

Meeting the Needs of Every Student in Math

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Let's try this

- The answer is 100.
- What might the question be?

Possibilities

- How old is really old?
- What is the first 3-digit number?
- What is a number with a digit sum of 1?
- What is 10×10 ?
- What comes after 99?
- What is a perfect score on a test?
- What is an easy number to multiply by?

A square

- The answer is “a square”.
- What might be the question?

Possibilities

- What shape has 4 sides?
- What shape are a lot of tiles?
- What shape is this? 
- What is a shape that starts with s?

How big? How small?

- A number takes exactly four words to say.
- What might it be?

Maybe

- 235
- 174
- 3042
- 5086
- 1 000 037

Which doesn't belong?

- $6 + 4$
- $7 + 1$
- $5 + 5$
- $15 - 5$

Differentiating instruction

- We have an obligation to ensure that students who are not “ready” for what other students are ready for have an opportunity to benefit from instruction.

Differentiating instruction

- We have to make decisions about whether the topic being addressed is worth intervening for.
- We have to be honest about who needs intervention (some students try to hide it.)

Differentiating instruction

- We have to make decisions about whether those students who need intervention can still remain as part of the larger group and how.

I believe

- That we need to keep students within the larger community of learners as much as possible as a first step.
- Let's look today at how that might happen.

You can see...

An open question like the previous ones

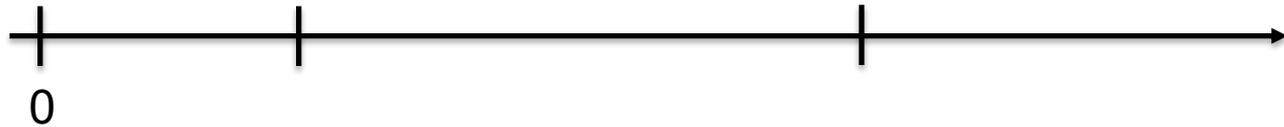
- is accessible to virtually all
- might even stretch strong students (if you push it)
- certainly generates lots of math talk

Generating conversation

- Open questions are not the only way to generate conversation, but they help.

More examples

- What numbers belong at the marks?



More examples

- What numbers belong at the marks?

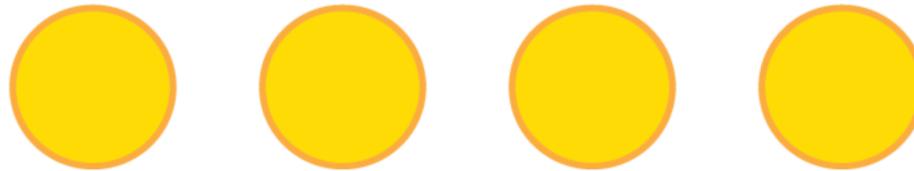


More examples

- What numbers belong at the marks?



More examples



- Some blue counters are on 10-frames. You add 4 yellow counters. Now all the 10-frames are full. How many blue counters might be on the 10-frames?

More examples

- Which fraction does not belong? Why?

$$\frac{3}{4}$$

$$\frac{3}{5}$$

$$\frac{1}{3}$$

$$\frac{5}{7}$$

More examples

- The number _____ is JUST A LITTLE closer to _____ than to _____.
- OR
- The number _____ is close to triple _____.

More examples

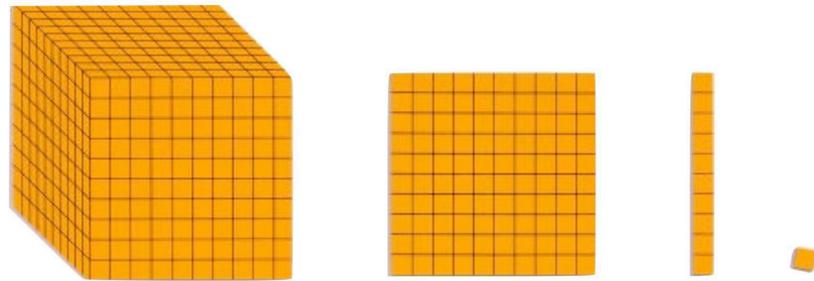
- My favourite number is _____ because _____.

