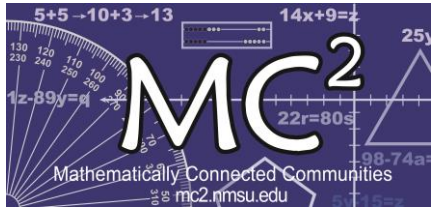


Using Number Talks to Build and Support Questioning and Discourse

December 2017

Learning Targets

- I can describe how number sense leads to algebraic thinking.
- I can describe how using number talks can help teachers make student thinking visible.
- I can describe how using number talks can help to hone teacher questioning skills.

How many different ways can you show 22x28?

Pause the video while you explore the different ways to show 22x28

Some strategies you may have come up with…

Share with a colleague all the strategies you came up with.

How are the strategies similar to or different from the strategies that follow?

Strategy 1
22x28

Traditional Algorithm

Strategy 2
22x28

Break a Factor Into
Two or More Addends

22x28
28(20+2)
560+56
616

Area Model

	20	2
28	560	56

560+56
616

Strategy 2 cont.
22x28

Break Both Factors Into Two or More Addends

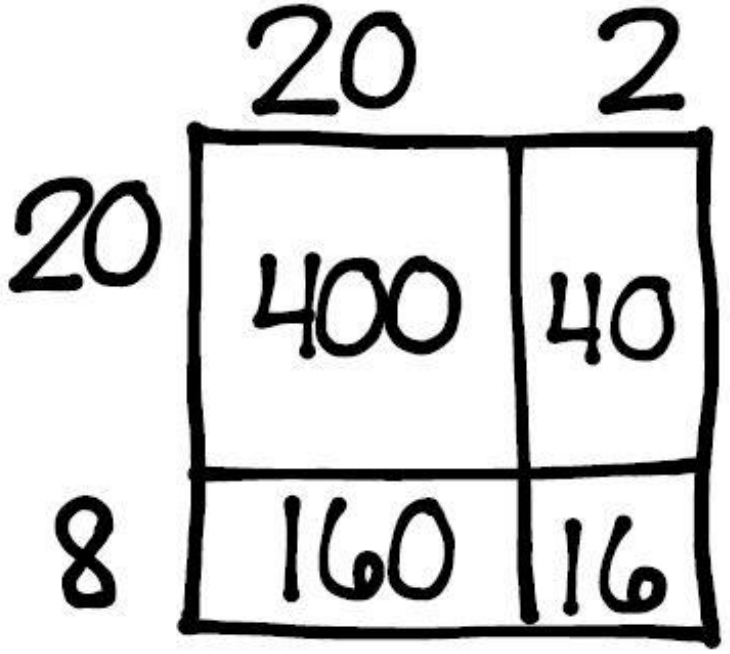
22x28

(20+2)(20+8)

