

Introduction

Toward greater focus and coherence

of the real number system. For example, the real number system is closed under addition, subtraction, multiplication, and division (division by 0 is excluded). An understanding of the real number system is necessary to understand the real number line, closed intervals, and open intervals. The real number system is also necessary to understand the concept of a function.

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Understanding mathematics

Understanding mathematics is a key component of mathematical proficiency. It involves understanding the concepts, procedures, and relationships in mathematics. Understanding mathematics is also necessary to understand the real number system. The real number system is closed under addition, subtraction, multiplication, and division (division by 0 is excluded). The real number system is also necessary to understand the concept of a function. A function is a rule that assigns a unique real number to each real number. The real number system is closed under addition, subtraction, multiplication, and division (division by 0 is excluded).

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How to read the grade level standards

Standards 1. Use addition and subtraction within 100 to solve problems involving unknowns in all positions—for example, $8 + \square = 12$, $50 - \square = 10$, and $48 + \square = 82$.

Clusters 1. Understand the meaning of addition, subtraction, and multiplication. 2. Apply and extend their understanding of addition, subtraction, and multiplication to solve problems involving unknowns in all positions—for example, $8 + \square = 12$, $50 - \square = 10$, and $48 + \square = 82$.

Domains 1. Operations and Algebraic Thinking

Number and Operations in Base Ten **3.NBT**
 Use place value understanding and properties of operations to perform multi-digit arithmetic.

Standard

1. Add to 1,000, including adding and subtracting across ones and tens.

1.1. Add within 100, including adding and subtracting across tens.

1.2. Add within 1,000, including adding and subtracting across hundreds.

1.3. Add and subtract within 100,000.

1.4. Round whole numbers to the nearest 10 or 100.

2. Fluently add and subtract within 100 using strategies based on place value, operation properties, and the relationship between addition and subtraction. (Illustrative Mathematics)

Domain

Cluster



7 Look for and make use of structure.

7-1 Recognize patterns in an arithmetic sequence and use them to describe the sequence.

For example, given the sequence $1, 3, 5, 7, \dots$, recognize that terms are generated by adding a constant number (in this case, 2) to the previous term, and use the pattern to find the 100th term.

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8 Look for and express regularity in repeated reasoning.

8-1 Recognize when to use a particular property of operations to simplify a given expression.

For example, to find $10(3+7)$, first add 3 and 7, then multiply the result by 10, because multiplying a sum by a scalar is easier than multiplying each addend by the scalar and then adding the products.

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Connecting the Standards for Mathematical Practice to the Standards for Mathematical Content

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Counting and Cardinality

- Know number names and the count sequence.
- Count to tell the number of objects.
- Compare numbers.

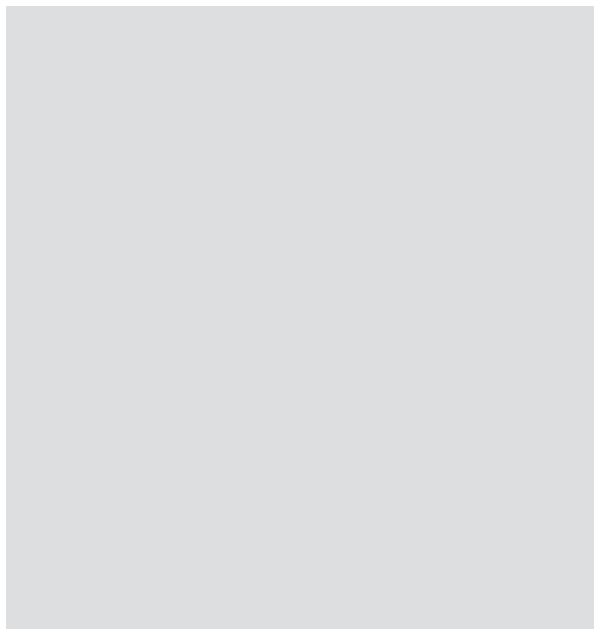
Operations and Algebraic Thinking

- Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

Number and Operations in Base Ten

- Work with numbers 11–19 to gain foundations for place value.

Measurement and Data



Counting and Cardinality**K.CC****Know number names and the count sequence.****Count to tell the number of objects.****Compare numbers.****Operations and Algebraic Thinking****K.OA****Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.**

Number and Operations in Base Ten**K.NBT****Work with numbers 11–19 to gain foundations for place value.**

1. Understand that the numbers 11–19 are composed of ten ones and one to nine more ones.

Measurement and Data**K.MD****Describe and compare measurable attributes.**

1. Describe measurable attributes of an object, such as length, height, weight, and temperature. Express the measurements with a number, a standard unit, and a measuring instrument (e.g., ruler, balance scale, thermometer, and clock).

Classify objects and count the number of objects in each category.

1. Classify objects into two categories and describe each.

Geometry**K.G****Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).**

1. Identify shapes in the environment, and describe those shapes using geometric terms. Recognize shapes and solids from different perspectives (e.g., rotation, translation).

Analyze, compare, create, and compose shapes.

1. Compose simple shapes to form larger shapes. For example, join side-by-side identical square blocks to form a rectangle with a longer horizontal side. Use a triangle and a square to form a trapezoid. Use two triangles to form a rectangle.

Mathematics | Grade 1

1.NF.A.1 Represent a whole as one unit. (1)

Grade 1 Overview

Operations and Algebraic Thinking

- Represent and solve problems involving addition and subtraction.
- Understand and apply properties of operations and the relationship between addition and subtraction.
- Add and subtract within 20.
- Work with addition and subtraction equations.

Number and Operations in Base Ten

- Extend the counting sequence.
- Understand place value.
- Use place value understanding and properties of operations to add and subtract.

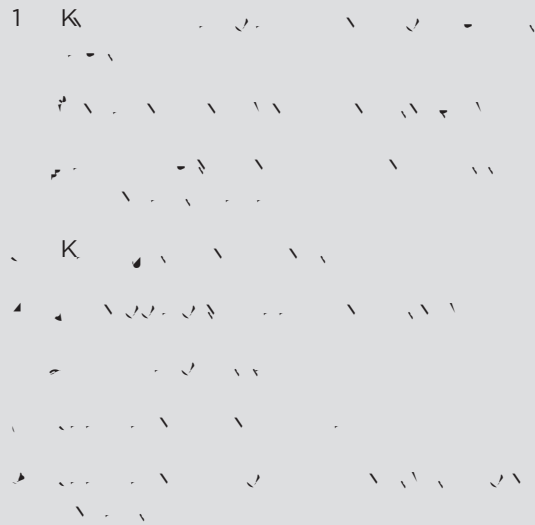
Measurement and Data

- Measure lengths indirectly and by iterating length units.
- Tell and write time.
- Represent and interpret data.

Geometry

- Reason with shapes and their attributes.

Mathematical Practices



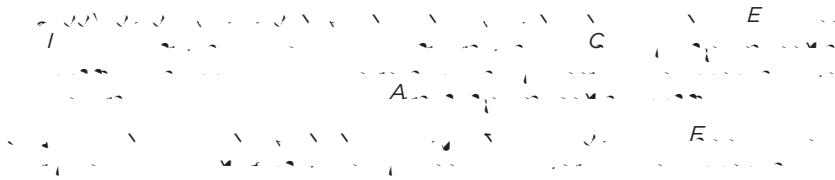
Operations and Algebraic Thinking

1.OA

Represent and solve problems involving addition and subtraction.



Understand and apply properties of operations and the relationship between addition and subtraction.

