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Illustrations by Abby King and McKenna Weekley

Building Up Geometry: The Story of Euclid



Dear Reader,

As I sit here in my college mathematics class pondering what to say in my "author's note," I realize I need to make a few things clear. First, much of the text you are about to read is made up. GASP! Second, many people don't think the subject of this story, Euclid, was a real person. GASP, again!! I happen to believe Euclid was real and did a lot of great mathematics work that is still used today. That said, there is little known about Euclid or his life. Historians who believe in Euclid speculate that he was born around 300BC in Alexandria, Egypt, was taught by Plato in Athens, Greece, and taught mathematics later in his life. His greatest works are collected in his book, *Elements*, a collection of geometric constructions and arguments. Whether you're a math lover like I am or not, I hope you enjoy this story about Euclid, a magical wizard, and an exciting journey!

Happy reading!
Abby

Once upon a time, around 300 BC, in Alexandria, Egypt, a baby boy was born. As his mother cradled him, she decided to name him Euclid. "Little Euclid, you are a special boy," she whispered, kissing his forehead.

And special, Euclid was.



"Euclid, it's time for bed! Say goodnight to your friends!"
"Mom!!! I just had my tenth birthday! Shouldn't that mean I can stay up for a little while longer?"
When his head hit the pillow, Euclid fell fast asleep.

All of a sudden, a strange man appeared.

"Hello Euclid, I am here to grant you three wishes."

"For my first wish, I would like to have pizza for breakfast!"

The man rolled his eyes. "Anything else? This is a once in a lifetime opportunity!"

"Well, I've always wanted to go to school and be taught by Mr. Plato." The man nodded, more satisfied with this wish. "And, someday I'd like to be a teacher myself!"

"Good luck, kid. You're only a child, how are you planning on becoming a teacher one day? That's too much of a wish for me to grant." And with that, the bearded man disappeared.



As Euclid walked downstairs, he smelled something. Something cheesy. Something saucy. Something warm.

"PIZZA!!"

"Good morning son, I decided I would make you pizza for breakfast."

"Pizza? Mom, are you sick?" He scarfed down his perfectly cheesy, perfectly saucy, perfectly warm pizza.



Euclid's father walked into the kitchen.

"Son, we have something we need to talk to you about. My boss just informed me that he needs me to work on a new project in Athens, Greece. We will be moving there and you will be going to the Academy of Athens where Mr. Plato will be teaching you."

"Is it my birthday or something?!"

And with that, Euclid's family packed up their belongings and headed to Athens.



While in school, Euclid learned so much. The more he learned, the more he wanted to teach all of his new knowledge to students of his own one day.



On the final day of school, Mr. Plato approached Euclid. "Euclid, could I talk to you?" "Of course, sir." "I know you have told me previously that you wanted to be a teacher, is that still true?" "It is!" "I would like to tell you I think you would make an amazing teacher. Especially in the subject of mathematics. I see that light in your eyes during class that I once had as a boy." Euclid ran out of school in excitement and began to think.

Euclid knew he wanted to be a teacher, but how? Where? Finding a job isn't an easy thing. It's almost impossible for teachers to find work. *I should've listened to the bearded man when he told me becoming a teacher was too much to ask for.*



After thinking long and hard, Euclid decided he wanted to build a school himself. His very own school. How hard could it be? *I'll move back to Alexandria, build a school, and that will be that. I mean, if Mr. Plato thinks I can do it, I must be able to.*



Euclid packed up his belongings and returned to Egypt. He found a plot of land outside of Alexandria, and decided it was the perfect place to build his school.



First, I must find pieces of wood to use for the foundation of the school. Euclid walked around and gathered sticks to use for his foundation. He layed out all of the pieces he had, and began to go to work. But wait, these pieces are all different sizes. Some are big, some are small, and some are somewhere in between. How am I supposed to make an even foundation out of these? This is so difficult! Why can't this be as easy as getting pizza for breakfast or moving to Athens? I want to be a kid again. Euclid was so exhausted from gathering materials, that he could barely keep his eyes open. He put some of the sticks he gathered in a row and fell asleep. In his sleep, the magical man appeared once again.