More examples

- You show an amount of money with 8 coins.
- You trade some coins for coins of equal value and now the same amount is shown with 18 coins.
- What did you start and end with?

More examples

- You show a number with 12 base ten blocks.
- What could the number have been?
- What could it not have been?

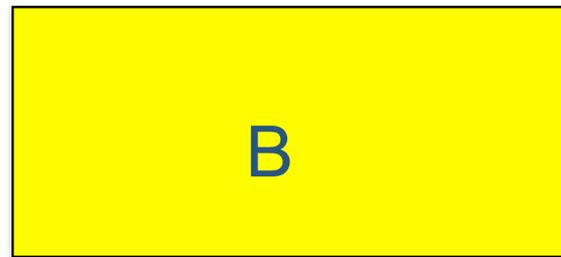
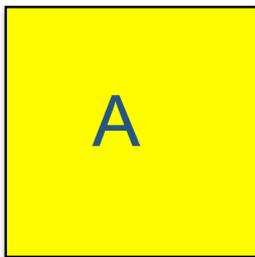


More examples

- You choose two numbers.
- The answer when you add them is 10 more than the answer when you subtract them.
- What could the numbers be?

More examples

- A shape is a lot more like shape A than shape B, but is not a square.
- What might it be? Why?



More examples

- Exactly three sides of a shape are equal in length. What could the shape look like?
- How do you know?

More examples

- It's ALMOST a metre long.
- What could it be?

More examples

- You and your friend have birthdays exactly 49 days apart. What else do you know about them?

More examples



$$300 - 125$$

Describe three problems you could solve by calculating $300 - 125$.

More examples

- You started an event before noon and ended after noon. It took 2 hours 29 minutes. When could you have started and ended?

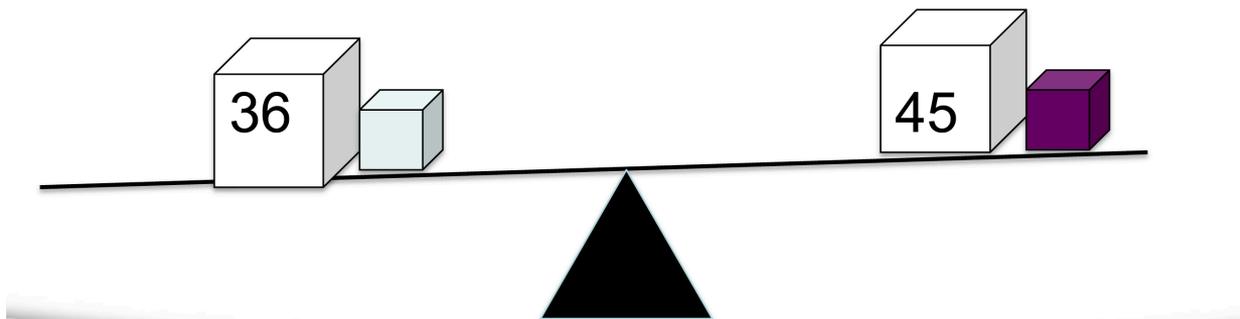
More examples

The fourth shape in a pattern is a red triangle.

What could the pattern look like?

More examples

- Each box holds marbles.
- What do you know about the blue and purple amounts?

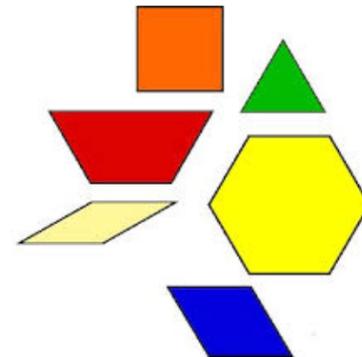


More examples

- Some cookies are grouped in 3s and 1 is left over.
- If the same cookies are grouped in 4s, there are 3 left over.
- How many cookies might there be?