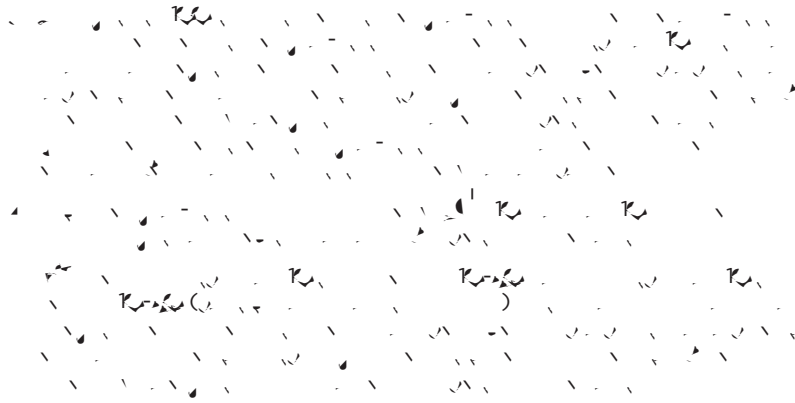


Add and subtract within 20.



Use place value understanding and properties of operations to add and subtract.

Use place value understanding and properties of operations to add and subtract.



Measurement and Data

1.MD

Measure lengths indirectly and by iterating length units.

1.MD.A.2. Measure the length of an object indirectly by using multiple copies of shorter length units. For example, use paper clips to measure the length of a pencil.

Mathematics | Grade 2

$100 - 30 = 70$ (1)
 $100 - 40 = 60$ (2)
 $100 - 50 = 50$ (3)

(1) $100 - 30 = 70$
 $100 - 40 = 60$
 $100 - 50 = 50$

(2) $100 - 40 = 60$
 $100 - 50 = 50$
 $100 - 30 = 70$

(3) $100 - 50 = 50$
 $100 - 30 = 70$
 $100 - 40 = 60$

(4) $100 - 30 = 70$
 $100 - 40 = 60$
 $100 - 50 = 50$

Grade 2 Overview

Operations and Algebraic Thinking

- Represent and solve problems involving addition and subtraction.
- Add and subtract within 20.
- Work with equal groups of objects to gain foundations for multiplication.

Number and Operations in Base Ten

- Understand place value.
- Use place value understanding and properties of operations to add and subtract.

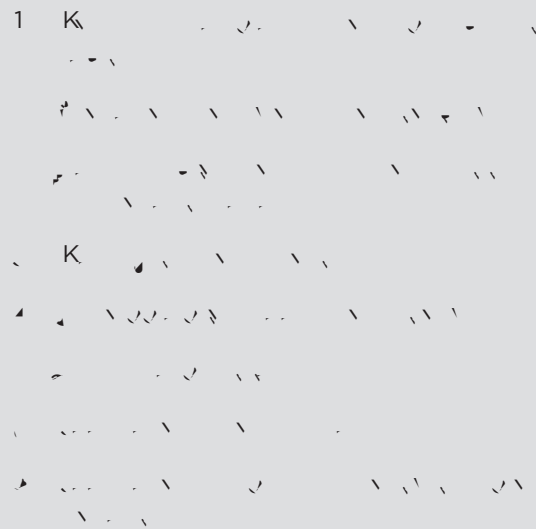
Measurement and Data

- Measure and estimate lengths in standard units.
- Relate addition and subtraction to length.
- Work with time and money.
- Represent and interpret data.

Geometry

- Reason with shapes and their attributes.

Mathematical Practices





Measurement and Data

2.MD

Measure and estimate lengths in standard units.

1. Measure an object to determine its length, and compare the results with another measurement.
2. Measure the length of an object using standard units of length.
3. Estimate lengths using standard units of length.

Relate addition and subtraction to length.

1. Add the length of one object to the length of another object to find the total length.
2. Subtract the length of one object from the length of another object to find the difference in length.

Work with time and money.

1. Tell and write time in hours and half-hours using analog and digital clocks.
2. Recognize and draw a quarter dollar, a half dollar, and a dollar coin, and know the value of each.

Represent and interpret data.

1. Represent data using a simple bar graph.
2. Interpret data from a simple bar graph.

Geometry

2.G

Reason with shapes and their attributes.

1. Recognize and draw shapes having specified attributes, such as a given number of vertices or sides or a given angle.
2. Partition a square, rectangle, or circle into two equal parts to describe the whole as the sum of the parts.
3. Partition a square, rectangle, or circle into four equal parts to describe the whole as the sum of the parts.

K



Grade 3 Overview

Operations and Algebraic Thinking

- Represent and solve problems involving multiplication and division.
- Understand properties of multiplication and the relationship between multiplication and division.
- Multiply and divide within 100.
- Solve problems involving the four operations, and identify and explain patterns in arithmetic.

Number and Operations in Base Ten

- Use place value understanding and properties of operations to perform multi-digit arithmetic.

Number and Operations—Fractions

- Develop understanding of fractions as numbers.

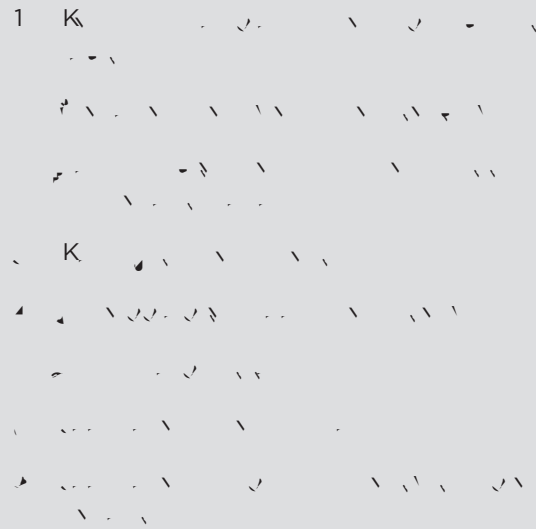
Measurement and Data

- Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.
- Represent and interpret data.
- Geometric measurement: understand concepts of area and relate area to multiplication and to addition.
- Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

Geometry

- Reason with shapes and their attributes.

Mathematical Practices





Number and Operations in Base Ten

3.NBT

Use place value understanding and properties of operations to perform multi-digit arithmetic.⁴

$$\begin{array}{r} 1 \\ 46 \overline{) 200} \\ \underline{92} \\ 108 \\ \underline{92} \\ 160 \\ \underline{138} \\ 220 \\ \underline{208} \\ 120 \\ \underline{116} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

K-12

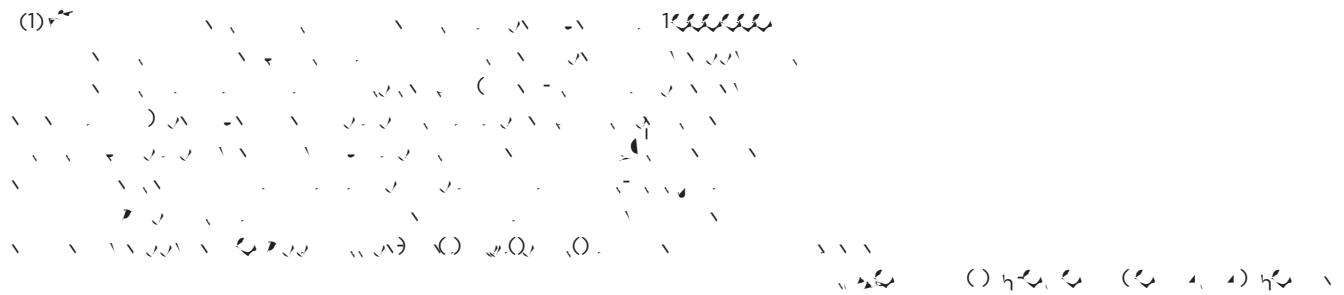
Geometry

3.G

Reason with shapes and their attributes.



Mathematics | Grade 4



Grade 4 Overview

Operations and Algebraic Thinking

- Use the four operations with whole numbers to solve problems.
- Gain familiarity with factors and multiples.
- Generate and analyze patterns.

Number and Operations in Base Ten

- Generalize place value understanding for multi-digit whole numbers.
- Use place value understanding and properties of operations to perform multi-digit arithmetic.

