PAINLESS, PURPOSEFUL, POWERFUL: Writing in the Secondary Math Classroom

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HELLO!

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> *Reflection and communication are intertwined processes in mathematics learning … Writing in mathematics can also help students consolidate their thinking because it requires them to reflect on their work and clarify their thoughts about the ideas.* Principles and Standards for School Mathematics,NCTM (2000), p. 61.

What benefit do students get from writing in these activities?

What benefit do teachers get from reading student writing in these activities?

How would you use these strategies in your classroom?

1

Fact or Fib

A twist on a familiar icebreaker

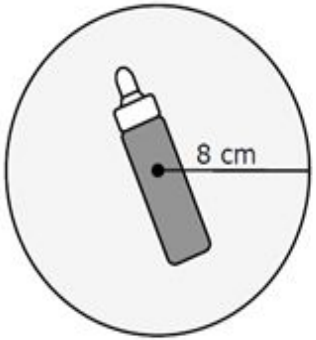
Fact or Fib

“Fact or Fib” is a writing strategy in which students are presented with a multiple choice math problem or a stimulus to write “fact” or “fib” thinking.

- If a multiple choice math problem is used, students respond to the multiple choice answers to write both “fact” and “fib” thinking.
- If a stimulus is used, students respond to the stimulus by writing their own “fact” and “fib” statements.

Fact or Fib - Multiple Choice

10. Candy quilted circular pieces to make into a baby quilt. The quilt piece below has a radius of 8 centimeters. Which expression could be used to find the approximate circumference of the quilt piece?



A $2(\pi)(16)$

B $2(\pi)(8)$

C $2(8)$

D $2(4)$

- **Answer choice A is a fib because the answer shows to multiply the 2 times pi times diameter and the formula says to multiply 2 times pi times radius.**
- **Answer choice B is a fact because the circumference of a circle is found by finding 2 times pi times radius and this answer choice shows that process.**
- **Answer choice C is a fib because it does not include pi in the answer.**
- **Answer choice D is a fib because it does not include pi and it took half of the radius to get this answer.**

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$5.99 per pizza

2

TOUR OF KNOWLEDGE

Put your students to work

TOUR OF KNOWLEDGE

Tour of Knowledge is a great way to generate review questions by:

- Posting/giving stimuli (graphs, equations, tables, diagrams) and then having students write what they know about the stimuli
- Giving students the opportunity to write possible test questions based on the stimuli
- Use some of the student questions as a formative or part of a summative assessment.

6th grade Stimulus

x	0	1	2	3
y	6	7	8	9

6th Grade Question

27 Mr. Martínez asked his students to write a situation that could describe the relationship between all the values of x and y in the table.

x	0	1	2	3
y	6	7	8	9

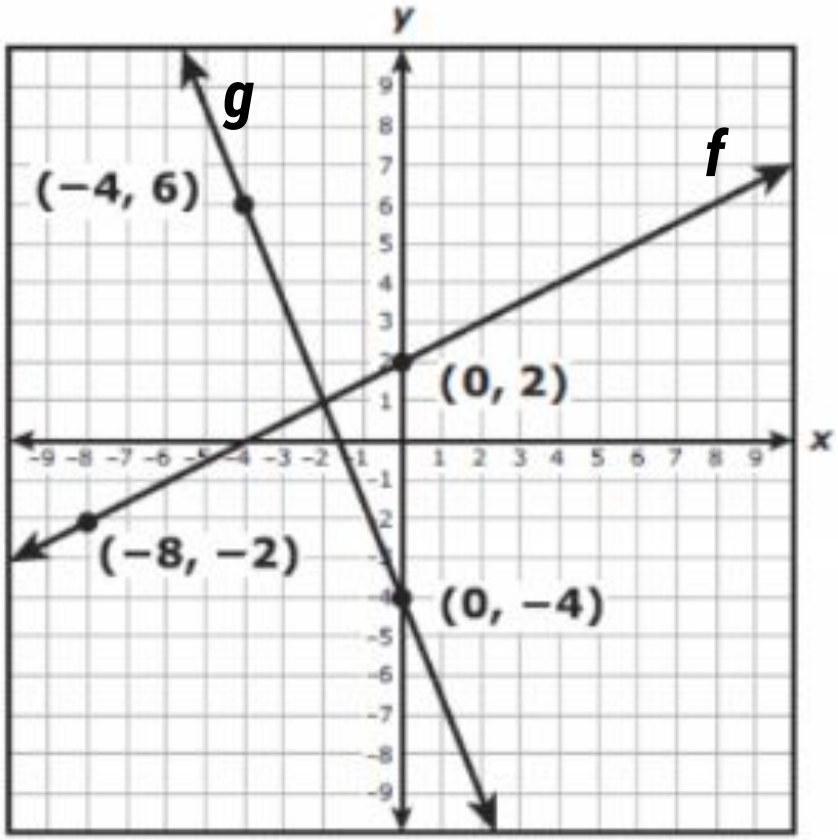
Which situation best describes the relationship between all the values of x and y in the table?

