

Math in Action Questions & Answers

Here are fun questions that you can use to engage your students mathematically. They range from complements and square roots to algebra, geometry, and trigonometry. They're meant to be great conversation starters, and they also highlight our new wall art characters.

Feel free to make up additional questions for students at different levels.

Get creative! Every activity has at least one question with the answer provided.

Warm-up and cool-down periods are a good time to have these conversations. *Have fun!*





Bike for Two

Two circles ride a tandem bicycle.
They overlap to form a Venn diagram.

Q: What is the rule for the numbers in the left circle? What is the rule for the numbers in the right circle?

A: The numbers in the left circle are multiples of 2, and the numbers in the right circle are multiples of 3.

Q: What is the rule for the numbers where the circles overlap? What other numbers could go there?

A: The numbers in the overlapping section of the circles are multiples of both 2 and 3, which makes them multiples of 6. Other numbers that could go there are 18, 24, 30, and so on.

9 On a Bike

9 rides a bicycle made of 3 gears.

Q: What has to happen for this bicycle to move forward?

A: Based on the way the gears fit together, the 9 needs to pedal the middle gear backward for the two others to move forward.



Percentage

A fraction runs, trips, falls, and rearranges itself into a percentage.

Q: What does "percent" mean?

A: "Per" is a Latin word that means "for each." "Cent" means "hundred." So, "percent" means "for each hundred."

Q: Can you guess where the percent symbol (%) comes from?

A: The term "per cento" was used in medieval and Renaissance Italy. People didn't want to write "per cento" out every time they wanted to write about percentages, so it was shortened to "p 100," then "p 0," then eventually to the symbol we use today.

Snow

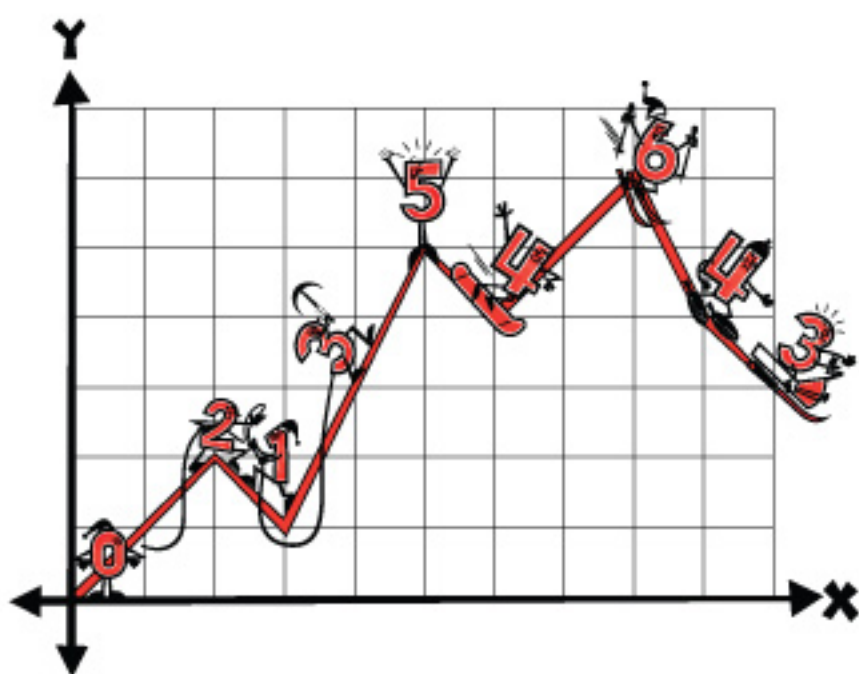
Digits hike, climb, snowboard, ski, snowshoe, and ride a snowmobile up and down the slopes of a line graph.

Q: Are the digits equal to the x-value or the y-value of the points they're on?

A: The digits are equal to the y-value.

Q: Which part of the graph is the steepest?