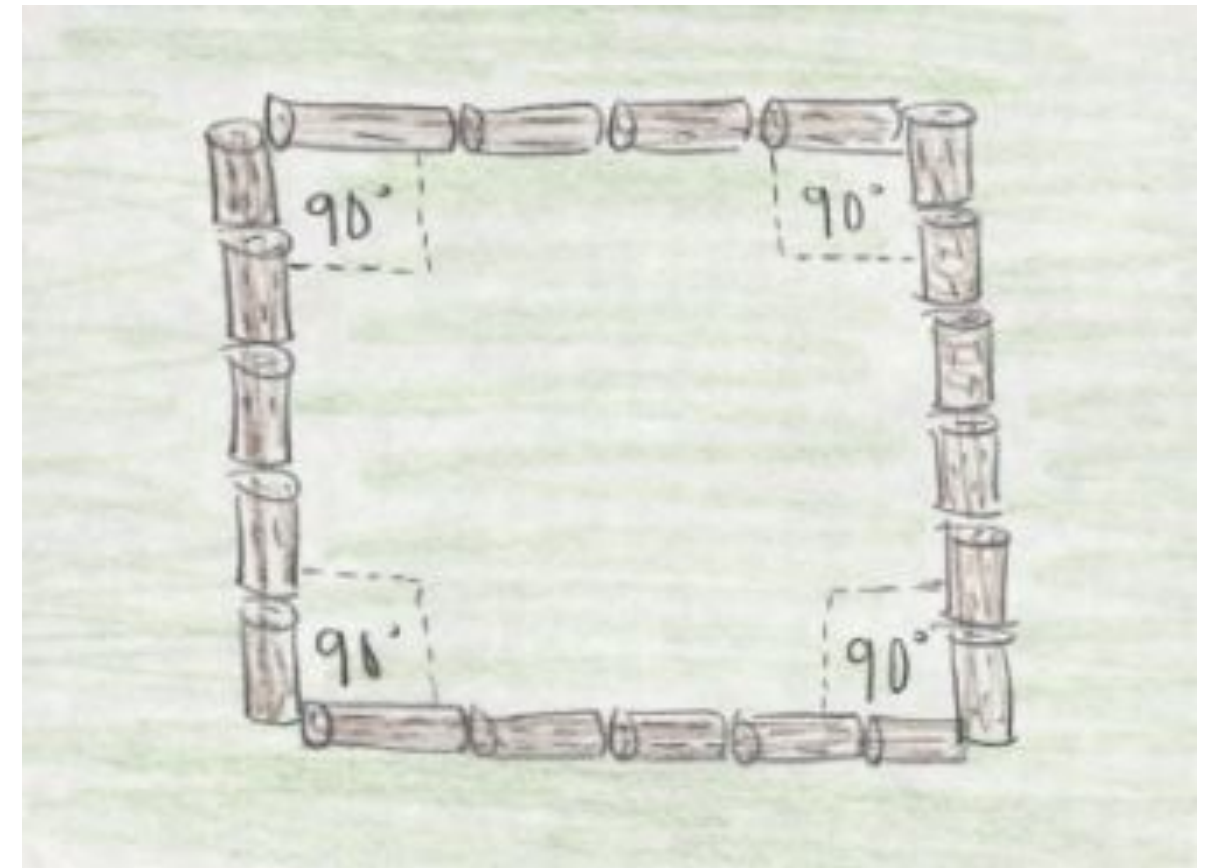
