



“A k’utz eats \$3 of chibj per day...”:



Strategies for Solving TAKS Math Problems When Students Don’t Know All the Words



**Deborah Svedman, M.Ed.
National Board Certified Teacher
University of Texas at El Paso
MELL Conference 2009
San Marcos, Texas**



For Ruben, wherever you are

- **Agenda:**
- **Introduction, research involved– 15 min.**
- **Practice strategies – 60 min.**
 - demonstrate, examples and practice, discuss
- **Wrap-up, evaluations – 15 min.**

- **Ruben was a Maya from Guatemala whose family was shot by guerrilla soldiers in the 1980s when he was about 6 years old. He escaped. He ended up in the US at 14 with no education in any language. He spoke a Maya dialect, Mam, and very little Spanish. I learned more from him than he ever learned from me. The foreign words I'm using today are Mam.***

About Deborah Svedman:

- **28 years teaching experience in El Paso, but it all started at a migrant school in Colorado**
- **Master's in Bilingual Education**
- **National Board Certified Teacher in mathematics**
- **Certified in Texas for secondary math, general elementary, and bilingual/ESL**
- **Taught all levels: 1st grade – graduate school, even P.E.**
- **Named Exemplary Teacher by U. S. Dept. of Education**
- **National Presidential Awardee for Excellence in Science and Mathematics Teaching**
- **I have four rescued dogs***

Premise of this presentation

- **Students know some English, but are not considered fluent – they are ELLs.**
- **Students are fairly literate in their own language.**
- **Students are being taught mathematics through a constructivist approach rather than by rote procedures or memorization, i.e. they recognize certain characteristics which allow them to “build” the problem and solve it with reasoning.**
- **Students have a working knowledge of mathematical terminology (academic vocabulary).***

Formal Research

- **“Standardized tests that aim to measure academic knowledge (e.g., math, science, literacy) are not sensitive to second language literacy development. What is perceived as lack of mastery of the content is often instead the normal pace of the second language acquisition process (Abedi & Lord, 2001; Echevarria & Graves, 2003; Solano-Flores & Trumbull, 2003).**
- **Tests are confounded by aspects of adolescent ELLs’ diversity (e.g., native language literacy, family background, educational history, mobility patterns).**
- **In addition, tests often refer to cultural experiences or historical background to which many adolescent ELLs have not yet been exposed. The ambiguity of this situation means that the test is not measuring what it is intending to measure.**
- **Thus, the scores do not tell teachers or policymakers what they need to know about students’ content knowledge and, in fact, may be misinterpreted.”**
- **Short, D., & Fitzsimmons, S. (2007). *Double the Work: Challenges and solutions to acquiring language and academic literacy for adolescent English language learners – A report to Carnegie Corporation of New York*. Washington, DC: Alliance for Excellent Education.***

My informal research says:

- **Students will stop at a word they don't understand and think they can't solve the problem if they don't know all the words. This isn't true for a lot of math problems.**
- **If students are shown how to look for clues or characteristics in spite of not knowing all the English words, they can solve many (but not all) math problems on the TAKS, *provided they know the math vocabulary and concept.***
- **Mario opens the door, figuratively...***

True Story

- My students were doing a TAKS review while out-of-state visitors were observing.
- One observer asked how language was a barrier in a math test. As if on cue, Mario raised his hand.
- He was stuck on the first problem. It read like this – *A nxbaalune* is an example of:
 - Reflection, translation, dilation, rotation
- I knew my class knew these 4 concepts well.
But...
- “Mis, que quiere decir ‘dork nobe’?”
- The observer, from back east, was speechless.*

Necessary TAKS vocabulary:

Shown below

Above

Widest

Narrowest

Twice

Product

Shift up/down

Shaded

Entire

Following

*How long

At Least

Reach

Choose

Trend

Replacement

Solution set

A few

Most of the _____

Some of the _____

No more than

*Distance *and* time

(Selected by first-year ELL high school 9th and 10th graders from released TAKS tests 2004-2006.)*

Necessary TAKS vocabulary:

Shown below	Above	Widest
Narrowest	Twice	Product
Shift up/down	Shaded	Entire
Following	*How long	At Least
Reach	Choose	Trend
Replacement	Solution set	A few
Most of the _____	Some of the _____	No more than

*Distance *and* time **(terms found in math dictionary)**

(Selected by first-year ELL high school 9th and 10th graders from released TAKS tests 2004-2006.)*

It's Your Turn...