Number and Operations—Fractions

- Extend understanding of fraction equivalence and ordering.
- Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.
- Understand decimal notation for fractions, and compare decimal fractions.

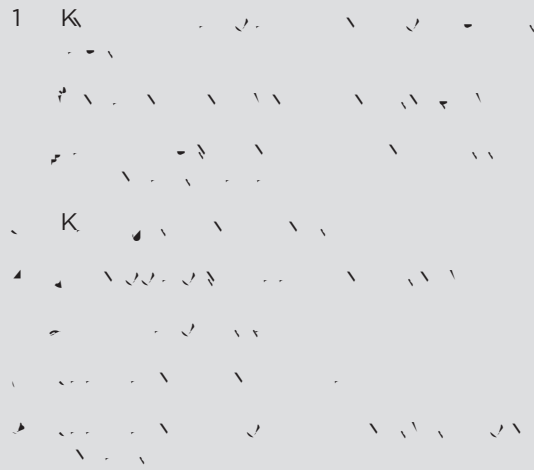
Measurement and Data

- Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
- Represent and interpret data.
- Geometric measurement: understand concepts of angle and measure angles.

Geometry

- Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

Mathematical Practices



Number and Operations—Fractions³

4.NF

Extend understanding of fraction equivalence and ordering.

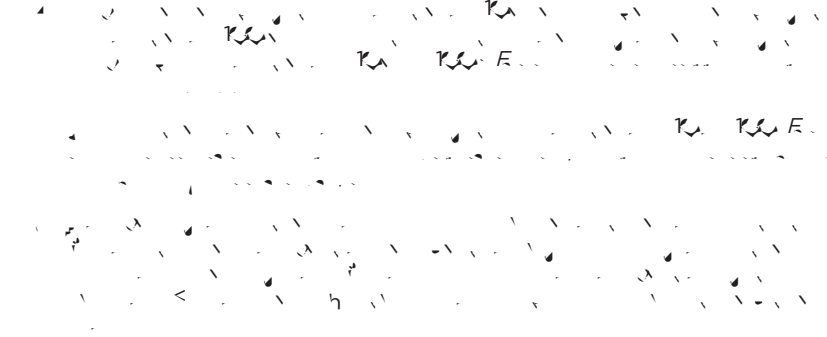
1. Compare two fractions having the same numerator or the same denominator by reasoning about their size. Represent the comparison on a number line.



Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.



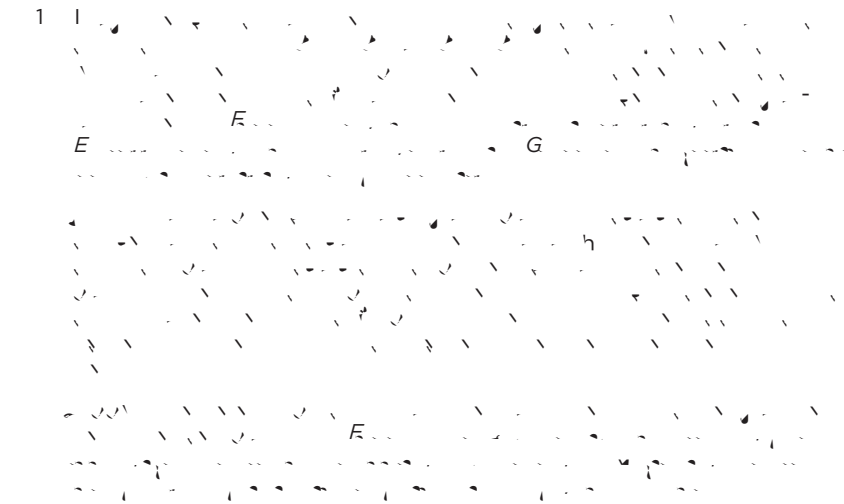
Understand decimal notation for fractions, and compare decimal fractions.



Measurement and Data

4.MD

Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.



Represent and interpret data.



Geometric measurement: understand concepts of angle and measure angles.





Mathematics | Grade 5



(1) $100 \div 10 = 10$
 The quotient is 10.
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Operations and Algebraic Thinking

Operations and Algebraic Thinking

5.OA

Write and interpret numerical expressions.



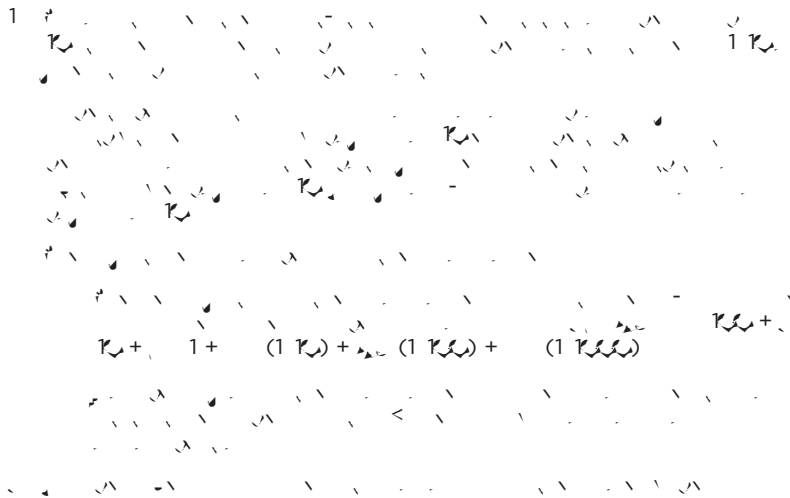
Analyze patterns and relationships.



Number and Operations in Base Ten

5.NBT

Understand the place value system.



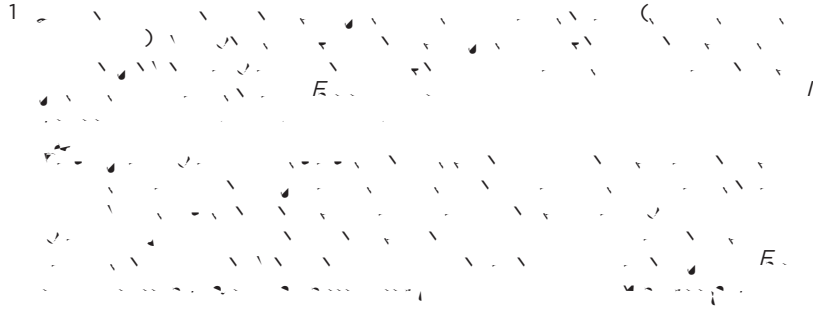
Perform operations with multi-digit whole numbers and with decimals to hundredths.



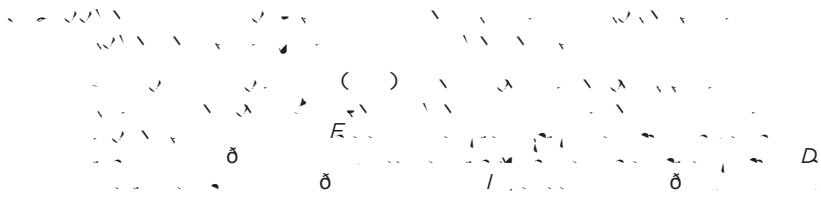
Number and Operations—Fractions

5.NF

Use equivalent fractions as a strategy to add and subtract fractions.



Apply and extend previous understandings of multiplication and division to multiply and divide fractions.



