the nmf weekly

Ask your math friend, James

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CIRCLES

G'Day!

This is your math friend James. Today I am answering a question from Amit.

HOW BIG A CIRCLE CAN YOU DRAW?

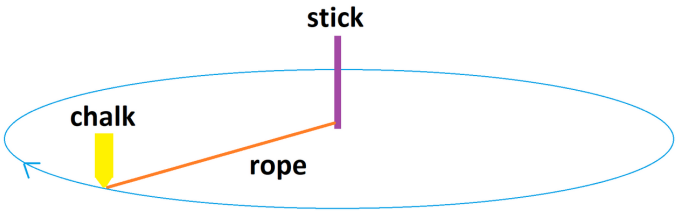
Hmm. Is Amit asking how big a circle that I, James, can draw? Or is he asking how big a circle anyone could draw?

Either way, I am now wondering:

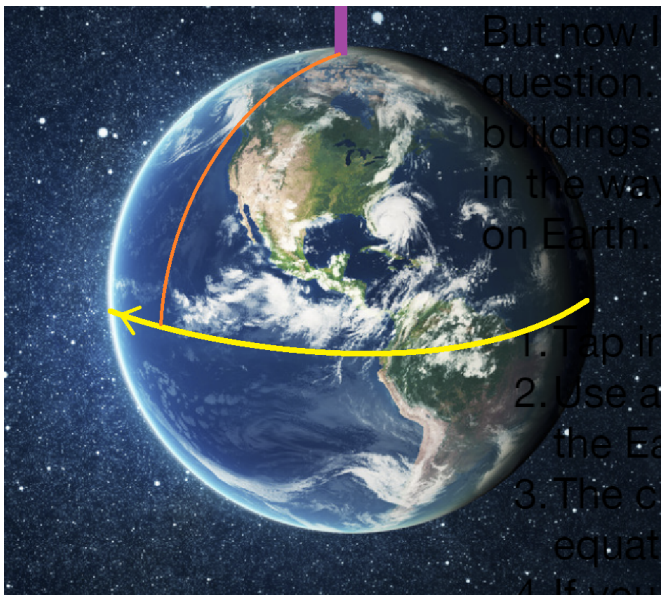
How would I draw a big circle... like, a really big circle... like, a really really <u>really</u> big circle?

I have an idea.

1. Tap a stick in the ground in the middle of a soccer field or a parking lot or some big flat open space.
2. Tie one end of the rope to the stick and then pull the rope taut.
3. Tie to the other end of the rope a big piece of sidewalk chalk and then, keeping the rope taut, trace a big circle on the ground by swinging that taut rope all the way around the stick.



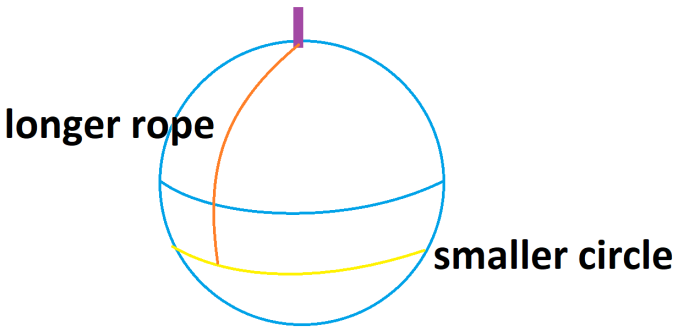
Only trees and buildings and mountains and lakes would stop me from drawing a really big circle. For example, I live in Arizona, and if Arizona were perfectly flat (it isn't) I could imaging tapping a stick in the middle of the state and drawing a circle the size of Arizona! (I'd have to use a <u>very</u> long rope.) Or if the entire US were perfectly flat, I could tap a stick in the middle of country and draw a circle the size of the US!



Ahh! Now I realize there <u>is</u> an answer to Amit's question. Even if the entire Earth was devoid of buildings and oceans and things that would get in the way, there is a biggest circle I could draw on Earth.

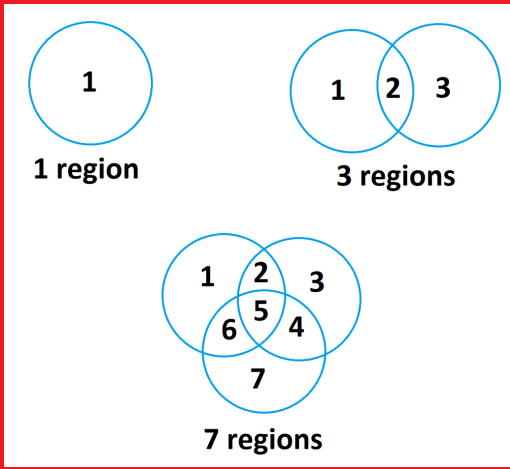
1. Tap in a stick at the North Pole.
2. Use a rope that is one-quarter the length of the Earth's equator, pull it taut, and start drawing.
3. The circle you draw will be the Earth's equator.
4. If you use a longer rope, your circles will be smaller!

A circle the size of the Earth's equator is the largest circle you could (theoretically) draw on Earth!



puzzle #1

One circle encloses 1 region.
Two circles can enclose 3 regions.
Three circles can enclose 7 regions.



How many regions can four circles enclose?

Check out MATHICAL for award-winning math books for middle-schoolers and teens, the YouTube channel NUMBERPHILE for math videos galore, and MORE MATH! for even more resources. Wowza!

Check out this video from NUMBERPHILE about a circle puzzle that has mathematicians baffled!

Do you have a math question for me to answer, or try to answer?

Write to me at the website.
Each week I'll pick a new question and give my thoughts on it!

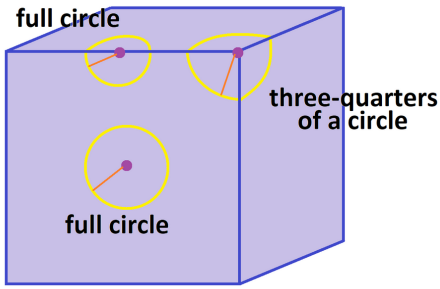
Here's a curious thought. Would circles still look like circles if the Earth were the shape of a cube?

To draw a circle, tap a stick in the ground and tie a rope to it, pull the rope taut and swing it all around the stick tracing the path of the second end as you do.

In the middle of a face of the cube, this gives a proper-looking circle.

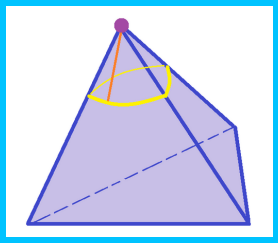
If you do this on the edge of the cube, you get what looks like a bent circle.

If you do this at the corner of the cube, you only get three-quarters of a usual-sized circle. (Do you see this?)



puzzle #2

Draw circles on the surface of a regular tetrahedron (triangular pyramid). What fraction of a full circle are the circles drawn at the corners?



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The NMF Weekly is written by mathematician Dr. James Tanton as a resource for friends and fans of the 2021 National Math Festival.

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