Determining the Validity of an Argument

References:

Stephan, M. (2020). Sociomathematical norms in mathematics education. *Encyclopedia of mathematics education*, 802-805.

Yackel, E., & Cobb, P. (1996). Sociomathematical norms, argumentation, and autonomy in mathematics. *Journal for Research in Mathematics Education, 27(4)*, 458-477.

Epp, S. S. (2003). The role of logic in teaching proof. *The American Mathematical Monthly, 110(10)*, 886-899.

Consider the following statement: *The sum of any two odd integers is even.*

● REC (a) How might you prove this statement? Discuss with your group.

(b) Below are 3 "proofs." Decide whether each one does or does not prove the statement above. Explain your reasoning.

Proof 1. Any odd number can be written as an even number plus 1. So, when you add two odd numbers, you will get the sum of two even numbers (which is even) plus 2 which is also even. Thus, the sum of two odd numbers is even.

Proof 2. Any odd number can be represented as 2n + 1 where n is an integer. So, the sum of two odd numbers would be:
   (2n+1) + (2n+1) = 2n + 2 = 2(n+1).
Because the sum is divisible by 2, it must be even.

Proof 3. Consider two odd integers x and y. Then, x = 2n+1 and y = 2m + 1. So,
   x + y = (2n + 1) + (2m + 1)
          = 2n + 2m + 2
          = 2 (n + m + 1).
Since n + m + 1 is an integer, we see that x + y is a multiple of 2 and is therefore even.

Sociomath Norm	Your own logical reasoning and sense-making (not the instructor) should be the authority for determining the validity of an argument. In cases where you aren't certain about the validity of an argument, you should ask questions and articulate your thinking to the classroom community.