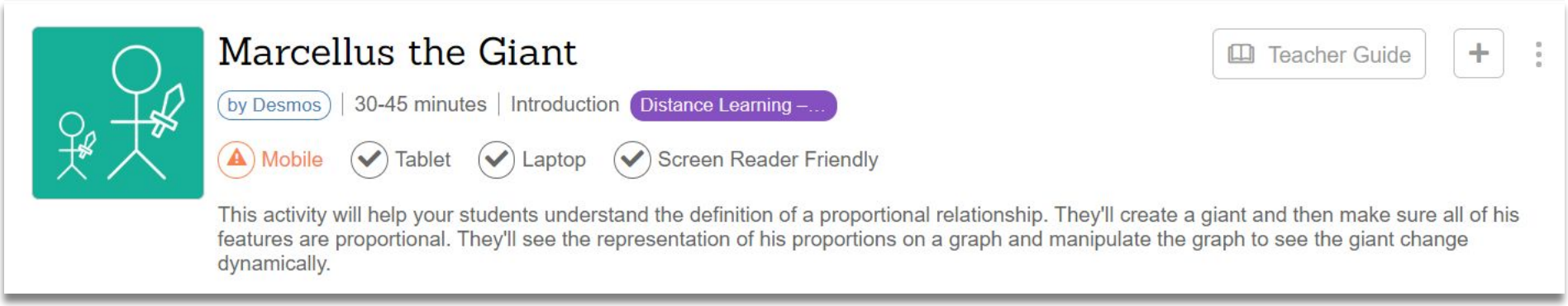
Marcellus the Giant- Desmos



Uses images and scaling to build understanding of what a proportional relationship is- defining the concept with multiple representations

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Teacher Guide

Marcellus the Giant

CLASS CODE

30-45 minutes | Introduction

This activity will help your students understand the definition of a proportional relationship. They'll create a giant and then make sure all of his features are proportional. They'll see the representation of his proportions on a graph and manipulate the graph to see the giant change dynamically.

French translation courtesy of Jocelyn Dagenais:
https://teacher.desmos.com/activitybuilder/custom/596750b9b52f643b4d5acc66

Activity Checklist

- ☐ Complete the activity using student preview.
- ☐ Identify your learning targets for the activity.
- ☐ Determine the screens where you'll bring the class together using Teacher Pacing and Pause Class. What will you discuss on those screens?
- ☐ Anticipate screens where students will struggle, then plan your response.
- ☐ Plan a challenge for students who finish the activity quickly and successfully.
- ☐ Make yourself available during the activity to students for individual help and questions when appropriate.
- ☐ Write out your summary of the activity's main ideas. How will you pull student work into that summary? Which parts of the activity can you skip to ensure that summary receives sufficient time?

My Learning Targets:

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Proportional Reasoning

Remember our everyday definition:

- Reasoning up and down in situations where there is a constant relationship between two quantities that are linked and varying together

