



A Focus on Consolidation

Alberta webinar
April, 2011



Imagine

- You are teaching students about the exponent laws.
- Vote for which ONE of the following questions you think best gets at the heart of what you want students to know.



Exponent questions

- A: What is $3^4 \times 3^5$?
- B: How do you know that $3^4 \times 3^5$ can be written as a power of 3?
- C: You multiply two numbers. The product can be written as a power of 3. What could you have multiplied? Explain.
- D: Which exponent law would you use to calculate $3^4 \times 3^5$?



How do the questions differ?

What is $3^4 \times 3^5$?

- To find out if students can "use" or "apply" the law



How do the questions differ?

How do you know that $3^4 \times 3^5$ can be written as a power of 3?

- To find out if students can see why some aspects of the exponent law makes sense



How do the questions differ?

You multiply two numbers. The product can be written as a power of 3. What could you have multiplied? Explain

- To find out if students can see the relationship between the exponent laws and factoring numbers



How do the questions differ?

Which exponent law would you use to calculate $3^4 \times 3^5$?

- To find out if students are familiar with terminology



It's important to..

- Think deeply about the outcomes (and indicators) and try to develop consolidating questions at the end of a lesson that require students to focus on the main point of the lesson.



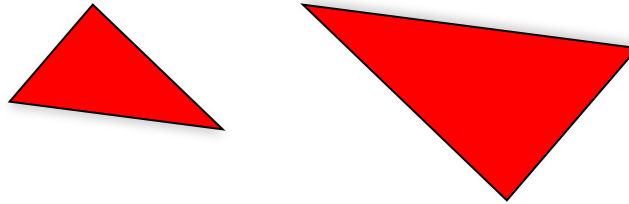
Similarity

In 10-3, we look at similarity of polygons.

- Which ONE of the following questions do you think is most important for kids to be able to answer for you to feel that they "got" it?
- Vote for A, B, C, or D.

Similarity

- A: Are these triangles similar? How do you know?

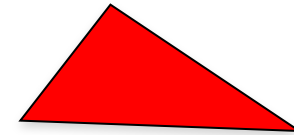


- B: Are these triangles similar? How do you know?

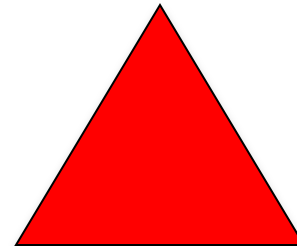
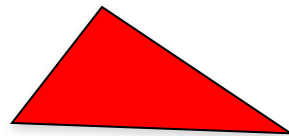


Similarity

- C: Draw a similar triangle.



- D: How do you know these triangles cannot be similar?





Or..

Would you prefer?

- You have drawn a triangle with side lengths 8 cm - 8 cm - 2 cm on a piece of paper.
- You enlarge it so that the 8 side is now 12 cm. How long is the 2 cm side now?

CPP

- In 2011, the prescribed contribution rate is 4.95% of gross salary up to \$48 300, with the first \$3500 exempt.
- Which question do you think is best?
Vote.
- I will ask some of you why.



CPP

- A: What is the maximum amount someone might have to pay? Explain.
- B: How would you estimate the amount you'd pay on a \$35 000 salary?
- C: Would it affect the amount you pay a lot if the rate went up to 5%? Explain.
- D: Explain why if you earn a big salary, your rate is actually lower than if you don't.



Absolute value

- Suppose you were teaching your Math 20-1 students about absolute value.
- Type in a text box on the next slide a question you might ask your students that gets at what you think is most important about absolute value.



One, Two.. Infinity

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14



Some thoughts

- When is $|x| = -x$? Why?



Some thoughts

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- Why is $|x|$ either x or $-x$?



Some thoughts

- When is $|x| = -x$? Why?
- Why is $|x|$ either x or $-x$?
- Why are there always two different numbers with a given absolute value? Or are there?



Some thoughts

- When is $|x| = -x$? Why?
- Why is $|x|$ either x or $-x$?
- Why are there always two different numbers with a given absolute value? Or are there?
- What picture can you draw to show what $|-1 - 7|$ means?



More thoughts

- What kind of number can be an absolute value? What kind can't?



More thoughts

- What kind of number can be an absolute value? What kind can't?
- How is $|x|$ different from $|x - 3|$?



How might thinking of big ideas help?



Suppose..

- You were teaching about quadratics in Math 20-1.
- One of the big ideas in algebra is:
 7. There is a predictable relationship between the geometric transformations that move graphs from one position to another and the algebraic expressions for those graphs.