More examples

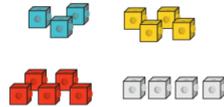
- Use pattern blocks.
- Build a design so that:
- Yellow area = 3 x red area
- Green area = 2 x blue area



More examples

- Do you think the number 15 is more like 10 or more like 20?

More examples



- Choose 2 colours. Put a few cubes of each colour on one side of the pan balance.
- Put cubes of the other 2 colours on the other side of the pan balance. Make sure the sides balance.
- Use addition to describe each side of the balance.

More examples

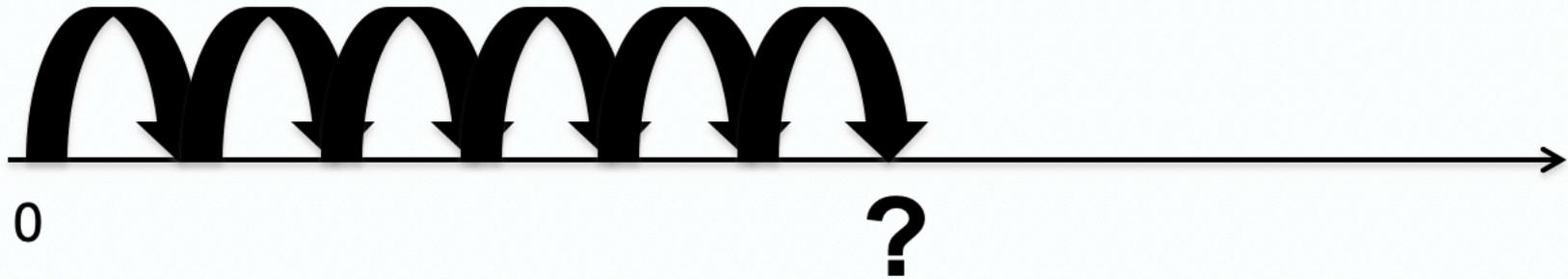
- You buy 2 items for less than \$5 each and 2 items for more than \$5 each.
- You spend, altogether, not too much more than \$30.
- What could the items cost?

More examples

- A fraction is just a LITTLE more than $\frac{1}{2}$.
- What could it be?

More examples

- What number might appear at the question mark? (All jumps are the same size.)



More examples

- This is $\frac{2}{3}$ of something. What could the something be?



More examples

- A number is made up of LOTS of tens and 3 ones. What could it be?



More examples

- You add two numbers. Each is less than 100.
- The sum is about 4 times as big as the smaller number.
- What might they be?

More examples

- ____ is $\frac{2}{3}$ of ____.
- ____ is 1 less than ____.

More examples

- Two decimal numbers are not that far apart.
- Their sum is 95.
- What could they be?

More examples

You create a spinner where :

- The red section is twice as big as the blue one.
- The blue section is half as big as the green one.
- Create such a spinner.

Assessment issues

Most open questions I've presented would work for assessment, unless you have built-in concerns about some answers being simpler than others.

- If you can get over that, there is no problem.

Assessment issues

If not, you can add conditions.

e.g. Instead of

The tenth shape in a pattern is a red triangle.

What could the pattern look like?

Assessment issues

- You could indicate that the core must have 3 elements (or it must be an ABB pattern).

Assessment issues

Instead of

- A number takes exactly four words to say.
- What might it be?

Require

- three numbers with different numbers of digits

Assessment issues

Instead of

- Exactly three sides of a shape are equal in length. What could the shape look like?
- How do you know?

Require

- that the shape cannot be a square or triangle

Strategies to create them

- Here is the answer. What is the question?
- 50
- A triangle
- A quotient with a remainder of 2

Strategies to create them

- How are these alike or different?
- bar graphs and pictographs
- Adding and multiplying

Strategies to create them

- Let students choose values.
- Choose 3 numbers to add so that the tens digit in the answer is 4.
- Choose a regular shape and its side length. Determine the perimeter and area.

Strategies to create them

- Use flexible words.
- The sum of two numbers is **almost** triple the difference. What could the numbers be?
- You multiply two numbers and the answer is **WAY MORE** than one of them, but not the other one. What might you have multiplied?

