



# Does The Crown Fit?

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The warm sunlight embraced the leaves upon the broad, firm maple trees as another day in July began. The forest buzzed with activity. Little critters chirped as they awoke, birds sang soft lullabies, and gorgeous butterflies flew around the woods, painting the scenery with bright colours.

Guinevere skipped through the leaves on the forest floor, crushing the fallen branches with her heels. The weather was perfect for a stroll; sunshine sprinkled the ground with light, fluffy clouds decorated the clear, blue sky with white and birds gracefully glided through the air, clearly enjoying the warm day.

Like every year, this wonderful day in mid-July was Guinevere's mother's birthday. And, like every year, Guinevere had procrastinated her mother's gift. Her mother disliked spending money on gifts, so buying something for her was out of the question. She could make her mother something, perhaps like a painting or a card, but that was simply too overused. Guinevere wanted to make some special, something unique for her mother. After all, she was the best parent Guinevere could ever ask for.

"How about a feather? Oh, but that's too simple. Hmm...I could search for a pretty flower and put it in a pot. Nah, I think she has enough in the greenhouse." Ideas whizzed around her head, only to get rejected as Guinevere murmured to herself busily, following the brown, dusty, dirt path into the heart of the forest.

With each step, Guinevere became increasingly frustrated. Right now, her best option was to find the most delicate flower she could and present it with a card, but where would she find such a pretty flower? Lips pursed, she thought for a bit, different places flashing in her mind. Searching for one around the forest would take too long, and the greenhouse was out of the question. Suddenly, a place popped into her head. Guinevere recalled her father mentioning a flower field right in the middle of the forest.

"Well, it's worth a shot!"

Distracted by possible gifts, Guinevere made her way to the field her father had described as "a gorgeous sight." She dearly hoped that one of the flowers blooming there would be enough to make her mother smile.

After just a few minutes, a sweet scent mixed into the air, flooding Guinevere's senses. The perfume of flowers was strong here, which meant that the field must be up ahead. The tall, dark green grass scattered around the forest floor was also shorter and lighter.

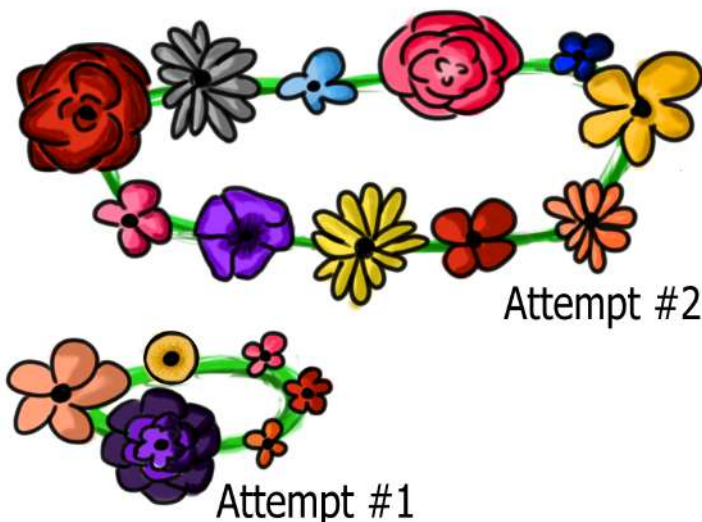
Guinevere's steps became quicker and quicker until she was sprinting through the forest, her polished red heels making a *clank clank clank* sound as she maneuvered through the woods, avoiding roots and bumps. The scent of flowers, mixed with the fresh air, guided her.

Guinevere burst through the forest into a meadow filled with flowers. Blue, purple, red, orange, yellow, and pink blended perfectly to create a swirl of colour, washing over the green field.

"Wow..." she breathed out. Scattered out were daisies, black-eyed susans and other flowers Guinevere didn't recognize. She looked for a flower to pick, but her indecisiveness got the better of her. Each flower looked just as pretty as the next; how could she pick only one? Suddenly, an idea dawned on her mind. Why choose one flower when she could use a bunch of them to make a flower crown?

Delighted by her sudden idea, Guinevere began collecting flowers from the field, determined to make the best flower crown seen to the human eye. Within mere moments, she had a small pile of flowers beside her. Gingerly, she began weaving.

The flowers, one by one, found their place in the crown, their bright colours splattering over the green stems. Just as quickly as Guinevere had picked it, the pile of flowers disappeared until only a line of braided flowers remained. As Guinevere connected the two ends, she realized that her "crown" was no longer than a very large bracelet. Resilient, she decided to try again. Guinevere picked every flower in front of her until she was left with a pile thrice the previous size. Her hands began to braid the flowers once again until none remained. This time, to her surprise, the rope turned out to be too long.