A: From $x = 3$ to $x = 5$ (the interval where the 3 is using a pickaxe).



Dancing

Complements of 10 dance with each other.

Q: Some whole-number pairs are missing from this dance party! Who could they be?

A: The whole numbers that are missing are 0 and 10, 1 and 9, and 4 and 6.

Q: If -2 comes to the dance party, then who should she bring with her to dance?

A: Since -2 and 12 add up to 10, -2 should bring 12 to the dance party.

Surfing

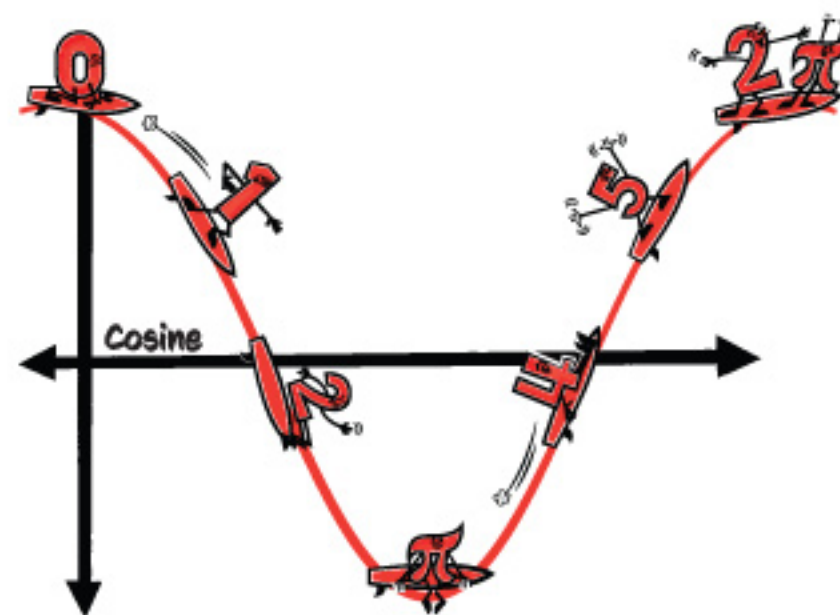
Numbers surf along a cosine graph.

Q: At what points does the graph intercept the x-axis?

A: In the portion of the graph that is shown, the graph intercepts the x-axis at $\frac{1}{2}\pi$ and $1\frac{1}{2}\pi$. That's between 1 and 2 and between 4 and 5, respectively.

Q: Do you think any of the numbers will ever break a record for highest wave surfed?

A: No! Each local maximum (and local minimum, for that matter) of a cosine function has the same output value.





Tri-Guy Weights

A right triangle lifts dumbbells. One dumbbell is labeled 8^2 , and the other is labeled 2^6 .

Q: What is the value of each dumbbell expressed without exponents?

A: Each dumbbell's expression is equal to 64.

Q: Can you think of another way to express the weight of one of the dumbbells?

A: Answers vary because there are an infinite number of ways to represent the number 64.

