

## Grade 6

### Strand 1—Number & Operation

(Online MCA, 11–19 items)

(Paper MCA, 14-19 items)

**Standard 6.1.1:** Read, write, represent and compare positive rational numbers expressed as fractions, decimals, percents and ratios; write positive integers as products of factors; use these representations in real-world and mathematical situations.

(Online MCA, 5–7 items)

(Paper MCA, 5–7 items)

#### Benchmarks

##### 6.1.1.1

Locate positive rational numbers on a number line and plot pairs of positive rational numbers on a coordinate grid.

##### *Item Specifications*

- Both axes must have the same scale
  - Items may require locating points on either axis
  - Vocabulary allowed in items: integer, x-axis, y-axis, horizontal axis, vertical axis, rational number, coordinate grid, and vocabulary given at previous grades
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##### 6.1.1.2

Compare positive rational numbers represented in various forms. Use the symbols  $<$ ,  $=$  and  $>$ .

##### *Item Specifications*

- Vocabulary allowed in items: is greater than, is less than, and vocabulary given at previous grades
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##### 6.1.1.3

Understand that percent represents parts out of 100 and ratios to 100.

##### *Item Specifications*

- Allowable notation: 25%,  $\frac{1}{4}$ , 1:4
  - Percents must be between 1 and 100, inclusive
  - Vocabulary allowed in items: percent, ratio, and vocabulary given at previous grades
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##### 6.1.1.4

Determine equivalences among fractions, decimals and percents; select among these representations to solve problems.

##### *Item Specifications*

- Allowable notation: 50%,  $\frac{1}{4}$ , 0.95,  $0.\overline{25}$
- Percents must be between 1 and 100, inclusive
- Vocabulary allowed in items: vocabulary given at previous grades

### 6.1.1.5

Factor whole numbers; express a whole number as a product of prime factors with exponents.

#### *Item Specifications*

- Prime factors are not greater than 13
  - Numbers being factored are less than 1,000
  - Vocabulary allowed in items: prime factor, prime factorization, exponent, power, base, and vocabulary given at previous grades
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### 6.1.1.6

Determine greatest common factors and least common multiples. Use common factors and common multiples to calculate with fractions and find equivalent fractions.

#### *Item Specifications*

- Vocabulary allowed in items: greatest common factor, least common multiple, and vocabulary given at previous grades
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### 6.1.1.7

Convert between equivalent representations of positive rational numbers.

#### *Item Specifications*

- Conversions are limited to within a representation (e.g.,  $7/4 = 1\frac{3}{4}$  and  $3^2 = 3 \cdot 3$ , not  $0.5 = 1/2$ )
- Vocabulary allowed in items: exponent, integer, and vocabulary given at previous grades

**Standard 6.1.2:** Understand the concept of ratio and its relationship to fractions and to the multiplication and division of whole numbers. Use ratios to solve real-world and mathematical problems.

(Online MCA, 2–6 items)

(Paper MCA, 2–6 items)

## **Benchmarks**

### 6.1.2.1

Identify and use ratios to compare quantities; understand that comparing quantities using ratios is not the same as comparing quantities using subtraction.

#### *Item Specifications*

- Allowable ratio notation:  $\frac{1}{4}$ , 1 to 4, 1:4, 1 out of 4
- Vocabulary allowed in items: ratio, and vocabulary given at previous grades

### 6.1.2.2

Apply the relationship between ratios, equivalent fractions and percents to solve problems in various contexts, including those involving mixtures and concentrations.

#### *Item Specifications*

- Allowable ratio notation:  $\frac{1}{4}$ , 1 to 4, 1:4, 1 out of 4, 25%
  - Rates may be expressed using the word “per”
  - Vocabulary allowed in items: ratio, percent, and vocabulary given at previous grades
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### 6.1.2.3

Determine the rate for ratios of quantities with different units.

#### *Item Specifications*

- Allowable ratio notation:  $\frac{1}{4}$ , 1 to 4, 1:4, 1 out of 4
  - Rates may be expressed using the word “per”
  - Vocabulary allowed in items: rate, ratio, unit rate, and vocabulary given at previous grades
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### 6.1.2.4

Use reasoning about multiplication and division to solve ratio and rate problems.

#### *Item Specifications*

- Allowable ratio notation:  $\frac{1}{4}$ , 1 to 4, 1:4, 1 out of 4
- Rates may be expressed using the word “per”
- Vocabulary allowed in items: rate, ratio, and vocabulary given at previous grades

**Standard 6.1.3:** Multiply and divide decimals, fractions and mixed numbers; solve real-world and mathematical problems using arithmetic with positive rational numbers.

(Online MCA, 4–6 items)

(Paper MCA, 5–7 items)

## **Benchmarks**

### 6.1.3.1

Multiply and divide decimals and fractions using efficient and generalizable procedures, including standard algorithms.