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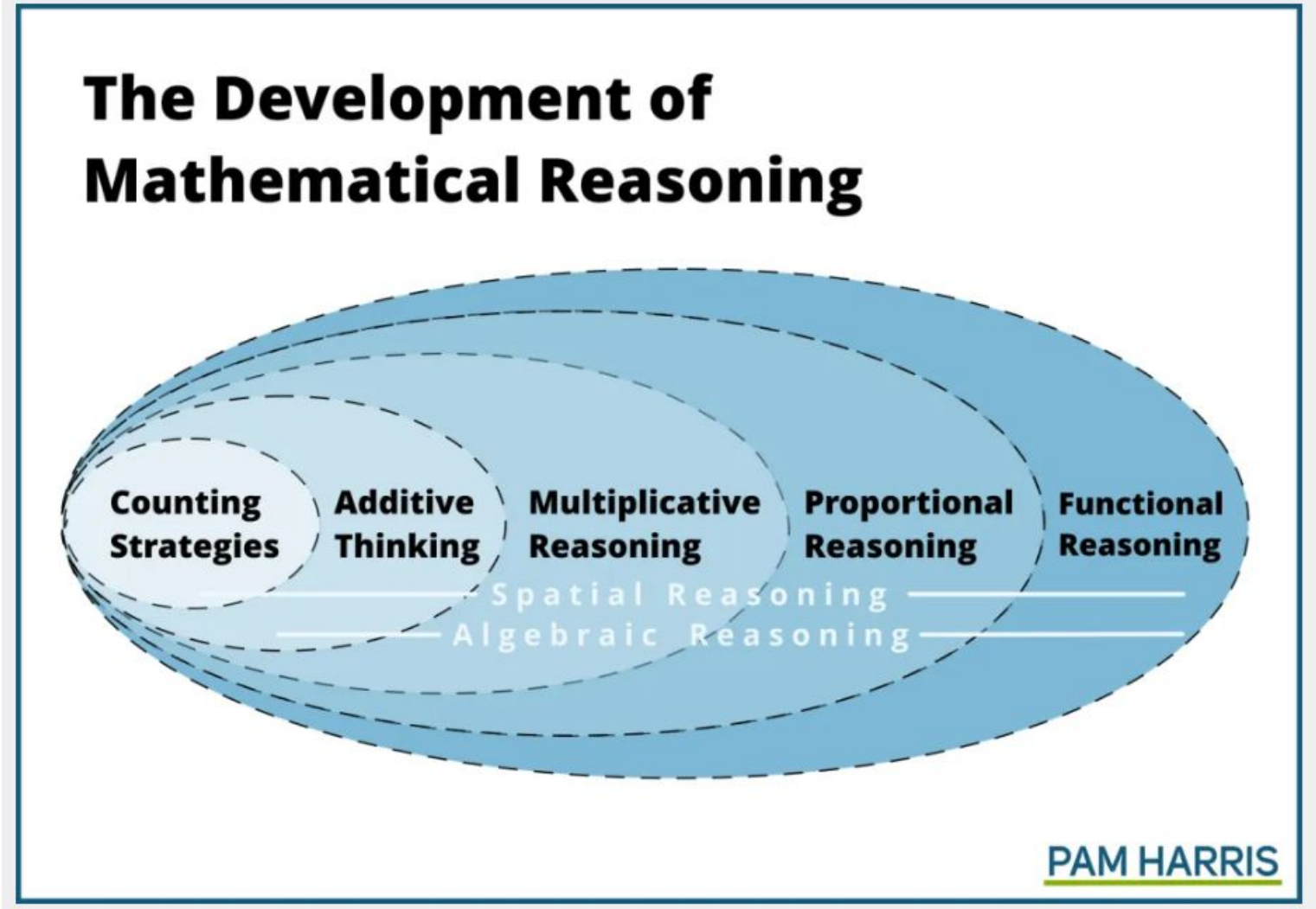

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https://www.mathisfigureoutable.com/development/

Why we visualize proportions & work on multiplicative reasoning:

"Proportional reasoning is critical for success in algebra. Students need lots of practice with the multiplicative relationships of ratios, rates, and proportions before they learn cross-multiplication as an algorithm."

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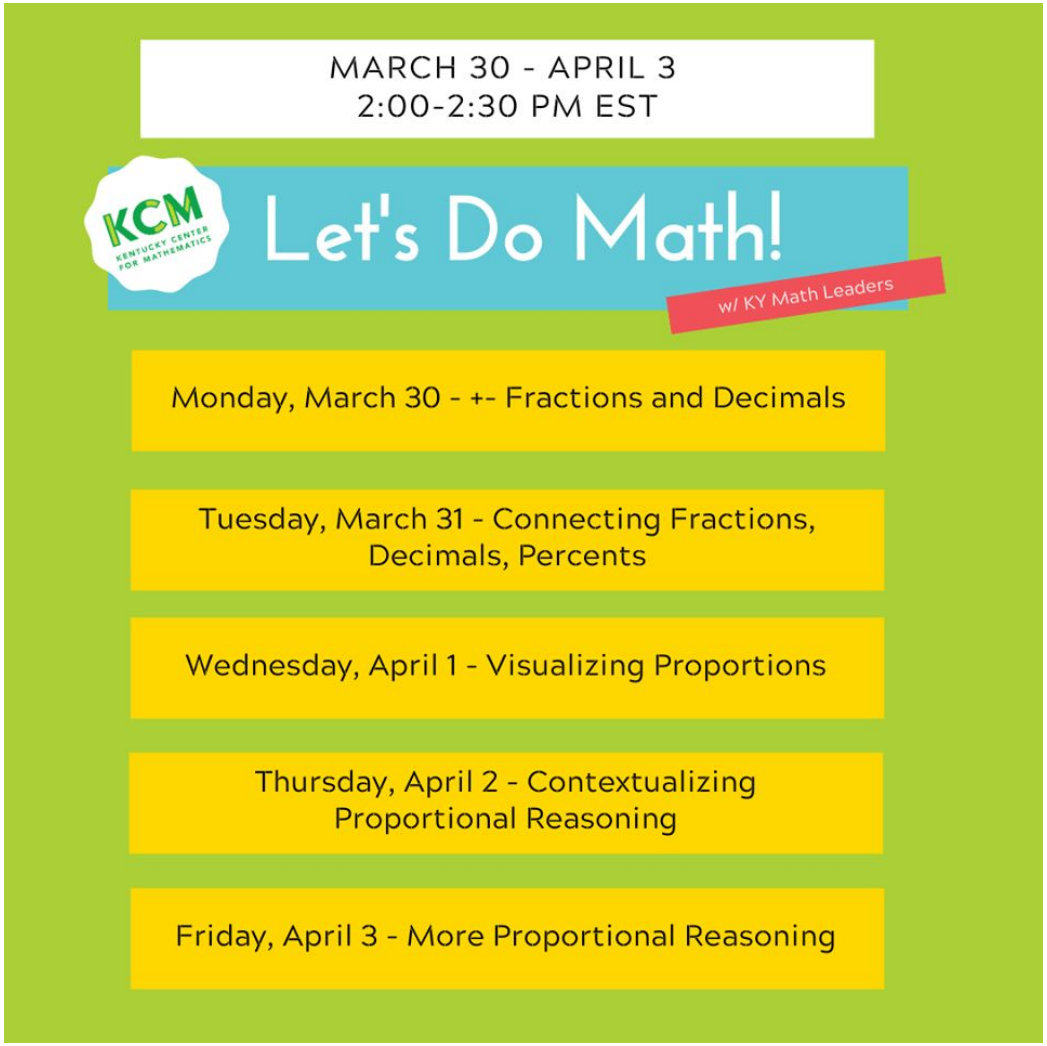
Upcoming Virtual Professional Learning



