PCMI

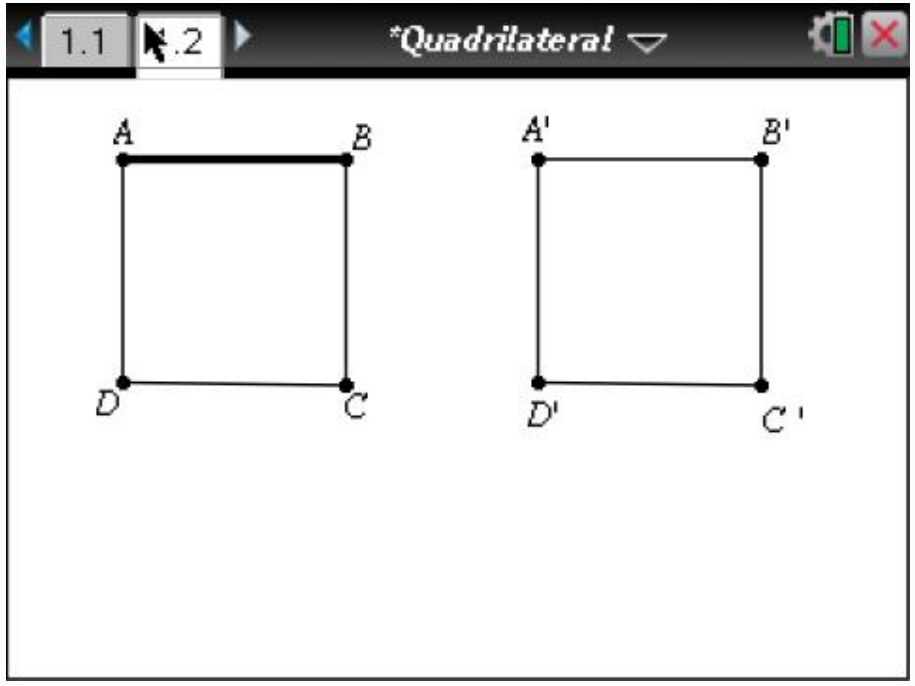
- 3 aspects
  - For your mathematics
  - For your teaching
  - For your community
- Reflecting on Practice

Reflecting on Practice: Worthwhile Tasks

Session 1

What makes a worthwhile task?

What do you (*as students*) predict will happen to the area if you "slant" the quadrilateral? Why?



Bringing it all together

A sixth grade class studying area of polygons in the fall

As you watch the video, consider :

- What about the nature of the task promoted or inhibited discussion?

Exponents

The teacher's goal was that students should know and be able to apply the laws of exponents. The video of this task being implemented is from the TIMSS 1999 video study and takes place in an eighth grade algebra classroom in the US. The tasks in which students are engaged are on the worksheet.

Exponents

An eighth grade class beginning the study of the exponent rules

As you watch the video, consider :

- What about the nature of the task promoted or inhibited discussion?

Exponents

SECTION 1

1. $a^2 \bullet a^4 =$

2. $a^2 \bullet a =$

3. $a^3 \bullet a \bullet a^4 =$

RULE: $a^m \bullet a^n =$

SECTION 2

4. $(a^2)^{3n}$

5. $(a^3)^2 =$

6. $(a^2)^4 =$

RULE: $(a^m)^n =$

SECTION 3

7. $(a \bullet b)^3 =$

8. $(a \bullet b)^5 =$

9. $(a \bullet b)^4 =$

RULE: $(a \bullet b)^m =$

SECTION 4

10. $\frac{a^4}{a^2} =$

11. $\frac{a^4}{a} =$

12. $\frac{a^3}{a^2} =$

RULE: $\frac{a^m}{a^n} =$

SECTION 5

At your tables, go around the table round robin with each person offering a thought about difference in the nature of the two tasks with respect to how they promoted or inhibited discussion

Without discussion, continue around the table round robin until no one has new ideas to offer. Then open the table to general thoughts.