- You are now an ELL student.**
- Read the problem and solve it.**
- Write down any strategies you use.**
- I've replaced some English words, but not mathematical vocabulary that needs to be taught.**
- If you get frustrated, remember how you feel. When your students are frustrated, you will understand better.**
- You will need a pencil, and probably an eraser. No calculator is necessary.***

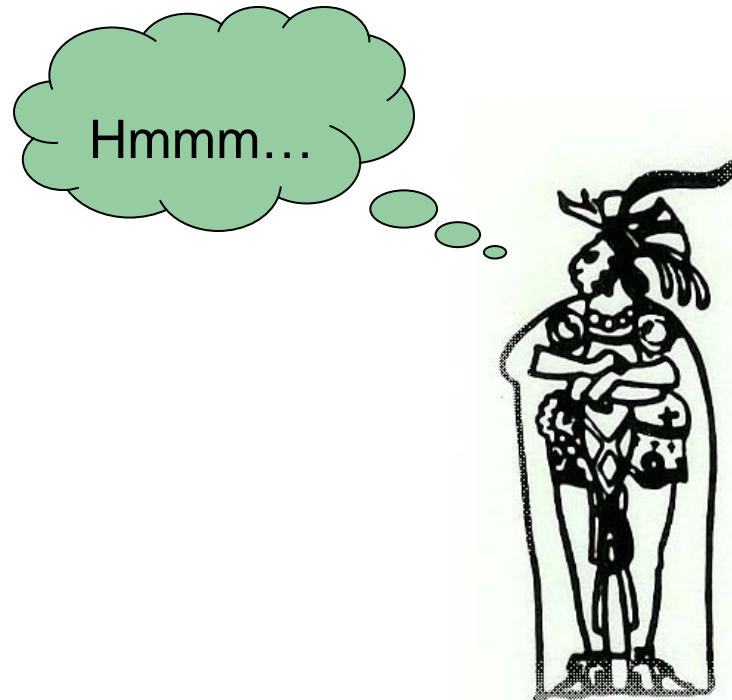
7th grade test 2006



- DeAndre bincham 15 cbinel ko'ne at 3 for \$0.65 and 56 xtalbil ko'ne at 7 for \$1.25. What was the total cost of the cbinel and xtalbil, not tz'el tax?
- F \$9.75
- G \$8.75
- H \$10.70
- J \$13.25

Look for the clues:

- DeAndre bincham **15 cbinel** ko'ne at 3 for **\$0.65** and **56 xtalbil** ko'ne at 7 for **\$1.25**.
What was the **total cost** of the cbinel and xtalbil, not tz'el tax?
- **F** \$9.75
- **G** \$8.75
- **H** \$10.70
- **J** \$13.25



Thinking Process

- **What information do you have?**
- 15 cbinel at 3 for \$0.65
- 56 xtalbil at 7 for \$1.25
- **What is required?**
- The TOTAL COST
- **What can you use** to find the cost of 15 cbinel? The 56 xtalbil? Proportions!
- Students must recognize the ratio format.*

Process (con't)

$$\frac{3cbinel}{\$0.65} = \frac{15cbinel}{x} \quad \frac{3times5}{0.65times5} = \frac{15 cbinel}{\$3.25}$$

$$\frac{7txalbil}{\$1.25} = \frac{56txalbil}{x} \quad \frac{7*8}{\$1.25*8} = \frac{56txalbil}{\$10.00}$$

Total cost is \$3.25 + \$10.00 = \$13.25 *letter J*

(*not* tz'el tax probably means **no tax)**

(If no tax rate is given, how could you calculate the tax?)

