

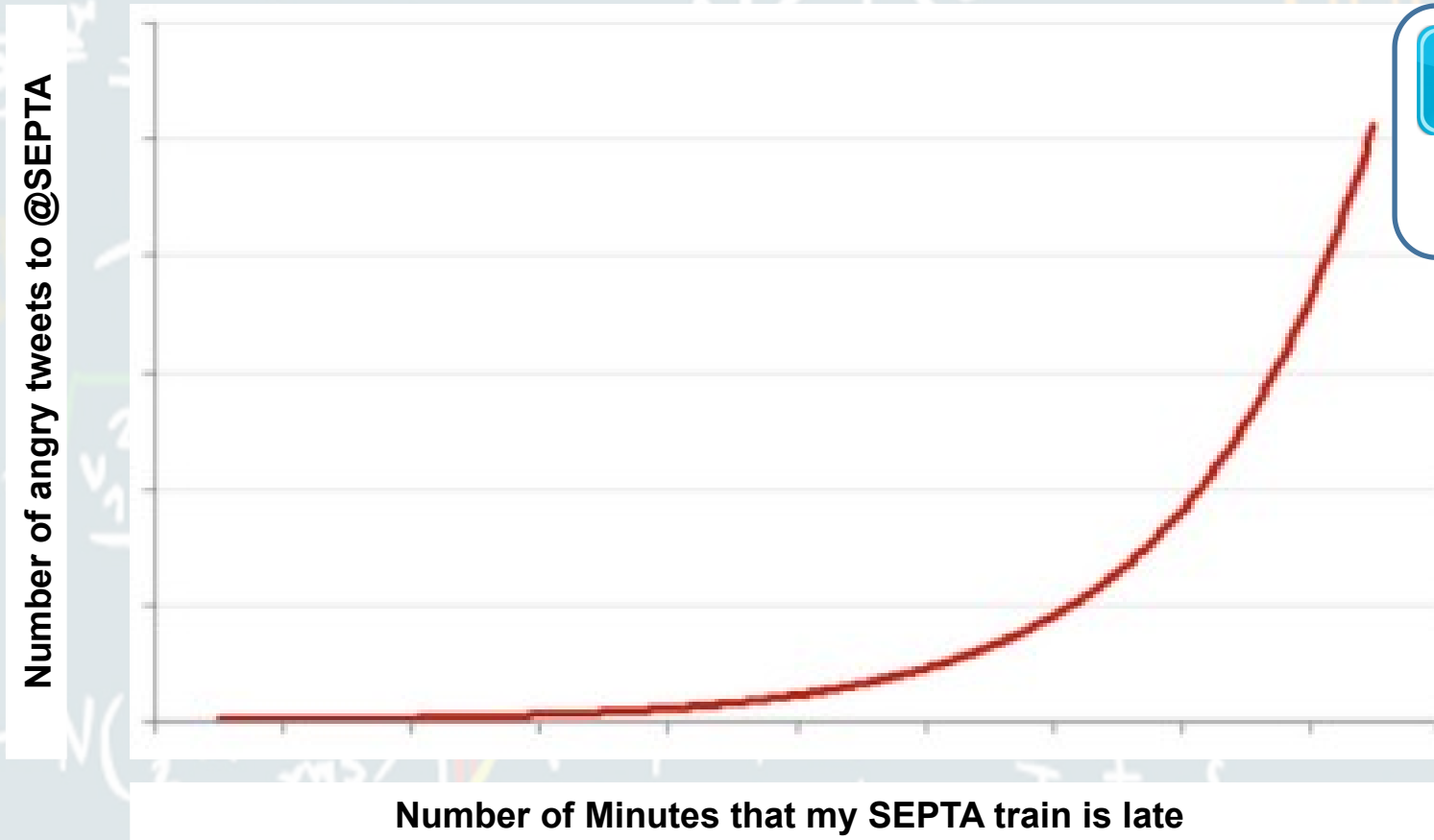
# Strategies for Effective Math Tutoring

GEAR UP Coach All-Campus Training

February 4<sup>th</sup>, 2017

# Graph yourself....

- Using the graph label the axis to describe your personality.
- Share and explain your graph to others in a small group.