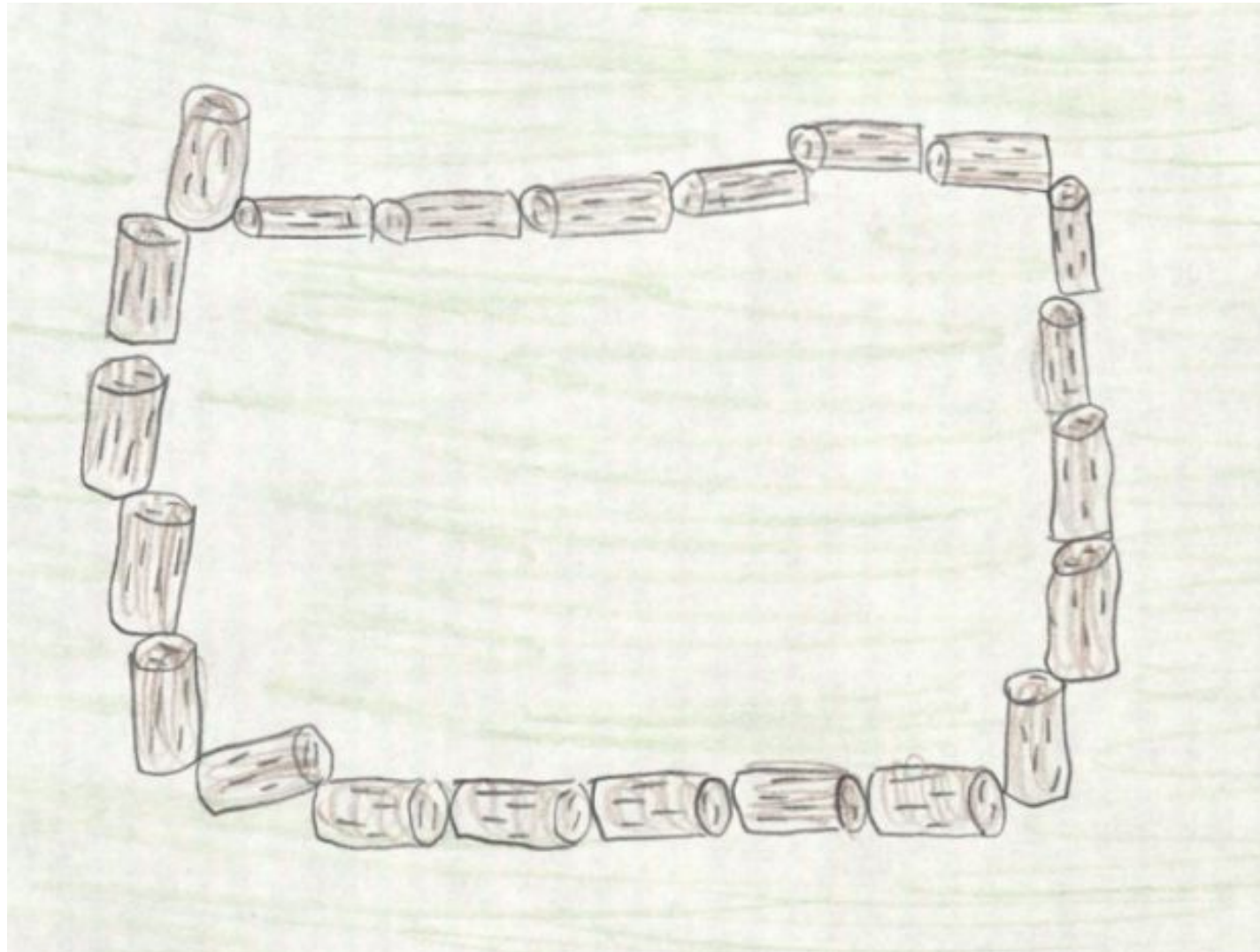