Frustrated and angry with her failures, Guinevere threw her flower crowns at her side, sighing. Was there a way to make accurate flower crowns? Perhaps if she measured her mother's head, she might know what length she needs to make her flower crown.

Guinevere ran out of the flower field without hesitation, trotting through the over-crowded forest while dodging roots and weeds. As her home became visible, beads of sweat decorated Guinevere's forehead. With harsh and short breaths, she gasped for air in front of the door, waiting to regain her posture.

She swung open the gold-and-red doors, dusting herself off at the door. Taking off her dirt-covered shoes, she slid through the entrance hall with her white, frilly socks, searching for her father.

"Not here...not here either...Oh! Father!" she spotted him in a pile of party decorations just across the hallway.

"Hey, Gwen. Say, which one of these decorations do you think your mother would like?"

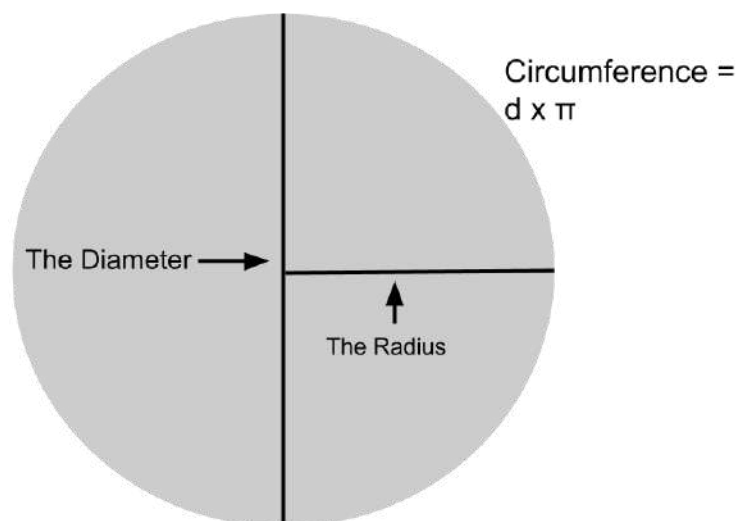
Guinevere giggled as she picked the bag containing yellow balloon decorations. "Father, I need your help with something."

After Guinevere had finished explaining, her father thought for a bit before signalling her to his side. "Alright, Gwen, I know what might help you. We use this formula to calculate the circumference of a circle," he began, "Basically, the circumference is the perimeter of a circle, so it's the measurement of the outside of the circle. Since the flower crown is going around your mother's head, we don't need to find the area."

Guinevere nodded along, following what her father was saying. He pulled out a sheet of paper from his desk as he continued explaining. "In geometry, you can find the area or circumference of a circle as long as you know two of its measurements."

He drew a circle on his paper and wrote the words "diameter" and "radius."

"Every circle has a diameter; the radius is half of the diameter. To find the circumference, we're going to use the diameter, although you could also write it as  $2r$ , which means 2 multiplied by the radius." Guinevere's father paused and looked at his daughter to see if she understood.



“So, if that’s the case, then if the diameter is 8, the radius is 4?” Guinevere asked.

“Yes! Exactly. Excellent, Gwen,” her father pat her head in approval. Then he turned back to his scribbled-circle to continue explaining.

“The final step to finding the circumference is to multiply the diameter is to multiply it by Pi,” on his sheet, now, was a funny-looking shape that kind of looked like the letter ‘h’ and ‘t’ combined.

“Pie? As in the food?” Guinevere’s stomach rumbled a bit as she thought of a crusty, fresh apple pie right out of the oven, served with a cold glass of milk.

“I wish,” her dad responded, “but this word is written with a ‘p’ and an ‘i’ only. We always use Pi to calculate the circumference of a circle. Although infinite, you may write the numerals of Pi as 3.14 if you don’t have a calculator with that button.”

Guinevere tilted her head to the side, confused. “Why can’t we use another number?”

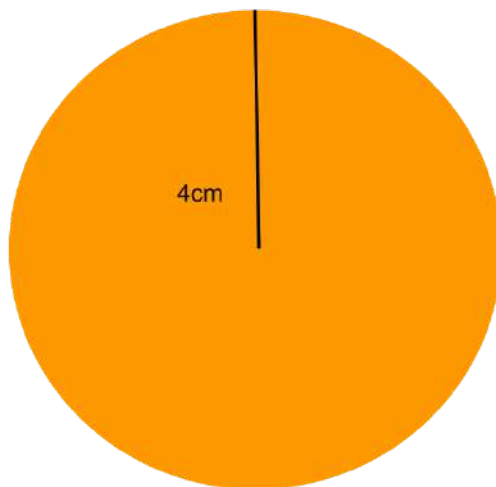
“You see, if you divide the circumference of any circle with its diameter, you will always end up with Pi,” explained her father.