Seriously?! [@SEPTA](#) 😡 🚆



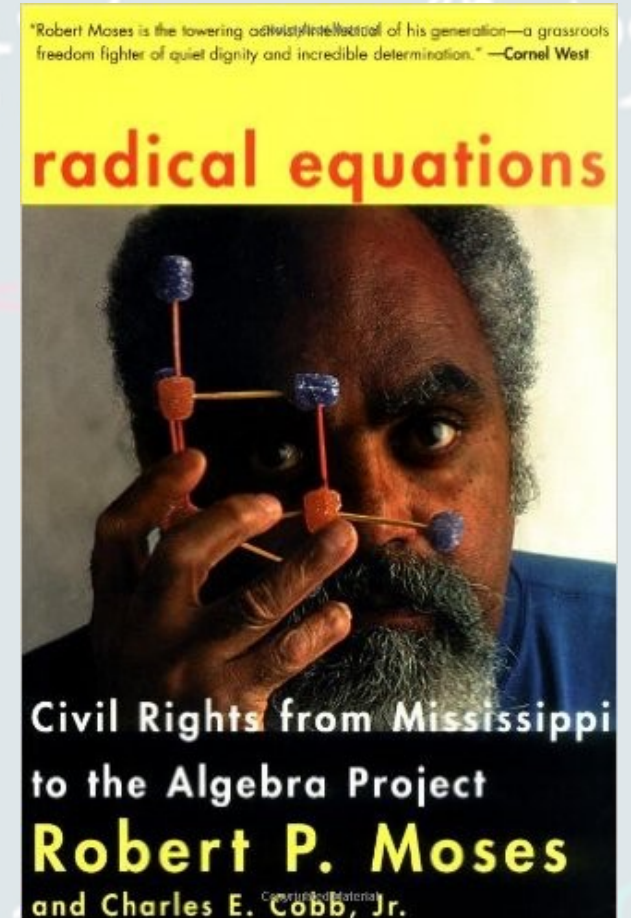
stickfigz.com

**“American students have not been succeeding in the mathematical part of their education at anything like a level expected of an international leader. Particularly disturbing is the consistency of findings that American students achieve in mathematics at a mediocre level by comparison to peers worldwide.”**

Source: National Mathematics Advisory Panel. Foundations for Success: The Final Report of the National Mathematics Advisory Panel, U.S. Department of Education: Washington, DC, 2008; p. xii

# The Global and Knowledge Economy...

“This rapid transformation elevated the educational requirements for people to access economic opportunities to fully participate in their citizenship; it also prompted the country to introduce legislation that encouraged standards of “universally available schooling.” As a result, algebra has become a gatekeeper of higher learning, career, and economic opportunities.”



Source: The Algebra Project - <http://www.algebra.org/>



# Goals of Good Tutoring

1. Helping the tutees **gain knowledge and skills** in the subject area. The focus is on immediate learning needs and on building a **foundation for future learning**.
2. Helping the tutees to gain in **math maturity**. This includes learning **how to learn math**, learning how to **think mathematically** and learning to become a **more responsible math student** (bring necessary paper, pencil, book, etc. to class; pay attention in class; do and turn required assignments).
3. Helping tutees learn to effectively deal with the various stresses inherent to being a student in our **educational system**.

Source: *Becoming a Better Math Tutor* by David Moursund & Robert Albrecht

<http://>

[i-a-e.org/downloads/free-ebooks-by-dave-moursund/208-becoming-a-better-mat](http://i-a-e.org/downloads/free-ebooks-by-dave-moursund/208-becoming-a-better-math-tutor/)

# Challenges

- ❑ Many students never gain an overview understanding of the whole game of math. They **learn math as a collection of unrelated elements**.
- ❑ The typical student a math tutor encounters tends to be **struggling** in our math education system.
- ❑ Tutees might make **statements and/or ask questions** such as the following that may be adverse to the goals of your tutoring session.

**Can you think of some potential examples?**

Source: *Becoming a Better Math Tutor* by David Moursund & Robert Albrecht

<http://i-a-e.org/downloads/free-ebooks-by-dave-moursund/208-becoming-a-better-math-tutor/>

**“I just can’t do math.”**

**“I’ve got better things to do in life than waste time doing**

**“Why do we have to learn this stuff?”**

**“Math is boring.”**

**“Math scares me.”**

**“The stuff we do in math class is not relevant to my life.”**

**“I hate math.”**

**“The math teacher makes me feel dumb.”**



# Tips for Math Good Tutoring – Two Way Communication

- ❑ The tutees learn to **express** (demonstrate) what they know, what they don't know, and what they want to know.
- ❑ Much of the success of tutoring lies in the tutor helping the tutee gain and regularly use **communication and attention-focusing skills**.
- ❑ Tutees should be actively **engaged in conversation** with the tutor.
- ❑ The tutor **provides feedback** based on what the tutee says and does.