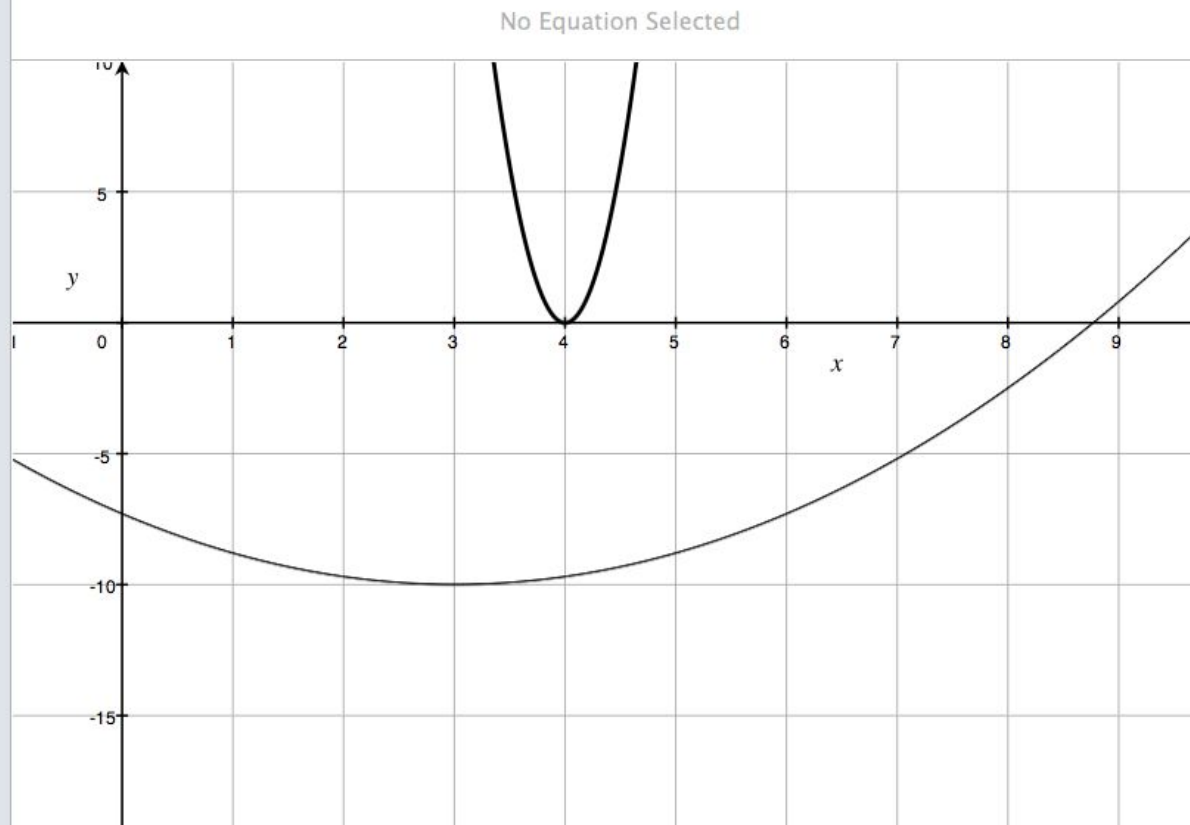


That might lead you to...

- You graph a quadratic that is much wider and a fair bit lower than
$$y = 3(x - 4)^2 + 8.$$
- What could its equation be?

One example

$y=3(x-4)^2+8$
 $y=0.3(x-3)^2-10$





That might lead you to...

OR

- Why does changing the p in $y=a(x-p)^2 + q$ not change how high or low the graph goes? What does it change?



So you try...

- What question could you see bringing out this big idea when working with quadratic (or linear or other types of) relations?
- Write your ideas in a text box on the next slide.