A Rachel had six dollars and then started to save one dollar each week.

B Beatriz ran one mile the first week and one mile each week after that.

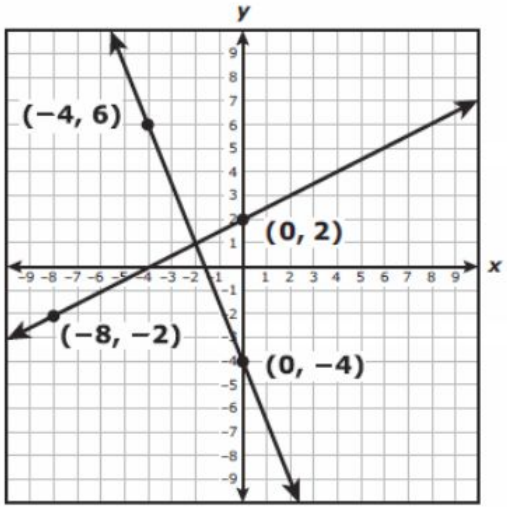
C James read zero books in six months and then started to read one book each week.

D Marion has six times the number of toy trains that Tony has.


y
x
g
f
(−4, 6)
(0, 2)
(−8, −2)
(0, −4)

8th Grade Question

11 The two lines graphed on the coordinate grid each represent an equation.



Which ordered pair represents a solution to both equations?

A (−4, 0)

B (−2, 1)

C (0, −4)

D (1, −2)

Algebra 1 Stimulus

$$y = -x^2 - 2x + 3$$

Algebra 1 Question

2018 – Q5

5 What is the range of $y = -x^2 - 2x + 3$?

A $x \leq 4$

B $x \geq -4$

C $y \leq 4$

D $y \geq -4$

3

STRUCTURED WRITING IN MATH

Just keep SWIMming

Solution Sentence

- Write the solution as a complete sentence.

REPEAT THIS SET OF STEPS AS NEEDED

Process

- What did you do? Write down the steps.

Why

- Why did you do it? Justification of your process.

Conclusion Sentence

- Connect the reasonableness of your solution to the question.

How do you use algebra tiles to solve the following problem? 3 + (-8) =

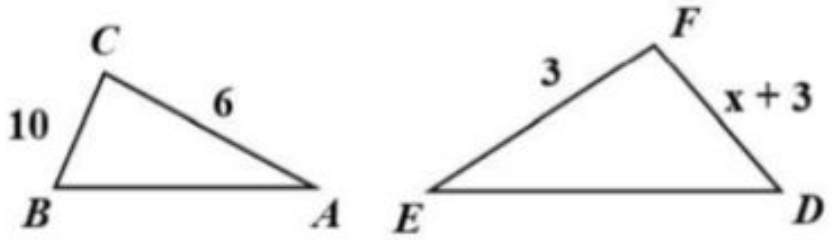
The answer to 3 + -8 is -5.

First I put down 3 yellow tiles and 8 red tiles to model the addition problem.

I combined 3 red tiles and 3 yellow tiles to make 3 zero pairs because 1 + -1 equals 0.

I know my answer is -5 because when I removed the zero pairs I had 5 red tiles left.

If $\Delta ABC \sim \Delta EDF$ solve for x.



Solution Sentence
- Write the solution as a complete sentence.

REPEAT THIS SET OF STEPS AS NEEDED

Process
- What did you do? Write down the steps.

Why
- Why did you do it? Justification of your process.

Conclusion Sentence
- Connect the reasonableness of your solution to the question.

STUDENT THINKING

- SUMMARIZE
- JUSTIFY
- ANALYZE
- COMMUNICATE
- COMPARE/CONTRAST
- CREATE
- APPLY REASONABLENESS

Reflection

What benefit do students get from writing in these activities?

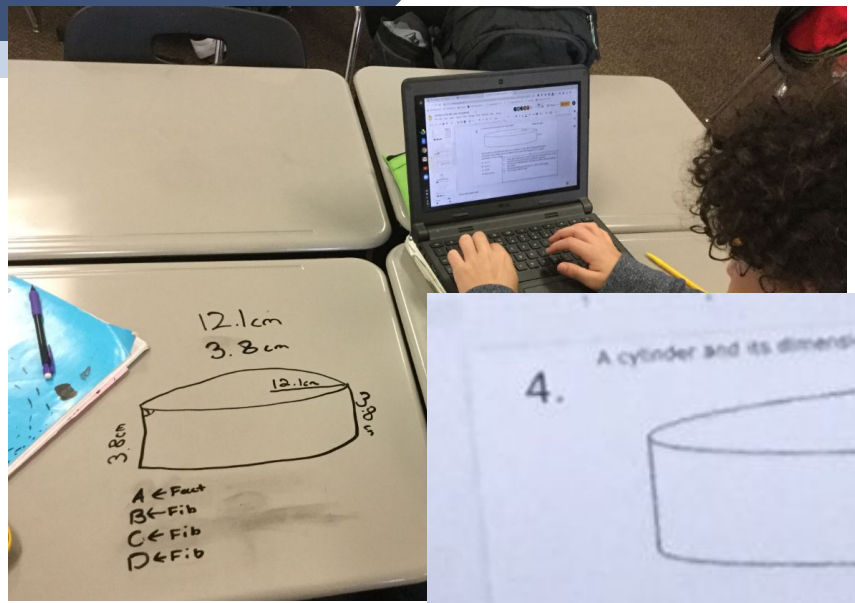
What benefit do teachers get from reading student writing in these activities?