400+160+40+16

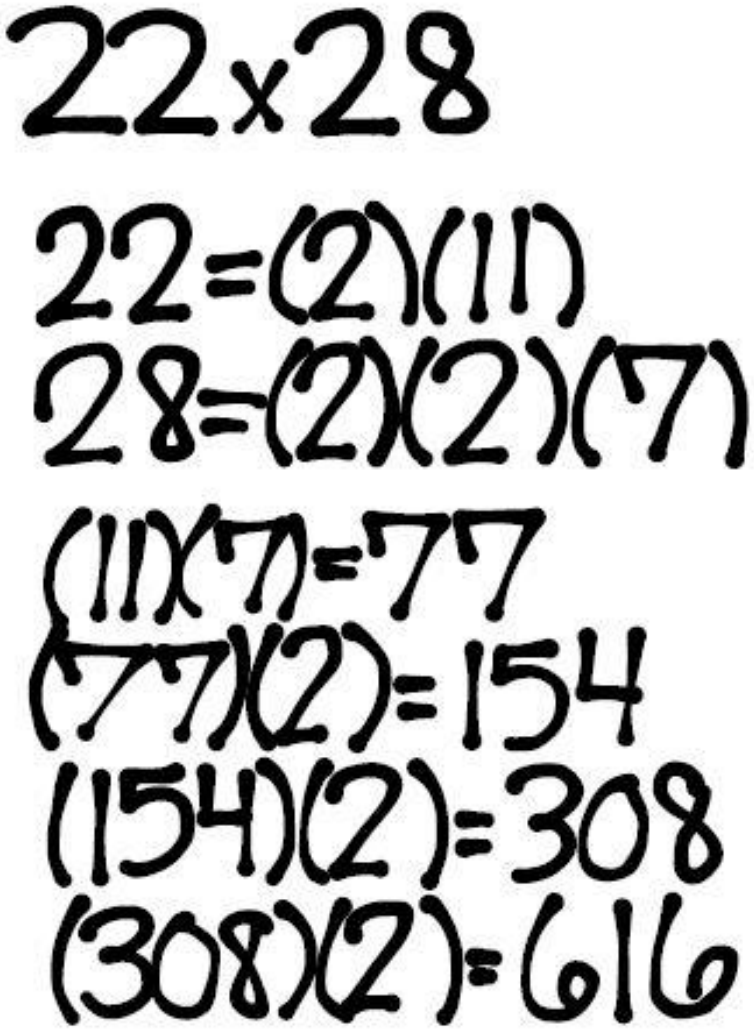
616

Area Model



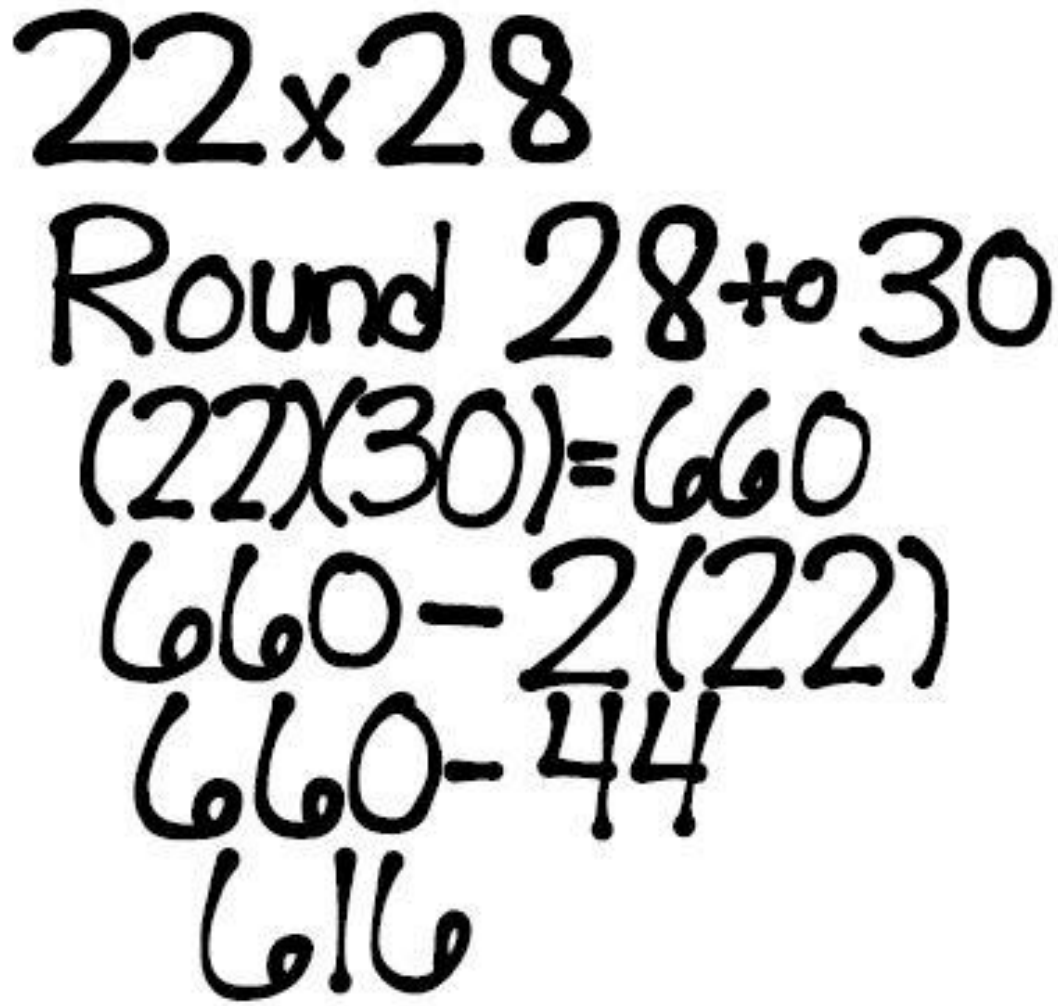
Strategy 3
22x28

Break a Factor Into Smaller Factors



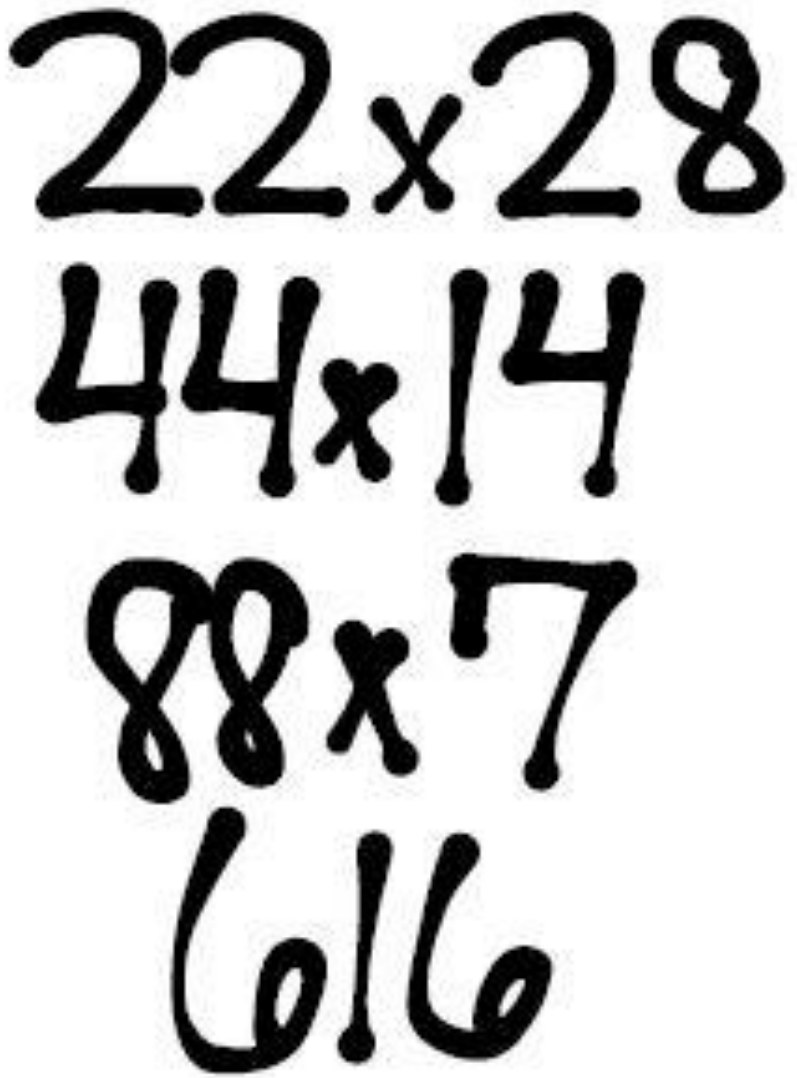
Strategy 4
22x28

Round a Factor and Adjust



Strategy 5
22x28

Halving and Doubling



Using Teacher Questioning

- Choose one of the strategies.
- What questions might you ask a student to better understand the mathematical decisions and thinking processes they utilized when solving the problem using that particular strategy?