Source: *Becoming a Better Math Tutor* by David Moursund & Robert Albrecht

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# Tips for Math Good Tutoring – Two Way Communication

- ❑ Tutoring is **not a lecture session**. Tutoring differs from the teacher talking to a class of 30 students, with the teacher delivery of information occasionally interrupted by a little bit of student response or question asking.
- ❑ Two-way communication in tutoring is especially **designed to facilitate learning**.
- ❑ Tutees who learn to effectively participate in such a communication have gained a **life-long skill**.

Source: *Becoming a Better Math Tutor* by David Moursund & Robert Albrecht

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# Activity - Engaging in math dialogue

What do you know or believe about the number 13?

An aluminum (Al) atom has 13 protons

Sum of factors of 13 = 14

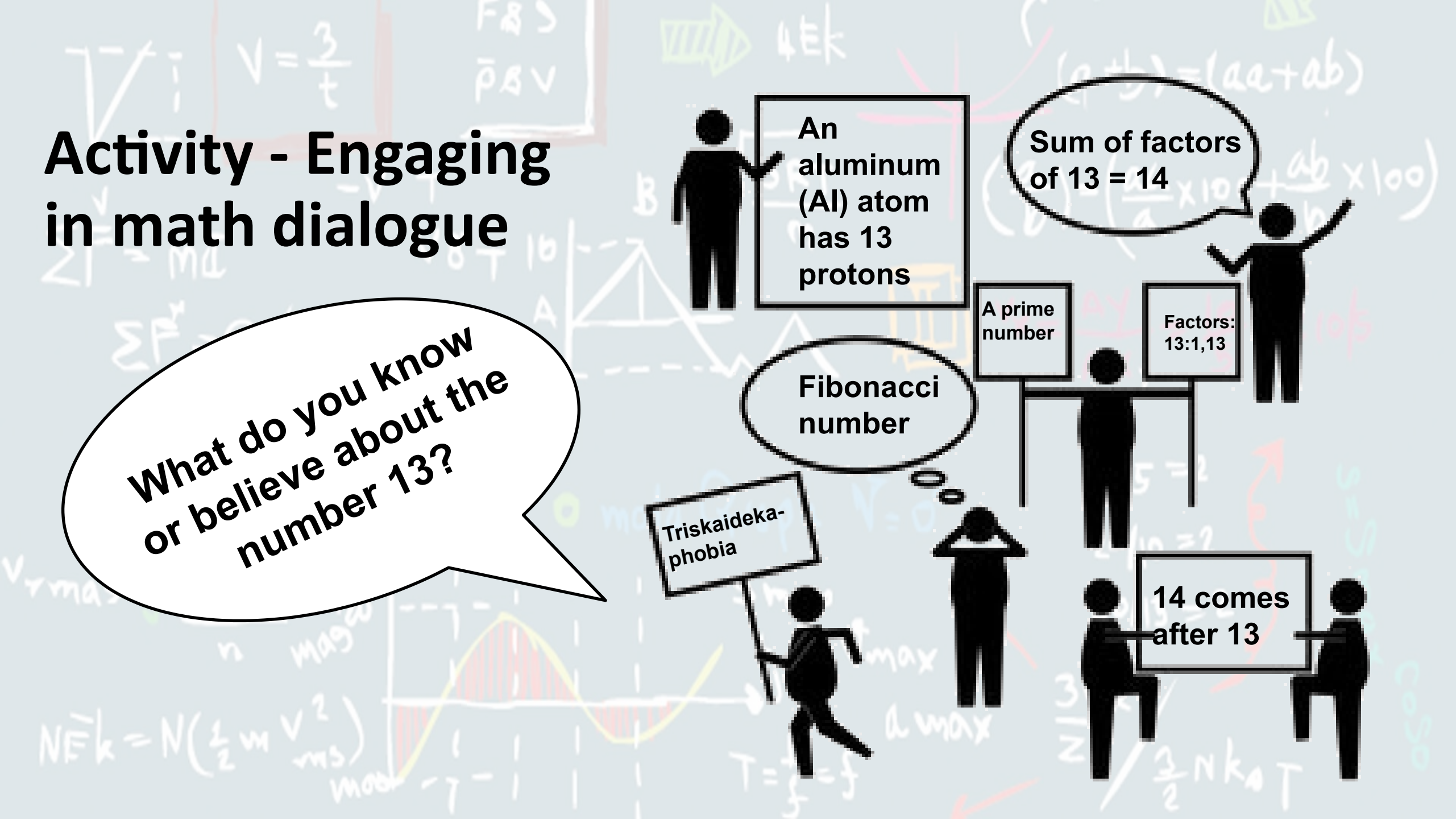
A prime number

Factors: 13:1,13

Fibonacci number

Triskaidekaphobia

14 comes after 13



# Tips for Math Good Tutoring – Interaction Starters

- ❑ Used to establish two way communication.
- ❑ Good way for the tutor both to role model math communication and to better understand the tutees math knowledge, skills, and weaknesses.



