

Grade 6 Math Claim 3

Primary Claim 3: Communicating Reasoning

Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others.

Secondary Claim(s): Tasks written primarily to assess Claim 3 will necessarily involve Claim 1 content targets. Related Claim 1 targets should be listed below the Claim 3 targets in the item form. If Claim 2 or Claim 4 targets are also directly related to the task, list those following the Claim 1 targets in order of prominence.

Primary Content Domain: Each task should be classified as having a primary, or dominant, content focus. The content should draw upon the knowledge and skills articulated in the progression of standards leading up to Grade 6.

Secondary Content Domain(s): While tasks developed to assess Claim 3 will have a primary content focus, components of these tasks will likely produce enough evidence for other content domains that a separate listing of these content domains will need to be included where appropriate.

Assessment Targets: Any given task should provide evidence for several of the following assessment targets; each of the following targets should not lead to a separate task. Multiple targets should be listed in order of prominence as related to the task.

Target A: Test propositions or conjectures with specific examples. (DOK 2)

Tasks used to assess this target should ask for specific examples to support or refute a proposition or conjecture (e.g., An item stem might begin, "Provide 3 examples to show why/how...").

Target B: Construct, autonomously¹, chains of reasoning that will justify or refute propositions or conjectures². (DOK 3, 4).

Tasks used to assess this target should ask students to develop a chain of reasoning to justify or refute a conjecture. Tasks for Target B might include the types of examples called for in Target A as part of this reasoning, but should do so with a lesser degree of scaffolding than tasks that assess Target A alone.

Some tasks for this target will ask students to formulate and justify a conjecture.

Target C: State logical assumptions being used. (DOK 2, 3)

Tasks used to assess this target should ask students to use stated assumptions, definitions, and previously established results in developing their reasoning. In some cases, the task may require students to provide missing information by researching or providing a reasoned estimate.

Target D: Use the technique of breaking an argument into cases. (DOK 2, 3)

Tasks used to assess this target should ask students to determine under what conditions an argument is true, to determine under what conditions an argument is not true, or both.

Target E: Distinguish correct logic or reasoning from that which is flawed and—if there is a flaw in the argument—explain what it is. (DOK 2, 3, 4)

Tasks used to assess this target present students with one or more flawed arguments and ask students to choose which (if any) is correct, explain the flaws in reasoning, and/or correct flawed reasoning.

Target F: Base arguments on concrete referents such as objects, drawings,

diagrams, and actions. (DOK 2, 3)

In earlier grades, the desired student response might be in the form of concrete referents. In later grades, concrete referents will often support generalizations as part of the justification rather than constituting the entire expected response.

Target G: At later grades, determine conditions under which an argument does and does not apply. (For example, area increases with perimeter for squares, but not for all plane figures.) (DOK 3, 4)

Tasks used to assess this target will ask students to determine whether a proposition or conjecture always applies, sometimes applies, or never applies and provide justification to support their conclusions. Targets A and B will likely be included also in tasks that collect evidence for Target G.

Relevant Verbs:	understand, explain, justify, prove, derive, assess, illustrate, and analyze
DOK Target(s):	2, 3, 4
Claim 3 Rationale:	<p>Mathematical Practice 3: Construct viable arguments and critique the reasoning of others.</p> <p>Mathematically proficient students:</p> <ul style="list-style-type: none"> • understand and use stated assumptions, definitions, and previously established results in constructing arguments. • make conjectures and build a logical progression of statements to explore the truth of their conjectures. • analyze situations by breaking them into cases. • recognize and use counterexamples. • justify their conclusions, communicate them to others, and respond to the arguments of others. • reason inductively about data, making plausible arguments that take into account the context from which the data arose. • compare the effectiveness of plausible arguments. • distinguish correct logic or reasoning from that which is flawed and, if there is a flaw, explain what it is. <ul style="list-style-type: none"> ○ Elementary students construct arguments using concrete referents such as objects, drawings, diagrams, and actions. ○ Later students learn to determine domains to which an argument applies. • listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve arguments. <p>Mathematical Practice 6: Attend to precision.</p> <p>Mathematically proficient students:</p> <ul style="list-style-type: none"> • communicate precisely to others. • use clear definitions in discussion with others and in their own reasoning. • state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. • specify units of measure and label axes to clarify the correspondence with quantities in a problem. • calculate accurately and efficiently, and express numerical

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	<p>answers with a degree of precision appropriate for the problem context.</p> <ul style="list-style-type: none"> ○ In the elementary grades, students give carefully formulated explanations to each other. ○ In high school, students have learned to examine claims and make explicit use of definitions.
Allowable Item Types*:	SR, CR, ER, TE, PT
Task Models:	<p>Proof and justification tasks: These begin with a proposition, and the task is to provide a reasoned argument why the proposition is or is not true. In some tasks, students may be asked to characterize the domain for which the proposition is true.</p> <p>Critiquing tasks: Some flawed reasoning is presented, and the task is to correct and improve it.</p> <p>Mathematical investigations: Students are presented with a phenomenon and are invited to formulate conjectures about it. They are then asked to prove one of their conjectures. This kind of task benefits from a longer time scale, and might best be incorporated into assessments associated with the Performance Tasks that afford a longer period of time for students to complete their work.</p> <p>Note: This is not a complete list; other types of tasks that fit the criteria above may be included.</p>
Allowable Tools:	protractor, ruler, calculator, spreadsheet, mathematical software
Key Nontargeted Constructs:	While a high level of linguistic ability is associated with Claim 3 tasks, students should not be penalized for weaknesses in written expressions (i.e., spelling, punctuation). It is desirable for students to be able to demonstrate reasoning or model an argument via symbols, geometric shapes, tables, diagrams, structured mathematical responses, technology-enhanced tools, etc.
Claim-Specific Attributes:	Tasks should be designed to take 10–20 minutes to solve. The computational demand on these tasks should focus on the skill level typically expected for Claim 1 tasks for grades lower than Grade 6, yet be consistent with the content domain emphases of Grade 6.
Accessibility Concerns:	Problems involving proofs and conjectures may sometimes be text-heavy. Translation tools and dictionaries should be available to ELL students. Text readers should be available to students as necessary.
Sample Items:	MAT.06.ER.3.0000G.F.175, MAT.06.ER.3.000EE.B.176, MAT.06.ER.3.000SP.F.195

*SR = selected-response item; CR = constructed-response item; TE = technology-enhanced item; ER = extended-response item; PT = performance task

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¹ By “autonomously” we mean that the student responds to a single prompt, without further guidance within the task.

² At the secondary level, these chains may take a successful student 10 minutes to construct and explain. Times will be somewhat shorter for younger students, but still giving them time to think and explain. For a minority of these tasks, subtasks may be constructed to facilitate entry and assess student progress towards expertise. Even for such “apprentice tasks” part of the task will involve a chain of autonomous reasoning that takes at least 5 minutes.