Ratios, Rates, and Proportional Relationships

Understanding Rates and Proportionality

Unit Rates

1. Calculate unit rates with whole numbers - Determine the unit rate from a given ratio involving whole-number quantities. (7.RP.A.1 - RA1)
2. Compute unit rates with fractions - Calculate the unit rate when given a ratio involving fractional quantities, including complex fractions. (7.RP.A.1 - RB2)
3. Solve real-world problems involving unit rates with fractions - Apply the concept of unit rates with fractions to solve practical problems involving various quantities (lengths, areas, prices, etc.). (7.RP.A.1 - RC3)

Identifying Proportional Relationships

1. Identify proportional relationships from tables - Determine if a relationship represented in a table is proportional by checking for a constant ratio between quantities. (7.RP.A.2.a - RD4)
2. Identify proportional relationships from graphs - Determine if a relationship represented by a graph is proportional by verifying if it is a straight line passing through the origin. (7.RP.A.2.a - RE5)
3. Identify proportional relationships from equations - Recognize proportional relationships when represented by equations of the form y = kx. (7.RP.A.2.a - RF6)
4. Represent proportional relationships with multiple representations - Translate and represent proportional relationships between tables, graphs, equations, and verbal descriptions. (7.RP.A.2 - RG7)
5. Interpret points (x, y) on the graph of a proportional relationship - Explain the meaning of any point (x, y) on the graph of a proportional relationship in the context of the situation, focusing on the significance of (0, 0) and (1, r) where r is the unit rate. (7.RP.A.2.d - RH8)

Constant of Proportionality

1. Find the constant of proportionality from tables - Calculate the constant of proportionality (unit rate) from a table of proportional values. (7.RP.A.2.b - RI9)
2. Find the constant of proportionality from graphs - Identify and calculate the constant of proportionality from the graph of a proportional relationship. (7.RP.A.2.b - RJ1)
3. Find the constant of proportionality from equations - Identify the constant of proportionality (k) in an equation of a proportional relationship (y = kx). (7.RP.A.2.b - RK2)
4. Interpret the constant of proportionality in context - Explain the meaning of the constant of proportionality in various real-world scenarios. (7.RP.A.2.b - RL3)
5. Compare constants of proportionality - Compare constants of proportionality from different representations (tables, graphs, equations, verbal descriptions) of proportional relationships. (7.RP.A.2.b - RM4)

Equations for Proportional Relationships

1. Write equations for proportional relationships from tables - Given a table of proportional values, write an equation in the form y = kx to represent the relationship. (7.RP.A.2.c - RN5)
2. Write equations for proportional relationships from graphs - Given a graph of a proportional relationship, write an equation in the form y = kx to represent the relationship. (7.RP.A.2.c - RO6)
3. Write equations for proportional relationships from verbal descriptions - Translate a verbal description of a proportional relationship into an algebraic equation. (7.RP.A.2.c - RP7)
4. Solve proportions using various methods - Solve for an unknown value in a proportion using cross-multiplication or other equivalent ratio strategies. (7.RP.A.2.c - RQ8)
5. Solve word problems involving proportional relationships - Apply understanding of proportional relationships to solve multi-step real-world problems. (7.RP.A.2 - RR9)

Applying Proportional Relationships to Real-World Problems

Percent Concepts

1. Understand the concept of percent as a rate per 100 - Understand that a percentage represents a part of a whole expressed as a fraction of 100. (7.RP.A.3 - RS1)
2. Convert between percents, fractions, and decimals - Fluently convert numbers between percent, fraction, and decimal forms. (7.RP.A.3 - RT2)

Solving Percent Problems

1. Solve percent problems (finding the part, whole, or percent) - Solve problems to find the unknown part, the whole, or the percentage, given the other two quantities. (7.RP.A.3 - RU3)
2. Solve multistep ratio problems - Solve complex problems involving ratios that require multiple steps or a combination of ratio concepts. (7.RP.A.3 - RV4)
3. Calculate percent increase and decrease - Determine the percentage increase or decrease of a quantity relative to its original amount. (7.RP.A.3 - RW5)
4. Solve word problems involving percent increase and decrease - Apply the concept of percent increase and decrease to solve real-world problems. (7.RP.A.3 - RX6)
5. Solve word problems involving discounts, markups, and commissions - Calculate and apply discounts, markups, and commissions in real-world scenarios. (7.RP.A.3 - RY7)
6. Solve percent error problems - Calculate percent error and apply it in real-world contexts to understand measurement accuracy. (7.RP.A.3 - RZ8)
7. Solve multistep percent problems - Solve complex real-world problems that require multiple steps and integrate various percent concepts (e.g., tax, tip, discount, percent increase/decrease). (7.RP.A.3 - SA9)
8. Solve simple interest problems - Calculate simple interest given the principal, interest rate, and time. (7.RP.A.3 - SB1)

