Parabola Volume 61 Issue 2 (2025), Article 5

The secret pattern hiding in square roots

Aaliya Syal[1]

Introduction

One day, while doing a square root question, I noticed something very strange and intriguing! I observed that:

$$\sqrt{16} + \sqrt{9} = 4 + 3 = 7\,;$$
$$16 - 9 = 7\,.$$

That couldn't just be a coincidence, right? I tested more numbers and every time, something magical seemed to be happening! I felt like a meticulous detective, finding a hidden code in the world of numbers.

This article is the story of my discovery. It portrays how a strange pattern led to a new formula that works with whole numbers, decimals and even messy square roots. It even connects with π! (And I'm not talking about the one you eat. I mean this kind, π.) So follow along to see how math can be weird, wonderful and fun!

How it all started

It all began with two numbers I already knew: 16 and 9.

Their square roots are 4 and 3, which are consecutive numbers (next to each other). I added them:

$$4 + 3 = 7\,.$$

Then I subtracted the original numbers:

$$16 - 9 = 7\,.$$

The answers matched. What?! Was that just luck? I tried another example:

$$\sqrt{36} + \sqrt{25} = 6 + 5 = 11\,;$$
$$36 - 25 = 11\,.$$

It worked again! My brain started buzzing with curiosity. Was there a secret pattern hiding inside square roots?

[1] Aaliya is a 12-year-old Year 8 student with a love for discovering patterns in numbers and exploring creative ideas in mathematics.

The pattern grows

I tried more and more examples, and the pattern kept growing.

If square roots differ by 1:

$$\sqrt{a} + \sqrt{b} = a - b\,.$$

If square roots differ by 2:

$$\sqrt{a} + \sqrt{b} = \frac{1}{2}\,(a - b)\,.$$

If square roots differ by 3:

$$\sqrt{a} + \sqrt{b} = \frac{1}{3}\,(a - b)\,.$$

So I created my very own formula:

$$\sqrt{a} + \sqrt{b} = \frac{1}{n} \times (a - b)\,,$$

where n is the difference between the square roots.

This even worked with decimal numbers and square roots like $\sqrt{30.25}$!

My formula in action

Example 1:

$$\sqrt{30.25} + \sqrt{6.25} = 5.5 + 2.5 = 8\,;$$
$$30.25 - 6.25 = 24 \to 24 \div 3 = 8\,.$$

Example 2:

$$\sqrt{22.09} + \sqrt{12.25} = 4.7 + 3.5 = 8.2\,;$$
$$22.09 - 12.25 = 9.84 \to 9.84 \div 1.2 = 8.2\,.$$

It worked every time, even with a calculator! This made the formula feel more real and powerful.

A special case: Using π in the formula

After doing some careful research on my observation and formula, I wondered if it would work for irrational roots like π. I decided to test this idea, and amazingly, it worked!

However, π only seemed to work with my formula when I used a version that could be squared or simplified, like π^2. Here's how I tested the idea: I used my general formula and tried plugging in numbers close to π^2 to see if it would still hold true.

Let $a = 4\pi^2$ and $b = \pi^2$. Then

$$\sqrt{a} = 2\pi\,, \quad \sqrt{b} = \pi\,, \quad \sqrt{a} - \sqrt{b} = 2\pi - \pi = \pi\,.$$

Plugged into the formula $\sqrt{a} + \sqrt{b} = \frac{1}{n} \times (a - b)$, this gives:

$$2\pi + \pi = \frac{1}{\pi} \times (4\pi^2 - \pi^2)\,;$$

Both sides equal 3π, so the formula holds true in this case!

As shown in this example, the formula works accurately for irrational roots like π too, if we take the square root of π^2 so that it simplifies nicely.

Why I love this

This pattern might not solve giant equations, but here's why I love it:

- It's simple, but powerful.
- It works with so many kinds of numbers.
- It makes mental math faster.
- It shows that even at the age of 12, you can discover something fun, something new.

And the best part? It started with curiosity. Just one random coincidence turned into a full proof discovery and formula, which was created completely by myself!

What's next?

Now I want to try similar patterns with cube roots, fourth roots, and other math topics. Maybe there are more hidden secrets waiting to be found.

Math isn't just about rules, it's about observing, testing, asking "Why?" or "How?", and having fun. This little discovery has already given me an amazing learning experience, which I am truly grateful for. I am looking forward to many more discoveries like this one!

Thanks for reading!

Best regards,
Aaliya Syal.