1 2 3 4



Geometry

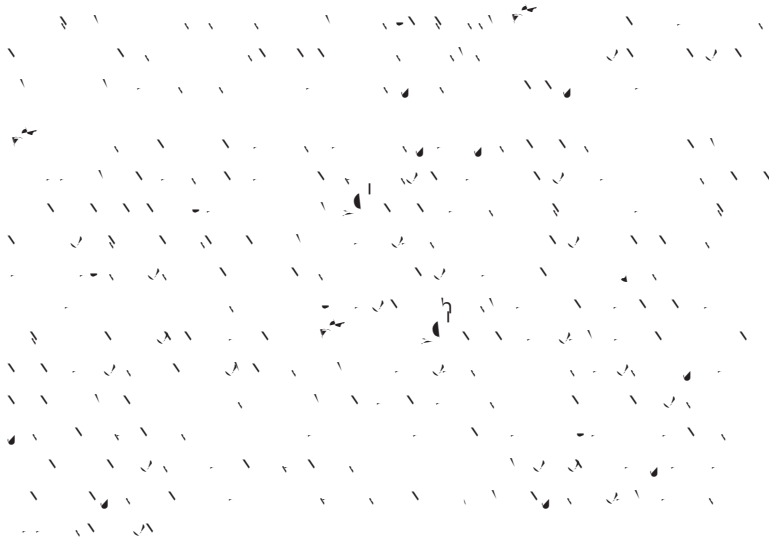
5.G

Graph points on the coordinate plane to solve real-world and mathematical problems.



Mathematics | Grade 6





Grade 6 Overview

Ratios and Proportional Relationships

- Understand ratio concepts and use ratio reasoning to solve problems.

The Number System

- Apply and extend previous understandings of multiplication and division to divide fractions by fractions.
- Compute fluently with multi-digit numbers and find common factors and multiples.
- Apply and extend previous understandings of numbers to the system of rational numbers.

Expressions and Equations

- Apply and extend previous understandings of arithmetic to algebraic expressions.
- Reason about and solve one-variable equations and inequalities.
- Represent and analyze quantitative relationships between dependent and independent variables.

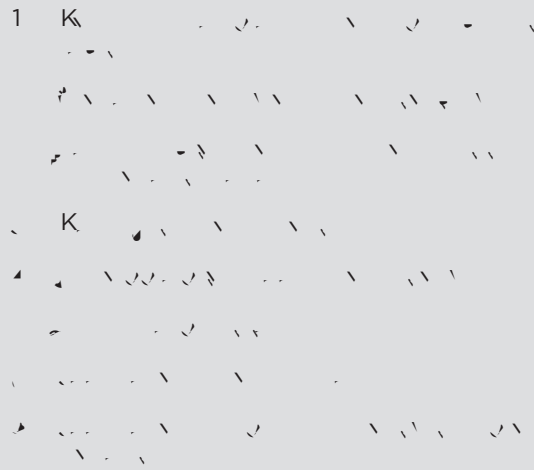
Geometry

- Solve real-world and mathematical problems involving area, surface area, and volume.

Statistics and Probability

- Develop understanding of statistical variability.
- Summarize and describe distributions.

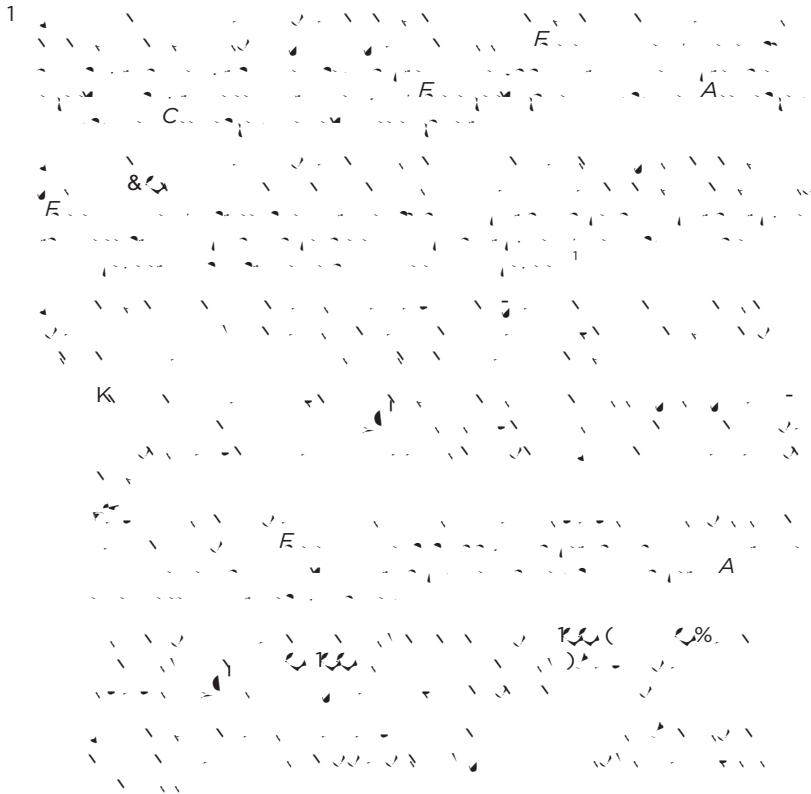
Mathematical Practices



Ratios and Proportional Relationships

6.RP

Understand ratio concepts and use ratio reasoning to solve problems.



The Number System

6.NS

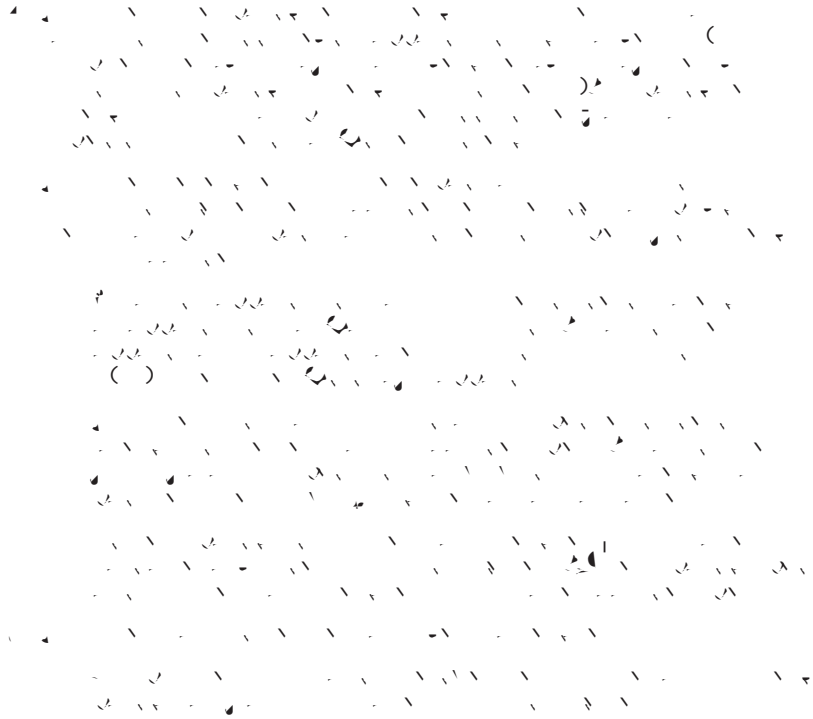
Apply and extend previous understandings of multiplication and division to divide fractions by fractions.



Compute fluently with multi-digit numbers and find common factors and multiples.



Apply and extend previous understandings of numbers to the system of rational numbers.





Reason about and solve one-variable equations and inequalities.





Statistics and Probability

6.SP

Develop understanding of statistical variability.

1. Understand that statistics from a random sample can be used to answer questions about a population. For example, a random sample of students from a school can be used to estimate the proportion of students in the school who walk to school.

Summarize and describe distributions.

1. Represent data with plots on a number line, including dot plots, histograms, and box plots.
2. Summarize the distribution of data on a number line, reporting the center, the overall shape, and any outliers.

Mathematics | Grade 7

(1) $\frac{1}{2}$ of the number of students who are in the school choir is 15. How many students are in the school choir?
 (2) $\frac{1}{3}$ of the number of students who are in the school choir is 15. How many students are in the school choir?
 (3) $\frac{1}{4}$ of the number of students who are in the school choir is 15. How many students are in the school choir?
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Ratios and Proportional Relationships

- Analyze proportional relationships and use them to solve real-world and mathematical problems.