Scale Drawings

1. Identify scale copies - Differentiate between scaled and non-scaled copies of a figure. (7.G.A.1 - SC2)

2. Explore scale copies - Understand the concept of scale copies and how they relate to original figures. (7.G.A.1 - SD3)
3. Corresponding sides and points in scale drawings - Identify corresponding sides, angles, and points between a figure and its scale copy. (7.G.A.1 - SE4)
4. Identify scale factor in scale drawings - Determine the scale factor between a figure and its scaled copy. (7.G.A.1 - SF5)
5. Interpret scale factor in scale drawings - Explain how scale factors affect the size of a scaled copy and how scaling can be reversed. (7.G.A.1 - SG6)
6. Construct scale drawings given a scale factor - Draw a scaled copy of a given figure using a specified scale factor. (7.G.A.1 - SH7)
7. Solve problems involving scale drawings: finding actual lengths - Use a scale drawing and its given scale to calculate actual distances or lengths of objects. (7.G.A.1 - SI8)
8. Determine the scale of a drawing - Determine the scale of a scale drawing based on actual object dimensions and drawing dimensions. (7.G.A.1 - SJ9)
9. Reproduce a scale drawing at a different scale - Reproduce a given scale drawing at a new, specified scale. (7.G.A.1 - SK1)
10. Relate scale drawings to area - Explain how the area of a scaled copy is related to the original area and the scale factor. (7.G.A.1 - SL2)
11. Solve problems involving scale drawings: word problems with scale factors - Solve word problems that require applying the concept of scale factor to find unknown lengths or dimensions. (7.G.A.1 - SM3)
12. Use different scales to describe drawings - Understand and apply different types of scales (with or without units) to describe and work with scale drawings. (7.G.A.1 - SN4)

The Number System

Operations with Rational Numbers

Understanding Rational Numbers

1. Interpreting Negative Numbers - Interpret signed numbers in the context of real-world scenarios like temperature and elevation, understanding their meaning and magnitude. (7.NS.A.1.b - NA1)
2. Changing Temperatures - Use a number line to model and solve problems involving changes in temperature, applying addition of positive and negative numbers. (7.NS.A.1.b - NB2)
3. Changing Elevation - Understand how to add positive and negative numbers in general through the context of changing elevation. (7.NS.A.1.b - NC3)
4. Money and Debts - Understand how positive and negative numbers apply to financial situations and calculate account balances using addition of rational numbers. (7.NS.A.1.b - ND4)
5. Understand absolute value - Understand the concept of absolute value as distance from zero. (7.NS.A.1.b - NE5)
6. Absolute value and opposite integers - Understand the relationship between absolute value and opposite integers. (7.NS.A.1.b - NF6)
7. Converting fractions to decimals - Convert fractions or mixed numbers to their decimal form using long division, recognizing terminating and repeating decimals. (7.NS.A.2.d - NG7)
8. Order rational numbers - Order a set of rational numbers presented in various forms (fractions, decimals, integers). (7.NS.A.2.d - NH8)

Adding and Subtracting Rational Numbers

1. Add with integer chips - Use integer chips to model and understand addition of integers, including how zero pairs are formed. (7.NS.A.1.b - NI9)
2. Adding negative numbers on the number line - Represent addition of negative numbers on a number line, understanding direction and distance. (7.NS.A.1.b - NJ1)
3. Number equations & number lines - Relate addition and subtraction equations of rational numbers to movements on a number line. (7.NS.A.1.b - NK2)
4. Add integers using counters - Model and solve integer addition problems using visual counters. (7.NS.A.1.b - NL3)
5. Add integers using number lines - Model and solve integer addition problems using a number line. (7.NS.A.1.b - NM4)

6. Integer addition rules - Apply rules for adding integers with different signs and same signs. (7.NS.A.1.b - NN5)

7. Add integers - Fluently add integers. (7.NS.A.1.b - NO6)

8. Add three or more integers - Add three or more integers efficiently. (7.NS.A.1.b - NP7)

9. Quantities that combine to zero: word problems - Describe real-world situations where opposite quantities combine to make zero. (7.NS.A.1.a - NQ8)

