

Choosing and using Open Questions in K-8 Math

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What do you think?

- The answer is 100.
- What might the question have been?

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?

How big? How small?

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

Possibilities

- 423
- 158
- 3022
- 4100
- 1 000 023
- $1 \frac{3}{10}$
- 2.03

You can see...

An open question like the previous ones

- are accessible to 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

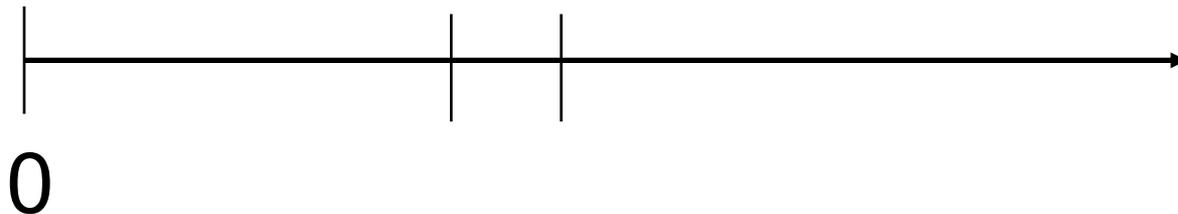
- There are a LOT of people in a car. How many might that be?
- There are NOT MANY students in a school. How many might there be?

More examples

- Do you think the number 15 is more like 10 or more like 20?
- Let's have a debate!

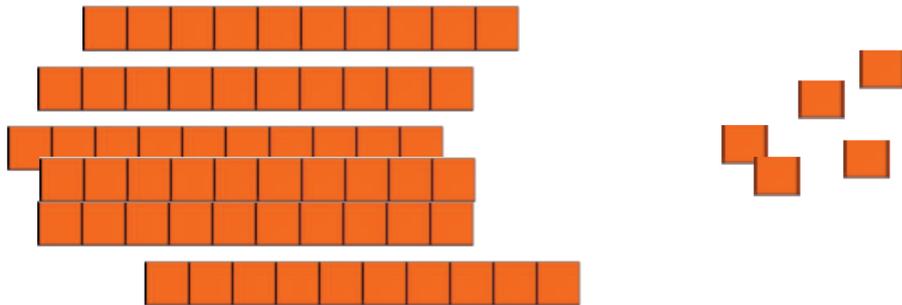
Number Line

- What names might make sense for the two numbers represented by the lines?



More examples

- A number is made up of LOTS of tens and 3 ones. What could it be?
- A number is represented with half as many ten rods as ones. What could it be?



Half as many ten rods as ones

- 24
- 36
- 60 (5 rods and 10 ones)
- 72 (6 rods and 12 ones)
- 1200 (100 rods and 200 ones)

12 blocks

- A number is represented with exactly 12 base ten blocks.
- What could it be?

12 blocks

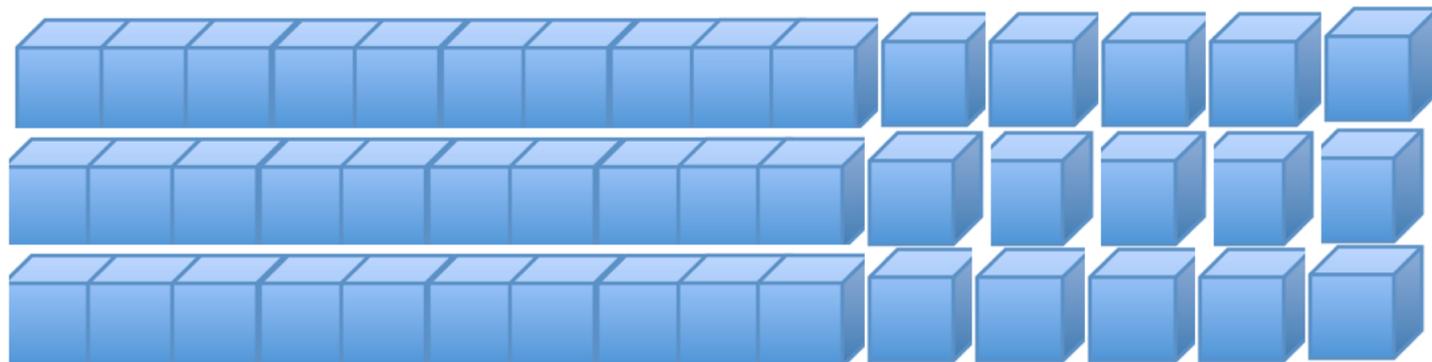
- 12 48
- 120 66
- 1200 147
- 111 57
- 30 624
- 102 912

More examples

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

More examples

- You use 18 blocks to model 3×15 .