One, Two.. Infinity

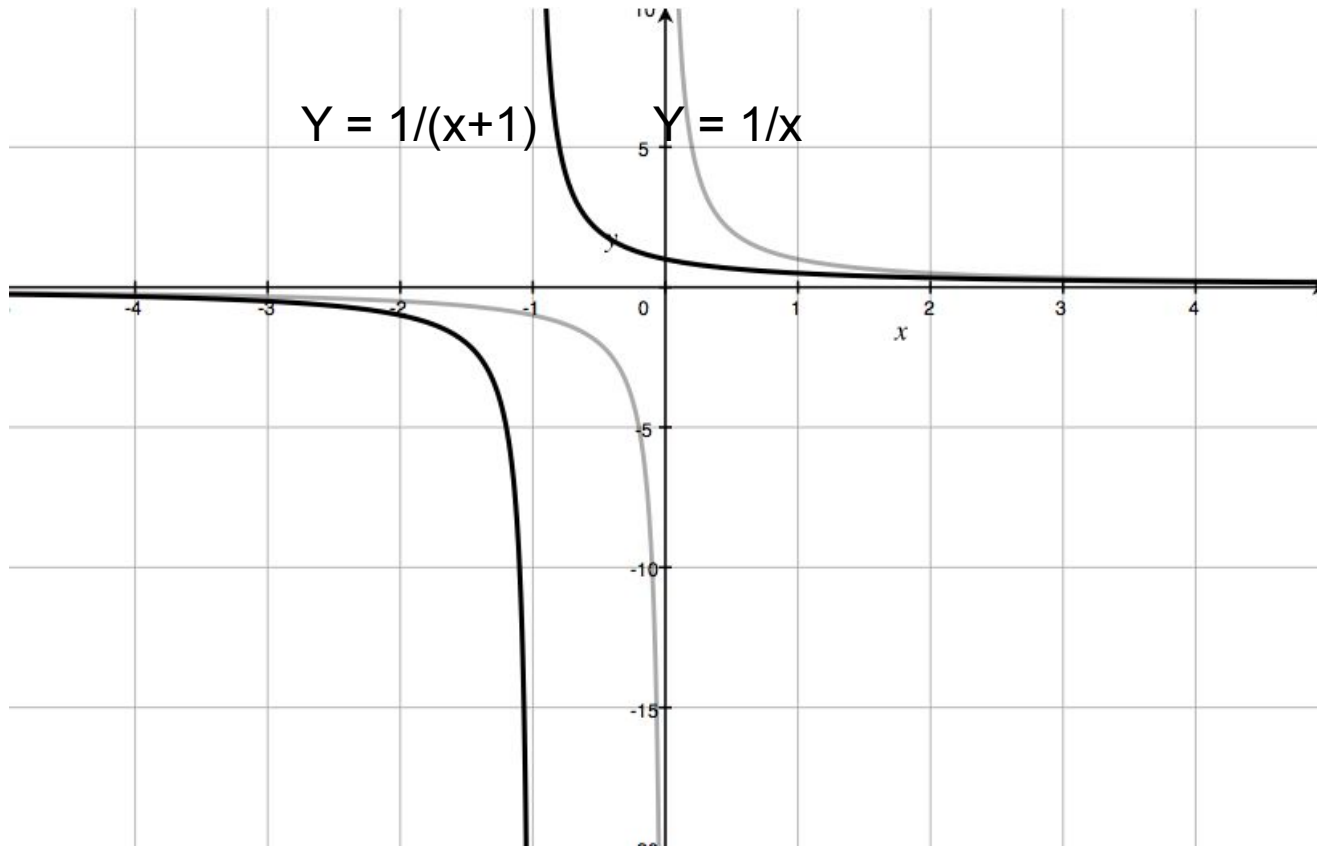
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Possibles

- How is the graph of $y = 1/(x+1)$ alike and different from the graph of $y = 1/x$?