Choose one person at your table to record the ideas as you go.

Tasks have to be justified in terms of the learning aims they serve and can work well only if opportunities for pupils to communicate their evolving understanding are built into the planning.

(Black & Wiliam, 1998)

Mathematics Teaching Practices: Effective teachers

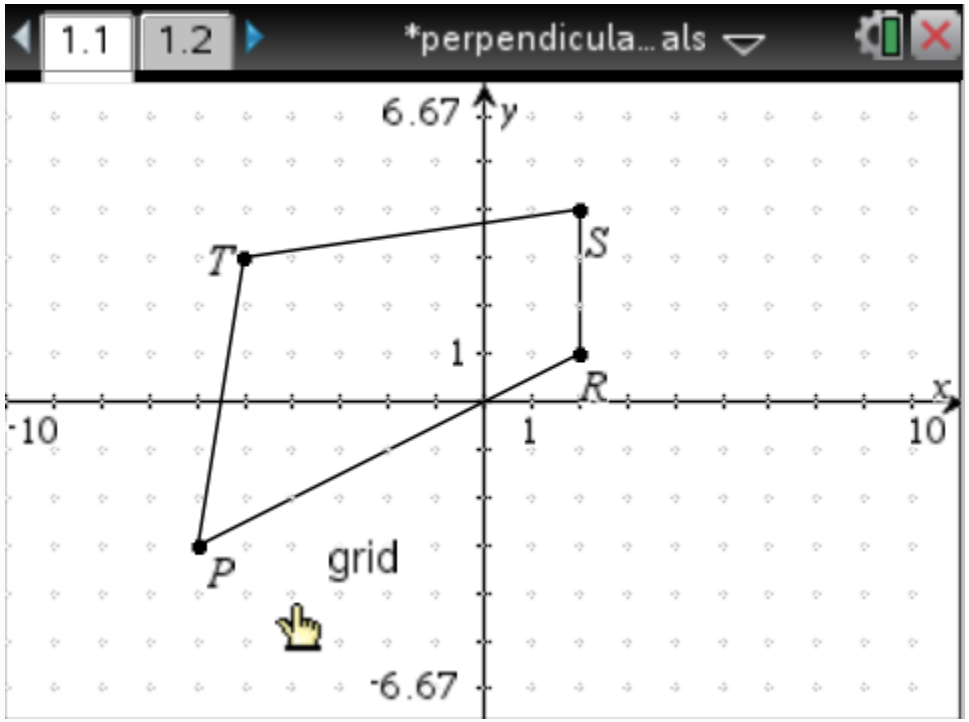
1. Establish mathematics goals to focus learning.
2. Implement tasks that promote reasoning and problem solving.
3. Use and connect mathematical representations.
4. Facilitate meaningful mathematical discourse.
5. Pose purposeful questions.
6. Build procedural fluency from conceptual understanding.
7. Support productive struggle in learning math.
8. Elicit and use evidence of student thinking.

(NCTM, 2014)

What do we mean when we say a “meaningful mathematical discourse”?

A Quadrilateral

- Move vertices R and S to create a quadrilateral whose diagonals are perpendicular to each other.



Student work

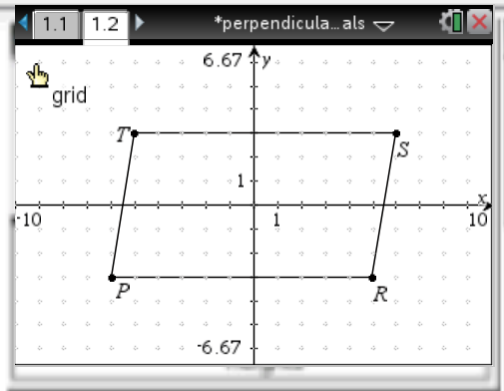
With your partner discuss what **students** might notice and wonder about when looking at these solutions. What mathematical ideas might emerge?