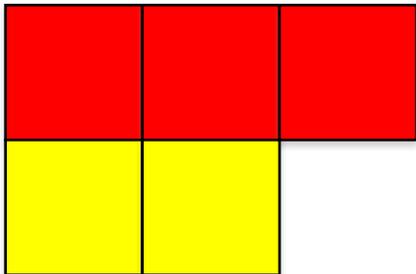
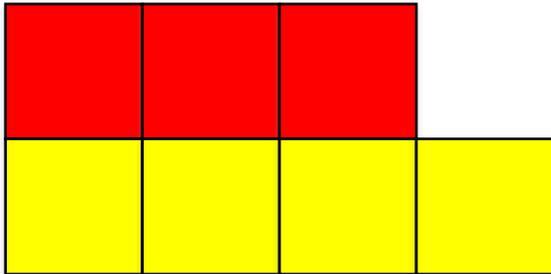
- What other multiplications can you show using exactly 18 blocks?

Maybe

More examples

- A design is made of square tiles.
- It is ALMOST half red.
- What could it look like?

Maybe



More examples

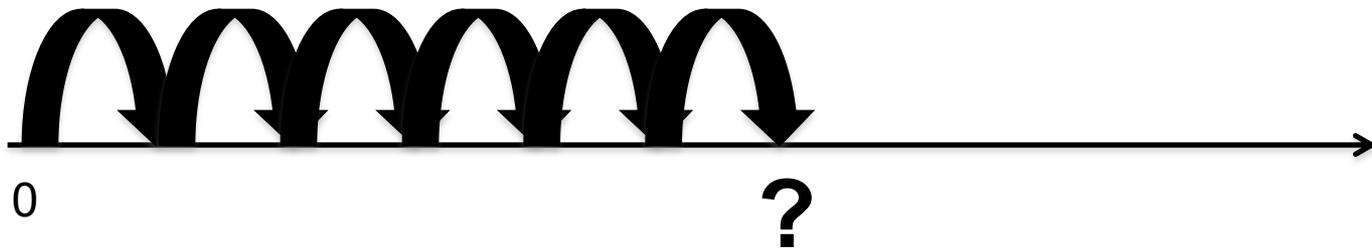
- A fraction is just a LITTLE more than $\frac{1}{2}$.
- What could it be?

More examples

- You know that triple a number is less than 50.
- What else do you know about it?

More examples

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



More examples

- Which one doesn't belong?

$3/5$

$2/3$

$3/8$

$4/5$

More examples

- _____ is $\frac{4}{5}$ of _____.
- OR
- _____ is 4 more than _____.
- OR
- _____ is 3 times as much as _____.

More examples

- Two decimal numbers are not that far apart.
- Their sum is 95.1.
- What could they be?