Two graphs

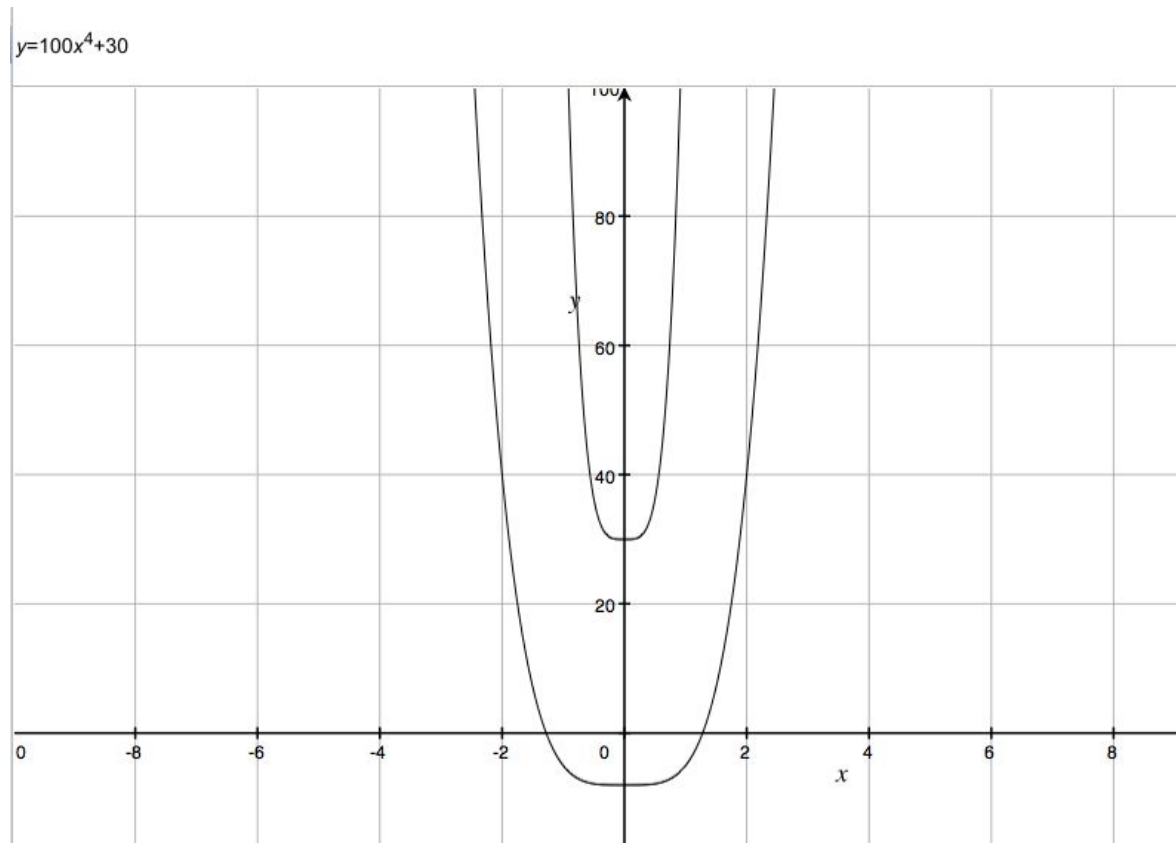




Possibles

- What degree 4 graph would be a lot narrower than $y = 3x^4 - 8$?
- Will it always stay "inside"?

maybe





Another big idea

is

3. The same algebraic expression or equation can be related to different real-world situations, and different algebraic expressions or equations can describe the same real-world situation.



So I might ask:

The equation $5f + 2t = 100$ represents a situation.

What could that situation be?

Write an idea in a text box on the next slide.



One, Two.. Infinity

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14



Possibles

- A pile of \$5 bills and a pile of toonies is worth \$100 altogether. How many of each?



Possibles

- A pile of \$5 bills and a pile of toonies is worth \$100 altogether. How many of each?
- Sue packaged 100 items; she put toy frogs in packages of 5 and toy toads in packages of 2. How many packages of each? Etc.



Or the other way...

- A trapezoid has its long base double the shorter one and the height half of the shorter base.
- How could you describe the area using one variable? [Write on next screen.]
- How do you know there is another way to do that?



One, Two.. Infinity

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Maybe...

- $A = (b + 2b)/2 \times b/2 = 3b^2/4$, but b represents the short base
- $A = (2h + 4h)/2 \times h = 3h^2$
- $A = (1/2b + b)/2 \times b/4 = 3b^2/16$, but b represents the long base



Or in solving equations

- Some boys and girls are in a class. There are 32 students altogether. There are 4 more boys than girls.
- What **different** equations could describe this scenario? Write on the next slide.
- What does the variable represent in each?



One, Two.. Infinity

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Maybe

- $x + (x + 4) = 32$ where x is the girls
- $x + (x - 4) = 32$ where x is the boys
- $(x + 2) + (x - 2) = 32$ where x is the average



Solving problems involving scale (20-3)



One big idea is...

3. Knowing the measurements of one shape can sometimes provide information about the measurements of another shape.



So you might ask:

- Suppose I drew a 6 cm couch on my plan and the couch is really 2.5 m long.
- What are some different ways I could represent the scale?

A good question, but not focused on the big idea.



So you might ask:

- I tell you I have made a scale diagram of my living room. I have drawn all the furniture.
- Why can I tell you the actual size of ANY of the pieces of furniture in the picture for you to be able to figure out the actual sizes of ALL of them?



Suppose we are in 10-3

- You are focused on SI and Imperial measurements.
- What do you think is most important?
- Please raise your hand and type in the chat box or take the microphone to speak.