The Number System

- Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

Expressions and Equations

- Use properties of operations to generate equivalent expressions.
- Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Geometry

- Draw, construct and describe geometrical figures and describe the relationships between them.
- Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

Statistics and Probability

- Use random sampling to draw inferences about a population.
- Draw informal comparative inferences about two populations.
- Investigate chance processes and develop, use, and evaluate probability models.

Mathematical Practices



-11 ()

Ratios and Proportional Relationships

7.RP

Analyze proportional relationships and use them to solve real-world and mathematical problems.

1. Recognize and represent proportional relationships between quantities. Use diagrams, tables, graphs, and equations to represent proportional relationships. For example, on a distance–time graph, the slope of a line represents the constant rate of travel. An equation like $T = 50t$ represents a proportional relationship between T (total distance) and t (time).

2. Identify the constant of proportionality (unit rate, slope, or constant multiplier) in a variety of representations. For example, in a table, the constant of proportionality is the constant multiplier between two quantities; in a graph, it is the slope of the line; in an equation, it is the coefficient of the independent variable.

3. Represent a proportional relationship with a table, graph, or equation. For example, a table with a constant multiplier of 4 represents the relationship $y = 4x$.

4. Apply and extend previous understandings of multiplication to multiply a rational number by a rational number. For example, $\frac{2}{3} \times \frac{3}{4} = \frac{2 \times 3}{3 \times 4} = \frac{2}{4} = \frac{1}{2}$.

The Number System

7.NS

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

1. Add and subtract rational numbers. For example, $\frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6} = \frac{5}{6}$.

2. Multiply and divide rational numbers. For example, $\frac{2}{3} \times \frac{3}{4} = \frac{2 \times 3}{3 \times 4} = \frac{2}{4} = \frac{1}{2}$.

3. Apply and extend previous understandings of addition, subtraction, multiplication, and division to add, subtract, multiply, and divide rational numbers. For example, $\frac{1}{2} - \frac{1}{3} = \frac{3}{6} - \frac{2}{6} = \frac{1}{6}$.

4. Understand that dividing by a fraction is equivalent to multiplying by its reciprocal. For example, $\frac{2}{3} \div \frac{3}{4} = \frac{2}{3} \times \frac{4}{3} = \frac{8}{9}$.



Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.



Statistics and Probability

7.SP

Use random sampling to draw inferences about a population.

1

Grade 8 Overview

The Number System

- Know that there are numbers that are not rational, and approximate them by rational numbers.

Expressions and Equations

- Work with radicals and integer exponents.
- Understand the connections between proportional relationships, lines, and linear equations.
- Analyze and solve linear equations and pairs of simultaneous linear equations.

Functions

- Define, evaluate, and compare functions.
- Use functions to model relationships between quantities.

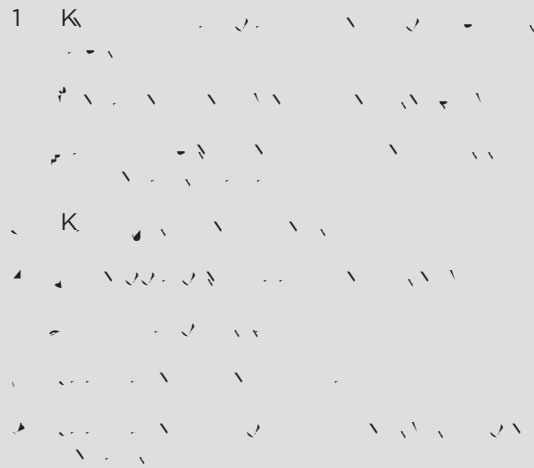
Geometry

- Understand congruence and similarity using physical models, transparencies, or geometry software.
- Understand and apply the Pythagorean Theorem.
- Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.

Statistics and Probability

- Investigate patterns of association in bivariate data.

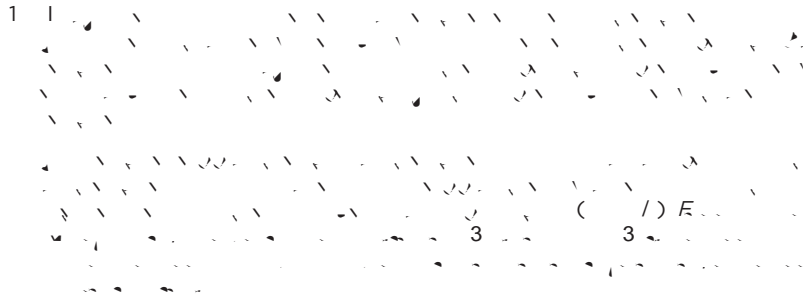
Mathematical Practices



The Number System

8.NS

Know that there are numbers that are not rational, and approximate them by rational numbers.



Expressions and Equations

8.EE

Work with radicals and integer exponents.



Understand the connections between proportional relationships, lines, and linear equations.





Understand and apply the Pythagorean Theorem.



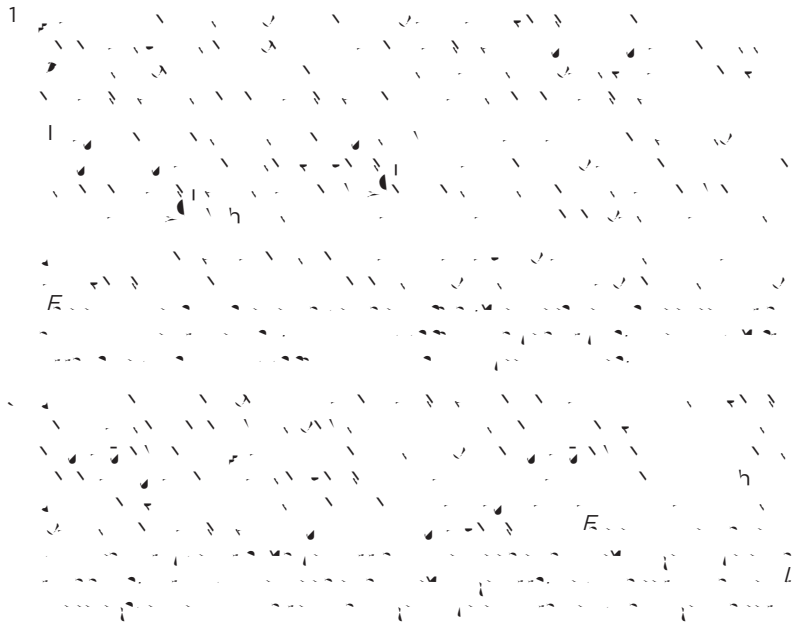
Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.



