

PCMI

3 weeks

3 roles

<http://projects.ias.edu/pcmi/hstp>



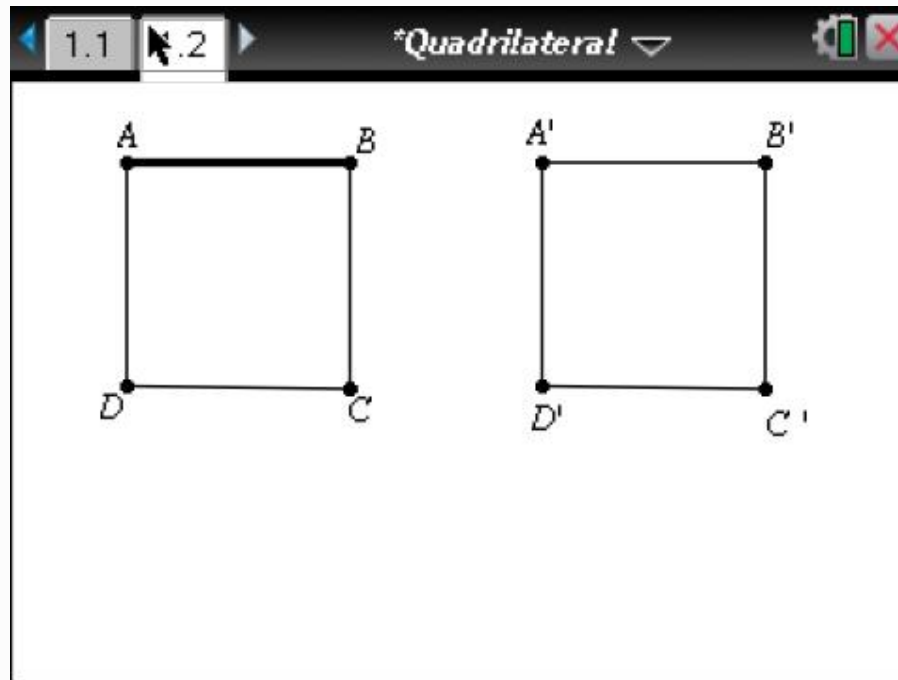
Reflecting on Practice: Worthwhile Tasks

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 :

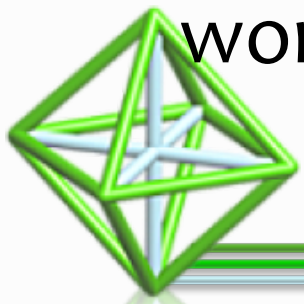
- What about the nature of the task promoted or inhibited discussion?



Video removed for copyright reasons.

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

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: $(a^n)^m =$

SECTION 3

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

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

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

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

SECTION 4

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

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

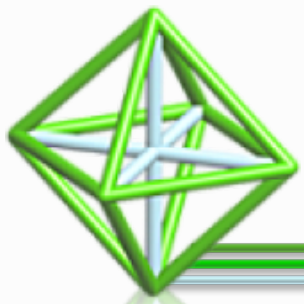
12. $\frac{a^3}{a^2} =$

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



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

By yourself, write down what you noticed about the nature of the exponent task that promoted or inhibited discussion.



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.

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



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.

- What was the big idea from your table?



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.