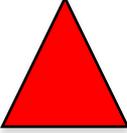
More examples

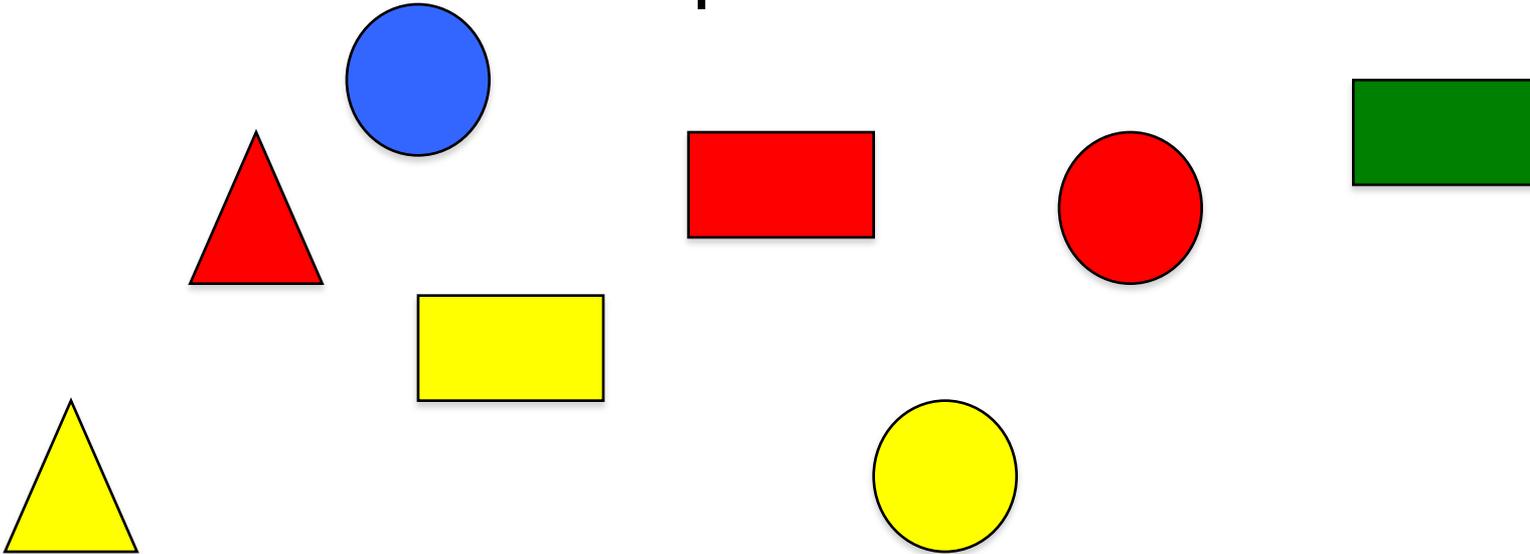
- The equation $25 + \square = 48$ describes two very different situations. What might those situations be?

More examples

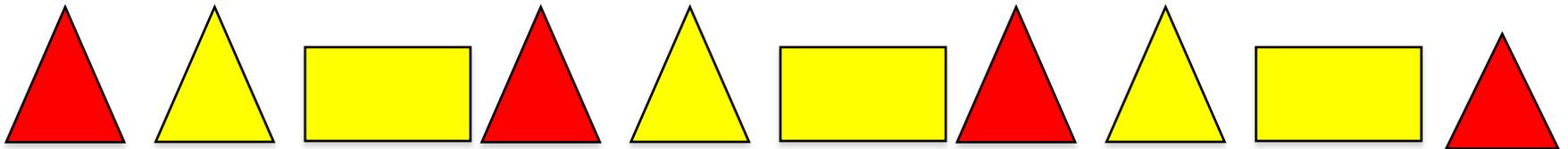
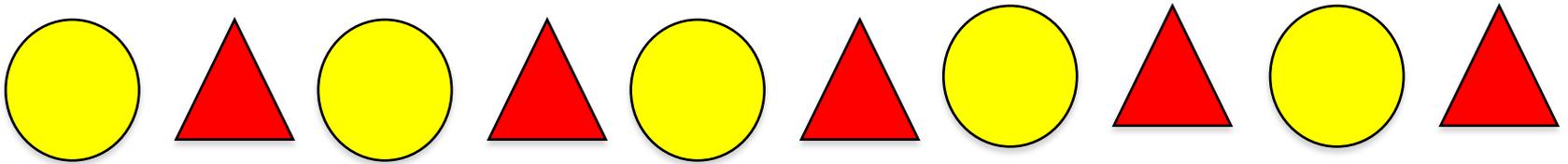
- You choose two numbers.
- You add them.
- You subtract them.
- The add answer is 10 more than the subtract answer.
- What are the numbers?