#### *Item Specifications*

- Items must not have context
  - Vocabulary allowed in items: reciprocal, and vocabulary given at previous grades
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### 6.1.3.2

Use the meanings of fractions, multiplication, division and the inverse relationship between multiplication and division to make sense of procedures for multiplying and dividing fractions.

#### *Item Specifications*

- Assessed within 6.1.3.1

### 6.1.3.3

Calculate the percent of a number and determine what percent one number is of another number to solve problems in various contexts.

#### *Item Specifications*

- Percents are not less than 1
  - Percents over 100 are 110, 125, 150 and 200
  - Vocabulary allowed in items: percent, and vocabulary given at previous grades
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### 6.1.3.4

Solve real-world and mathematical problems requiring arithmetic with decimals, fractions and mixed numbers.

#### *Item Specifications*

- Items are limited to no more than two operations
  - Vocabulary allowed in items: reciprocal, and vocabulary given at previous grades
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### 6.1.3.5

Estimate solutions to problems with whole numbers, fractions and decimals and use the estimates to assess the reasonableness of results in the context of the problem.

#### *Item Specifications*

- Assessed within 6.1.3.

## **Strand 2—Algebra**

**(Online MCA, 10–13 items)**

**(Paper MCA, 12-16 items)**

**Standard 6.2.1:** Recognize and represent relationships between varying quantities; translate from one representation to another; use patterns, tables, graphs and rules to solve real-world and mathematical problems.

(Online MCA, 3–4 items)

(Paper MCA, 4–5 items)

### **Benchmarks**

#### **6.2.1.1**

Understand that a variable can be used to represent a quantity that can change, often in relation to another changing quantity. Use variables in various contexts.

#### *Item Specifications*

- Allowable multiplication notation:  $3x$ ,  $xy$ ,  $3 \cdot 4$ ,  $3(4)$
- Equations will not contain exponents
- Vocabulary allowed in items: evaluate, and vocabulary given at previous grades

### 6.2.1.2

Represent the relationship between two varying quantities with function rules, graphs and tables; translate between any two of these representations.

#### *Item Specifications*

- Allowable multiplication notation:  $3x$ ,  $xy$ ,  $3 \cdot 4$ ,  $3(4)$
- Equations will not contain exponents
- Vocabulary allowed in items: translate, function, coordinate grid, and vocabulary given at previous grades

**Standard 6.2.2:** Use properties of arithmetic to generate equivalent numerical expressions and evaluate expressions involving positive rational numbers.

(Online MCA, 2–3 items)

(Paper MCA, 2–3 items)

### **Benchmarks**

#### 6.2.2.1

Apply the associative, commutative and distributive properties and order of operations to generate equivalent expressions and to solve problems involving positive rational numbers.

#### *Item Specifications*

- Allowable multiplication notation:  $3x$ ,  $xy$ ,  $3 \cdot 4$ ,  $3(4)$
- Items must not have context
- Vocabulary allowed in items: order of operations, simplify, and vocabulary given at previous grades

**Standard 6.2.3:** Understand and interpret equations and inequalities involving variables and positive rational numbers. Use equations and inequalities to represent real-world and mathematical problems; use the idea of maintaining equality to solve equations. Interpret solutions in the original context.

(Online MCA, 5–6 items)

(Paper MCA, 6–8 items)

### **Benchmarks**

#### 6.2.3.1

Represent real-world or mathematical situations using equations and inequalities involving variables and positive rational numbers.

#### *Item Specifications*

- Allowable multiplication notation:  $3x$ ,  $xy$ ,  $3 \cdot 4$ ,  $3(4)$ ,  $x^2$
- $<$ ,  $>$  and  $=$  symbols are allowed
- Vocabulary allowed in items: vocabulary given at previous grades

### 6.2.3.2

Solve equations involving positive rational numbers using number sense, properties of arithmetic and the idea of maintaining equality on both sides of the equation. Interpret a solution in the original context and assess the reasonableness of results.

#### *Item Specifications*

- Allowable multiplication notation:  $3x$ ,  $xy$ ,  $3 \cdot 4$ ,  $3(4)$ ,  $x^2$
- Vocabulary allowed in items: reasonable, and vocabulary given at previous grades

## Strand 3—Geometry & Measurement

(Online MCA, 8–11 items)

(Paper MCA, 10-12 items)

**Standard 6.3.1:** Calculate perimeter, area, surface area and volume of two- and three-dimensional figures to solve real-world and mathematical problems.

(Online MCA, 3–5 items)

(Paper MCA, 3–5 items)

### **Benchmarks**

#### **6.3.1.1**

Calculate the surface area and volume of prisms and use appropriate units, such as  $\text{cm}^2$  and  $\text{cm}^3$ . Justify the formulas used. Justification may involve decomposition, nets or other models.

