

MYP Mathematics: Investigating a Mathematical Statement

Statement of inquiry: *Mathematicians use **logic** to understand mathematical **relationships** and thereby generalize how multiplication functions across number types when making scientific calculations.*

Concept question: *Is it always true that multiplication increases a value?*

Objectives	Objective B: Investigating patterns ii. describe patterns as relationships and/or general rules consistent with findings iii. verify and justify relationships and/or general rules. ¹
Concepts	Logic, relationships , generalization, validity
Global Context	Scientific and technical innovation: Patterns in mathematics
ATL Skill	Critical Thinking: Draw justifiable conclusions and generalizations
Resources and Preparation	<ol style="list-style-type: none"> Set up a Kialo discussion around the concept question with the thesis: “<i>Multiplication always increases a value.</i>” (Alternative questions are at the end of the lesson plan.) Use Tasks and Small Group Mode to structure the discussion, if appropriate. Share the discussion with students.
Activities	<p>Introduction (5 mins)</p> <ul style="list-style-type: none"> Display the statement: <i>Multiplication always increases a value.</i> Think-pair-share: Ask students to discuss for two minutes and note down their thoughts. Gather students’ initial ideas. <p>Concept Formation (5–10 min)</p> <ul style="list-style-type: none"> What does the <i>logic</i> of multiplication tell us about how the operation behaves with different types of numbers? How does the <i>relationship</i> between the multiplicand and the multiplier affect the outcome? <p>Main Activity (30 min)</p> <ul style="list-style-type: none"> Students will work in small groups in their own copy of the Kialo discussion responding to the thesis: <i>Multiplication always increases a value.</i> Explain that students can use PROS to support the statement and CONS to challenge it, building their argument using claims, examples, and explanations. Model the following example before students begin: <ul style="list-style-type: none"> Claim: Multiplying increases a value when you multiply by any whole number greater than 1. Example: $5 \times 3 = 15$ — 15 is greater than 5. Explanation: When you multiply by a whole number greater than 1, you are adding that number to itself multiple times. Example: For example, 5×3 is the same as $5 + 5 + 5$, which increases the value.
Reflection	<p>Exit Ticket (10 min)</p> <p>Critical thinking focus- draw justifiable conclusions and generalizations.</p> <ul style="list-style-type: none"> Generalization: Can you generalize a rule about what happens when you multiply by numbers greater than 1, less than 1, or equal to 0 or 1? Validity: Is the statement “<i>Multiplication always increases a value</i>” valid in all situations? If not, under what conditions is it valid or invalid?
Alternative Debatable Questions	<ul style="list-style-type: none"> Is it always true that dividing decreases a value? Does multiplying two negative numbers always result in a negative product? Does addition always increase the value of a number? Does squaring a number always result in a larger value? Does having more digits always mean a number is larger?

¹IBO. (2020). *Mathematics guide (For use from September 2020/January 2021)*. Geneva. International Baccalaureate Organization.