10. Signs of sums - Determine the sign of a sum involving positive and negative numbers, including cases where they combine to make zero. (7.NS.A.1.a - NR9)

11. Absolute value to find distance - Calculate the distance between two rational numbers on a number line using absolute value. (7.NS.A.1 - NS1)

12. Absolute value to find distance challenge - Solve challenging problems involving finding the distance between rational numbers using absolute value, potentially in multi-step scenarios. (7.NS.A.1 - NT2)

13. Adding & subtracting negative numbers - Add and subtract negative numbers, including integers and other rational numbers. (7.NS.A.1 - NU3)

14. Adding & subtracting rational numbers - Perform addition and subtraction with any rational numbers (integers, fractions, decimals, positive and negative). (7.NS.A.1 - NV4)

15. Addition & subtraction: find the missing value - Solve for a missing value in addition and subtraction equations involving rational numbers. (7.NS.A.1 - NW5)

16. Equivalent expressions with negative numbers - Identify or create equivalent expressions involving negative numbers, focusing on addition and subtraction properties. (7.NS.A.1 - NX6)

17. Interpret negative number addition and subtraction expressions - Understand and explain the meaning of expressions involving addition and subtraction of negative numbers. (7.NS.A.1 - NY7)

18. Interpreting negative number statements - Interpret and analyze statements involving negative numbers in real-world contexts related to addition and subtraction. (7.NS.A.1 - NZ8)

19. Negative number addition and subtraction: word problems - Solve real-world word problems involving addition and subtraction of negative numbers. (7.NS.A.1 - OA9)

20. One-step equations with negatives (add & subtract) - Solve one-step linear equations involving addition and subtraction of negative numbers. (7.NS.A.1 - OB1)

21. Order of operations with negative numbers - Apply the order of operations to expressions involving multiplication and division of negative numbers. (7.NS.A.1 - OC2)

22. Ordering negative number expressions - Order expressions involving negative numbers (created through addition or subtraction) from least to greatest or greatest to least. (7.NS.A.1 - OD3)

23. Substitution with negative numbers - Substitute negative numbers into expressions and evaluate them. (7.NS.A.1 - OE4)

24. Subtracting negative numbers - Subtract negative numbers, understanding that subtracting a negative is equivalent to adding a positive. (7.NS.A.1.c - OF5)

25. Understand subtraction as adding the opposite - Formally understand and apply the rule that subtraction is equivalent to adding the additive inverse. (7.NS.A.1.c - OG6)

26. Representing Subtraction - Use a number line to model and solve subtraction problems involving positive and negative numbers. (7.NS.A.1.c - OH7)

27. Subtracting Rational Numbers - Solve subtraction expressions with rational numbers, including understanding the concept of working in reverse. (7.NS.A.1.c - OI8)

28. Subtract integers using counters - Model and solve integer subtraction problems using visual counters. (7.NS.A.1.c - OJ9)

29. Subtract integers using number lines - Model and solve integer subtraction problems using a number line. (7.NS.A.1.c - OK1)

30. Integer subtraction rules - Apply rules for subtracting integers. (7.NS.A.1.c - OL2)

31. Subtract integers - Fluently subtract integers. (7.NS.A.1.c - OM3)

32. Add and subtract integers using counters - Model and solve addition and subtraction problems using integer counters. (7.NS.A.1.c - ON4)

33. Adding & subtracting negative fractions - Add and subtract negative fractions, applying properties of operations. (7.NS.A.1.d - OO5)

34. Commutative and associative properties of addition with integers - Apply the commutative and associative properties of addition to simplify expressions with integers. (7.NS.A.1.d - OP6)

35. Adding and Subtracting to Solve Problems - Represent gains and losses using signed numbers and apply rational number addition and subtraction to solve real-world problems. (7.NS.A.1.d - OQ7)

36. Integer addition and subtraction rules - Apply combined rules for integer addition and subtraction. (7.NS.A.1.d - OR8)

37. Add and subtract integers - Fluently add and subtract integers. (7.NS.A.1.d - OS9)

38. Complete addition and subtraction equations with integers - Fill in missing values in addition and subtraction equations with integers. (7.NS.A.1.d - OT1)

39. Add and subtract positive and negative decimals - Add and subtract decimals, including positive and negative values. (7.NS.A.1.d - OU2)