More examples

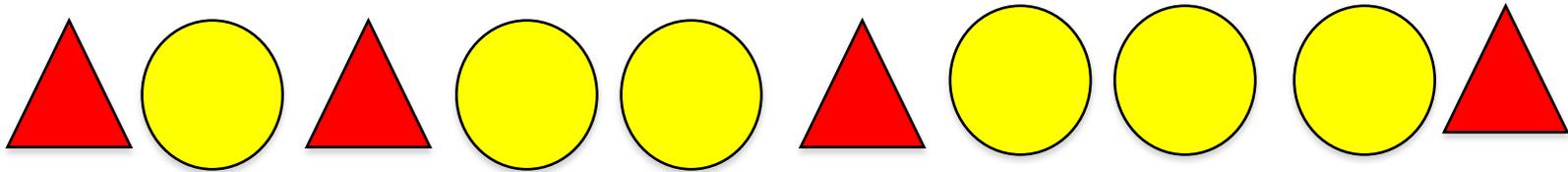
- The 10th shape in a pattern is 
- What could the pattern be?



Maybe



Maybe



More examples

- The 20th term in a growing pattern is 41.
- What are possibilities for the pattern?

Maybe

- 22, 23, 24, 25, 26,...
- 3, 5, 7, 9, 11,.....
- -16, -13, -10, -7, -4, -1,.....

More examples

- A shrinking pattern has both a 50 and a 38 in it. What might it decrease by?

More examples

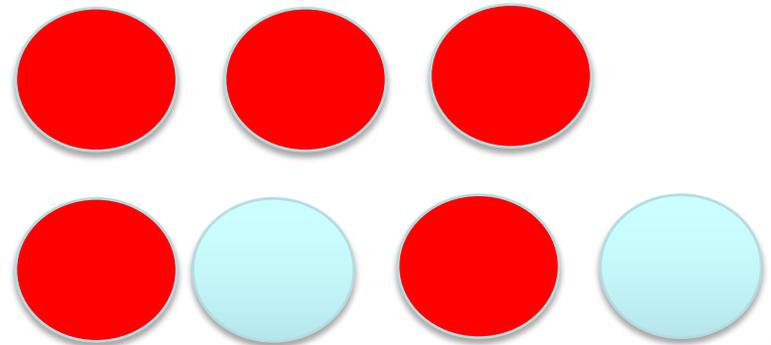
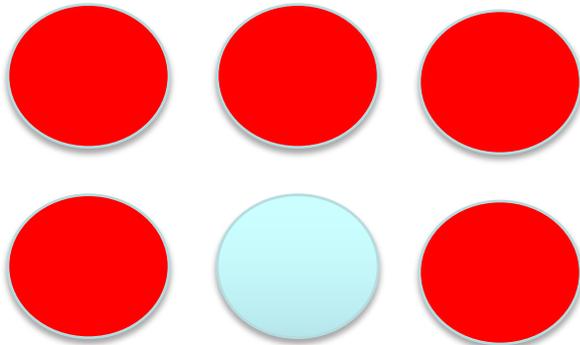
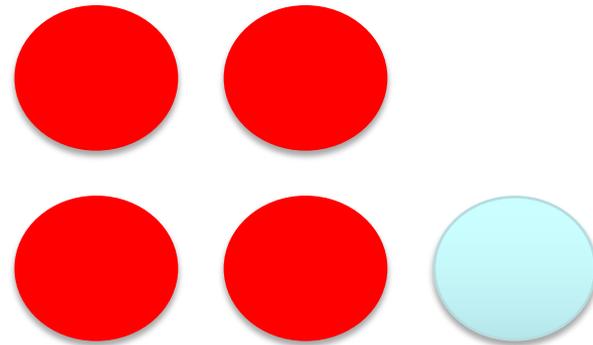
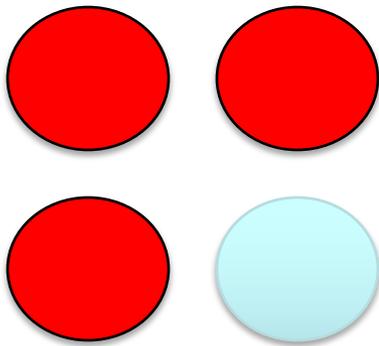
- Two patterns both have an 8 in them somewhere.
- The first one grows way faster than the second one.
- What could they be?