Skater

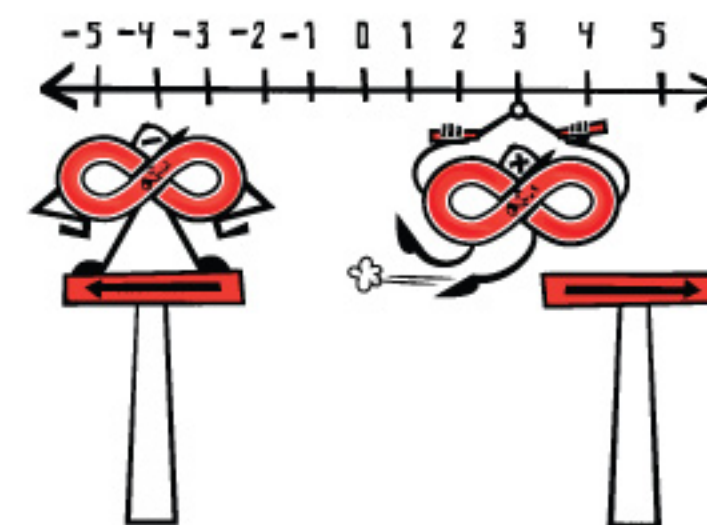
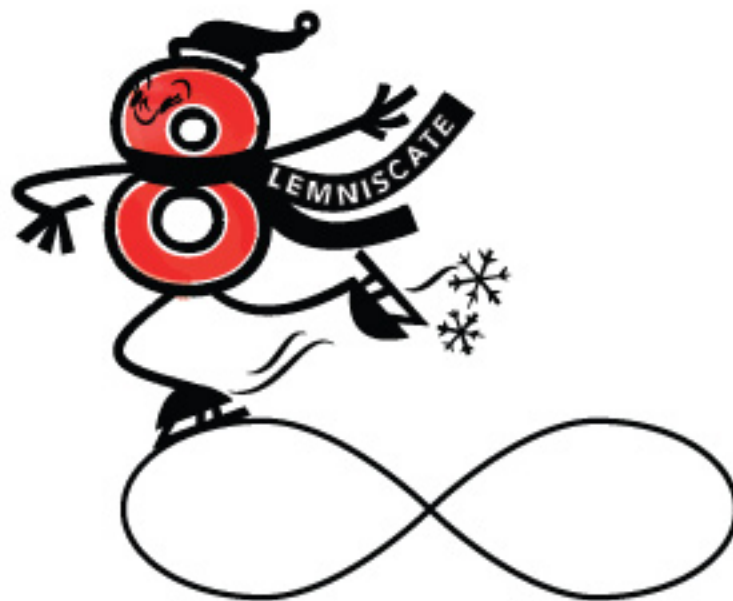
A figure skater traces a lemniscate (the graph of a figure-eight shaped curve).

Q: A lemniscate has two foci (F_1 and F_2). Estimate where F_1 and F_2 are, as well as the midpoint, M . What do you notice about the midpoint? Now, envision two tangent lines to the curve at M . What do you notice about them?

A: The midpoint occurs at the center. The tangent lines are perpendicular.

Q: Why do you think the symbol that stands for infinity is shaped like that?

A: The history of the infinity symbol isn't entirely clear! It might be shaped that way because it's a path you can trace over and over without stopping. It could be shaped similarly to the Roman numeral for 1,000 – CIO – which was used informally to mean "infinitely many." It's also possible that it was designed to look like the last letter of the Greek alphabet, ω . Who knows?!



Infinity Zip Line

Positive and negative infinity ride along an infinitely long zip line in opposite directions.

Q: If negative infinity gets on the zip line, will he go left or right?

A: To approach negative infinity on the zip line, he will need to go left. Numbers approach negative infinity as they move left on a number line and positive infinity as they move right on a number line.

Q: Which infinity will travel farther on the zip line?

A: Neither will travel farther than the other because they will both zip onward forever.

Monkey Bars

The first seven numbers in the Fibonacci sequence play on monkey bars.

Q: What number will climb on the monkey bars after the 8?

A: The sum of 5 and 8 is 13, so 13 will be the next number on the monkey bars.

Q: What is the pattern that describes the Fibonacci sequence?

A: Each number in the Fibonacci sequence is the sum of the two numbers before it.



Trampoline

A pair of opposite and reciprocal fractions bounce on a trampoline.

Q: What do you notice about the slopes of the fractions' vincula? (A vinculum is the bar that separates the numerator from the denominator.)

A: The vincula are perpendicular. Lines with opposite and reciprocal slopes are perpendicular.