How would you use these strategies in your classroom?

Fact or Fib Ideas

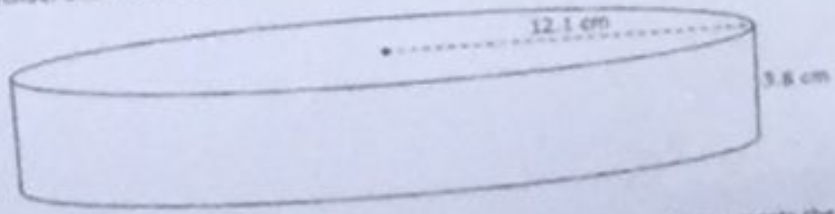
- Focus of the strategy is for students to experience the process of error analysis
  - Use as a warm-up
  - Set as expectation for justification on a test
  - Use as test corrections process

Fact or Fib Example



Kaleb & Logan

4. A cylinder and its dimensions are shown below.



One equation for calculating the volume of a cylinder is $V = Bh$, where B represents the area of the base of the cylinder. Which expression can be used to find the value of B, in square centimeters, for this cylinder?

A $\pi(12.1)^2$

B $2\pi(12.1)$

C $\pi(3.8)^2$

D None of these

A. Fact: when solving for volume(V=Bh) you have to solve for 1 area of B which for area of a circle is pie times r squared

B. Fib- this is the lateral surface area for a cylinder but were looking for volume

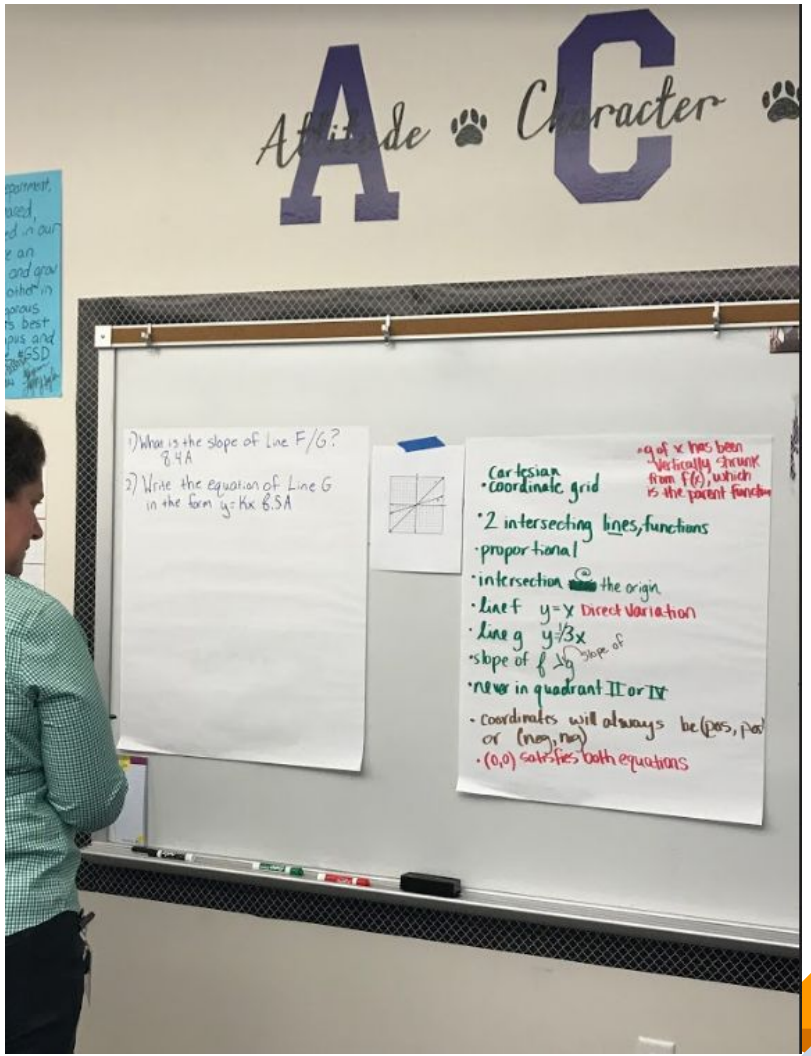
C. Fib- we are looking for the area of 1 base not the height