"Hey mister, you're back! I need another wish! I need help building this school!"

"Euclid, Euclid, you silly boy. You already used your wishes, and I cannot help you beyond those. I know you can figure this out. And if you cannot, I must say I told you so!"

"You're no help at all!" Euclid screamed. Then, the man was gone.

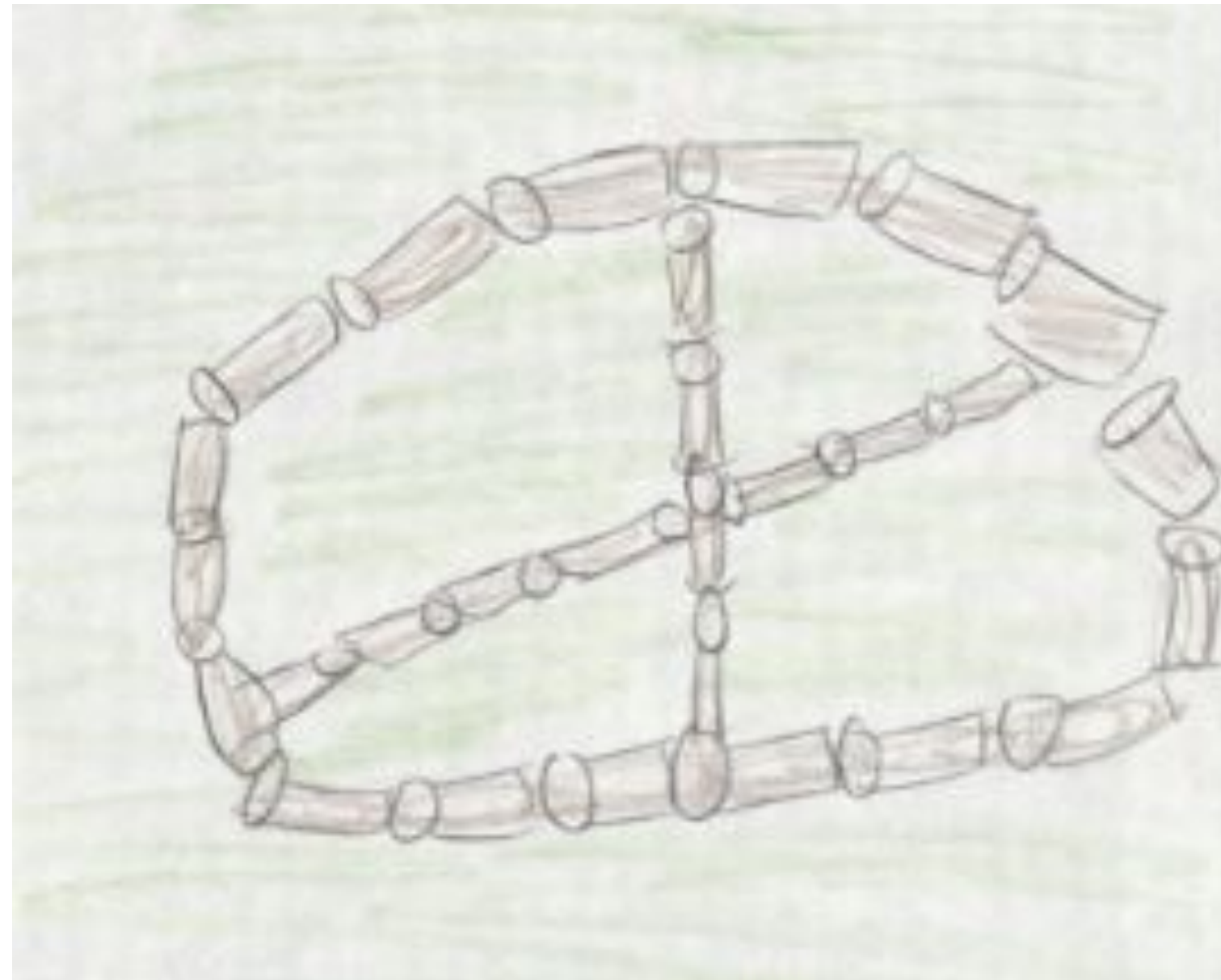
In the morning, Euclid remembered the dream he had. He looked at all of the materials in front of him and began to work. My first step will be the outside framework of the school. I would like the outside of the building to be a rectangular shape. Euclid began to lay out his materials, and then realized the shape of his structure looked a bit off.