Possible big idea

1. The unit chosen for a measurement affects the numerical value for that measurement in a predictable way.



So you might ask...

- I measured the length of the same item using a metric unit and an Imperial unit. It took a lot of metric units and very few Imperial units.
- What could the units have been? How do you know?



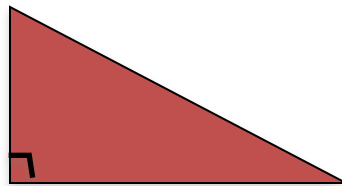
Trig

- A relevant big idea

BIM 2. Shapes can have measurements that are independent, but sometimes one measure of a shape can be determined simply by knowing other measurements of that shape.

So..

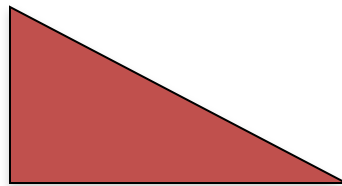
- I might ask:
- Why do you only need to know 1 other angle (not the right angle) and 1 side length in this triangle to know all the other angles and side lengths?





So..

- I might ask:
- What if the bottom left angle were not a right angle?





Factoring

- The calculation of LCM and GCF can easily relate to classifying numbers.
- For example, there is no way that 28 can be the LCM of 3 and anything since we classify 28 as a non-multiple of 3.



Big Idea

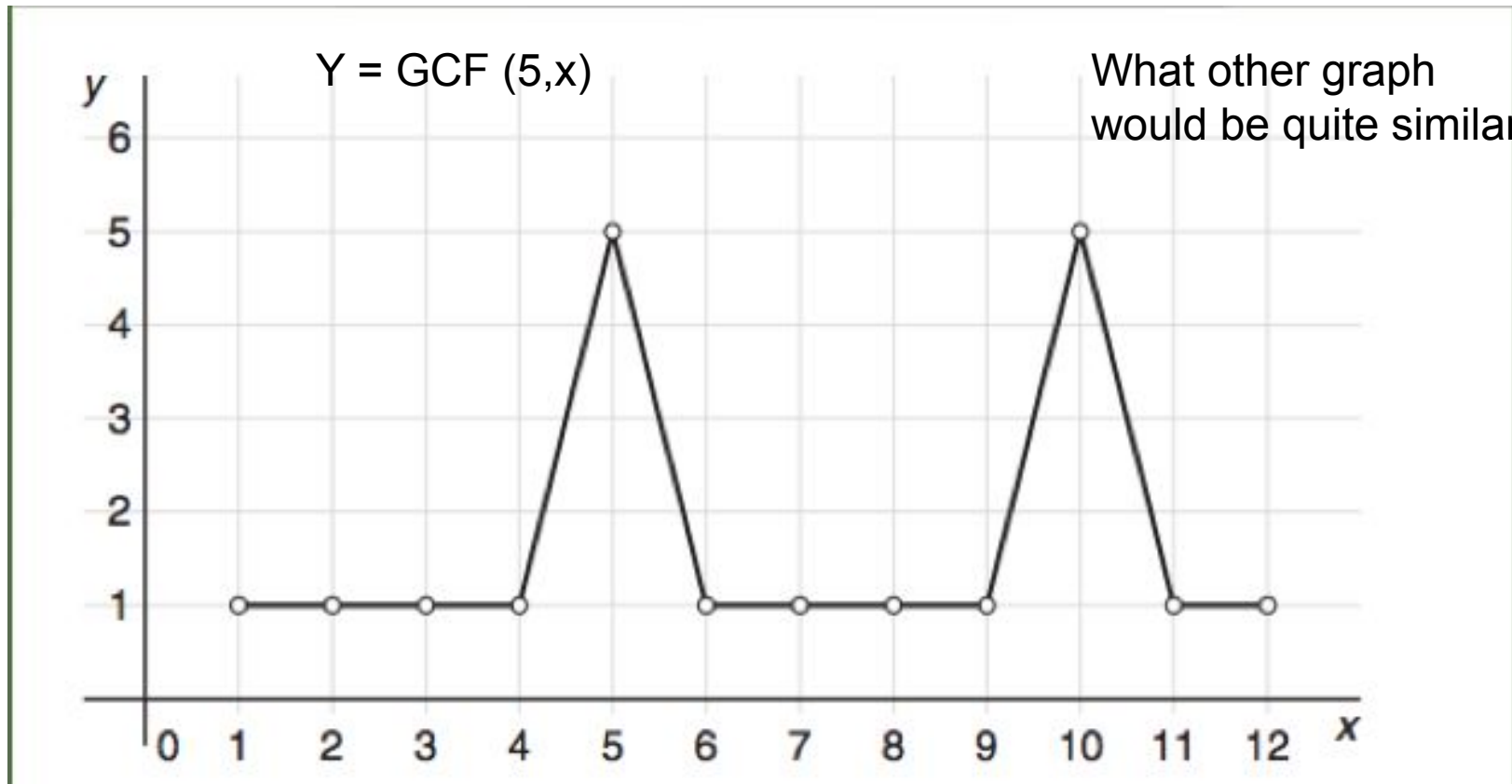
2. Classifying numbers provides information about the characteristics of the numbers.



