NEWSFLASH
Join LIVE Bluebird Math Circle to work on these activities together with friends and family.
Monday May 10, 5-6 PM MDT online.
Sign up at https://aimathcircles.org/Bluebird

MATH JOKE
How far can you see on a clear day?
93 million miles — from here to the Sun.

**Family Circle: Extraterrestrial civilizations’ count**

Do you ever stargaze? People of Earth have been observing, mapping, and counting stars since ancient times. We've been watching Mars, Venus, and other planets in our home solar system for almost as long. But what about far-away planets circling other suns?

It was only in 1992 that the scientists first confirmed evidence of one such planet. According to NASA exoplanet counter (https://exoplanets.nasa.gov/), we have already found several thousands exoplanets (planets in other solar systems). We have also found many Earth-like planets. While most of them are hundreds to thousands light years away, we may make our first attempt to estimate the number of extraterrestrial (ET) civilizations.

What questions should we ask? What should we take into account? What is important, and what is not? What data do we need? Let’s come up with 8-10 parameters that we could use to make a preliminary estimation. After we are done, we can attempt to construct a formula for the number of ET-civilizations.

If you don't know how to start, the math mental trick is to think of a smaller, more familiar problem. For example, we know butterflies a bit better than space aliens. What can cause butterflies to live in a habitat? We can think about flowers they need; temperature that's neither too hot nor too cold; not too many predators - and these are the parameters we can use to estimate the number of butterflies!

**WISDOM OF THE CROWD**

Collective intelligence is more powerful than any individual one. At a 1906 country fair in Plymouth, 800 people participated in a contest to estimate the weight of an ox. Statistician Francis Galton observed that the median guess, 1207 pounds, was accurate within 1% of the true weight of 1198 pounds.

**PROMPT**—With a group of friends, try to estimate the weight of a dog or any other animal that would allow you to weigh it. Write down all the guesses. Now, weigh the animal and check whose guess is the best.

Is it a good estimation method? Would you prefer a different one? Besides weight, what other parameters can you estimate using Wisdom of the Crowd?
PINON NUTS HARVEST AND MORE PLAY - suggested by Donna Fernandez, Navajo Prep School

You want to harvest about half of pinon nuts in a tree, and leave the rest for the forest creatures to eat and for growing new trees. How would you estimate the number of pinon nuts on a tree? Can you find some helpful approaches?

You don’t need a serious reason to estimate: just play with friends or by yourself to pass the time. How many people in a crowd, potatoes in a bag, polka dots on a shirt? Find cute and silly sets to estimate for fun. Who between your friends can estimate the closest without counting, and how do they accomplish that? Let’s say you need to teach estimation techniques to a friend or a sibling. How would you do it?

Ask Bluebird

QUESTION—What is the difference between geometry, mathematics, trigonometry, calculus, and precalculus? – from Ciera T.

BLUEBIRD SAYS—Great question, because math is all about similarities in different things, and differences in similar things. Let’s start with similarities: all five belong with mathematics; all five involve "modern literacies" that many communities want all their members to know. Now for your question, the differences:

○ Mathematics is a field of study and of collective human knowledge. Other field of study examples: physics, medicine, visual arts, geography, psychology. Billions of people participate in mathematics as everyday users or professionals. Math touches thousands of vocations and cultures, and has many thousands of years in rich history. It’s huge.

○ Geometry is a branch of mathematics, also called mathematics subject area. It studies shape. Math people sort all their work into branches. Why? Because mathematics is huge. It is easier to find past math if you know which branch to search, and easier to collaborate with people if you know who specializes in what subject area. Can you estimate the number of branches in all of mathematics? You will find that different people count them differently. By one of the "official" counts, called Mathematics Subject Classification 2020, there are sixty-three subject areas: https://mathscinet.ams.org/msc/pdfs/classifications2020.pdf Besides the general Geometry you asked about, there are also these funky geometric branches: Algebraic Geometry, Differential Geometry, and Convex and Discrete Geometry.

○ Calculus and trigonometry are topics. If math is a huge tree with geometry as one of its broad branches, then calculus is a smaller offshoot, and trig is a tiny twig. Calculus studies continuous change, and belongs to a branch called Real Functions. Trigonometry deals with relationships between lengths and angles in triangles: a narrow subtopic from Computational Math.

○ Another meaning for four of your words—geometry, mathematics, trigonometry, and calculus—is school classes. In that sense, they are made of tiny subtopics, lined up one after another like beads on a string so that newbies can learn. A first grader may have a broad class called "mathematics" with starter topics from several different branches studying shape, number, chance, measure, and so on. Geometry, as in class, teaches topics only from geometry, as in the branch of math. Calculus, as in class, is even more narrow: it teaches subtopics only from calculus, as in math topics. Trig is curious: a tiny subtopic that looms large in school classes for historical and psychological reasons. Finally, precalculus isn’t a math field, branch, or topic, only a class: a pile of subtopics from algebra, geometry, and computation; whatever comes handy for studying calculus.

FUN FACT OF THE FORTNIGHT

How many terrestrial (Earth-like) planets are there? How would you estimate that?

So far, 165 are confirmed, out of the 4383 exoplanets that are confirmed. There are 5939 more candidates that we are just starting to track. In 2017, NASA announced the discovery of the most Earth-sized planets found in the habitable zone of a single star, called TRAPPIST-1. That system has seven rocky worlds, all of them with the potential for water on their surface. NASA has also identified 24 Super-Habitable Planets, with the most favorable conditions for life. Watch NASA Exoplanet Excursions: https://www.youtube.com/watch?v=cL1WbM2FSvQ