Strategies to create them

- Adjust existing problems, e.g.
- $25 + 36 = \square$
- could become:
- You add a two-digit even number to a two-digit odd number. What could the answer be?

Strategies to create them

- Adjust existing problems, e.g.
- $25 + 36 = \square$
- could become:
- You add to numbers that are 11 apart.
What could the answer be?
- Are there numbers it can't be?

Strategies to create them

- Adjust existing problems, e.g.
- $25 + 36 = \square$
- could become:
- You add together two perfect squares.
What are some possible answers? What are some numbers you can't get?

Parallel Tasks

- These are two related, but different tasks that suit kids at different places.
- The questions you ask work for both groups.

Example

What number on the number line does the dot represent?

Choice 1:



Choice 2:



Questions to Ask

- What is a number you think it is less than?
- What is another number you think it is less than?

Example

Choice 1: Choose two 3-digit numbers to add for a total close to 400. How could you use base ten blocks to help you add?

Choice 2: Choose two 2-digit numbers to add for a total close to 40. How could you use base ten blocks to help you add?

Questions to Ask

- Could one of the numbers be 10?
- Could it be 20?
- Could your two numbers be 10 apart?
- Could they be 20 apart?
- How could you estimate the numbers?
- How could using base ten blocks help you figure them out?

Example

Choice 1: Model two fractions with the same numerator. Tell which is greater and why.

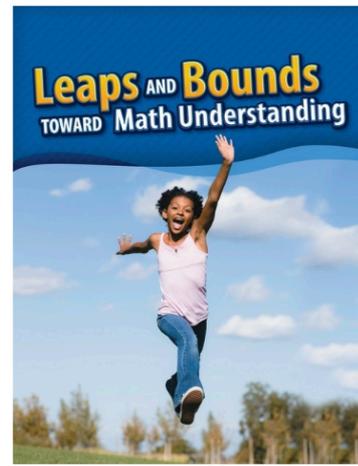
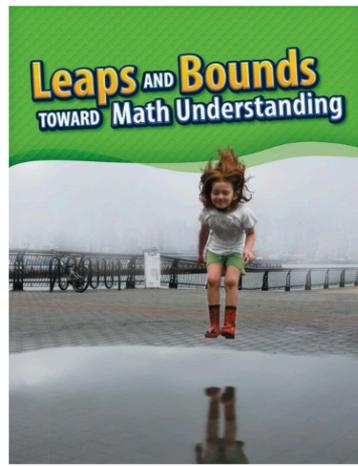
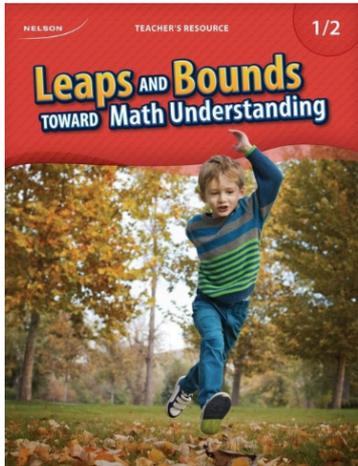
Choice 2: Model two fractions with the same denominator. Tell which is greater and why.

Questions to ask

- Could both have been more than $\frac{1}{2}$?
- Could both have been less than $\frac{1}{2}$?
- You used 3 numbers. What 3 numbers did you use?
- How did you decide which was greater?