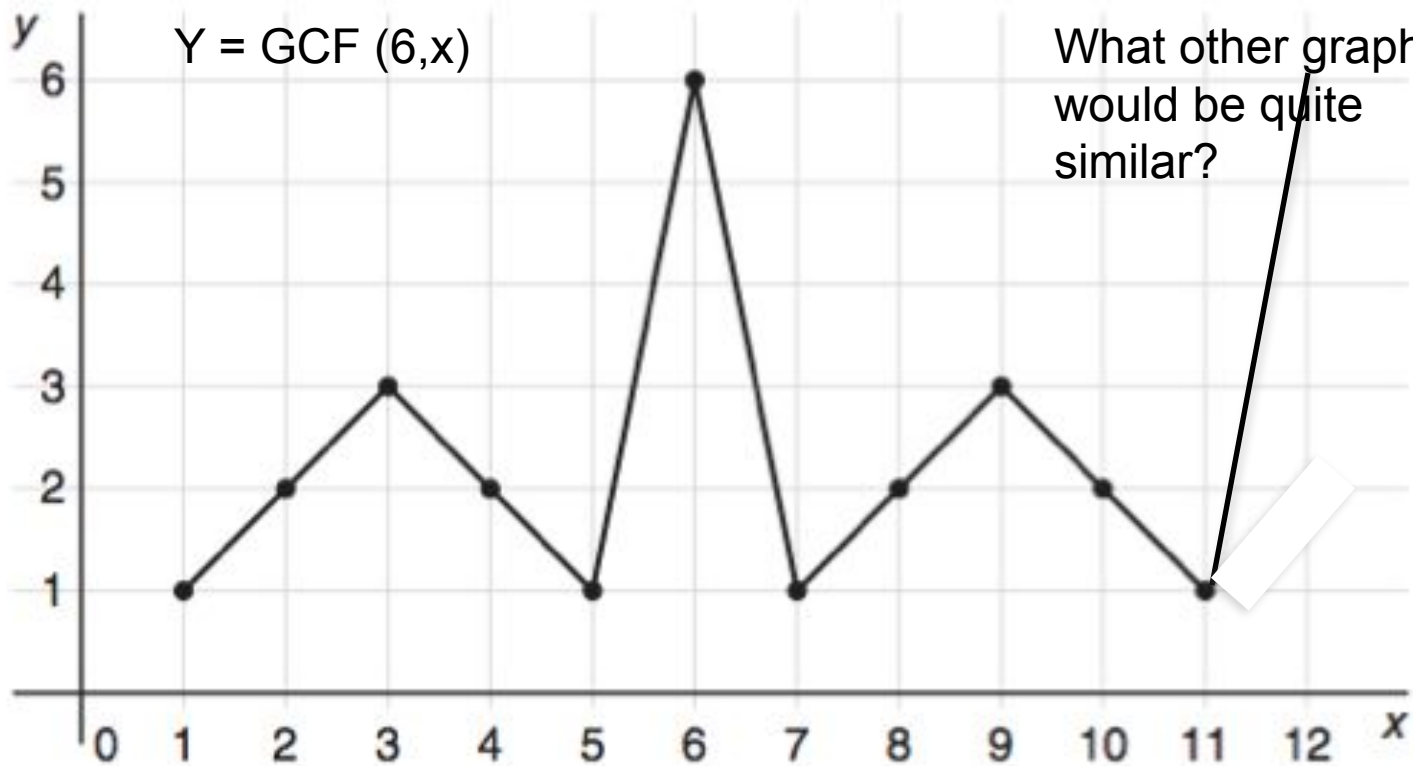
So...

- I might ask:
- The LCM of two numbers is 20 times the GCF.
- What do you know about the two numbers?