Euclid thought about what he could do to get his structure to be a perfect rectangle. OH! I've got something! If I lay my materials in a straight line and connect another straight line to my original line, I will have right angles. How did I not think of this before? And, all right angles are equal because every right angle equals 90 degrees, so I won't have to worry about that anymore!" And with that, Euclid successfully built a perfect rectangular base.

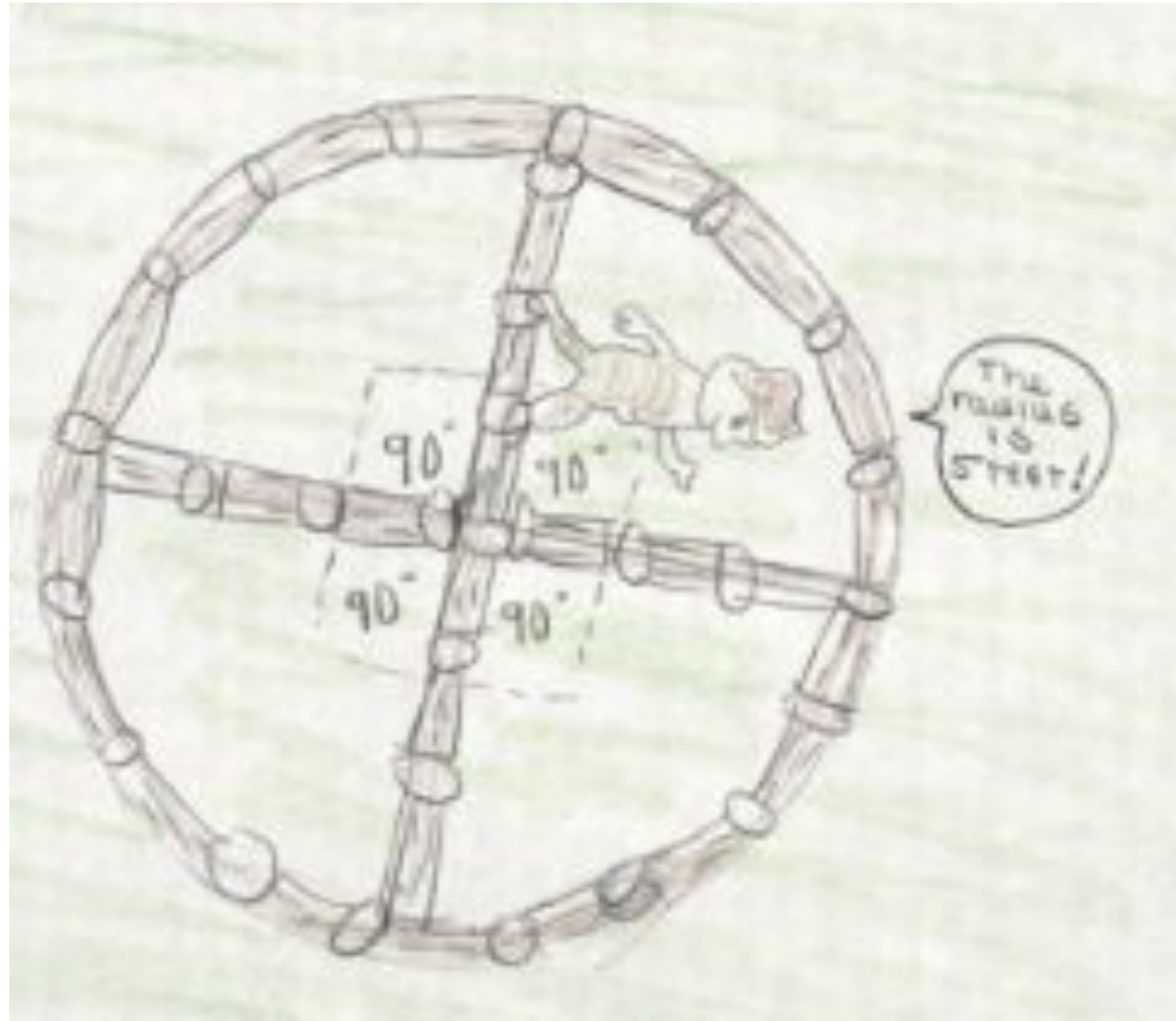
I would like a circular room in this school. But how do I make a circle be perfectly round, and not some circle-ish, shape? Euclid began to place his materials in a shape that looked to be circular, then had an idea. What if I make a line going across the circle, and then another cutting across that?