Maybe

- For what values of x is $4 + x = x + 2 + 2$?
- Create an equation involving variables and division signs that you know is ALWAYS true. Tell why it is true.

More examples

- Which group is reddest?



More examples

- If all the fruit were blueberries, how many would there be?



More examples

- One line is about 5 cm shorter than another.
- Draw what they might look like.

More examples

- The number of square centimetres in one rectangle is *WAY* less than another, but it has *WAY* more perimeter.
- What could the two rectangles look like?

More examples

- The volume of one prism is exactly 100 cubic units more than the volume of another. What might the dimensions of each be?

Maybe

- Small one: $4 \times 5 \times 6$
- Large one: $2 \times 10 \times 11$

- Small one: $5 \times 3 \times 10$
- Large one: $5 \times 5 \times 10$

Maybe

- What might this graph be describing? (It should make sense.)



More examples

- The mean of a set of data is a LOT more than the median. What could the values be?

More examples

- The mean of a set of data is double the median. What could the values be?

More examples

- The mean of a set of data increases by 20 when one data value is removed. What might the data set be and which piece would be removed?

Maybe

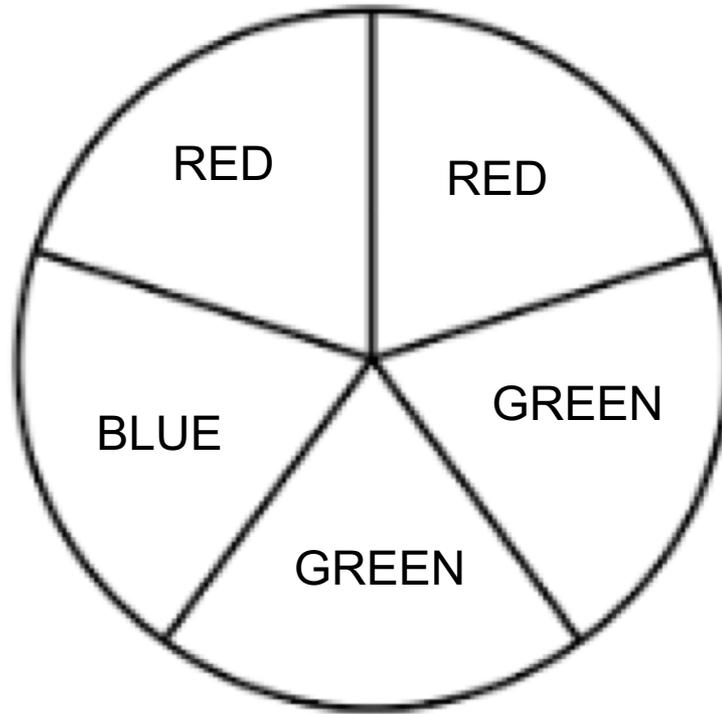
- 100, 60, 20 compared to 100, 60
- 200, 200, 20, 20, 10 compared to
200, 200, 20, 20

More examples

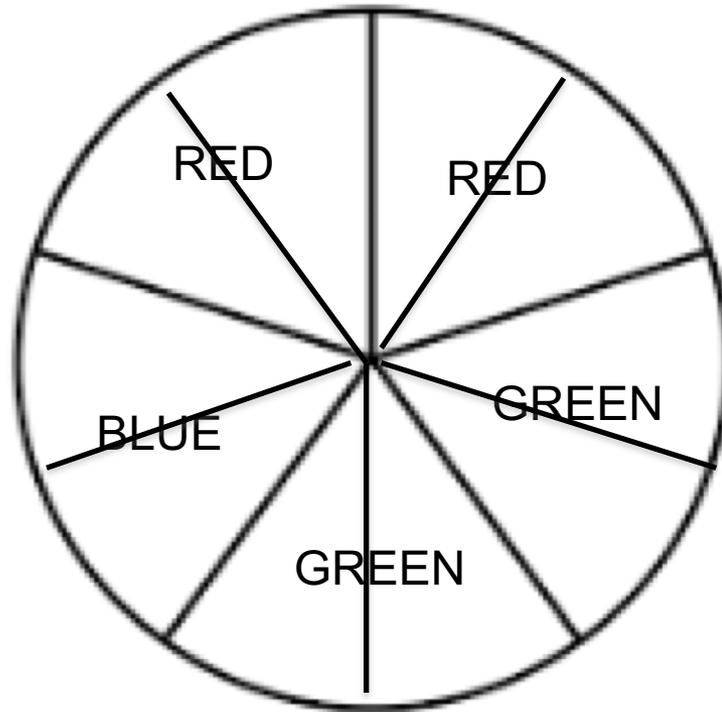
You create a spinner where :