- Pause for personal reflections and/or discussions

Possible questions for each strategy

- Traditional Algorithm:
  - What is the actual value of this digit?
  - What does it mean to carry?
  - Why do you write that digit above the tens column?
  - Why is it that when you multiply 2 by 8 and carry the 1, do you add it to the product of 8 x ”2”?
  - How could you represent your thinking with a picture?
  - Why do you move over one place when you are doing the second multiplication?
- Breaking Factors into Addends
  - How did changing 22 into 20 plus 2 (or 28 into 20 plus 8) help you solve the problem?
  - Why didn’t breaking up the 22 and/or the 28 change the value of the answer?
  - How did you decide to break up the factor(s) that way?

Source: *Making Number Talks Matter.* Humphreys & Parker, pgs 67-73

Possible questions for each strategy

- Breaking Factors into Smaller Factors
  - How did you decide which number to factor?
  - How did you decide which factors to use?
  - How did factoring 22 (or 28) make the problem easier?
  - Why does this strategy work?
- Rounding and Adjusting
  - How did rounding the factor to 20 (or 30) make this problem easier?
  - How did you know what to subtract (or add)?
  - How did you decide which factor to round?
- Halving and Doubling
  - How did you decide which number to double and which number to halve?
  - Why did that make it an easier problem to think about?

Source: *Making Number Talks Matter.* Humphreys & Parker, pgs 67-73

Shifting Gears – Arithmetic to Algebra

What are the different properties of real numbers that allow students to utilize the various strategies for multiplying 22 x 28?

Pause for personal reflections and/or discussions.

What are the misconceptions that students have when multiplying polynomials?

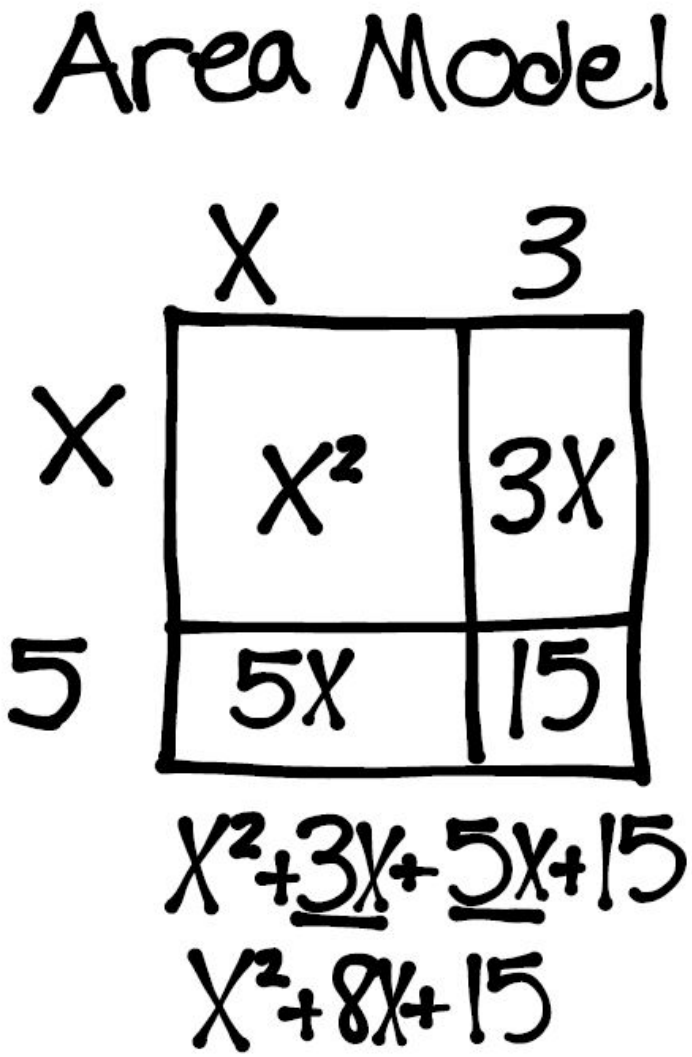
Pause the video to generate a list of misconceptions you have seen students bring to the table when multiplying polynomials.

How many different ways can you show (x+3)(x+5)?