7th grade test 2006

- DeAndre bought 15 party hats priced at 3 for \$0.65 and 56 noisemakers priced at 7 for \$1.25. What was the total cost of the hats and noisemakers, not including tax?
- **F** \$9.75
- **G** \$8.75
- **H** \$10.70
- **J** \$13.25



***Piece of
Cake!***

7th grade test 2006

- Brenda wants to make a cone for her party. The circular base of the cone is shown below. The diameter of the circular base is 16 centimeters.
- How many centimeters will Brenda make for the height of the cone?

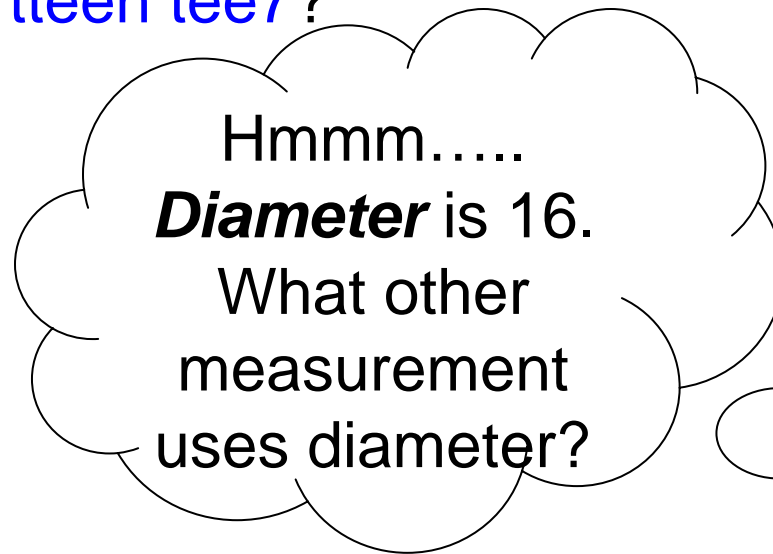
- F** 25 cm
- G** 50 cm
- H** 79 cm
- J** 201 cm



Let's analyze:

- Brenda wants to tmaa tza7n tteen tee7 pero poon circular kuteente xjaal xiimal ju shown below. The diameter of the kuteente xjaal xiimal ju is 16 centimeters.
- Kinn how many centimeters wu7n ex til Brenda make tmaa tza7n tteen tee7?

- F 25 cm
- G 50 cm
- H 79 cm
- J 201 cm



How to Analyze Information:

- The picture shows a circular object
- “What shape do you see?”
- The diameter is given in centimeters
- “What number is given? What does it represent?”
- The question asks how many centimeters
- “What other measurement uses *diameter*?” (Encourage use of formula chart if necessary.)
- The radius is $\frac{1}{2}$ the diameter, or a value of 8. No answer is 8, so that isn't what is required.
- The circumference is pi times the diameter. 3.14 times 16 is 50.24. Letter G is 50 – very close! Logical, yes?

- Brenda wants to attach a string of beads along the circular bottom of the lamp shade shown below. The diameter of the bottom of the lamp shade is 16 centimeters.
- About how many centimeters long should Brenda make the string of beads?

F 25 cm

G 50 cm

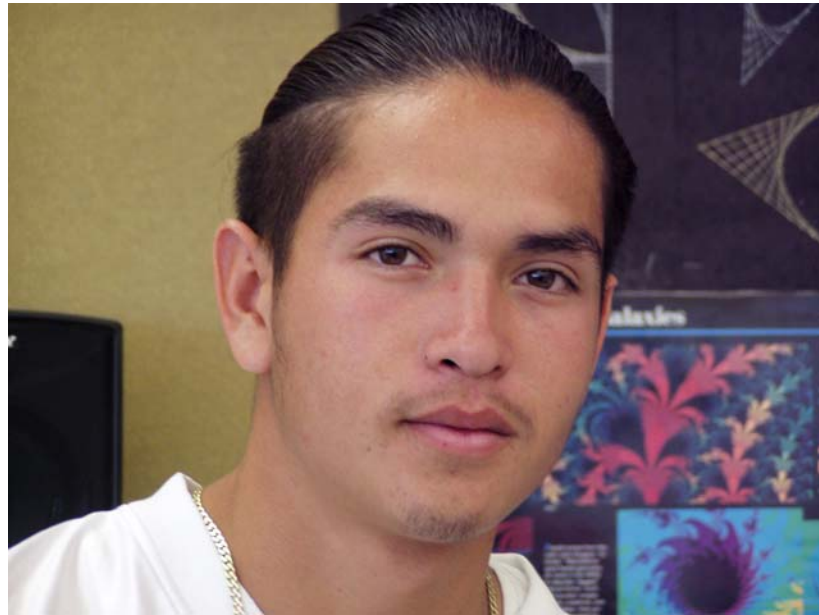
H 79 cm

J 201 cm



You can probably do this one:

- Jerry has a CD nka that contains 4 ta'c'ul CDs, 1 jatumel CD, 2 nimxse CDs, and 3 ca7j CDs. What is the probability of Jerry ju7lil selecting a ca7j CD and then, without replacing it, ju7lil selecting a nimxse CD from his nka?
- **A** $\frac{1}{2}$
- **B** $\frac{1}{15}$
- **C** $\frac{3}{50}$
- **D** $\frac{1}{20}$



Thinking Process

- What words indicate the concept you're solving for (and therefore are vital to teach)?
- *Probability, selecting, without replacement*
- 4 ta'c'ul CDs Total CDs = 10
- 1 jatumel CD
- 2 nimxse CDs $\frac{3}{10} \text{ times } \frac{2}{9} = \frac{6}{90} = \frac{1}{15}$
- 3 ca7j CDs

*Looks like letter B is a pretty good choice!**

Now back to English...

- Jerry has a CD case that contains 4 country CDs, 1 rock'n'roll CD, 2 rap CDs, and 3 Tejano CDs. What is the probability of Jerry randomly selecting a Tejano CD and then, without replacing it, randomly selecting a rap CD from his case?

- 4 country CDs Total CDs = 10

- 1 rock'n'roll CD

- 2 rap CDs

- 3 Tejano CDs

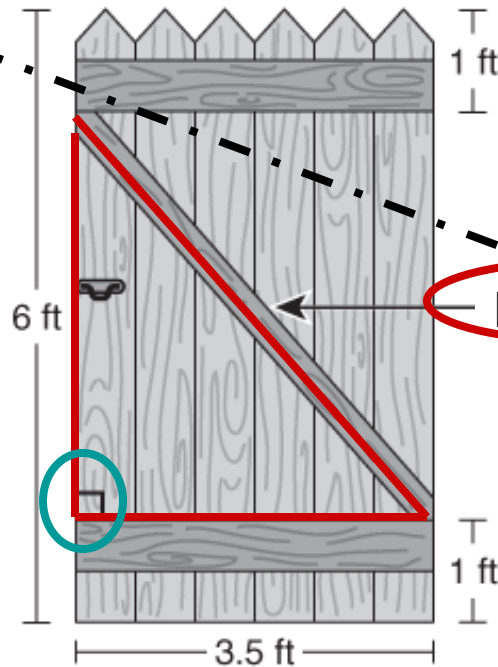
$$\frac{3}{10} \text{ times } \frac{2}{9} = \frac{6}{90} = \frac{1}{15}$$

2006 9th grade TAKS

35 Mr. Choonte xjaal a teenkjtzone, as shown below.

Which is koomo to the length in feet of the diagonal jaalo that Mr. Choonte used to puaaq the teenkjtzone?

- A 4.9 ft
- B 5.3 ft**
- C 6.1 ft
- D 6.9 ft



To recap:

- You cannot teach all the English words that will be on any TAKS, but you DO know what mathematical vocabulary can be expected, and you must teach that!
- You need to be supportive and give students strategies for reasonable problem solving.
- You need to teach concepts, not just procedures, to your students.

Comments, questions?

- Thank you for the opportunity to share some of my experiences with you today.
- Work with your ELLs to show them that they can do math even if they don't know all the English, but
- You *must* provide the academic language to give them proper clues and guidance, as well as the mathematical concepts.

Adios – n'tenq coxä

- Please complete an evaluation form prior to leaving.
- Make sure you take everything with you – materials, cell phone, purse, calculator, etc.
- Enjoy the rest of the conference!

– ***dsvedman@utep.edu***