

# Mathematical Reasoning Standards in grades K-7

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## Kindergarten

### **1.0 Students make decisions about how to set up a problem:**

- 1.1 Determine the approach, materials, and strategies to be used.
- 1.2 Use tools and strategies, such as manipulatives or sketches, to model problems.

### **2.0 Students solve problems in reasonable ways and justify their reasoning:**

- 2.1 Explain the reasoning used with concrete objects and/or pictorial representations.
- 2.2 Make precise calculations and check the validity of the results in the context of the problem.

In a bag there are 4 apples, 3 oranges, 5 bananas, and 3 potatoes.  
How many pieces of fruit are in the bag altogether? How many different kinds of fruit are in the bag? How many objects altogether are in the bag?

## Grade 1

- 1.0 Students make decisions about how to set up a problem:**
  - 1.1 Determine the approach, materials, and strategies to be used.
  - 1.2 Use tools, such as manipulatives or sketches, to model problems.
- 2.0 Students solve problems and justify their reasoning:**
  - 2.1 Explain the reasoning used and justify the procedures selected.
  - 2.2 Make precise calculations and check the validity of the results from the context of the problem.
- 3.0 Students note connections between one problem and another.**

## Grade 2

- 1.0 Students make decisions about how to set up a problem:**
  - 1.1 Determine the approach, materials, and strategies to be used.
  - 1.2 Use tools, such as manipulatives or sketches, to model problems.
- 2.0 Students solve problems and justify their reasoning:**
  - 2.1 Defend the reasoning used and justify the procedures selected.
  - 2.2 Make precise calculations and check the validity of the results in the context of the problem.
- 3.0 Students note connections between one problem and another.**

## Grades 3, 4, 5

### **1.0 Students make decisions about how to approach problems:**

- 1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.
- 1.2 Determine when and how to break a problem into simpler parts.

### **2.0 Students use strategies, skills, and concepts in finding solutions:**

- 2.1 Use estimation to verify the reasonableness of calculated results.  
Prove or disprove a classmate's claim that 49 is more than 21 because 9 is more than 1.
- 2.2 Apply strategies and results from simpler problems to more complex problems.
- 2.3 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.
- 2.4 Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.
- 2.5 Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.
- 2.6 Make precise calculations and check the validity of the results from the context of the problem.

### **3.0 Students move beyond a particular problem by generalizing to other situations:**

- 3.1 Evaluate the reasonableness of the solution in the context of the original situation.
- 3.2 Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.
- 3.3 Develop generalizations of the results obtained and apply them in other circumstances.

## Grade 6

### **1.0 Students make decisions about how to approach problems:**

- 1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.
- 1.2 Formulate and justify mathematical conjectures based on a general description of the mathematical question or problem posed.
- 1.3 Determine when and how to break a problem into simpler parts.

### **2.0 Students use strategies, skills, and concepts in finding solutions:**

- 2.1 Use estimation to verify the reasonableness of calculated results.
- 2.2 Apply strategies and results from simpler problems to more complex problems.
- 2.3 Estimate unknown quantities graphically and solve for them by using logical reasoning and arithmetic and algebraic techniques.
- 2.4 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.
- 2.5 Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.
- 2.6 Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.
- 2.7 Make precise calculations and check the validity of the results from the context of the problem.

### **3.0 Students move beyond a particular problem by generalizing to other situations:**

- 3.1 Evaluate the reasonableness of the solution in the context of the original situation.
- 3.2 Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.
- 3.3 Develop generalizations of the results obtained and the strategies used and apply them in new problem situations.

## Grade 7

### **1.0 Students make decisions about how to approach problems:**

- 1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.
- 1.2 Formulate and justify mathematical conjectures based on a general description of the mathematical question or problem posed.
- 1.3 Determine when and how to break a problem into simpler parts.

### **2.0 Students use strategies, skills, and concepts in finding solutions:**

- 2.1 Use estimation to verify the reasonableness of calculated results.
- 2.2 Apply strategies and results from simpler problems to more complex problems.
- 2.3 Estimate unknown quantities graphically and solve for them by using logical reasoning and arithmetic and algebraic techniques.
- 2.4 Make and test conjectures by using both inductive and deductive reasoning.
- 2.5 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.
- 2.6 Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.
- 2.7 Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.
- 2.8 Make precise calculations and check the validity of the results from the context of the problem.

### **3.0 Students determine a solution is complete and move beyond a particular problem by generalizing to other situations:**

- 3.1 Evaluate the reasonableness of the solution in the context of the original situation.
- 3.2 Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.
- 3.3 Develop generalizations of the results obtained and the strategies used and apply them to new problem situations.