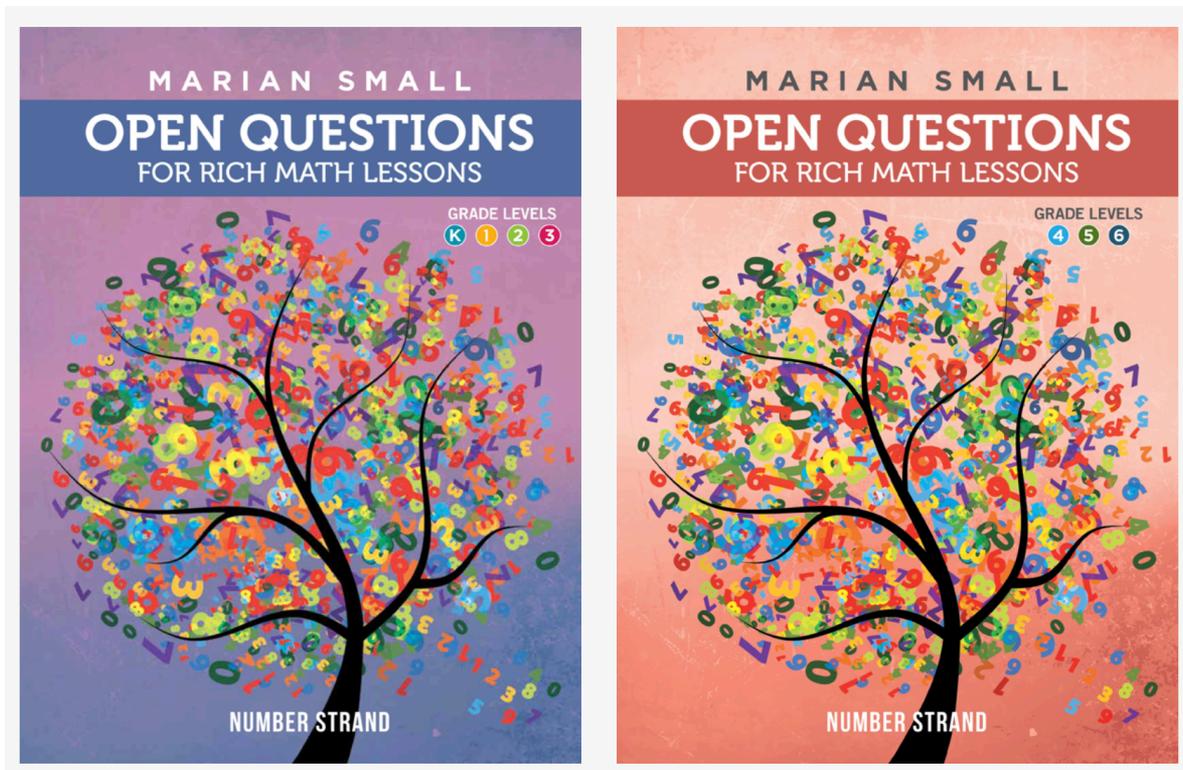
Where can you find examples?

- Many of you have Leaps and Bounds for Grades 7-8. That can help.



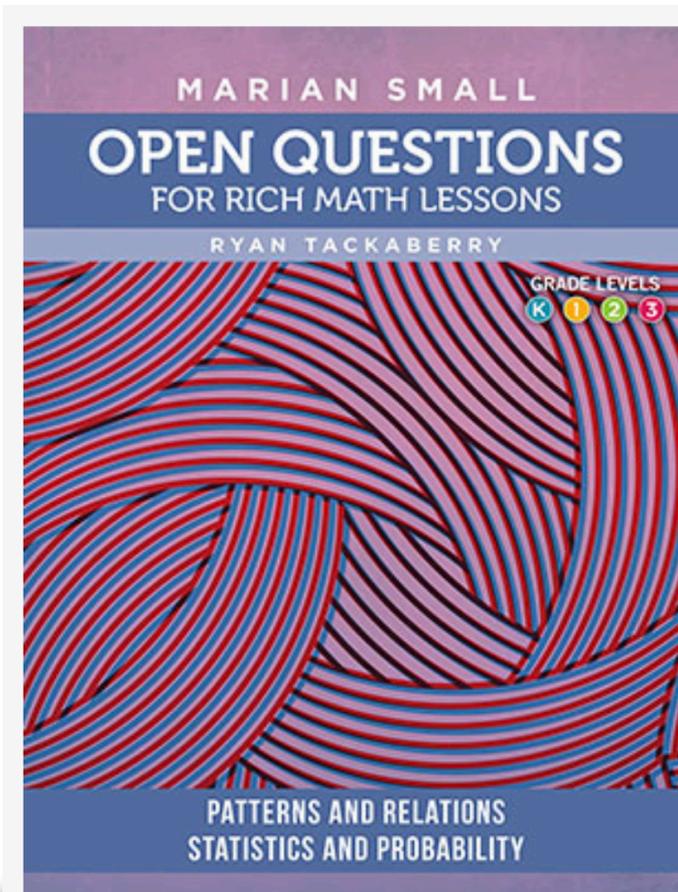
Where can you find examples?

