

Alice Growing and Shrinking in Wonderland

Alice in Wonderland is a book written by the mathematician Charles Dodgson who used the pen name Lewis Carroll. You may have read the book or seen the movie in which a young girl Alice has fanciful adventures with strange animals and people. In one of these dream like experiences Alice drinks a magical potion which makes her shrink and later eats cake which makes her grow. Here is original text from Lewis Carroll.

ALICE OPENED THE DOOR AND FOUND A PASSAGE THAT ...LED INTO THE LOVELIEST GARDEN YOU EVER SAW. HOW SHE LONGED TO GET OUT OF THE DARK HALL AND WANDER ABOUT AMONG THOSE BEDS OF BRIGHT FLOWERS , AND THOSE COOL FOUNTAINS, BUT SHE COULD NOT GET HER HEAD THROUGH THE DOORWAY. ...SHE WENT BACK TO THE TABLE, HALF HOPING SHE MIGHT FIND ANOTHER KEY ON IT,...THIS TIME SHE FOUND A LITTLE BOTTLE ON IT, AND TIED AROUND THE NECK OF THE BOTTLE WAS A PAPER LABEL, WITH THE WORDS "DRINK ME" BEAUTIFULLY PRINTED WITH LARGE LETTERS.. ...HOWEVER, THIS BOTTLE WAS NOT MARKED "POISON", SO ALICE VENTURED TO TASTE IT, AND FINDING IT VERY NICE, SHE VERY SOON FINISHED IT OFF. "WHAT A CURIOUS FEELING!" SAID ALICE; "I MUST BE SHUTTING UP LIKE A TELESCOPE." AND SO IT WAS INDEED: SHE WAS NOW ONLY TEN INCHES HIGH, AND HER FACE BRIGHTENED UP AT THE THOUGHT THAT SHE WAS NOW THE RIGHT SIZE FOR GOING THROUGH THE DOOR INTO THAT LOVELY GARDEN.



SOON HER EYES FELL ON A LITTLE GLASS BOX THAT WAS UNDER THE TABLE: SHE OPENED IT, AND FOUND IN IT A VERY SMALL CAKE, ON WHICH THE WORDS "EAT ME" WERE BEAUTIFULLY MARKED IN CURRANTS. "WELL, I'LL EAT IT," SAID ALICE, "AND IF IT MAKES ME GROW LARGER I CAN REACH THE KEY; AND IF IT MAKES ME GROW SMALLER, I CAN CREEP UNDER THE DOOR; SO EITHER WAY I'LL GET INTO THE GARDEN, AND I DON'T CARE WHICH HAPPENS!"

The author never specifies how much Alice shrinks or grows in her adventure, but let's do some experimenting of our own. Suppose Alice's starting height is 10 cm. She then drinks a potion that makes her shrink by 10% of her height, then immediately eats a portion of cake which makes her grow by 8% of her height. Complete as many of the following activities as you can.

1. What do you think will happen to Alice's height as she repeats this process over and over? Will she eventually be growing taller or shorter?
2. Create a number table which gives Alice's height after each repetition of drinking the potion and eating the cake.
3. Can you find a way to represent this situation algebraically with an equation and variables?

4. Draw a graph which shows Alice's height as she repeats the growing and shrinking process.
5. Explain how your table, equation, and graph support or refute your original prediction in part 1.
6. Draw a picture of Alice before she has any of the drink or cake and another picture of Alice after she has drunk and eaten several times. Be sure to pay attention to scale in your drawings.
7. If the shrinking and growing percentages were changed, under what conditions would Alice be shrinking or growing?