40. Add and subtract positive and negative fractions - Add and subtract fractions, including positive and negative values. (7.NS.A.1.d - OV3)

41. Add and subtract rational numbers - Fluently add and subtract rational numbers (integers, fractions, and decimals). (7.NS.A.1.d - OW4)

Multiplying and Dividing Rational Numbers

1. Exponents with negative fractional bases - Evaluate expressions with negative fractional bases raised to whole-number exponents. (7.NS.A.2.a - OX5)

2. Position, Speed, and Direction - Understand multiplication of signed numbers in the context of position, speed, and direction, and apply it to real-world scenarios. (7.NS.A.2.a - OY6)

3. Multiplying Rational Numbers - Interpret signed numbers for speed and direction and understand why multiplying two negative numbers results in a positive product. (7.NS.A.2.a - OZ7)

4. Multiply! - Multiply rational numbers, including expressions with multiple factors. (7.NS.A.2.a - PA8)
5. Understand multiplying by a negative integer using a number line - Visualize and understand multiplication involving negative integers using a number line model. (7.NS.A.2.a - PB9)
6. Integer multiplication rules - Apply rules for multiplying integers with different signs and same signs. (7.NS.A.2.a - PC1)
7. Multiply integers - Fluently multiply integers. (7.NS.A.2.a - PD2)
8. Dividing by zero - Understand why division by zero is undefined. (7.NS.A.2.b - PE3)
9. Dividing Rational Numbers - Use multiplication and division relationships to determine division rules for rational numbers. (7.NS.A.2.b - PF4)
10. Negative Rates - Multiply and divide rational numbers in constant rate problems involving negative values. (7.NS.A.2.b - PG5)
11. Integer division rules - Apply rules for dividing integers with different signs and same signs. (7.NS.A.2.b - PH6)
12. Equal quotients of integers - Identify equal quotients involving negative integers. (7.NS.A.2.b - PI7)
13. Divide integers - Fluently divide integers. (7.NS.A.2.b - PJ8)
14. Dividing mixed numbers with negatives - Divide mixed numbers that include negative values. (7.NS.A.2 - PK9)
15. Dividing negative numbers - Perform division operations involving negative numbers. (7.NS.A.2 - PL1)
16. Dividing positive and negative fractions - Divide fractions, including those with positive and negative values. (7.NS.A.2 - PM2)
17. Equivalent expressions with negative numbers (multiplication and division) - Identify or create equivalent expressions involving multiplication and division of negative numbers. (7.NS.A.2 - PN3)
18. Exponents with integer bases - Evaluate expressions with integer bases raised to whole-number exponents. (7.NS.A.2 - PO4)

19. Multiplying & dividing negative numbers word problems - Solve real-world word problems involving multiplication and division of negative numbers. (7.NS.A.2 - PP5)

20. Multiplying negative numbers - Perform multiplication operations involving negative numbers. (7.NS.A.2 - PQ6)

21. Multiplying positive and negative fractions - Multiply fractions, including those with positive and negative values. (7.NS.A.2 - PR7)

22. Negative signs in fractions - Understand the placement and meaning of negative signs in fractions. (7.NS.A.2 - PS8)

23. One-step equations with negatives (multiply & divide) - Solve one-step linear equations involving multiplication and division of negative numbers. (7.NS.A.2 - PT9)

24. Order of operations with negative numbers - Apply the order of operations to expressions involving multiplication and division of negative numbers. (7.NS.A.2 - PU1)

25. Signs of expressions - Determine the sign of the result of expressions involving multiplication and division of rational numbers. (7.NS.A.2 - PV2)

26. Signs of expressions challenge - Solve challenging problems involving determining the signs of complex expressions with multiplication and division of rational numbers. (7.NS.A.2 - PW3)

27. Simplify complex fractions - Simplify complex fractions involving rational numbers. (7.NS.A.2 - PX4)

28. Integer multiplication and division rules - Apply combined rules for integer multiplication and division. (7.NS.A.2.c - PY5)

29. Multiply and divide integers - Fluently multiply and divide integers. (7.NS.A.2.c - PZ6)

30. Complete multiplication and division equations with integers - Fill in missing values in multiplication and division equations with integers. (7.NS.A.2.c - QA7)

31. Multiply and divide positive and negative decimals - Multiply and divide decimals, including positive and negative values. (7.NS.A.2.c - QB8)

32. Multiply and divide positive and negative fractions - Multiply and divide fractions, including positive and negative values. (7.NS.A.2.c - QC9)