Or I might show this graph



Or I might show this graph





Graphs of Lines

- We want students to graph the equations of lines.
- What do you think are important ways for them to distinguish (or classify) equations of lines?
- Type in a text box on the next slide.



One, Two.. Infinity

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14



Maybe..

- One idea might be the difference between lines with positive slope and negative slope (or increasing vs decreasing functions)



So I might ask..

- A linear relation is graphed.
- The slope is very steep and negative.
- If the line goes through $(8,3)$, what value you expect y to be if it also passes through $(10, y)$?



Or I might ask, about
quadratics



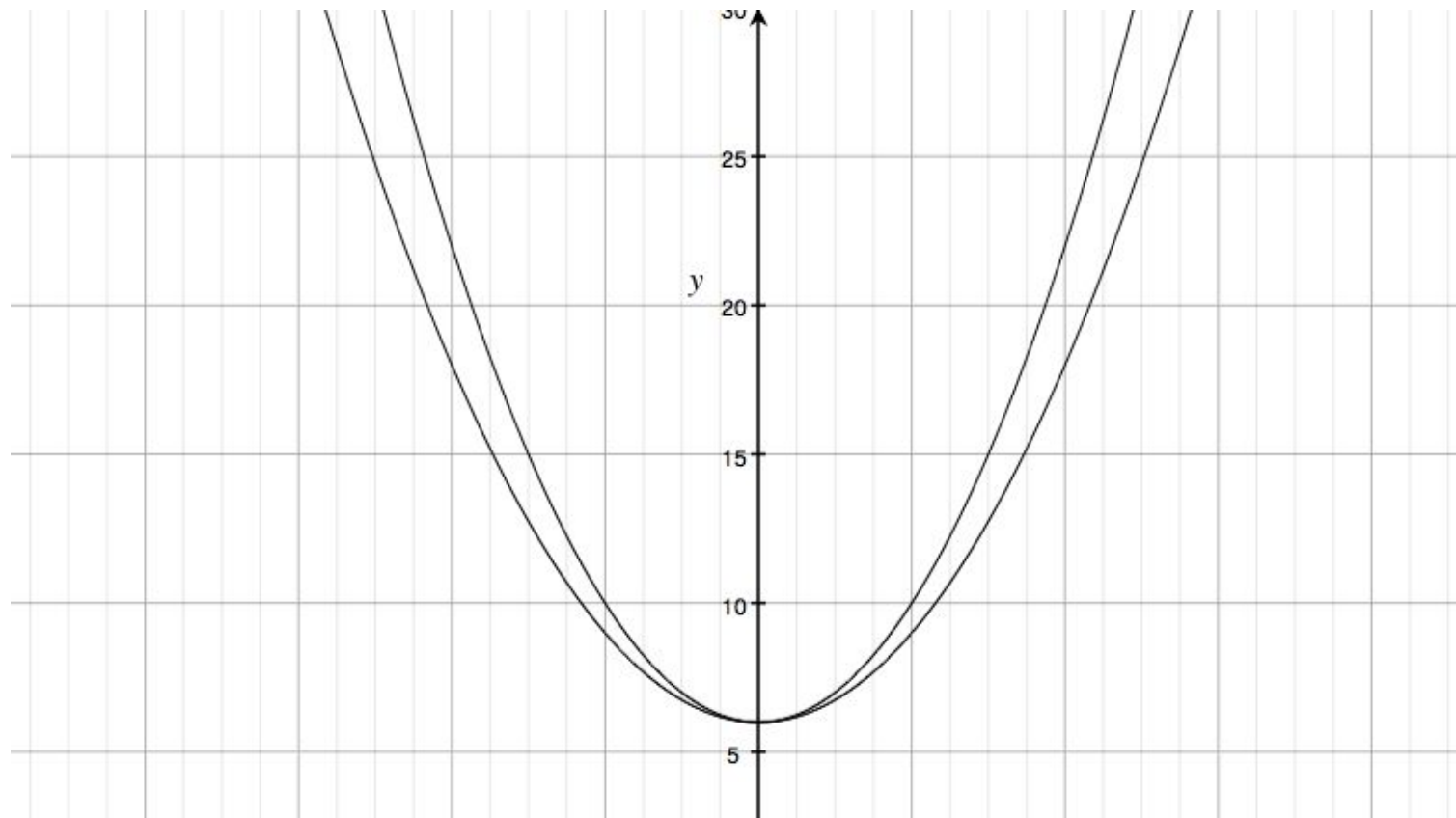
Maybe

- Is the graph of $y = 3x^2 + 6$ more like the graph of $y = 4x^2 + 6$ or more like the graph of $y = 3x^2 + 7$?



