Using open questions in the K-6 Math Classroom

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Suppose I ask

- There were 24 kids in the class.
- Each one paid $15 for the field trip.
- How much was collected?
- Explain your thinking.

The problem is…

- For some kids these numbers are too much and they are excluded.
- For some kids, this is not much of a problem.
- So how do we change it up to be more useful to more kids?

Maybe

- There were more than 15 kids in a class.
- Each one paid MORE THAN $10 but LESS THAN $25 for the field trip.
- How much are you sure is TOO LOW?
- How much is TOO HIGH?
- How much might have been collected?
- Explain your thinking.

What is great about this is…

- That kids can pick numbers they can be successful with, but see that the process is the same no matter what.
- Even the too low and too high estimates leave a lot of latitude for all students.
- But really strong students are likely to pick tighter “too low” or “too high” estimates to challenge themselves.

Math is tricky

- We learned math believing that all kids need to be doing the same skill on the same day, when we know this is unrealistic.
- But we didn’t see options.

Open questions

- Provide a viable option for differentiation.
- One question can meet the needs of many learners because the question is not overly tight and so benefits a broader range of students.

A good open question

- engenders thinking, not repetition.
- focuses on important math.
- allows entry to all learners.
- leads to rich mathematical conversation.
- extends strong learners and
- provides LOTS of assessment for learning info.

Where they belong in a lesson

- They can either start a lesson, be the main problem for a lesson or can be used to see if students have learned the math ideas you were trying to expose.

Some samples

Q Stand on a number on a number line. Name two numbers that come before your number. Name two numbers that come after your number.

Q There are 10 people in a room, and there are more boys than girls in the room. How many of each might there be?

Q Make a train of green counting rods and a train of brown counting rods that are about the same length. Try to do this several ways.

Q A song lasts about 30 claps. What song might it be? How do you know? What song might it be if you clapped faster?

Q A pattern of shapes includes more green shapes than yellow shapes. What could the pattern look like?

Q Choose numbers to put in the blanks to make the statement true:

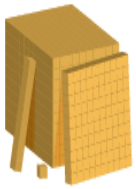
____ is a lot closer to ____ than to ____.

Q Create 4 patterns where the 10th shape is a green triangle. Make the patterns as different as you can. Tell what makes each one a pattern.

Q Choose two activities that you think would take about the same amount of time to do. Then, do the two activities to figure out for sure which one takes more time. Repeat with a different pair of activities.

Q Use at least four different colours of pattern blocks to create a design that has an area of about 20 blue blocks. How you know that the area is about 20 blue blocks?

$ Q Show an amount of money using six coins.
How else could you show this amount?
Repeat for two other amounts.



Q Break the number 48 up to show each of the following things about it. Show each thing using a number line or base ten blocks.

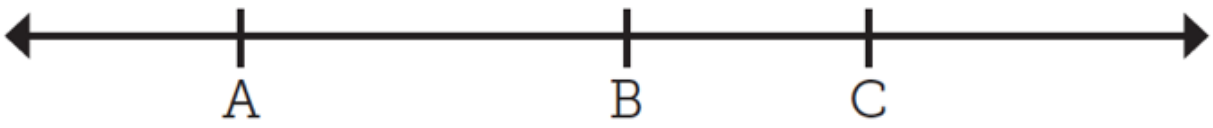
a) It is even.

b) It is between 40 and 50.

c) It can be broken up into three groups.

d) It has 4 groups of 10 and some leftovers.

Q Choose three numbers less than 100 to put at points A, B, and C on the number line below.
Explain why those numbers make sense.
Repeat with other numbers.



Q A number that includes the digits 2 and 5 is greater than a number that includes the digits 7 and 8. How is that possible? The numbers can have two or three digits.

Q A shrinking number pattern has a number in the 20s as the fifth term. What might the pattern be? Think of lots of possibilities.