“Huh..” Guinevere’s eyes grew with surprise. Pi was a funny number with a funny name, but it was also surprisingly important.

“So, that’s it? We just multiply the diameter of a circle with Pi to get the perimeter?”

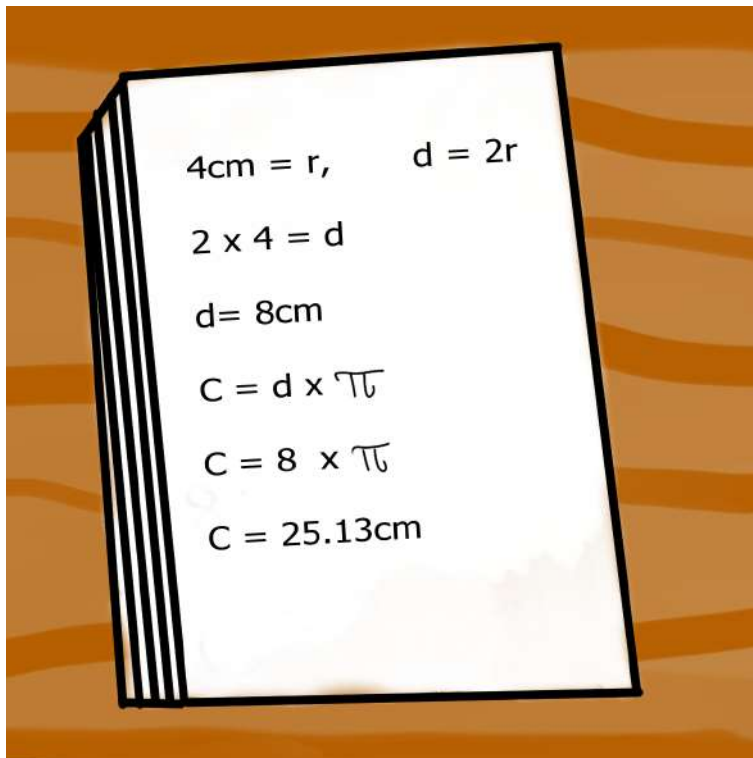
“Yep,” her father nodded, “it’s quite easy, is it not?” her father pulled out a high-tech-looking calculator that was painted midnight-black on the back, covered with strange buttons on the front. He handed it to Guinevere. There were shapes and numbers Guinevere had never seen before! Some had small numbers next to an “x” while others had words such as “cos.” Guinevere wondered if her father could teach her about the equations someday. Lost in thought and confusion, Guinevere was brought back to Earth by her father’s poking. He handed her a sheet of paper that an orange circle decorated the middle.

“Here, solve this. I’ll be back in a minute with your mother’s head size. I believe they took some measurements for a hat,” without looking back, he left the room, leaving Guinevere alone with her thoughts.



“Wha--? It’s only one measurement! How am I supposed to find the circumference like this?” Guinevere looked at the circle, confused. Then she took a deep breath and decided to use what she had. After all, her father wasn’t unreasonable. “Okay, let’s see what I know.” she began jotting down notes. “Half of the circle’s length is 4 cm...what was it called again? Oh! Right. Radius. My father also said that the radius was half of the diameter. So, four multiplied by two would equal the diameter.”

“So, now we have eight. The next step is multiplying eight by Pi” Guinevere pulled out the calculator and pressed the  $\pi$  button. The device spat out the numbers 25.13 at her. Guinevere wrote down the numbers as her father entered the room.



He took a peek at her sheet and smiled before sitting down in his chair again. “Great job. It wasn’t so hard, was it?”