Ugggghh, these lines are crossing one other, but it's still not a perfect circle. He sat with his chin pressed to his chest, thinking. AHA! I need to ensure that the lines are the same length and then cross them at right angles on all sides so that the lines will be perpendicular. And that means where the two lines cross is the center of the circle! Now I can build my perfect circular room!



Euclid liked his circular room so much that he decided he needed another one. He started work using the same process he discovered with the first room, but then he got stuck. He loved the first room SO much, he wanted this one to be the exact same size. He paced around the room trying to come up with a solution. The more he paced, the more frustrated he got. *I have nothing, I have no idea how to build another circular room the same size as the last one.*



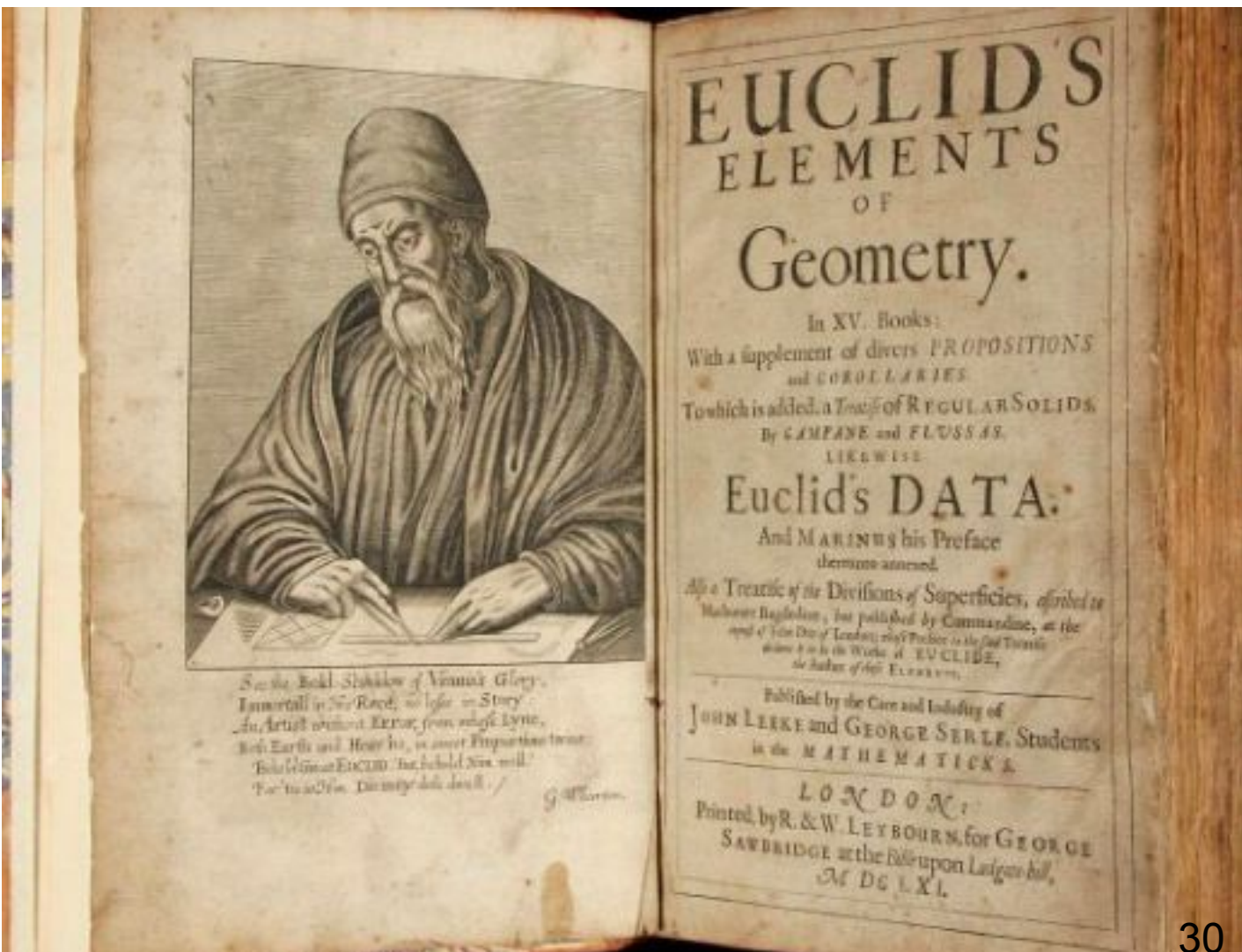


I've got it!! If I use my feet to measure how long the center of the last room to the outside of the room is, that will give me the radius of the circle. Then, all I have to do is build this room with the same radius and voila, they will be equal! Euclid's thinking was correct.

After weeks of building and problem solving, Euclid stood in front of his finished school. He was so proud of all of his hard work and couldn't wait to open it and start teaching students of his own.



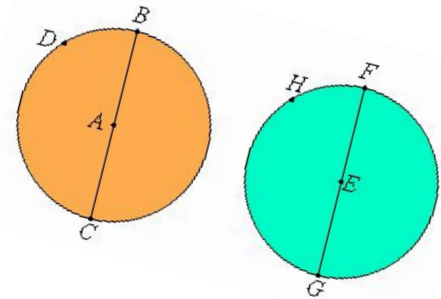
Euclid, now referred to as the father of geometry, taught in the school he had built for many years, enlightening the minds of young people, as Plato did for him. In fact, all of the hard work he put in while building the school paid off. It turned out that