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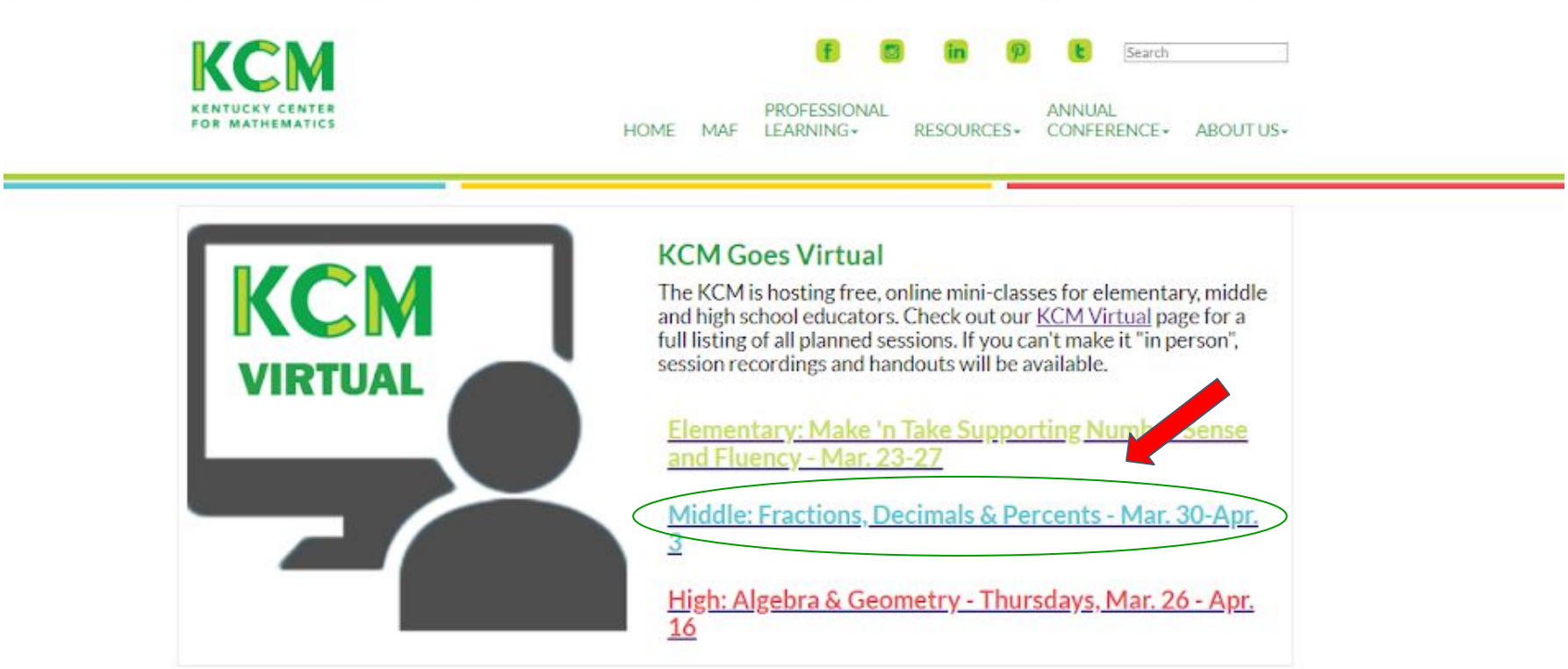

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KCM Support for Educators

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