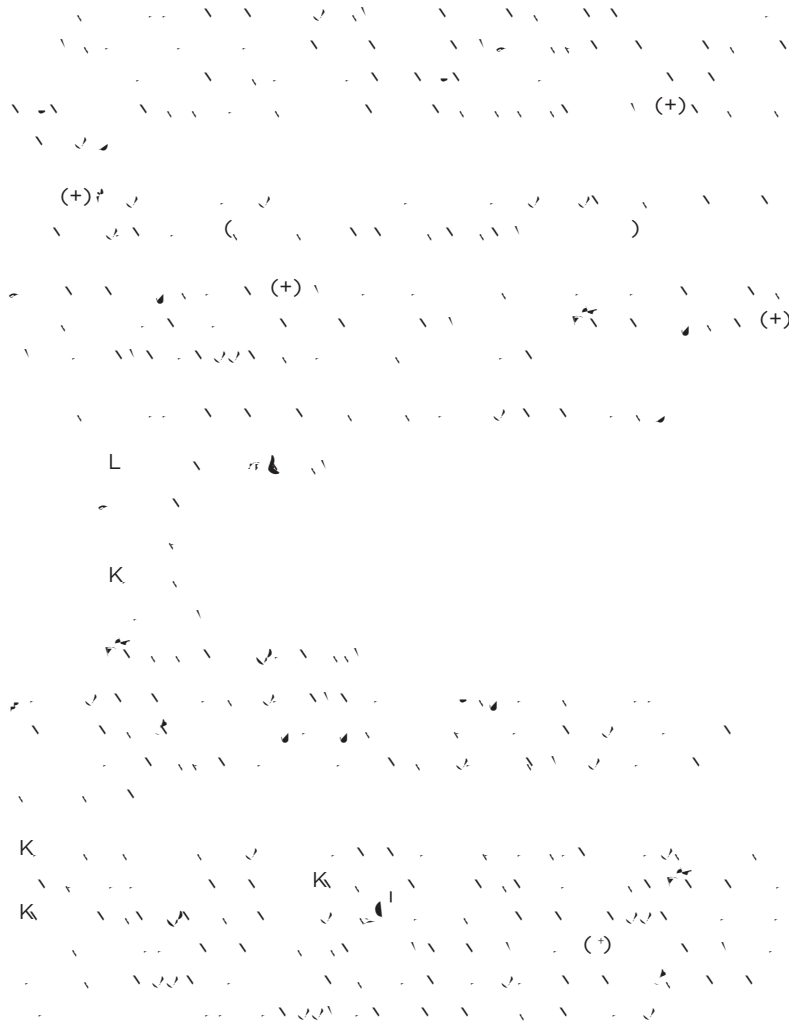
Statistics and Probability

8.SP

Investigate patterns of association in bivariate data.



Mathematics Standards for High School



Mathematics | High School—Number and Quantity

Numbers and Number Systems



The Real Number System

- Extend the properties of exponents to rational exponents
- Use properties of rational and irrational numbers.

Quantities

- Reason quantitatively and use units to solve problems

The Complex Number System

- Perform arithmetic operations with complex numbers
- Represent complex numbers and their operations on the complex plane
- Use complex numbers in polynomial identities and equations

Vector and Matrix Quantities

- Represent and model with vector quantities.
- Perform operations on vectors.
- Perform operations on matrices and use matrices in applications.

Mathematical Practices



The Real Number System

N-RN

Extend the properties of exponents to rational exponents.

$$1 \quad \sqrt[3]{27} = 27^{\frac{1}{3}} = (3^3)^{\frac{1}{3}} = 3^{\frac{3}{3}} = 3^1 = 3$$

$$2 \quad \sqrt[3]{27} = 27^{\frac{1}{3}} = (3^3)^{\frac{1}{3}} = 3^{\frac{3}{3}} = 3^1 = 3$$

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Algebra Overview

Seeing Structure in Expressions

- Interpret the structure of expressions
- Write expressions in equivalent forms to solve problems

Arithmetic with Polynomials and Rational Expressions

- Perform arithmetic operations on polynomials
- Understand the relationship between zeros and factors of polynomials
- Use polynomial identities to solve problems
- Rewrite rational expressions

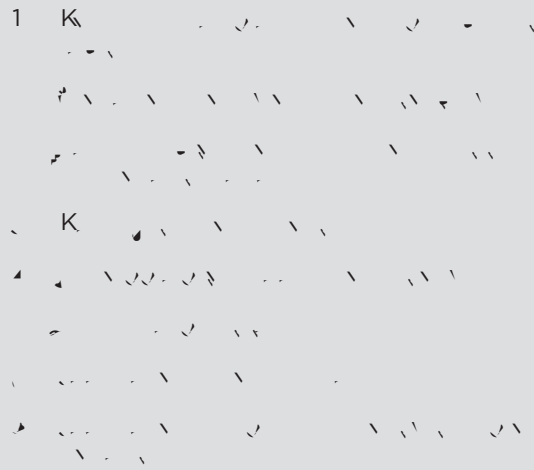
Creating Equations

- Create equations that describe numbers or relationships

Reasoning with Equations and Inequalities

- Understand solving equations as a process of reasoning and explain the reasoning
- Solve equations and inequalities in one variable
- Solve systems of equations
- Represent and solve equations and inequalities graphically

Mathematical Practices



Seeing Structure in Expressions

A-SSE

Interpret the structure of expressions

$$\begin{aligned}
 1 &= (x^2 + 2x + 1) + (2x^2 + 4x + 2) + (x^2 + 2x + 1) + \dots + (x^2 + 2x + 1) \\
 &= (x^2 + 2x + 1) + 2(x^2 + 2x + 1) + (x^2 + 2x + 1) + \dots + (x^2 + 2x + 1) \\
 &= (x^2 + 2x + 1)(1 + 2 + 1 + \dots + 1) \\
 &= (x^2 + 2x + 1)(n) \\
 &= (x + 1)^2(n) \\
 &= (x + 1)^2(n)
 \end{aligned}$$

Write expressions in equivalent forms to solve problems

$$\begin{aligned}
 x^2 - 4x + 4 &= (x - 2)^2 \\
 x^2 - 4x + 4 &= (x - 2)^2
 \end{aligned}$$

Rewrite rational expressions

$$\frac{x^2 + 5x + 6}{x^2 - 4} = \frac{(x+2)(x+3)}{(x-2)(x+2)} = \frac{x+3}{x-2}$$

Creating Equations⁺**A-CED****Create equations that describe numbers or relationships**

$$1 \text{ } \frac{1}{x} + \frac{1}{y} = \frac{1}{z} \quad | \quad \text{Multiply both sides by } xyz \text{ to clear the denominators.}$$

$$\frac{yz}{x} + \frac{xz}{y} = \frac{xy}{z} \quad | \quad \text{Multiply both sides by } xyz \text{ to clear the denominators.}$$

$$yz^2 + x^2z = xy^2 \quad | \quad \text{Rearrange terms to form a polynomial equation.}$$

$$yz^2 + x^2z - xy^2 = 0 \quad | \quad \text{Factor the polynomial equation.}$$

Mathematics | High School—Functions



Interpreting Functions

- Understand the concept of a function and use function notation
- Interpret functions that arise in applications in terms of the context
- Analyze functions using different representations

Building Functions

- Build a function that models a relationship between two quantities
- Build new functions from existing functions

Linear, Quadratic, and Exponential Models

- Construct and compare linear, quadratic, and exponential models and solve problems
- Interpret expressions for functions in terms of the situation they model

Trigonometric Functions

- Extend the domain of trigonometric functions using the unit circle
- Model periodic phenomena with trigonometric functions
- Prove and apply trigonometric identities

Interpreting Functions

F-IF

Understand the concept of a function and use function notation

1. Understand that a function assigns to each element x in a set A exactly one element y in a set B . Understand that the graph of a function on a coordinate plane consists of points (x, y) such that y is the unique real number satisfying $y = f(x)$.

Building Functions**F-BF****Build a function that models a relationship between two quantities**

1. Given a situation that one quantity is a linear function of another, write a function that describes the situation. Interpret the slope and the y-intercept of the function in terms of the situation. Graph the function and describe the graph.
2. Given a situation that one quantity is a quadratic function of another, write a function that describes the situation. Interpret the coefficients of the function in terms of the situation. Graph the function and describe the graph.
3. Given a situation that one quantity is an exponential function of another, write a function that describes the situation. Interpret the parameters of the function in terms of the situation. Graph the function and describe the graph.

Build new functions from existing functions

4. For a given function or situation, create a new function by adding, subtracting, multiplying, or dividing the original function by a constant. Interpret the new function in terms of the situation.
5. For a given function or situation, create a new function by reflecting, stretching, or compressing the original function. Interpret the new function in terms of the situation.
6. For a given function or situation, create a new function by shifting the original function. Interpret the new function in terms of the situation.
7. For a given function or situation, create a new function by combining two or more functions. Interpret the new function in terms of the situation.