33. Multiply and divide rational numbers - Fluently multiply and divide rational numbers (integers, fractions, and decimals). (7.NS.A.2.c - QD1)

Solving Real-World Problems with Rational Numbers

Problem Solving with Rational Numbers

1. Expressions with Rational Numbers - Evaluate expressions using all four operations on rational numbers. (7.NS.A.3 - QE2)
2. Solving Problems with Rational Numbers - Apply rational number concepts and all four operations to solve real-world problems. (7.NS.A.3 - QF3)
3. Solving Equations With Rational Numbers - Solve equations involving negative numbers and all four operations. (7.NS.A.3 - QG4)
4. Representing Contexts with Equations - Write and solve equations for situations involving negative numbers and all four operations. (7.NS.A.3 - QH5)
5. The Stock Market - Use positive and negative numbers to represent directed change and apply rational number operations in the context of the stock market. (7.NS.A.3 - QI6)
6. Add and subtract integers: word problems - Solve word problems involving addition and subtraction of integers. (7.NS.A.3 - QJ7)
7. Add, subtract, multiply, and divide integers - Perform all four operations with integers. (7.NS.A.3 - QK8)
8. Add, subtract, multiply, or divide two decimals - Perform any of the four operations on two decimals. (7.NS.A.3 - QL9)
9. Add, subtract, multiply, and divide decimals: word problems - Solve multi-step real-world problems involving all four operations with decimals. (7.NS.A.3 - QM1)
10. Add, subtract, multiply, and divide fractions and mixed numbers: word problems - Solve word problems involving all four operations with fractions and mixed numbers. (7.NS.A.3 - QN2)
11. Multi-step word problems with positive rational numbers - Solve multi-step word problems involving positive rational numbers using all four operations. (7.NS.A.3 - QO3)

Equivalent Expressions and Interpretation

1. Equivalent expressions: negative numbers & distribution - Generate and identify equivalent linear expressions by applying the distributive property with negative numbers. (7.EE.A.1 - ES6)
2. Subtraction in Equivalent Expressions - Apply the distributive property to expressions with negative coefficients, understanding subtraction as adding the opposite. (7.EE.A.1 - ET7)
3. Expanding and Factoring - Use the distributive property to expand or factor linear expressions with rational coefficients. (7.EE.A.1 - EU8)
4. Write equivalent expressions using properties - Write equivalent expressions by applying properties of operations (commutative, associative, distributive). (7.EE.A.1 - EV9)
5. Interpreting linear expressions - Interpret the meaning of parts of a linear expression in terms of a real-world context. (7.EE.A.2 - EW1)
6. Writing expressions word problems - Write linear expressions to represent real-world situations, understanding how different forms can highlight relationships. (7.EE.A.2 - EX2)
7. Identify equivalent linear expressions using algebra tiles - Use algebra tiles to visually identify equivalent linear expressions. (7.EE.A.2 - EY3)
8. Identify equivalent linear expressions I - Identify equivalent linear expressions through algebraic manipulation. (7.EE.A.2 - EZ4)
9. Identify equivalent linear expressions II - Identify more complex equivalent linear expressions through algebraic manipulation. (7.EE.A.2 - FA5)
10. Identify equivalent linear expressions: word problems - Identify equivalent linear expressions that represent the same real-world situation. (7.EE.A.2 - FB6)

Solving Equations and Inequalities

Solving Equations

1. Rational number word problems - Solve multi-step word problems involving rational numbers (positive and negative, in various forms: whole numbers, fractions, and decimals), using appropriate strategies and tools. (7.EE.B.3 - FC7)

2. Rewriting decimals as fractions challenge - Convert repeating decimals to fractions, a foundational skill for working with rational numbers in different forms. (7.EE.B.3 - FD8)

3. Add and subtract decimals: word problems - Solve real-world problems involving addition and subtraction of decimals. (7.EE.B.3 - FE9)

4. Multiply decimals and whole numbers: word problems - Solve real-world problems involving multiplication of decimals and whole numbers. (7.EE.B.3 - FF1)

5. Divide decimals by whole numbers: word problems - Solve real-world problems involving division of decimals by whole numbers. (7.EE.B.3 - FG2)

6. Estimate sums, differences, and products of decimals - Use estimation strategies to assess the reasonableness of answers for decimal operations. (7.EE.B.3 - FH3)