Z Swings

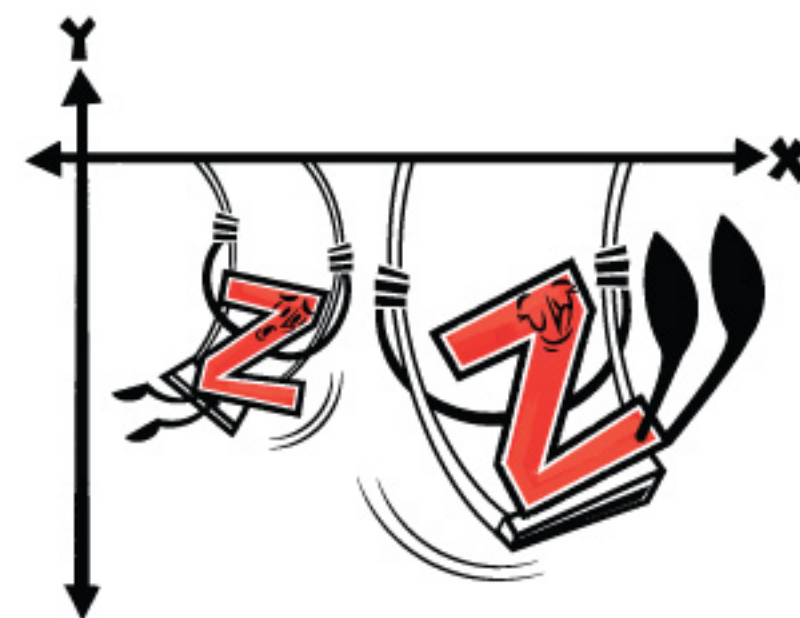
A pair of Zs play on a swing set made out of a coordinate plane.

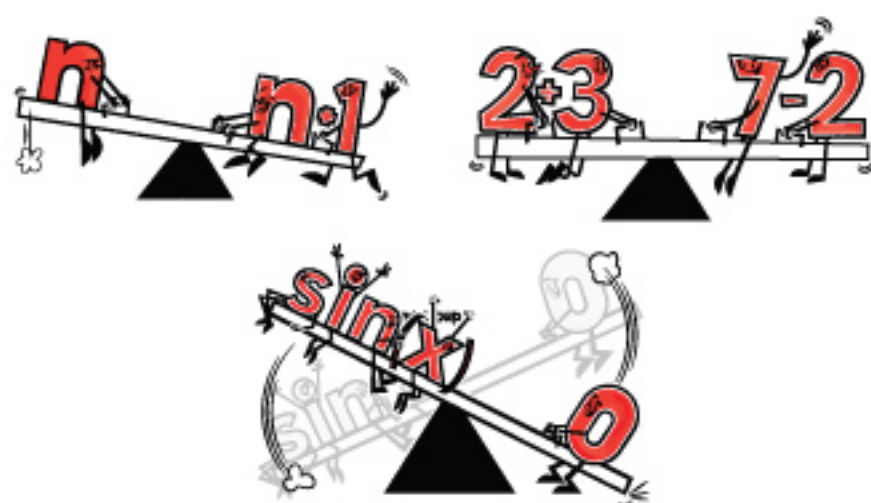
Q: What can you tell me about the z-values of both Zs?

A: A z-coordinate represents a third dimension on a graph. If an xy-plane is on the wall of a building, then the z-coordinate is how far in front of or behind the wall a point is located. Since the left Z is behind the swing set, its z-value is negative. The right Z is in front of the swing set, so its z-value is positive.

Q: What can you tell about the x- and y-values of both Zs?

A: Both of them are to the right of the y-axis and below the x-axis. So, they both have positive x-values and negative y-values.





Seesaw

Expressions play on seesaws.

Q: Why is $n + 1$ always heavier than n ?

A: Even though n is a variable, it has the same value on both sides of the seesaw. One more than any number will always be more than the number itself.

Q: Why won't $\sin(x)$ balance with 0 on their seesaw?