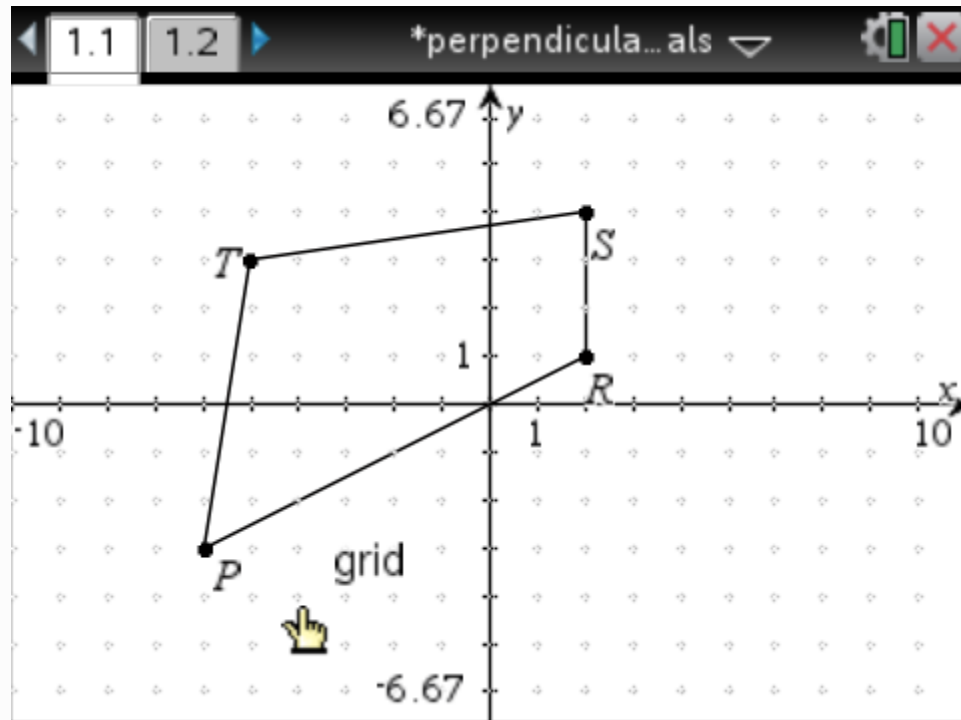


What do we mean when we say a
“meaningful mathematical discourse”?