7. Add, subtract, multiply, and divide decimals: word problems - Solve multi-step real-world problems involving all four operations with decimals. (7.EE.B.3 - FI4)

8. Maps with decimal distances - Solve problems involving distances on maps using decimal operations. (7.EE.B.3 - FJ5)

9. Evaluate numerical expressions involving decimals - Evaluate numerical expressions involving decimals, applying order of operations. (7.EE.B.3 - FK6)

10. Add and subtract fractions: word problems - Solve real-world problems involving addition and subtraction of fractions. (7.EE.B.3 - FL7)

11. Add and subtract mixed numbers: word problems - Solve real-world problems involving addition and subtraction of mixed numbers. (7.EE.B.3 - FM8)

12. Estimate sums and differences of mixed numbers - Use estimation strategies to assess the reasonableness of answers for mixed number operations. (7.EE.B.3 - FN9)

13. Multiply fractions and mixed numbers: word problems - Solve real-world problems involving multiplication of fractions and mixed numbers. (7.EE.B.3 - FO1)

14. Divide fractions and mixed numbers: word problems - Solve real-world problems involving division of fractions and mixed numbers. (7.EE.B.3 - FP2)

15. Estimate products and quotients of fractions and mixed numbers - Use estimation strategies to assess the reasonableness of answers for fraction and mixed number operations. (7.EE.B.3 - FQ3)

16. Maps with fractional distances - Solve problems involving distances on maps using fractional operations. (7.EE.B.3 - FR4)

17. Evaluate numerical expressions involving fractions - Evaluate numerical expressions involving fractions, applying order of operations. (7.EE.B.3 - FS5)

18. Multi-step word problems with positive rational numbers - Solve multi-step word problems involving positive rational numbers using all four operations. (7.EE.B.3 - FT6)

19. Write an equation from words - Translate verbal descriptions into algebraic equations. (7.EE.B.4 - FU7)

20. Solve equations using properties - Solve equations by applying properties of equality. (7.EE.B.4 - FV8)

21. Model and solve equations using algebra tiles - Use algebra tiles to model and solve one- and two-step equations. (7.EE.B.4 - FW9)

22. Write and solve equations that represent diagrams - Write and solve equations based on visual diagrams (e.g., tape diagrams, hanger diagrams). (7.EE.B.4 - GA1)

23. Find the mistake: two-step equations - Identify and correct errors in the process of solving two-step linear equations. (7.EE.B.4.a - GB2)

24. Two-step equations - Solve two-step linear equations of the form $px + q = r$. (7.EE.B.4.a - GC3)

25. Two-step equations with decimals and fractions - Solve two-step linear equations where coefficients and constants are decimals or fractions. (7.EE.B.4.a - GD4)

26. Two-step equations word problems - Translate and solve real-world word problems by setting up two-step linear equations. (7.EE.B.4.a - GE5)

27. Solve one-step equations - Solve one-step linear equations with rational numbers. (7.EE.B.4.a - GF6)

28. Solve one-step equations with decimals and fractions - Solve one-step linear equations where coefficients and constants are decimals or fractions. (7.EE.B.4.a - GG7)

29. Solve two-step equations without parentheses - Solve two-step linear equations of the form $px + q = r$ without parentheses. (7.EE.B.4.a - GH8)

30. Solve two-step equations with parentheses - Solve two-step linear equations of the form $p(x + q) = r$ involving parentheses. (7.EE.B.4.a - GI9)

31. Solve two-step equations - Fluently solve two-step linear equations of both forms $px + q = r$ and $p(x + q) = r$. (7.EE.B.4.a - HA1)

32. Solve two-step equations with fractions - Solve two-step linear equations where coefficients and constants are fractions. (7.EE.B.4.a - HB2)

33. Choose two-step equations: word problems - Select the correct two-step equation to represent a given word problem. (7.EE.B.4.a - HC3)

34. Solve two-step equations: word problems - Solve real-world word problems by setting up and solving two-step linear equations. (7.EE.B.4.a - HD4)

35. Solve equations involving like terms - Solve linear equations that require combining like terms before solving. (7.EE.B.4.a - HE5)

36. Solve equations: complete the solution - Complete the steps to solve linear equations, demonstrating understanding of the solution process. (7.EE.B.4.a - HF6)

Solving Inequalities

1. Testing solutions to inequalities - Determine whether a given value is a solution to a linear inequality. (7.EE.B.4 - HG7)

2. Relationships between Quantities - Find unknown values in relationships and interpret them as proportional or not proportional, leading to equation building. (7.EE.B.4 - HH8)

