

Module 1: What is Argumentation?

Module Goals:

- Develop a deeper understanding of argumentation and its potential in the math classroom.
- Analyze mathematical arguments within a basic structure.

Thinking is the hardest work there is, which is probably the reason why so few engage in it. — — Henry Ford

Community Agreements

Purpose: To set the ground rules that will help us stay focused on the important work in which we engage throughout these sessions.

Guiding Question: What are some of the things that are important for a group to agree to in order for that group to work well together?

What is a Mathematical Argumentation? Sum of Two Consecutive Numbers Task

Consider the following mathematical statement:

When you add any two consecutive numbers, the answer is always odd.

Think:

- 1) Is this statement (claim) true?
- 2) What's your argument to show that it is or is not true?

Student Work Samples: Consecutive Sums Tasks

The student work samples shared here are based on actual student responses.

When you add any two consecutive numbers, the answer is always odd.

For each student response: (1) Discuss the student's argument? (2) Determine if the argument shows the claim is true.

Micah's Response

5 and 6 are consecutive numbers, and $5 + 6 = 11$ and 11 is an odd number.

12 and 13 are consecutive numbers, and $12 + 13 = 25$ and 25 is an odd number. 1240 and 1241 are consecutive numbers, and $1240 + 1241 = 2481$ and 2481 is an odd number.

That's how I know that no matter what two consecutive numbers you add, the answer will always be an odd number.

Does the argument show the claim is true?

Roland's Response

The answer is always odd.

A number + The next number =

• • • • • • •
• • • • • •

An odd number

• • • • • • •
• • • • • •

There's always one left over when you put them together, so it's odd.

Does the argument show the claim is true?

Angel's Response

Consecutive numbers go even, odd, even, odd, and so on. So if you take any two consecutive numbers, you will always get one even and one odd number.

And we know that when you add any even number with any odd number the answer is always odd.

That's how I know that no matter what two consecutive numbers you add, the answer will always be an odd number.

Does the argument show the claim is true?

Kira's Response

Consecutive numbers are n and $n+1$.

Add the two numbers:

$$n + (n+1) = 2n + 1$$

You get $2n + 1$ which is always an odd number, because an odd number leaves a remainder of 1 when divided by 2. (2 goes into $2n + 1$ n times, with a remainder of 1)

Does the argument show the claim is true?

¹Original problem from Bieda, K., Holden, C., & Knuth, E. (2006). Does proof prove?: Students' emerging beliefs about generality and proof in middle school. *Proceedings of the 28th Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*. Mérida, Mexico: Universidad Pedagógica Nacional (pp 395 – 402).

Reflecting on the Quality of Your Arguments

Questions for Reflection:

1. How does your argument compare to the student samples?

2. How would you modify your work to make a stronger argument?