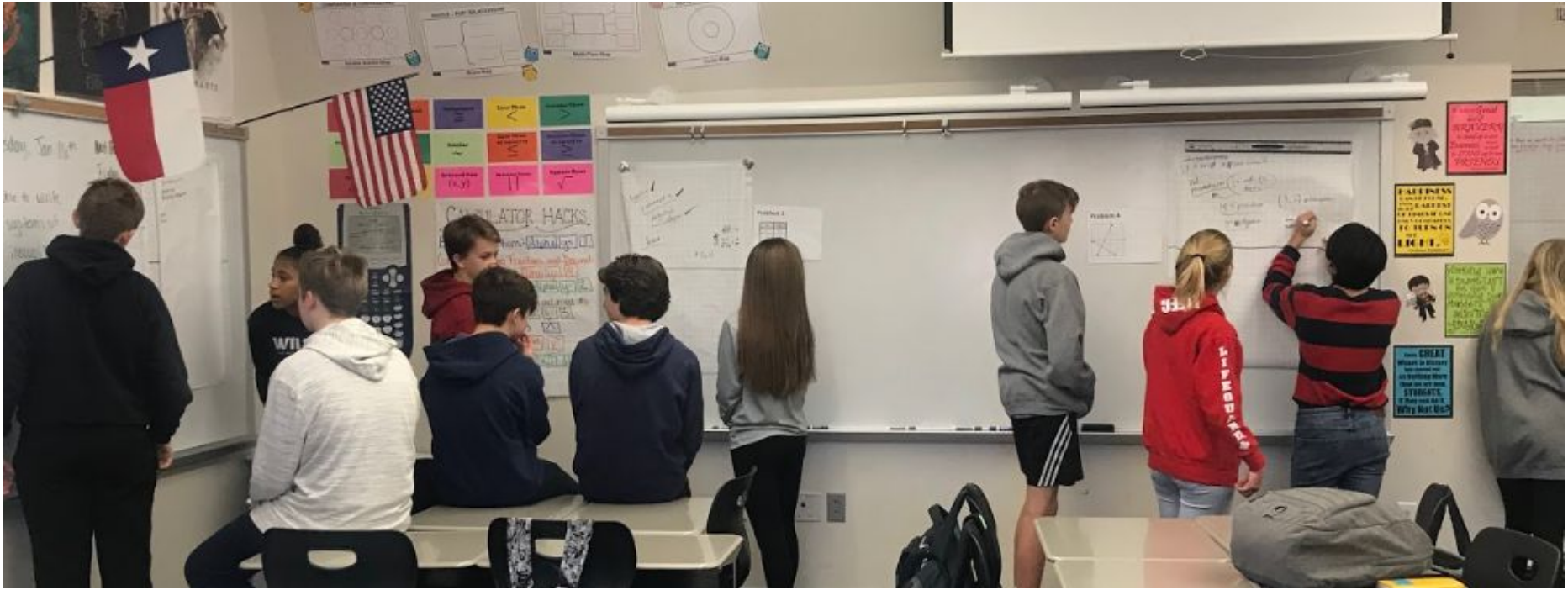
D. Fib- A is the correct answer

Tour of Knowledge Ideas

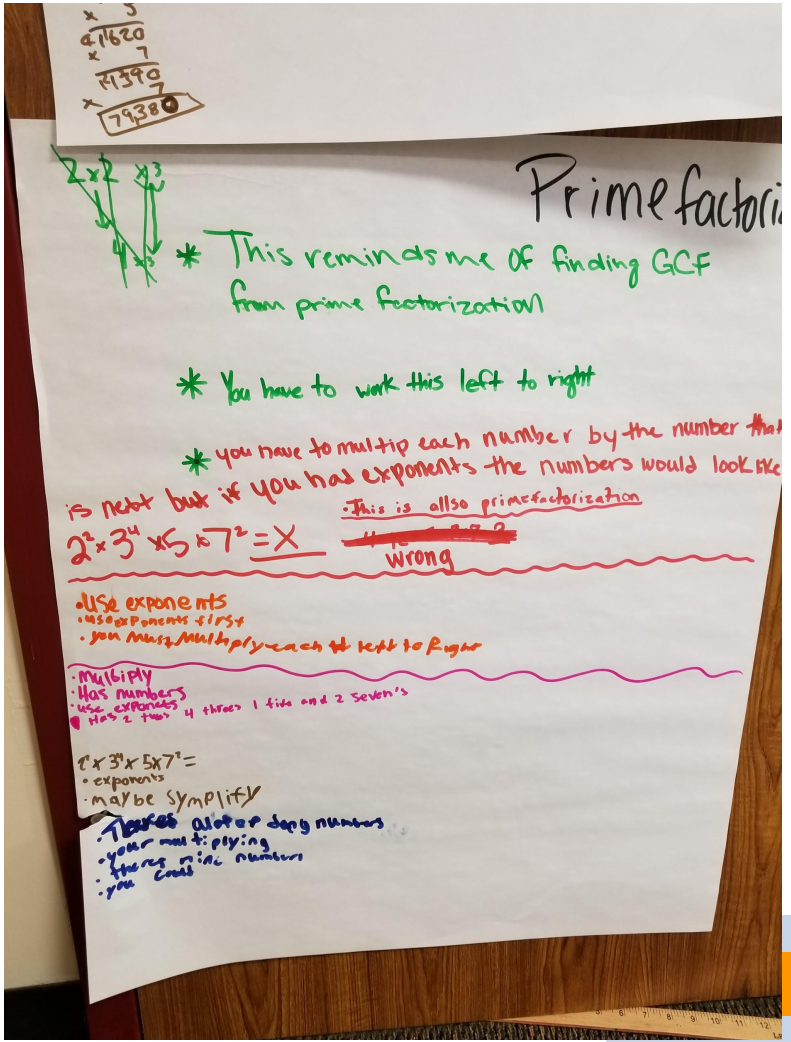
- Focus of the strategy is to gauge student understanding through the listing of facts and student-created questions about different stimuli
  - Use as review
  - Use to introduce a unit when prior knowledge is expected and then add to it throughout the unit
  - Use student-created questions on assessment