3. Reasoning about Contexts with Tape Diagrams (Part 1) - Interpret tape diagrams representing word problems and use them to find unknown values, laying groundwork for equation solving. (7.EE.B.4 - HI9)

4. Reasoning about Contexts with Tape Diagrams (Part 2) - Write and match equations with tape diagrams representing the same situation, connecting visual models to algebraic representations. (7.EE.B.4 - JA1)

5. Reasoning about Equations and Tape Diagrams (Part 1) - Coordinate tape diagrams, equations of the form $px + q = r$, and verbal descriptions to interpret solutions in context. (7.EE.B.4 - JB2)

6. Reasoning about Equations and Tape Diagrams (Part 2) - Coordinate tape diagrams, equations of the form $p(x + q) = r$, and verbal descriptions to interpret solutions in context. (7.EE.B.4 - JC3)

7. Distinguishing between Two Types of Situations - Write and categorize equations of the forms $px + q = r$ and $p(x + q) = r$ from given situations and tape diagrams. (7.EE.B.4 - JD4)

8. Reasoning about Solving Equations (Part 1) - Use balanced hanger diagrams to visualize and write equations of the form $px + q = r$, and solve them. (7.EE.B.4 - JE5)

9. Reasoning about Solving Equations (Part 2) - Use balanced hanger diagrams to visualize and write equations of the form $p(x + q) = r$, and solve them. (7.EE.B.4 - JF6)

10. Dealing with Negative Numbers - Solve equations of the forms $px + q = r$ and $p(x + q) = r$ that involve negative numbers. (7.EE.B.4 - JG7)

11. Different Options for Solving One Equation - Choose between expanding using the distributive property or dividing both sides by p when solving equations. (7.EE.B.4 - JH8)

12. Using Tape Diagrams and Equations to Solve Problems - Translate real-world word problems into equations using tape diagrams and solve for unknown values. (7.EE.B.4 - JI9)

13. Solving Problems about Percent Increase or Decrease - Solve word problems about percent increase or decrease using tape diagrams and equations. (7.EE.B.4 - KA1)

14. Reintroducing Inequalities - Write inequality statements to represent situations and use substitution to check solutions. (7.EE.B.4 - KB2)

15. Finding Solutions to Inequalities in Context - Write inequalities that represent real-world situations and determine valid solutions for the inequality. (7.EE.B.4 - KC3)

16. Efficiently Solving Inequalities - Solve inequalities by using associated equations and testing values to determine the direction of the solution set. (7.EE.B.4 - KD4)

17. Inequalities in Context - Match an inequality to a real-world scenario, solve it, and interpret the meaning of the solution in that context. (7.EE.B.4 - KE5)

18. Modeling with Inequalities - Write and solve inequalities for real-world problems and analyze their solutions and their implications. (7.EE.B.4 - KF6)

19. Solutions to inequalities - Determine if a given value is a solution to an inequality. (7.EE.B.4 - KG7)

20. Graph inequalities on number lines - Graph the solution set of an inequality on a number line. (7.EE.B.4 - KH8)

21. Write inequalities from number lines - Write an inequality that represents a given graph on a number line. (7.EE.B.4 - KI9)

22. One-step inequalities - Solve one-step linear inequalities of the form $px + q > r$ or $px + q < r$ and graph their solution sets. (7.EE.B.4.b - LA1)

23. Two-step inequalities - Solve two-step linear inequalities of the form $px + q > r$ or $px + q < r$ and graph their solution sets. (7.EE.B.4.b - LB2)

24. Two-step inequality word problems - Translate and solve real-world word problems by setting up two-step linear inequalities, and interpret the solution in context. (7.EE.B.4.b - LC3)

25. Solve one-step inequalities - Solve one-step linear inequalities. (7.EE.B.4.b - LD4)

26. Graph solutions to one-step inequalities - Graph the solution sets of one-step inequalities on a number line. (7.EE.B.4.b - LE5)

27. One-step inequalities: word problems - Solve real-world word problems by setting up and solving one-step inequalities. (7.EE.B.4.b - LF6)

28. Solve two-step inequalities - Solve two-step linear inequalities. (7.EE.B.4.b - LG7)

29. Graph solutions to two-step inequalities - Graph the solution sets of two-step inequalities on a number line. (7.EE.B.4.b - LH8)

