

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 cm^2 and 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 cm^2
- Vocabulary allowed in items: vocabulary given at previous grades

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 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 cm^2 .

Item Specifications

- Allowable notation: 3 square centimeters, 3 cm sq, 3 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° . 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

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