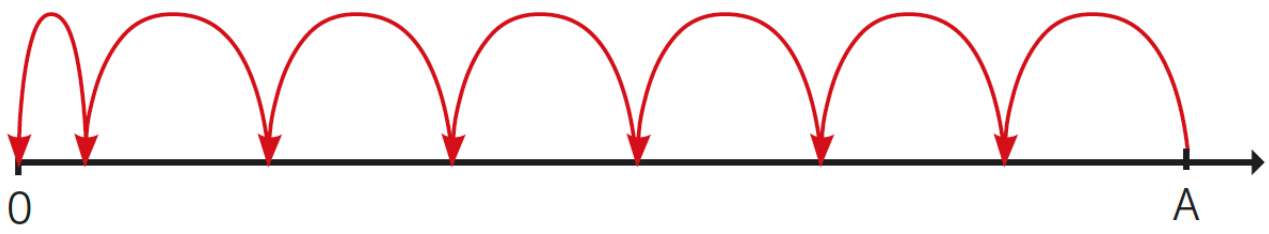
Q The result of a subtraction problem is 1 less than the result of 30 – 15. What might the problem be?

Q Which fraction do you think does not belong: $\frac{3}{10}$, $\frac{3}{3}$, $\frac{1}{8}$, or $\frac{2}{3}$? Why?

$ Q You represent an amount of money with 28 coins, including 13 quarters. How many other coins (not 28) might you have used to represent that same amount? Explain.

Q You figured out the missing number in a multiplication equation, and you thought it was really easy. What might the equation be, and why did you think it would be really easy?

Q Choose a value for the jump size and point A so that this picture shows division. What division does it show? Notice that the jump to 0 is a different size from all the others.
Repeat with different jump sizes and different numbers for point A.



Q Which do you think does not belong?

4×23 3×33 5×21 7×14

Q Create a sentence that includes all of these words and numbers:

4125 people more 2093

Q Think of some fractions where the numerator is 3 less than the denominator. Which of these could be true?

- The fraction is less than $\frac{1}{2}$.
- The fraction is greater than $\frac{1}{2}$.
- The fraction is greater than $\frac{3}{4}$.
- The fraction is greater than $\frac{9}{10}$.
- The fraction is less than $\frac{1}{8}$.

Explain your thinking.

Q Fill in the blanks so that the five numbers are in order from least to greatest. Use each digit 0 to 9 only once.

$$\square.\square\square < 1.\square < \square.\square\square < \square.\square < 6.\square$$

Think of three or more possibilities. How do you know they are ordered correctly?

Q Think of five-digit numbers where the sum of the digits is 24. List 10 or more possible numbers. Order them from least to greatest.

Q The 30th term in a growing number pattern is the same as the 15th term in another growing number pattern. What could the two patterns be?

Q Do you think that the ratios 5:2 and 24:10 are more alike than the ratios 5:2 and 20:17? Explain.

You could ask

Q Is it true that knowing 75% of a number also tells you 10% of a number?

Q Suppose $4 \times \square = \triangle$. What other equations relating $\square$ and $\triangle$ must also be true?

SAMPLE RESPONSE

$8 \times \square = 2 \times \triangle$

$\triangle \div 4 = \square$

$\triangle \div \square = 4$

Strategies You Can Use

- Start with the answer. Students create the question.

For example..

- The answer is 200.
- What might the question have been?

Alike and Different

- How are adding and multiplying alike? Different?
- How is adding decimals like adding whole numbers? How is it different?
- How are fractions and decimals alike? Different?

Choose your own values

- Choose two different pairs of two-digit numbers.
- Multiply them different ways.
- Tell how you multiplied each pair and why you used different ways.

Use “soft” words

- You add two decimal numbers and the answer is slightly less than 7.
- What might they be?

Use “soft” words

- You divide number A by number B.
- The answer is a little more than number B.
- What could the numbers have been?

Starting with a standard question and opening it up

- Now you start with a few standard number or pattern or relation questions and try to open them up to work for more students and to create richer conversations.