A: Look at the graph of a sine function. See how the output undulates above and below 0 ? A sine wave has just as many output values above zero as it has below zero. We can see this in the picture of the surfing numbers as well. That's a cosine wave, which looks pretty similar to a sine wave. It, too, has just as many output values above zero as it has below zero!

Tri-Guy Leg Press

A triangle does a leg press on a triangular machine.

Q: The two triangles in this image have one congruent angle. What is its measure?

A: Both of the triangles are right triangles. That means that they both have 90 -degree angles, which are marked with the little box in the corner.



Flying Disc

A fraction circle throws a flying disc with an equal sign on it to a percentage.

Q: Numbers can be written three different ways: decimals, fractions and percentages. How would you write this number as a decimal or a fraction?

A: As a decimal, this number is 0.75 . As a fraction, this number is $\frac{3}{4}$.

Q: What fractional part is missing from the fraction circle?

A: The fraction circle is missing $\frac{1}{4}$, or one quarter.

Pi

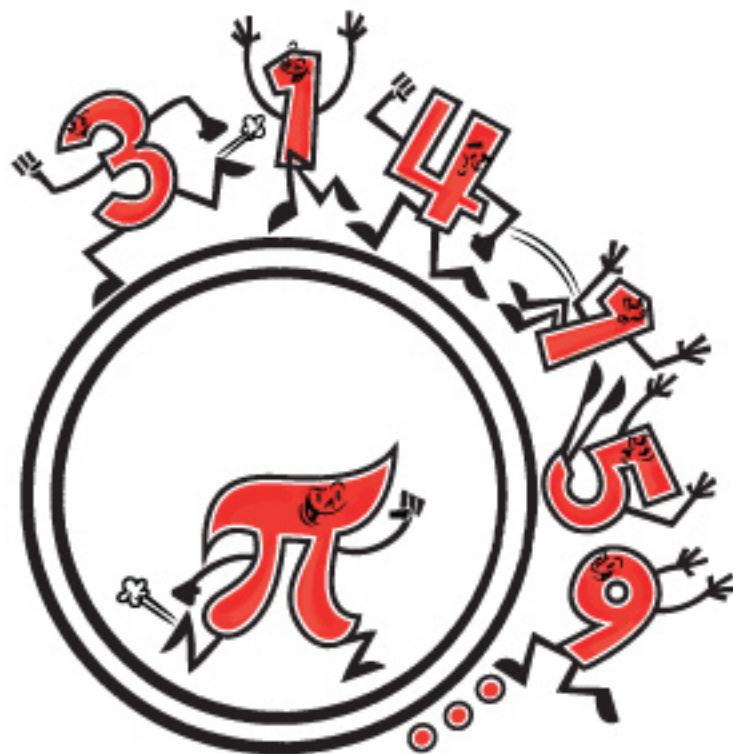
Pi runs inside a wheel as the first six digits of pi run along the outside.

Q: Why is there a dot-dot-dot after the 9?

A: Pi is an irrational number. That means it is not a ratio of two integers, so its decimal digits go on forever without repeating a pattern.

Q: What is pi, anyway?

A: While pi is not a ratio of integers, it is a ratio of the circumference of any circle to its diameter. If we take any perfect circle and divide the measure of its circumference by the measure of its diameter, we always get pi.



All About "Ace"

Named "Ace," our A+ character is our brand ambassador, company mascot, and students' cheerleader rolled into one. Always positive, Ace represents academic perseverance, youthful exuberance and a love of learning math. If a student has doubts, Ace supports them in staying the course. And whenever they "ace" a test, he's there to help them celebrate!

Diving

Numbers climb up a diving board, and their square roots dive off.

Q: What numbers were 3 and 2 before they jumped off the diving board?

A: Since 3 squared is 9, the 3 used to be a 9. Since 2 squared is 4, the 2 used to be a 4.

Q: What numbers will 25 and 16 turn into when they jump off the diving board?

A: The square root of 25 is 5, so 25 will turn into 5. The square root of 16 is 4, so 16 will turn into 4.