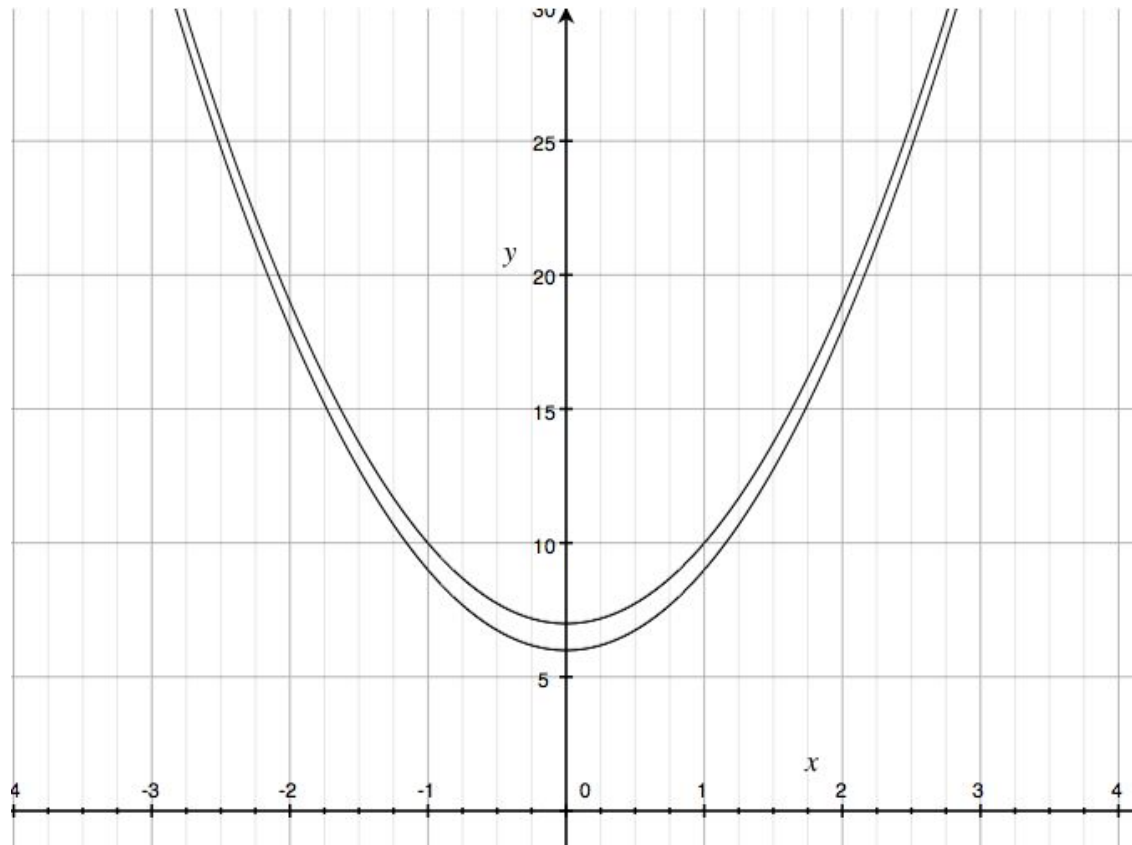
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Or..





Another important direction

- We want students to realize that a lot of mathematics is about stating more based on what is given.



Another important direction

- We want students to realize that a lot of mathematics is about stating more based on what is given.
- In other words- if you know a little, you know more than you realized.



Another important direction

- This could lead to interesting questions.



For example

- You are teaching about sequences and series.
- You might ask:



For example

- You know that the fifth and eighth terms of an arithmetic sequence are 12 and 24, respectively.
- What other things do you know about the sequence?
- What would you say?
- Raise your hand or type in the chat box.

Systems of equations

- You might ask:
- You are solving
$$2x + 3y = 70$$
 and
$$4y - 3x = 320$$

How do you know that x can't be positive and y negative? What mix is possible?

- Type in chat box or use microphone.



Systems of equations

- $2x + 3y = 80$ and
 $5y - 2x = 320$

Or

What do you know about $2x$?

What do you know about $8y$?

- Type in chat box or use microphone.



Notice

- The focus on consolidation has been on concepts, not skills.
- The skills matter, but it is the concepts we should be making sure to check on.

Source for my big ideas