Tour of Knowledge Examples

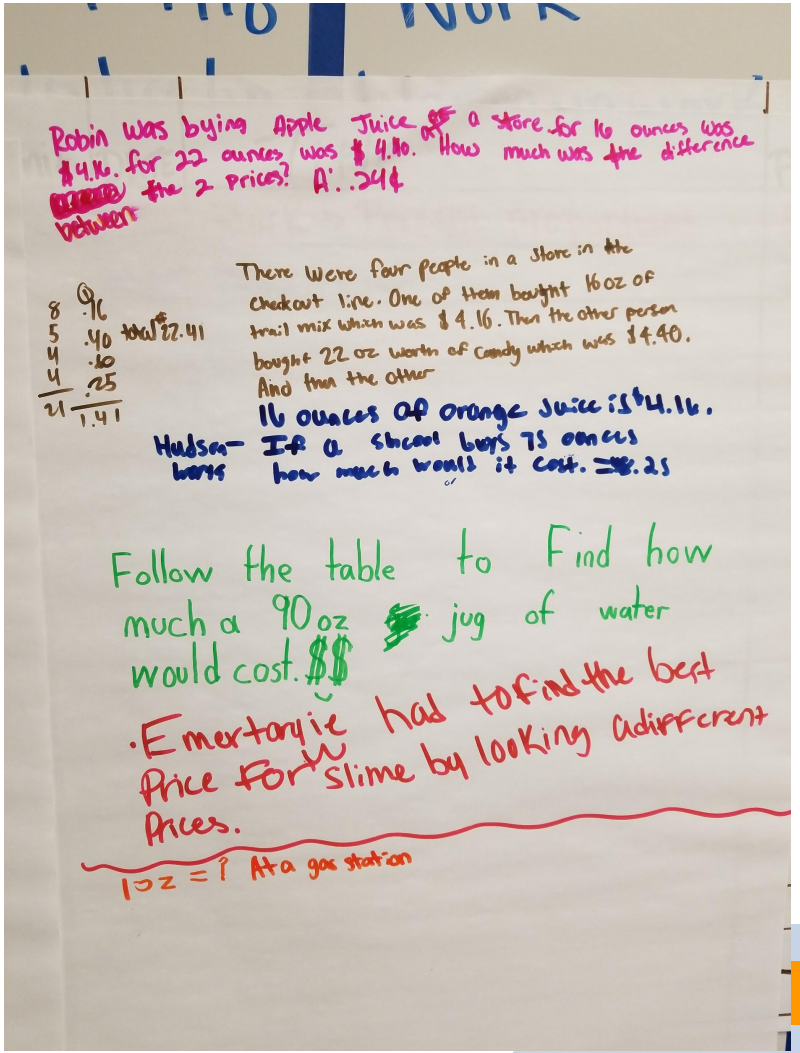



CALCULATOR HACKS

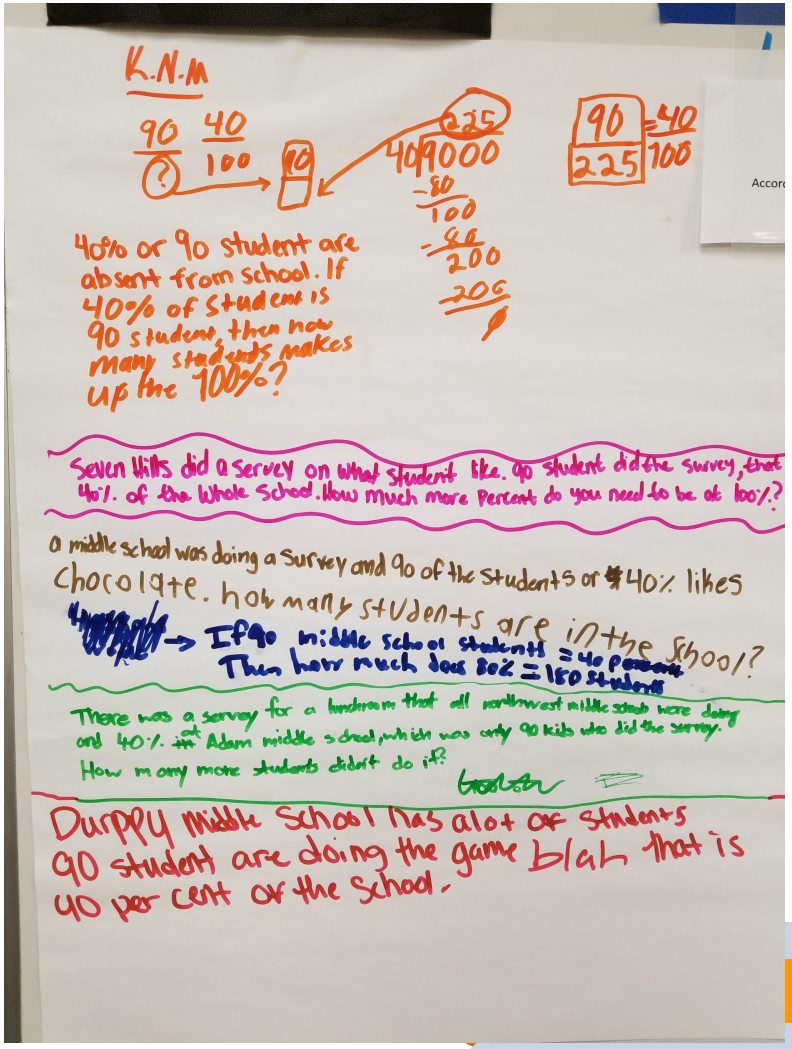
$2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 5 \times 7 \times 7$



16 ounces	$4.16
22 ounces	$4.40
40 ounces	$5.60
75 ounces	$8.25



According to a survey 90 middle school students, or 40%,