Pause the video to generate as many ways to show (x+3)(x+5).

Pause for personal reflection and/or share with a colleague.

One way to visually show (x+3)(x+5) is....

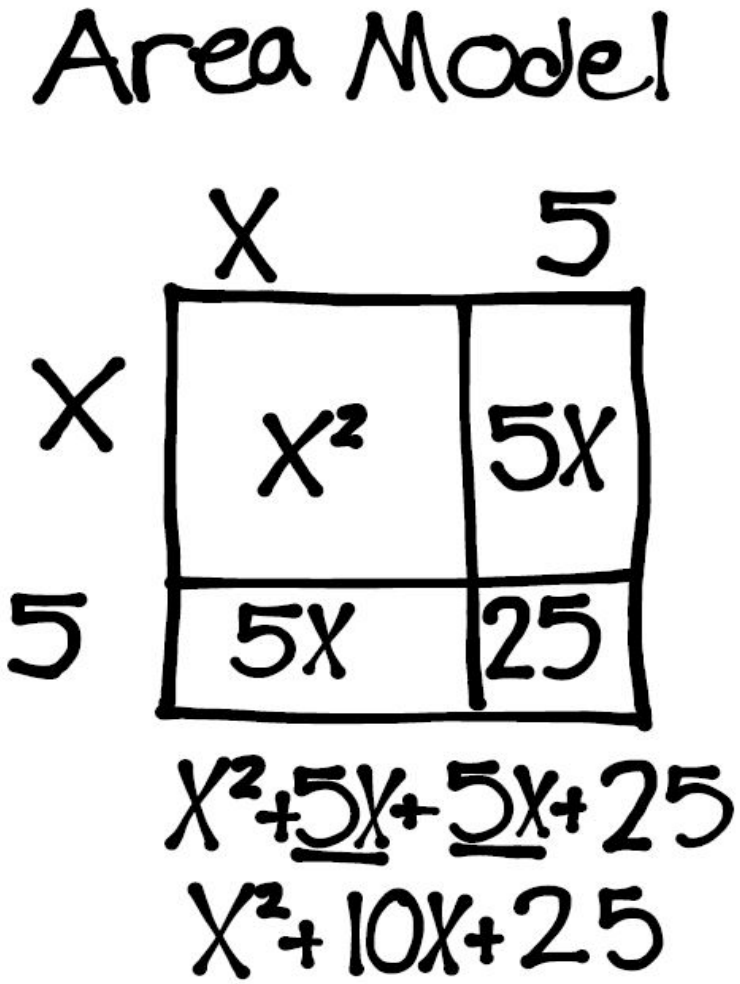


How many different ways can you show $(x+5)^2$?

Pause the video to generate as many ways to show $(x+5)^2$.

Pause for personal reflection and/or share with a colleague.

One way to visually show $(x+5)^2$ is....



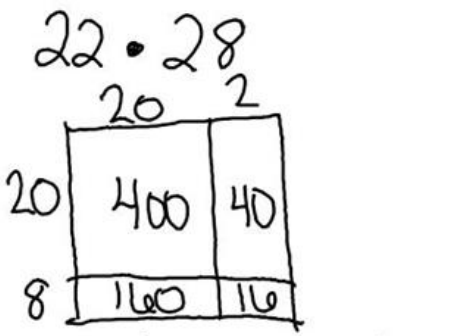
Connections and Reflections

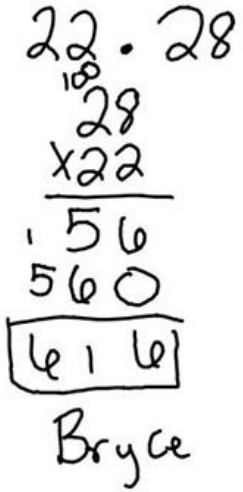
Pause the video to discuss and reflect on the following…

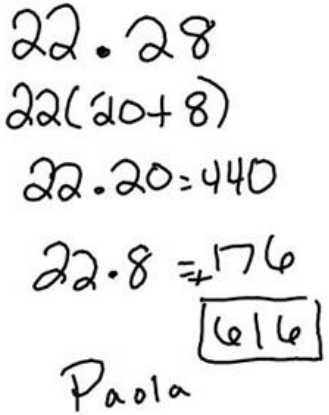
- How is modeling 22x28 similar to and different from modeling $(x+5)^2$?
- How does visualizing 22x28 build a strong foundation for visualizing and modeling $(x+5)^2$?