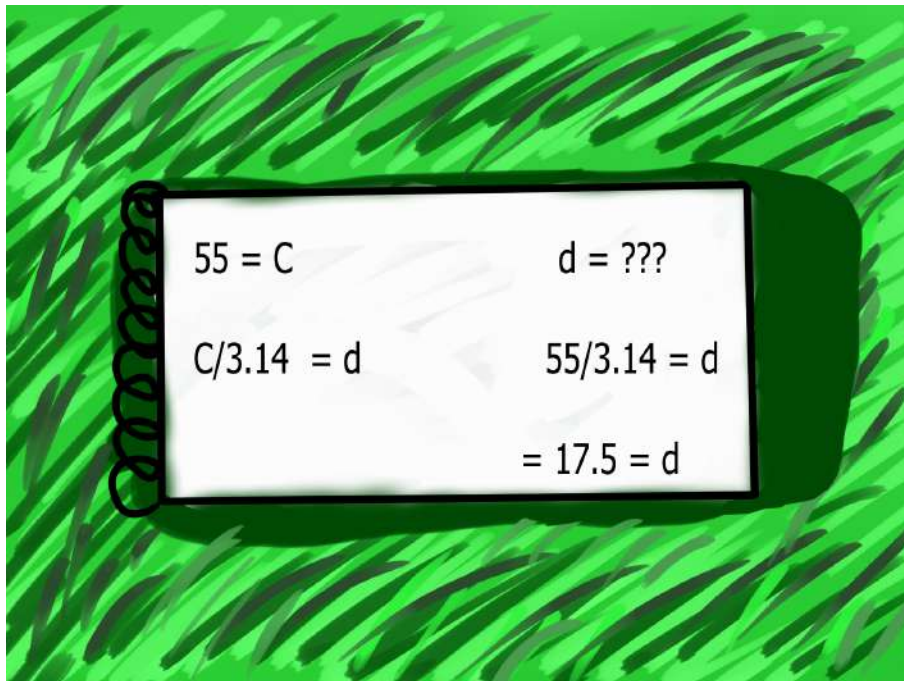
“I was pretty worried when you gave me one measurement only, but it turned out to be much easier than I thought.”

Guinevere’s father patted her head, “ Wonderful. Before I forget, here you go.”

He gave her a miniature sheet that had Guinevere’s mother’s measurements. The size of her head was 55cm. Thanking her father, Guinevere made her way to the flower field once again with a notebook, pencil and a ruler in her hands.

“Alright, third time’s the charm!” However, before she could start picking flowers, she came up with an idea to make her braiding easier. “If I can find the diameter of my mother’s head, then I can keep braiding the flowers until the diameter matches my mother’s head.”

So Guinevere held her pencil and notebook and began writing. This time, she was given the circumference instead of another measurement; all she had to do was reverse the operation, right? Since the opposite of multiplication is division, she would have to divide the circumference by Pi to find the diameter.



“It’s approximately 17.5cm, but since the flower crown can be slightly off, I can round it to 18cm. And, since I don’t have a calculator with me, I’ll just use 3.14,” Guinevere nodded as she wrote the numbers down. Then, she collected some more flowers for what she hoped to be the final time. She held the two ends together and measured the space between one side to the other every few braids until the flower crown’s diameter was 18cm long.

Guinevere connected the two ends of the flower crown with a sigh of relief and laid backwards in exhaustion. However, the day was far from over. With her stuff in her hands, Guinevere walked back to her home, this time, taking the time to enjoy the weather and the gorgeous scenery.

Back in her room, Guinevere laid down her colourful flower crown on her ash-brown, wood desk. As she remained idle, a delicious scent wafted into her spacious room, dragging away Guinevere. The smell of freshly baked cake came from the kitchen downstairs. As Guinevere followed it, the sound of panicking maids grew louder.

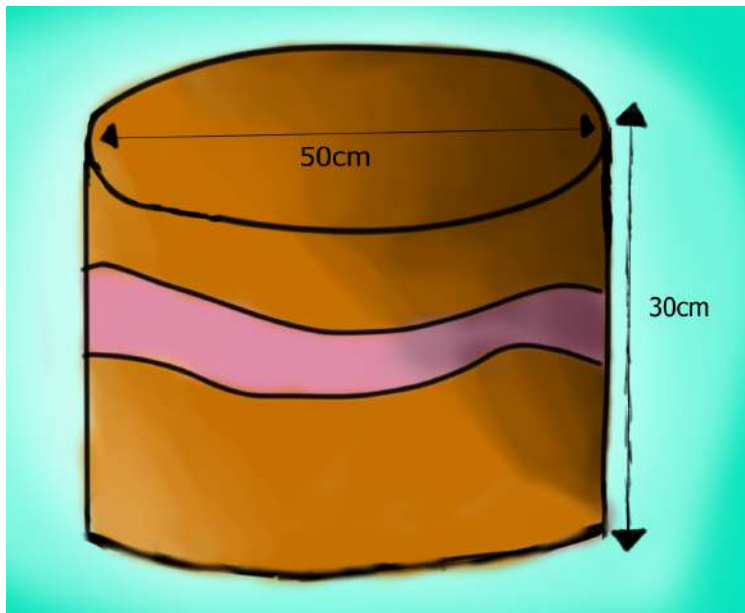
“We don’t have the measurements for the cake! Ohh, how are we going to get the cake frosted in time?”