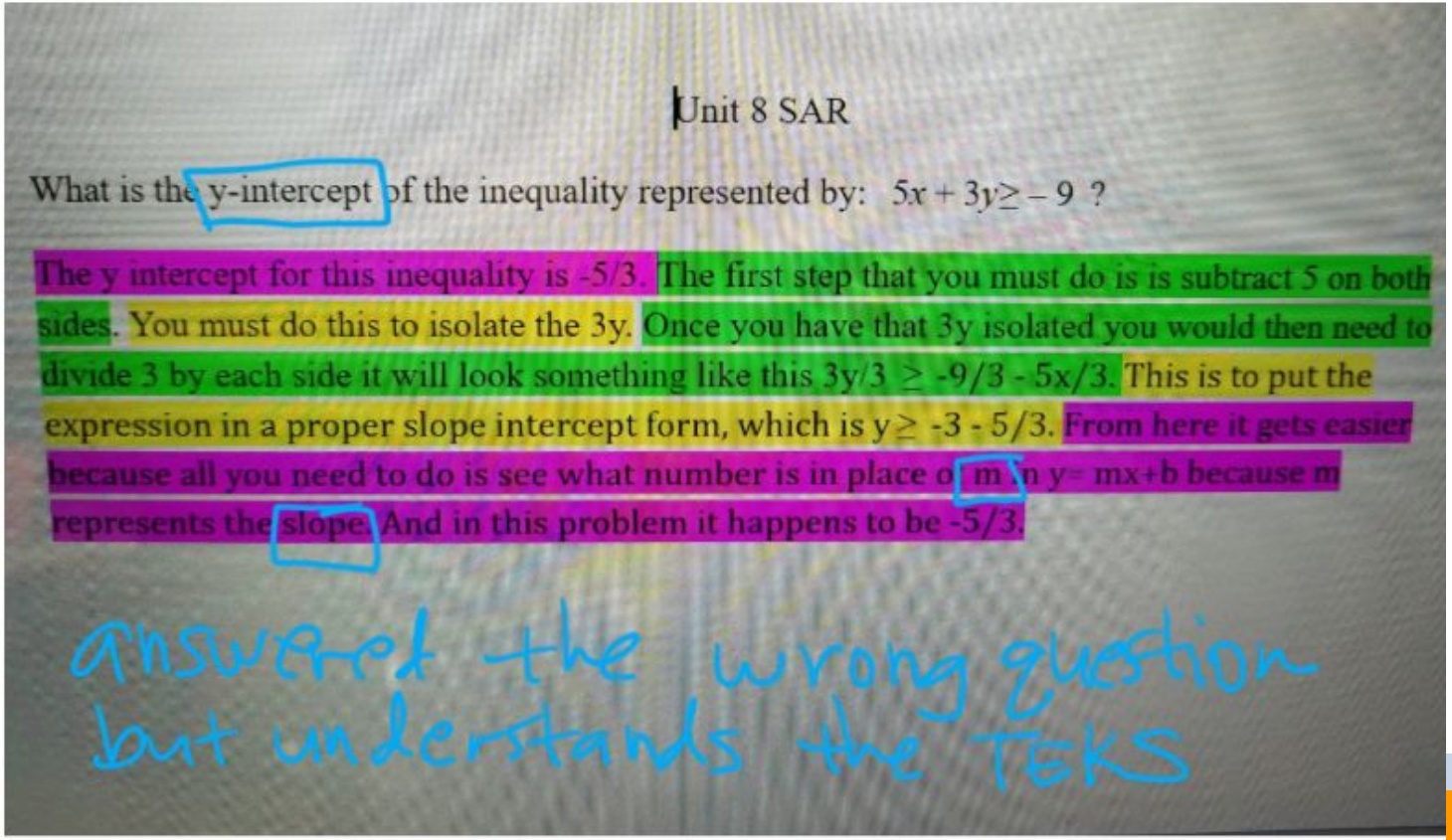


SWIM Ideas

- Focus of the strategy is to use a structured process to write a justification of thinking about a given problem
  - Explicitly practice the process, including the use of the highlighters, so students clearly understand the expectations of writing in complete sentences when students SWIM on their own.