Linear, Quadratic, and Exponential Models⁺**F-LE****Construct and compare linear, quadratic, and exponential models and solve problems**

1. Construct a linear, quadratic, or exponential model from a description of a situation. Graph the model and describe the graph.
2. Compare linear, quadratic, and exponential models.
3. Solve problems involving linear, quadratic, and exponential models.

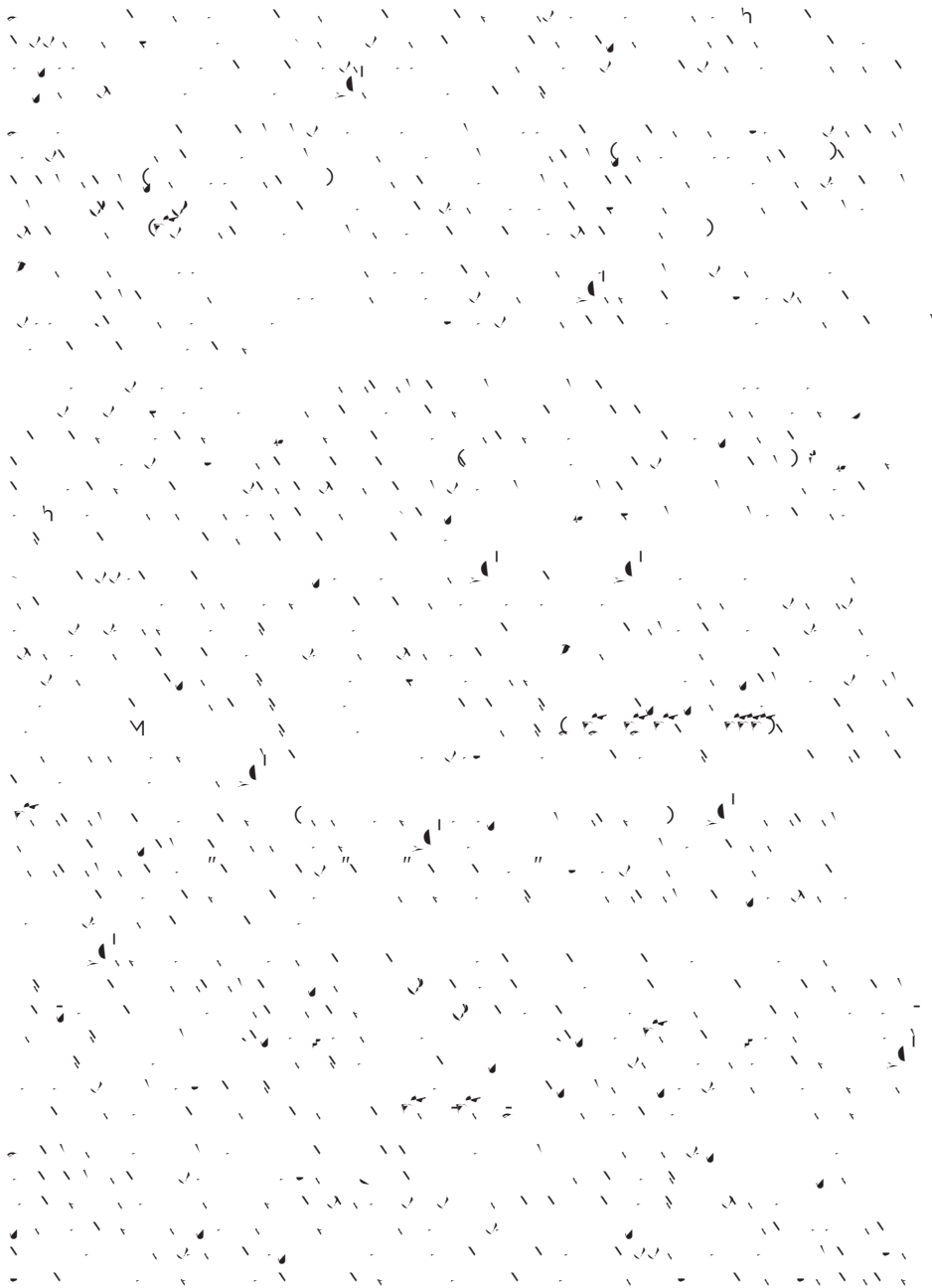
For example, the function $f(x) = 4x^2 - 4x + 1$ can be written in vertex form or factored form as $f(x) = (2x - 1)^2$. Graphing this function on a coordinate plane reveals that it has a minimum at $(0.5, 0)$ and that it crosses the x -axis at $x = 0.5$. The graph of the function $f(x) = 4x^2 - 4x + 1$ is shown below.



Mathematics | High School—Modeling



Mathematics | High School—Geometry



Geometry Overview

Congruence

- Experiment with transformations in the plane
- Understand congruence in terms of rigid motions
- Prove geometric theorems
- Make geometric constructions

Similarity, Right Triangles, and Trigonometry

- Understand similarity in terms of similarity transformations
- Prove theorems involving similarity
- Define trigonometric ratios and solve problems involving right triangles
- Apply trigonometry to general triangles

Circles

- Understand and apply theorems about circles
- Find arc lengths and areas of sectors of circles

Expressing Geometric Properties with Equations

- Translate between the geometric description and the equation for a conic section
- Use coordinates to prove simple geometric theorems algebraically

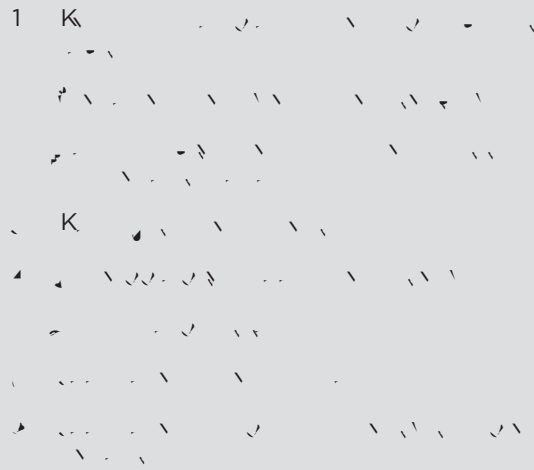
Geometric Measurement and Dimension

- Explain volume formulas and use them to solve problems
- Visualize relationships between two-dimensional and three-dimensional objects

Modeling with Geometry

- Apply geometric concepts in modeling situations

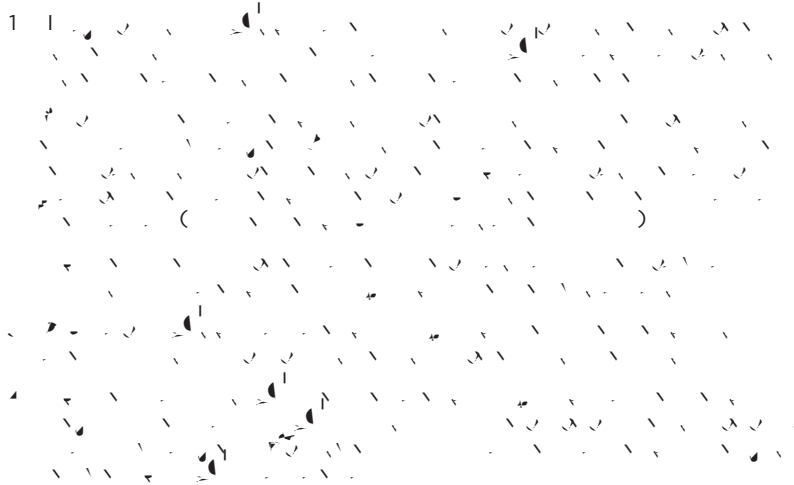
Mathematical Practices



Congruence

G-CO

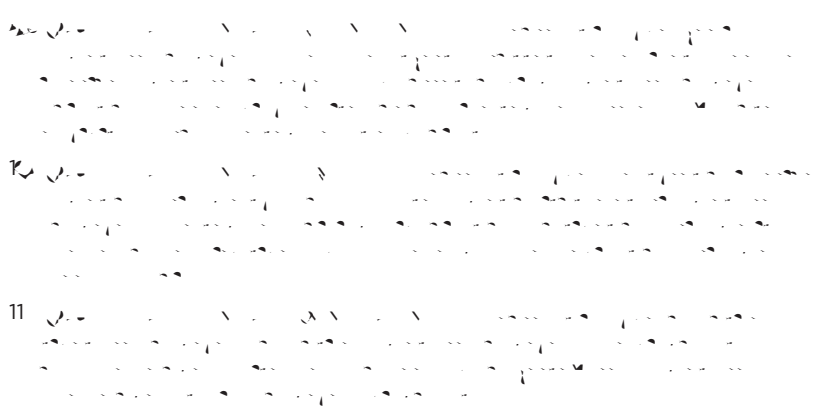
Experiment with transformations in the plane