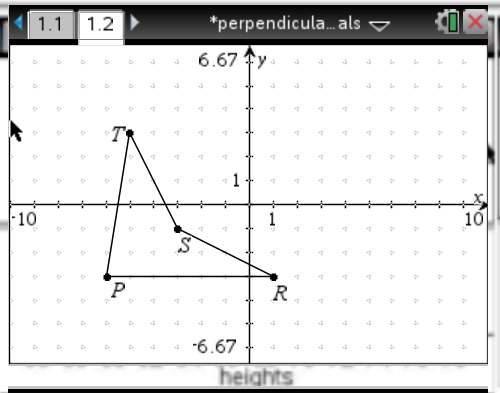
TI-Nspire CAS Navigator Teacher Software Class Capture

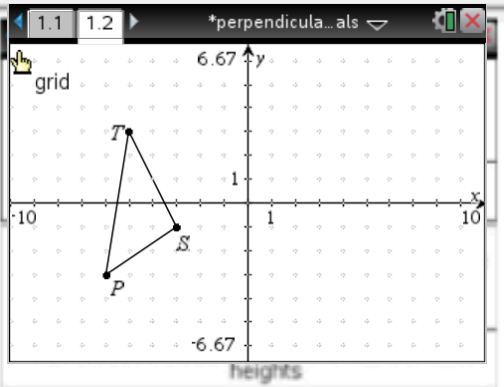
File Edit View

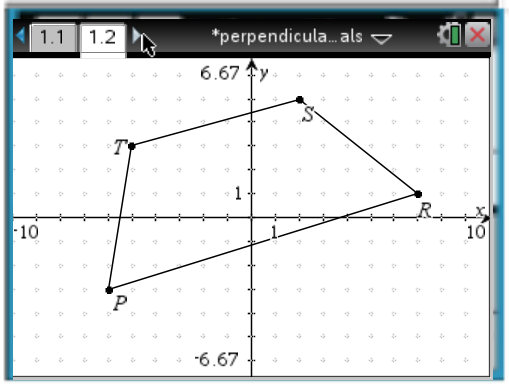
Make Presenter | Show Student Names | Auto-Refresh: 30 seconds | View

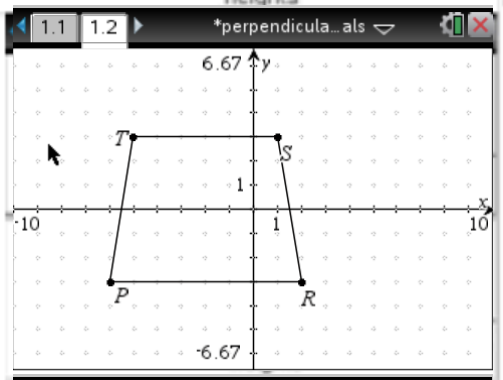
Current Frame | Add to Stack | Remove from Stack