  - Work through the problems first to see how many steps it will take to solve the problem and then check to make sure a good conclusion sentence can be made.

SWIM Student Writing Example



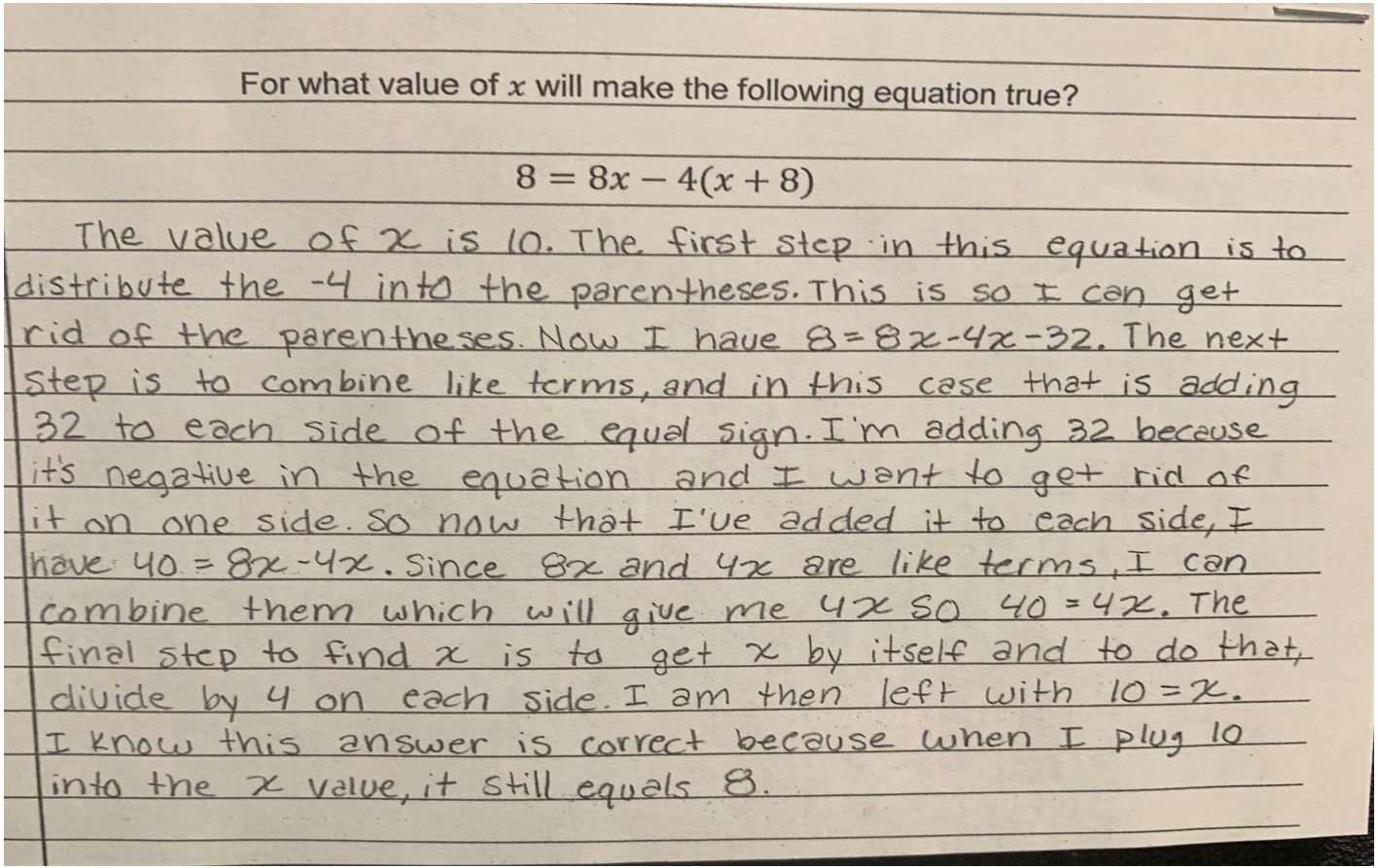
Unit 8 SAR

What is the y-intercept of the inequality represented by: $5x + 3y \geq -9$?