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# Tips for Math Good Tutoring – Active Listening

- ❑ Intentionally focuses on who you are listening to, whether in a group or one-on-one, in order to understand what he or she is saying.
- ❑ As the listener, you should then be able to repeat back in your own words what they have said to their satisfaction. This does not mean you agree with the person, but rather understand what they are saying.

## Math tutoring example:

**Ask the tutee to respond to, “What did you learn in math class since the last time we got together?” If the tutee’s answer is too short and/or not enlightening, the tutor can ask probing questions.**

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# Tips for Math Good Tutoring – Creating a Repertoire of Activities

- ❑ Math contains a large number of “fun” but challenging activities for students.
- ❑ A math tutor can have a **repertoire of such activities** and draw an appropriate one out of the bag when time and the situation seem right.



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# Tips for Math Good Tutoring – Mathematical Equations Rethinked Under Common Core

Take for example the concept: *the division of fractions.*

Traditionally, we have been taught to

$$\frac{1}{3} \div \frac{4}{5}$$

flip the second fraction...  
and multiply!

$$\frac{1}{3} \times \frac{5}{4}$$

Where we multiply the reciprocal of the divisor (the answer being 5/12).

But **why?** And what does the result mean?



# Cont.

Just from symbols and numbers, it can be difficult to comprehend why the answer is 5/12.

But! Here comes to Common Core method:

- The key is **visualization**.

<https://www.youtube.com/watch?v=5SmaxC0S0>



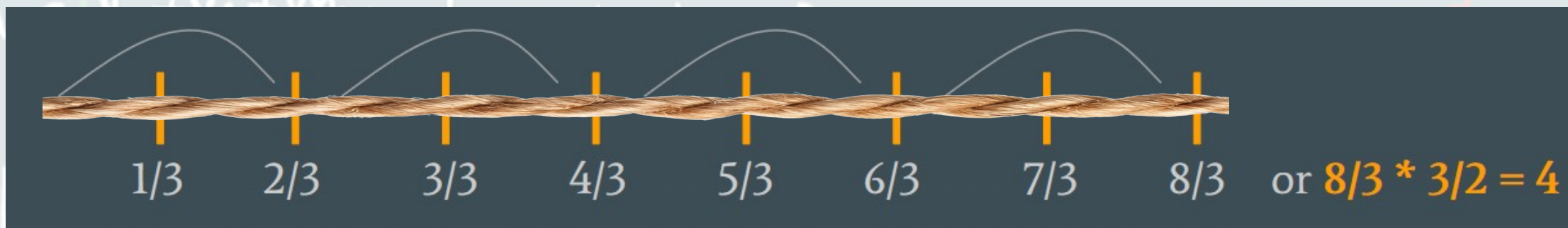
# Cont.

*“Tricks and tips get you somewhere, but a deep understanding gets you anywhere.”*

Common Core Mathematics Standards emphasize:

- Deep **mastery** of concepts (**Process > Result**)
- Visualization enables **contextual application**

Take for example: *There is a  $\frac{8}{3}$  cm string. Each student in class gets  $\frac{2}{3}$  cm of that string. How many students in total can the teacher give out that string to?*



# Resources

- ❑ The Algebra Project - <http://www.algebra.org/>
- ❑ Being A Better Math Tutor - [https://www.math.cornell.edu/twiki/pub/MSC/BecomingABetterMathTutor/Becoming\\_a\\_Better\\_Math\\_Tutor.pdf](https://www.math.cornell.edu/twiki/pub/MSC/BecomingABetterMathTutor/Becoming_a_Better_Math_Tutor.pdf)
- ❑ Math Learning Center: <http://www.mathlearningcenter.org/>
- ❑ Khan Academy <https://www.khanacademy.org/math>
- ❑ Pearson/Prentice Hall Algebra 1 Textbook Video Tutorials and Tests <http://www.phschool.com/webcodes10/index.cfm?area=view&wcprefix=atk&wcsuffix=0099>