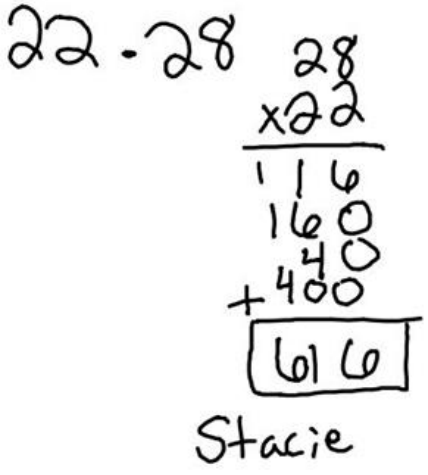
Jeremy's Video

Jeremy's Video- Student Strategies









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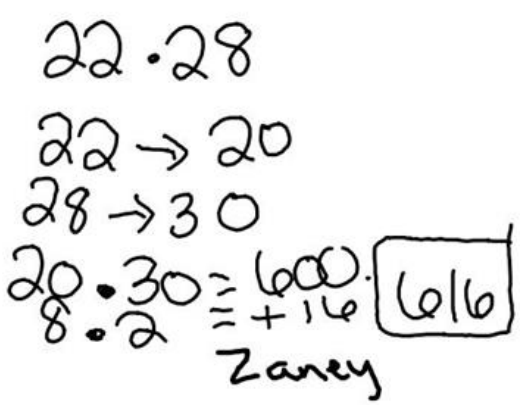

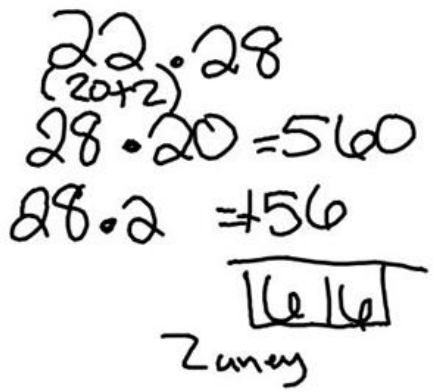

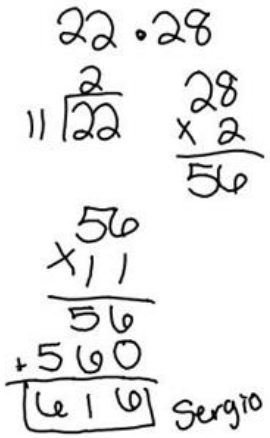

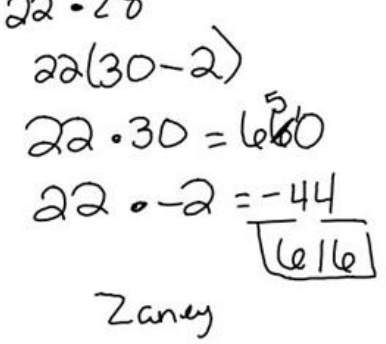

Video Reflection

Pause the video to discuss and reflect on the following…

- How did the number talk protocol explicitly support making student thinking visible and why is it important?
- How did questioning play a role in revealing student thinking?

Video Reflection con't

Pause the video to discuss and reflect on the following…

- What does it do for student learning and understanding when we are able to support them in visualizing the mathematics they are engaged in?
- How do the questions we ask make the mathematics visible to all students?

Self-Reflection & Action Planning

On your own, reflect on the following…

- What professional learning are you walking away with today?
- What will you commit to between now and next week to implement what you have learned?

Additional Resources

- https://www.youcubed.org/resources/stanford-onlines-learn-math-teachers-parents-number-talks/