A Quadrilateral

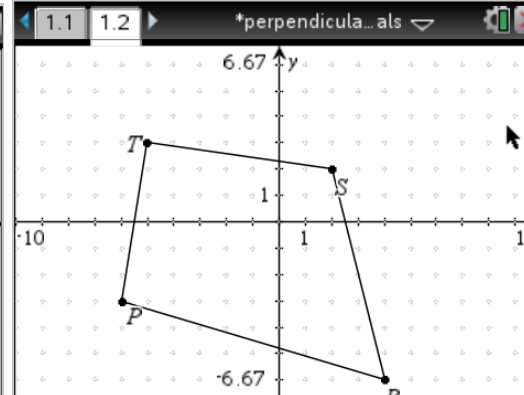
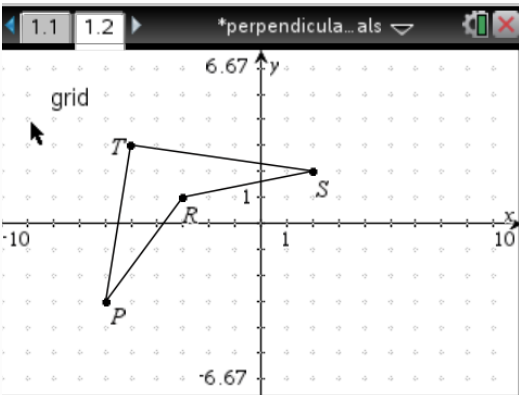
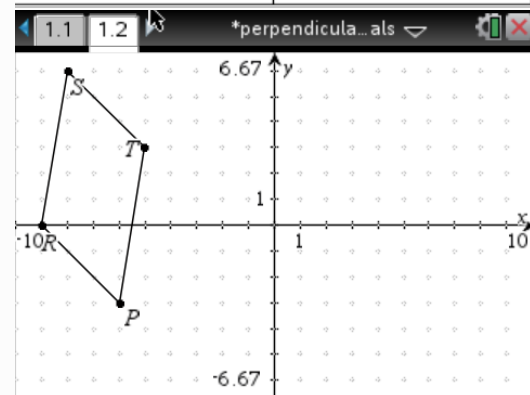
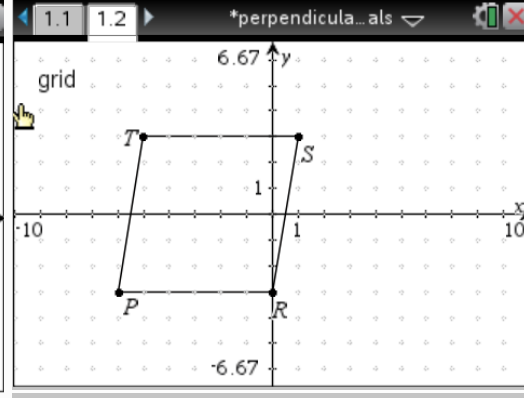
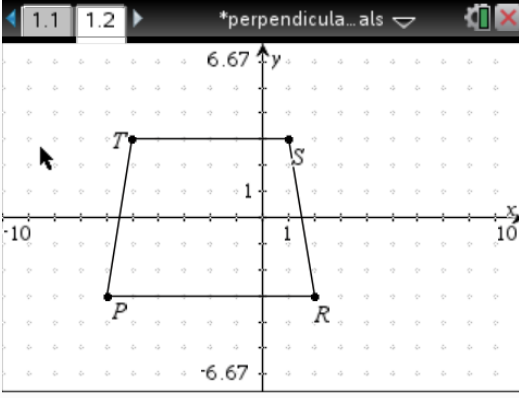
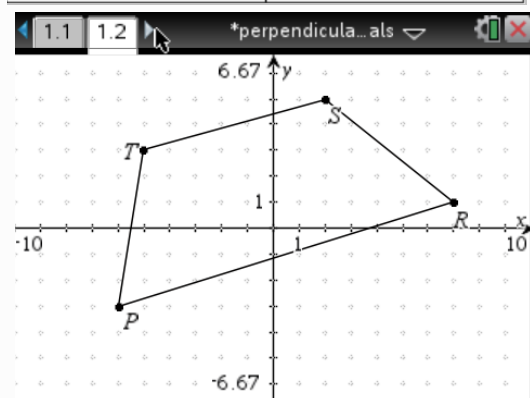
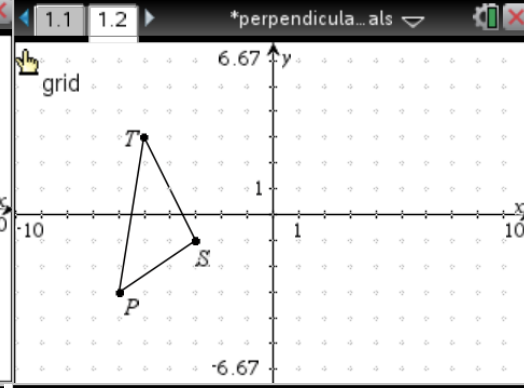
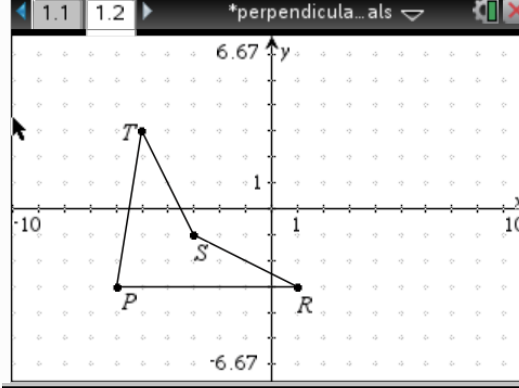
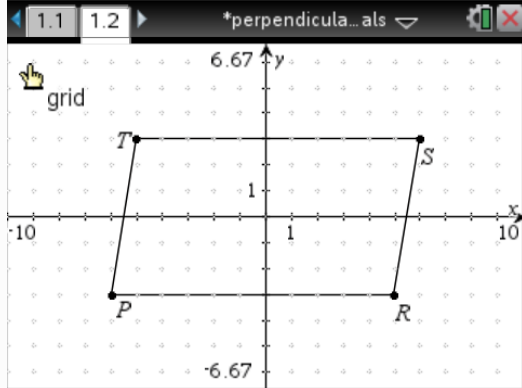
- Move vertices R and S to create a quadrilateral whose diagonals are perpendicular to each other.



Student work

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





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?

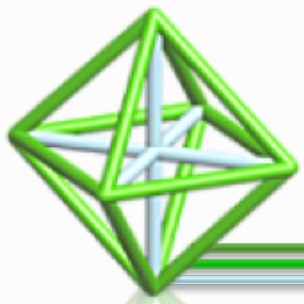


How did the nature of the tasks we have looked at today engage students in reasoning and sense making and promote or inhibit discussion?



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.

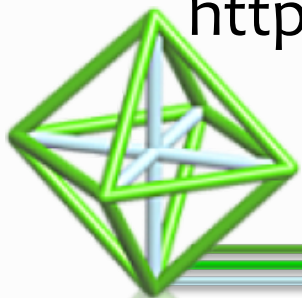


Cirillo, M. (2013). What Are some strategies for facilitating productive classroom discussions? NCTM Research Brief. S, DeLeeuw, Series Editor, Reston VA: National Council of Teachers of Mathematics. <http://www.nctm.org/news/content.aspx?id=35386>



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- **Timss video series 1999. US2 Exponents**
[http://www.timssvideo.com/videos/mathematics/](http://www.timssvideo.com/videos/mathematics/United States)
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