- Some of you have copies of



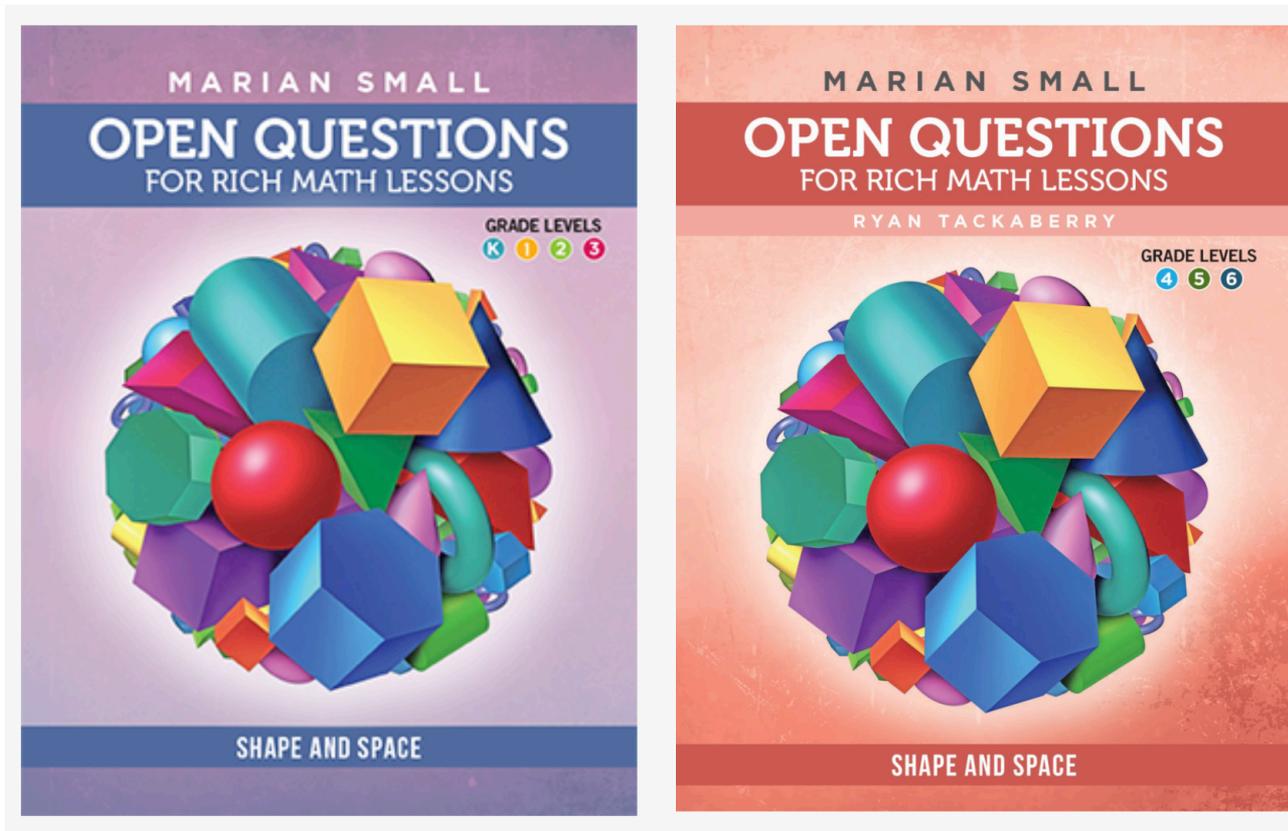
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Where can you find examples?

- Some of you might want to check out my newest resource from Rubicon Publishing: MathUp.



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