#### *Item Specifications*

- Allowable notation: 3 square centimeters, 3 cm sq,  $3 \text{ cm}^2$
- Vocabulary allowed in items: vocabulary given at previous grades

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#### **6.3.1.2**

Calculate the area of quadrilaterals. Quadrilaterals include squares, rectangles, rhombuses, parallelograms, trapezoids and kites. When formulas are used, be able to explain why they are valid.

#### *Item Specifications*

- Congruent side marks (hash marks) may be used
- Allowable notation: 3 square centimeters, 3 cm sq,  $3 \text{ cm}^2$
- Vocabulary allowed in items: vocabulary given at previous grades

#### **6.3.1.3**

Estimate the perimeter and area of irregular figures on a grid when they cannot be decomposed into common figures and use correct units, such as cm and  $\text{cm}^2$ .

#### *Item Specifications*

- Allowable notation: 3 square centimeters, 3 cm sq,  $3 \text{ cm}^2$
- Vocabulary allowed in items: vocabulary given at previous grades

**Standard 6.3.2:** Understand and use relationships between angles in geometric figures.

(Online MCA, 3–4 items)

(Paper MCA, 3–5 items)

**Benchmarks**

**6.3.2.1**

Solve problems using the relationships between the angles formed by intersecting lines.

*Item Specifications*

- Allowable notation:  $\angle A$ ,  $m\angle A$ ,  $\triangle ABC$
  - Vocabulary allowed in items: intersecting, vertical, adjacent, complementary, supplementary, straight, hypotenuse, leg, and vocabulary given at previous grades
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**6.3.2.2**

Determine missing angle measures in a triangle using the fact that the sum of the interior angles of a triangle is  $180^\circ$ . Use models of triangles to illustrate this fact.

*Item Specifications*

- Allowable notation:  $\angle A$ ,  $m\angle A$ ,  $\triangle ABC$
  - Vocabulary allowed in items: adjacent, complementary, supplementary, interior, exterior, hypotenuse, leg, and vocabulary given at previous grades
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**6.3.2.3**

Develop and use formulas for the sums of the interior angles of polygons by decomposing them into triangles.

*Item Specifications*

- Allowable notation:  $\angle A$ ,  $m\angle A$ ,  $\triangle ABC$
- Vocabulary allowed in items: interior, diagonal, and vocabulary given at previous grades

**Standard 6.3.3:** Choose appropriate units of measurement and use ratios to convert within measurement systems to solve real-world and mathematical problems.

(Online MCA, 2–3 items)

(Paper MCA, 2–3 items)

**Benchmarks**

**6.3.3.1**

Solve problems in various contexts involving conversion of weights, capacities, geometric measurements and times within measurement systems using appropriate units.

*Item Specifications*

- Vocabulary allowed in items: customary, metric, capacity, and vocabulary given at previous grades

### 6.3.3.2

Estimate weights, capacities and geometric measurements using benchmarks in measurement systems with appropriate units.

#### *Item Specifications*

- Vocabulary allowed in items: customary, metric, capacity, and vocabulary given at previous grades

## **Strand 4—Data Analysis & Probability**

**(Online MCA, 6–8 items)**

**(Paper MCA, 6-8 items)**

**Standard 6.4.1:** Use probabilities to solve real-world and mathematical problems; represent probabilities using fractions, decimals and percents.

(Online MCA, 6–8 items)

(Paper MCA, 6–8 items)

### **Benchmarks**

#### **6.4.1.1**

Determine the sample space (set of possible outcomes) for a given experiment and determine which members of the sample space are related to certain events. Sample space may be determined by the use of tree diagrams, tables or pictorial representations.

#### *Item Specifications*

- Size of the sample space will not exceed 36
- Vocabulary allowed in items: probability, outcome, tree diagram, event, random, sample space, combinations, and vocabulary given at previous grades

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#### **6.4.1.2**

Determine the probability of an event using the ratio between the size of the event and the size of the sample space; represent probabilities as percents, fractions and decimals between 0 and 1 inclusive. Understand that probabilities measure likelihood.

#### *Item Specifications*

- Size of the sample space is no more than 100
- Vocabulary allowed in items: probability, outcome, event, likely, unlikely, certain, impossible, ratio, random, sample space, and vocabulary given at previous grades



### **6.4.1.3**

Perform experiments for situations in which the probabilities are known, and compare the resulting relative frequencies with the known probabilities; know that there may be differences.

#### *Item Specifications*

- Vocabulary allowed in items: probability, outcome, event, theoretical, frequency, relative frequency, random, and vocabulary given at previous grades
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### **6.4.1.4**

Calculate experimental probabilities from experiments; represent them as percents, fractions and decimals between 0 and 1 inclusive. Use experimental probabilities to make predictions when actual probabilities are unknown.

#### *Item Specifications*

- Size of the sample space is no more than 100
- Vocabulary allowed in items: probability, outcome, event, experimental, frequency, predict, random, and vocabulary given at previous grades