Understand congruence in terms of rigid motions



Prove geometric theorems



Make geometric constructions



Similarity, Right Triangles, and Trigonometry

G-SRT

Understand similarity in terms of similarity transformations



Mathematics | High School—Statistics and Probability ⁺



Statistics and Probability Overview

Interpreting Categorical and Quantitative Data

- Summarize, represent, and interpret data on a single count or measurement variable
- Summarize, represent, and interpret data on two categorical and quantitative variables
- Interpret linear models

Making Inferences and Justifying Conclusions

- Understand and evaluate random processes underlying statistical experiments
- Make inferences and justify conclusions from sample surveys, experiments and observational studies

Conditional Probability and the Rules of Probability

- Understand independence and conditional probability and use them to interpret data
- Use the rules of probability to compute probabilities of compound events in a uniform probability model

Using Probability to Make Decisions

- Calculate expected values and use them to solve problems
- Use probability to evaluate outcomes of decisions

Mathematical Practices





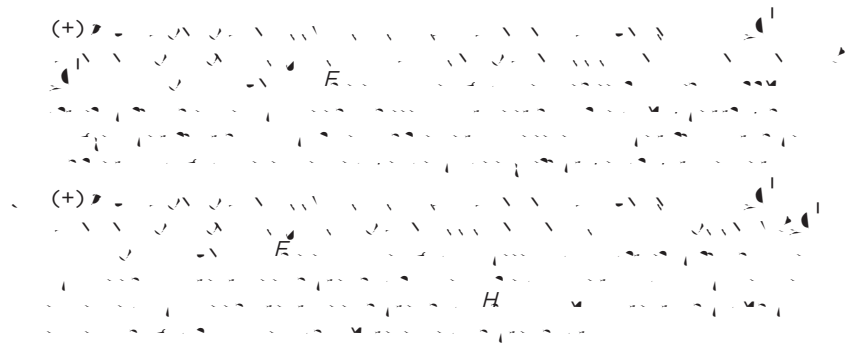


Conditional Probability and the Rules of Probability

S-CP

Understand independence and conditional probability and use them to interpret data

1. Understand conditional probability and probability of independent events.
- Understand that $P(A|B)$, the probability of A given B , is defined as $\frac{P(A \cap B)}{P(B)}$ provided $P(B) > 0$. Understand that $P(A|B)$ and $P(A)$ are the same if and only if A and B are independent events.



Use probability to evaluate outcomes of decisions

4



Addition and subtraction within 5, 10, 20, 100, or 1000.

Use mental strategies to add and subtract within 100, e.g., by counting on; making tens; decomposing 100 into 90 and 10; and decomposing a number into tens and ones. For example, to add 26 and 38, first add 26 and 4 to get 30, then add 34 to get 64.

Additive inverses.

Understand that adding the opposite of a number results in a zero sum. For example, $3 + (-3) = 0$.

Associative property of addition.

Understand that for any numbers a , b , and c , $(a + b) + c = a + (b + c)$.

Associative property of multiplication.

Understand that for any numbers a , b , and c , $(a \times b) \times c = a \times (b \times c)$.

Bivariate data.

Understand that bivariate data is data with two variables.

Box plot.

A graph showing the distribution of data. The box represents the interquartile range, the line inside the box is the median, the whiskers extend to the minimum and maximum values, and the dots represent outliers.

Commutative property.

Understand that for any numbers a and b , $a + b = b + a$ and $a \times b = b \times a$.

Complex fraction.

A fraction where the numerator or denominator is itself a fraction. For example, $\frac{\frac{1}{2}}{\frac{3}{4}}$.

Computation algorithm.

A set of steps for performing a mathematical operation.

Computation strategy.

A method for solving a problem that involves computation.

Congruent.

Two figures are congruent if they have the same shape and size.

Integer.

Interquartile Range.

Line plot.

Mean.

Mean absolute deviation.

Median.

Midline.

Multiplication and division within 100 K.

Multiplicative inverses.

Number line diagram.

Percent rate of change.

Probability distribution.

Properties of operations

Properties of equality

Properties of inequality

Properties of operations

Probability.

Probability model.

Random variable.

Rational expression.

Rational number.

Rectilinear figure.

Rigid motion.

Repeating decimal

Sample space

Scatter plot

Similarity transformation

Tape diagram

Terminating decimal

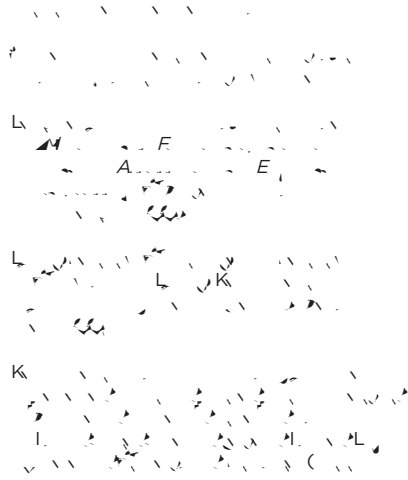
Third quartile

Transitivity principle for indirect measurement

TABLE 1. *Grade 7 Mathematics Standards*

Grade	Standard	Standard Number	Standard Description
7	Number and Operations—Rational Numbers	1	Adding, subtracting, and multiplying rational numbers as fractions. Adding, subtracting, and multiplying mixed numbers.
		2	Understanding that dividing by a fraction is equivalent to multiplying by its reciprocal. Dividing whole numbers and decimal numbers.
		3	Understanding that the sum of two rational numbers is rational. Understanding that the product of two rational numbers is rational. Understanding that the quotient of a rational number and a nonzero rational number is rational.
7-8	Number and Operations—Real Numbers	1	Understanding that real numbers and the rational numbers are closed under addition, subtraction, and multiplication. Understanding that the real numbers are closed under division.
		2	Understanding that every real number has a reciprocal (other than zero), and that the reciprocal of a real number is a real number.
		3	Understanding that the real numbers are closed under addition, subtraction, multiplication, and division.
7-8	Expressions and Equations	1	Using properties of operations to generate equivalent expressions.
		2	Understanding and applying the Distributive Property.
		3	Using the distributive property to identify equivalent expressions.
7-8	Functions	1	Understanding that a function maps each input value to exactly one output value. Understanding that the graph of a function on a coordinate plane passes the vertical line test.
		2	Understanding that a function can be represented by a set of ordered pairs, a table, a graph, or an equation.
		3	Understanding that a function can be represented by a set of ordered pairs, a table, a graph, or an equation.
7-8	Geometry	1	Understanding that the area of a shape with an inscribed square is less than the area of the shape.
		2	Understanding that the area of a shape with an inscribed square is less than the area of the shape.
		3	Understanding that the area of a shape with an inscribed square is less than the area of the shape.
7-8	Statistics and Probability	1	Understanding that a probability distribution is a list of all possible outcomes and their probabilities.
		2	Understanding that a probability distribution is a list of all possible outcomes and their probabilities.
		3	Understanding that a probability distribution is a list of all possible outcomes and their probabilities.





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