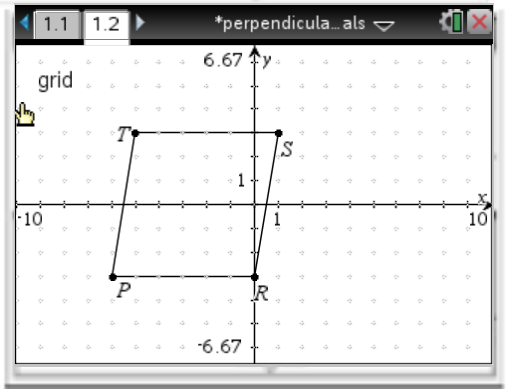


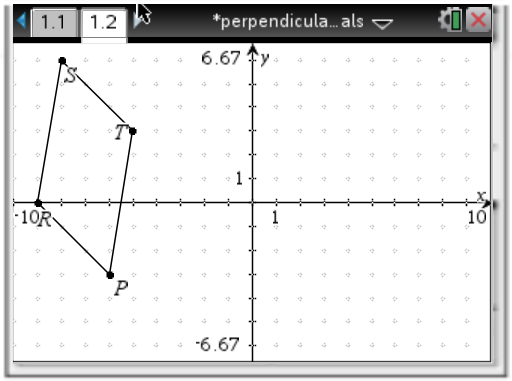


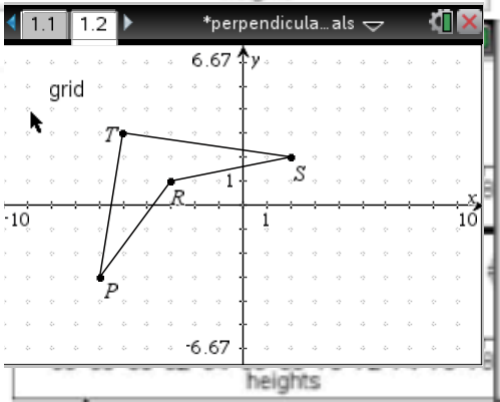


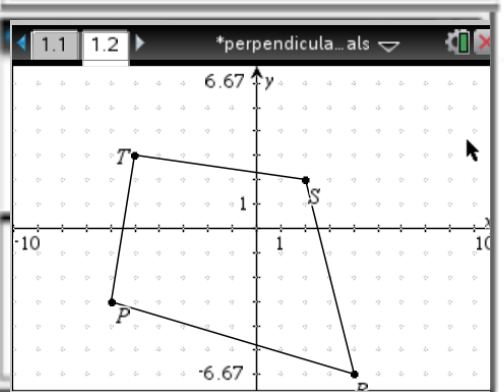












A spaghetti container has a hexagonal base. Which shape will hold the same amount of spaghetti as the original container and be the most economical?

Which shape will hold the same amount of spaghetti and be the most economical?

	Area of base	Surface area	Volume	Ratio of surface area to volume
Cylinder				
Rectangular prism				
Shape 3				

Spaghetti

Unit 1, Day 2

A pasta company sells spaghetti where each strand is 8 inches long. They wish to produce the most economical container for the spaghetti. The volume should be 128 cubic inches. Since the box must hold the spaghetti, they wish to make it 8 inches tall. What shape container should they make? Fill out the table to find out. Use at least four different dimensions for the sides of a rectangular base.

Base	Dimension of base	Area base	Height	Volume	Surface area
Circle	Radius =				
Square	Side =				
Rectangle	Length= Width =				
	Length = Width =				
	Length = Width =				
	Length =				
	Width =				

Another important consideration in a worthwhile task is the level of thinking and reasoning required of students, the cognitive demand.

What is different about the nature of this task with respect to cognitive demand than the perpendicular diagonals task?

How did the nature of the tasks we have looked at today engage students in reasoning and sense making and promote or inhibit discussion?

Discussions are important because they surface student thinking, which should inform our next steps as teachers – not to "set them straight" but to work together to negotiate mathematical understanding.

We've identified some characteristics of tasks that engage students in productive discussions.

Cirillo, M. (2013). What Are some strategies for facilitating productive classroom discussions? NCTM Research Brief. S, DeLeeuw, Series Editor, Reston VA: National Council of Teachers of Mathematics. http://www.nctm.org/news/content.aspx?id=35386

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- Bringing It All Together (2012). Video clip from T-Cubed Common Core State Standards Professional Development Workshop. Brennan, B., Olson J. & the Janus Group. Curriculum Research & Development Group. University of Hawaii at Manoa, Honolulu HI (2009).
- Cirillo, M. (2013). *What Are Some Strategies for Facilitating Productive Classroom Discussions?* NCTM Research Brief. S, DeLeeuw, Series Editor, Reston VA: National Council of Teachers of Mathematics. http://www.nctm.org/news/content.aspx?id=35386

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- National Council of Teachers of Mathematics. (2015). Principles to Actions. Reston VA: The Council
- **Timss video series 1999. US2 Exponents**

  http://www.timssvideo.com/videos/mathematics/

  United%20States