The y intercept for this inequality is -5/3. The first step that you must do is is subtract 5 on both sides. You must do this to isolate the 3y. Once you have that 3y isolated you would then need to divide 3 by each side it will look something like this $3y/3 \geq -9/3 - 5x/3$. This is to put the expression in a proper slope intercept form, which is $y \geq -3 - 5/3$. From here it gets easier because all you need to do is see what number is in place of m in $y = mx+b$ because m represents the slope. And in this problem it happens to be -5/3.

answered the wrong question but understands the TEKS

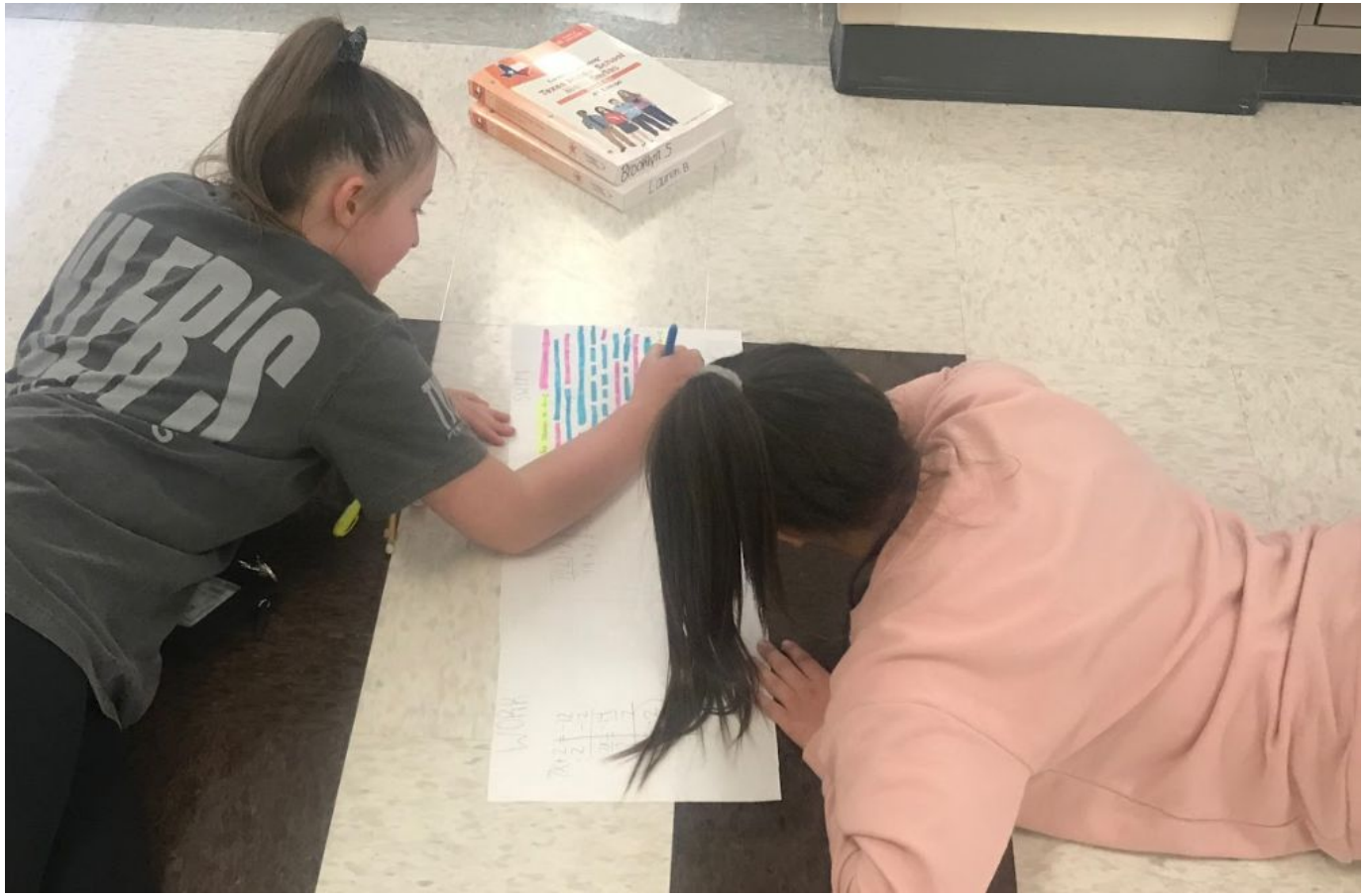
SWIM Student Writing Example



For what value of x will make the following equation true?

$$8 = 8x - 4(x + 8)$$

The value of x is 10. The first step in this equation is to distribute the -4 into the parentheses. This is so I can get rid of the parentheses. Now I have 8=8x-4x-32. The next step is to combine like terms, and in this case that is adding 32 to each side of the equal sign. I'm adding 32 because it's negative in the equation and I want to get rid of it on one side. So now that I've added it to each side, I have 40=8x-4x. Since 8x and 4x are like terms, I can combine them which will give me 4x so 40=4x. The final step to find x is to get x by itself and to do that, divide by 4 on each side. I am then left with 10=x. I know this answer is correct because when I plug 10 into the x value, it still equals 8.



Students Practicing SWIM

Thanks for your participation

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