many of the math solutions he used to build the school had never been done before by anybody. These ideas became published in a book called *Elements*. Euclid's book of elements is still looked upon very highly to this day and is referred to as the most influential and successful textbook ever written.



Euclid's Elements Included in *Building Up Geometry: The Story of Euclid*

Book 3: Definition 1

Equal circles are those whose diameters are equal, or whose radii are equal.

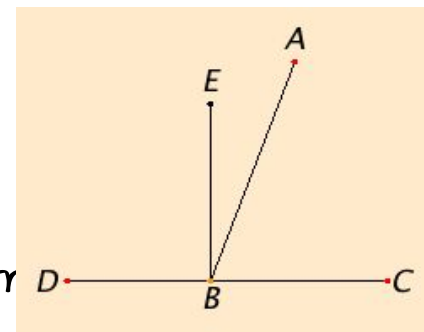


Book 1: Proposition 13

If a straight line stands on a straight line, then it makes either two right angles or angles whose sum equals two right angles.

Book 3: Definition 4

Straight lines in a circle are said to be equally distant from the center when the perpendiculars drawn to them from the center are equal.



Book 11: Proposition 6

If two straight lines are at right angles to the same plane, then the straight lines are parallel

References

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<https://mathcs.clarku.edu/~djoyce/elements/book111/book111.html>

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Common Core State Standards: 7.G.4 Work with circles.

a. Explore and understand the relationships among the circumference, diameter, area, and radius of a circle.

4.MD.5 Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement.

5.G.4 Identify and describe commonalities and differences between types of quadrilaterals based on angle measures, side lengths, and the presence or absence of parallel and perpendicular lines, e.g., squares, rectangles, parallelograms, trapezoids, and rhombuses.

Target reading level: 4-5th grade