Guinevere entered the kitchen quietly, peeking around. “Is something the matter?” she asked the first maid she spotted.

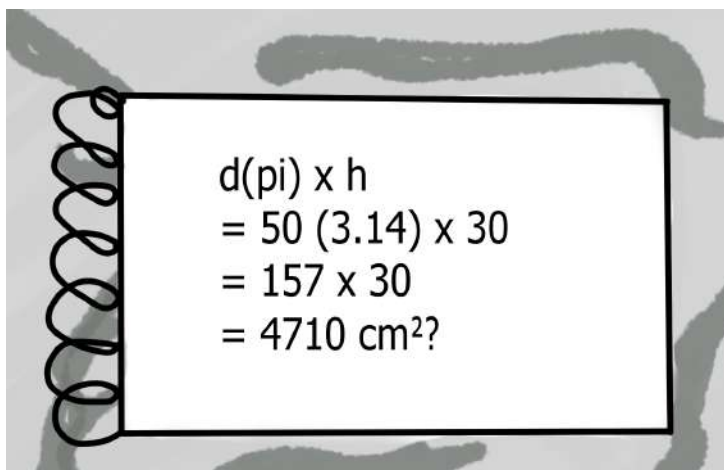
“Oh, mistress! It’s about your mother’s cake. You see, we don’t have the frosting measurements, and it’s causing such a stir. The baking powder was more effective than we thought, and it doesn’t fit our initial amount of fondant.”

Guinevere giggled and asked, “May I try to help out? Oh, but before I start, might I ask if you plan to cover the bottom as well?”

The maid dressed in black, white and a royal red shook her head as a “no”. With that, Guinevere began measuring the cake. The diameter was 50cm, and the height was 30cm.



Since she will be searching for the outside of the cake, Guinevere decided to find the perimeter. But wait, which formula would she use for that? The perimeter of a cylinder is different from the volume. Guinevere thought for a bit. Perhaps she could find the perimeter of the sides by multiplying the circumference by height?



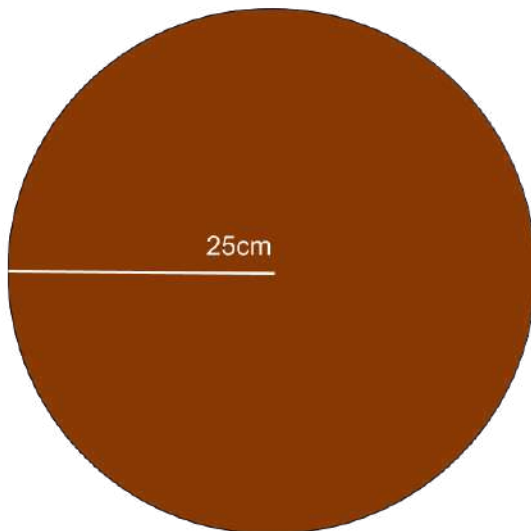


“Good job,” a deep voice boomed behind her. When Guinevere looked behind her, she was met by her father’s face.

“Thank you father, I was a bit unsure about this.”

“Don’t relax yet, you’re still not done. You need to find the area of the base then add it to this measurement. The formula for finding the area is simple, square the radius, then multiply by Pi.”

Guinevere wrote down the formula her father said and began to figure it out.



$$50/2 = r$$
$$50/2 = 25 \text{ cm} = r$$

$$r^2 \times \pi$$
$$= 25^2 \times 3.14$$
$$= 625 \times 3.14$$
$$= 1962.5\text{cm}^2$$

“Good, now add the two.”

“1962.5 plus 4710 equals 6672.5, so the surface area is 6672.5 centimeters?”

“No worries, although, if you’re trying to find the perimeter of a 3d shape, I’d recommend surface area. Oh, I’ll teach you that later. For now, let’s get going.”

The maids looked at the measurements and organized themselves. Soon, the kitchen was buzzing with activity. “Thank you, mistress,” thanked the maid in red, “we’ll ensure that the cake will be finished before dinner.”

Guinevere and her father nodded their heads in farewell as they exited the kitchen.

“So, did you make your mother a flower crown?” asked her father curiously.

“Yes, I did. Thank you for your help. I learned a lot today!” Guinevere’s eyes sparkled with excitement as she imagined her mother’s reaction.

“Well, I’m glad your old man got to teach you a thing or two. Now, come along, we have party decorations to set up!”