- 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.

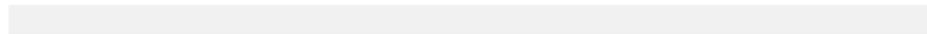
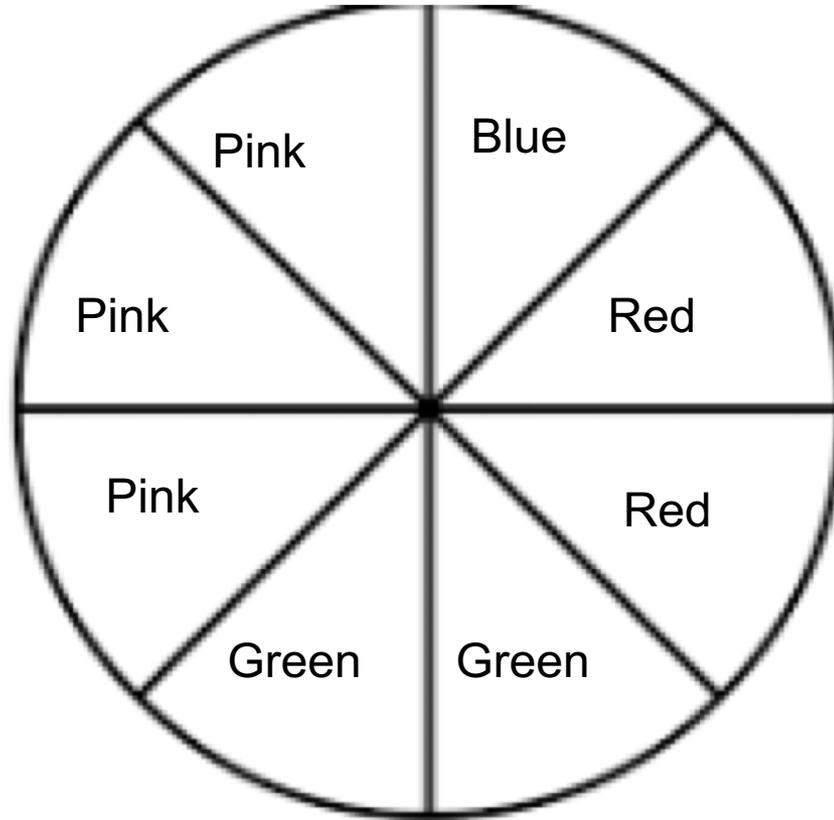
Maybe



Maybe



OR



Assessment issues

Some open questions are not really assessable in terms of marking, e.g.

- Is 10% a lot or not?

But many are:

- E.g. Fill in the blanks in 5 ways.

Use fractions, decimals, whole numbers and negative numbers.

_____ is 60% of _____.

Assessment issues

Instead of

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

Change it to

- List numbers that are least 1000 apart that each take four words to say.

Assessment issues

Instead of

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

Change it to

- List two ways that 15 is more like 10 than like 20.
- List two ways that 15 is more like 20 than 15.

Assessment issues

Instead of

- A design is made of square tiles.
- It is ALMOST half red.
- What could it look like?

Just add:

How do you know you're right.

Strategies to create them

- Here is the answer. What is the question?
- The answer could be the word *square*.
- the number 95
- the calculation $4 \times (-3)$
- a particular graph

Strategies to create them

- How are these alike or different?
- numbers with 3 factors and numbers with 5 factors
- bar graphs and pictographs
- multiplying numbers under 10 and adding numbers under 10

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?

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