Geometry

Geometric Figures and Relationships

Angles

1. Identify angle relationships (complementary, supplementary, vertical, adjacent) - Identify and define complementary, supplementary, vertical, and adjacent angles in various geometric figures. (7.G.B.5 - GA1)
2. Find measures of complementary and supplementary angles - Calculate unknown angle measures using the definitions of complementary and supplementary angles (angles adding to 90° or 180°). (7.G.B.5 - GB2)
3. Determine unknown angles using complementary and supplementary relationships (no visual) - Calculate the measure of a complementary or supplementary angle when given the measure of its partner angle, without visual aids. (7.G.B.5 - GC3)
4. Determine unknown angles using vertical angle relationships - Find the measure of an unknown angle when given its vertical angle. (7.G.B.5 - GD4)
5. Write and solve simple equations for unknown angles - Write and solve one-step and multi-step algebraic equations to find unknown angle measures based on relationships like complementary, supplementary, vertical, and adjacent angles. (7.G.B.5 - GE5)
6. Solve multi-step problems with angle relationships - Solve multi-step problems involving various angle relationships (complementary, supplementary, vertical, and adjacent) to find unknown angles in complex figures. (7.G.B.5 - GF6)
7. Write and solve simple equations for unknown angles in figures - Set up and solve one-step or two-step algebraic equations to find unknown angle measures using the relationships between supplementary, complementary, vertical, and adjacent angles. (7.G.B.5 - GG7)

8. Solve multi-step problems involving angle relationships - Apply knowledge of complementary, supplementary, vertical, and adjacent angles in multi-step problems to find unknown angle measures. (7.G.B.5 - GH8)

Triangles

1. Classify triangles by sides and angles - Recall and apply classifications of triangles based on side lengths (equilateral, isosceles, scalene) and angle measures (acute, right, obtuse). (7.G.A.2 - GI9)
2. Triangle side length rules (Triangle Inequality Theorem) - Determine if three given side lengths can form a triangle by applying the Triangle Inequality Theorem. (7.G.A.2 - HA1)
3. Ordering triangle sides and angles - Understand and apply the relationship between the lengths of sides and the measures of angles in a triangle (e.g., the longest side is opposite the largest angle). (7.G.A.2 - HB2)
4. Constructing triangles with given conditions (sides) - Draw triangles using a ruler and protractor when given specific side lengths, and identify if a unique triangle, multiple triangles, or no triangle can be formed. (7.G.A.2 - HC3)
5. Constructing triangles with given conditions (angles) - Draw triangles using a ruler and protractor when given specific angle measures, and identify if a unique triangle, multiple triangles, or no triangle can be formed. (7.G.A.2 - HD4)
6. Constructing triangles with given conditions (sides and angles) - Draw triangles using a ruler and protractor when given a combination of side lengths and angle measures, and identify if a unique triangle, multiple triangles, or no triangle can be formed. (7.G.A.2 - HE5)

Three-Dimensional Figures

1. Identify bases of three-dimensional figures - Recognize and identify the base(s) of various three-dimensional figures, such as prisms and pyramids. (7.G.A.3 - HF6)
2. Cross sections of 3D objects (basic) - Describe the two-dimensional shapes that result from slicing right rectangular prisms and right rectangular pyramids with a plane (horizontal, vertical, and diagonal slices). (7.G.A.3 - HG7)

Area, Volume, and Surface Area

Circles

1. Identify parts of a circle (radius and diameter) - Identify and define the radius, diameter, and center of a circle, and understand their relationship. (7.G.B.4 - HH8)
2. Explore the relationship between circumference and diameter (informal derivation of pi) - Investigate and understand the proportional relationship between the diameter and circumference of circles, leading to an informal derivation of pi. (7.G.B.4 - HI9)
3. Calculate circumference of a circle - Apply the formula for the circumference of a circle ($C = \pi d$ or $C = 2\pi r$) to solve problems. (7.G.B.4 - IA1)
4. Calculate circumference of parts of circles (semicircles, quarter circles) - Calculate the circumference of semicircles and quarter circles. (7.G.B.4 - IB2)
5. Solve problems involving circumference and rotations - Use the radius or diameter of a circular object (like a wheel) to determine the distance it travels in a given number of rotations. (7.G.B.4 - IC3)
6. Estimate the area of a circle - Estimate the area of a circle using informal methods, such as approximating it with a square. (7.G.B.4 - ID4)
7. Informal derivation of the area of a circle formula - Explain the relationship between the area and circumference of a circle and informally derive the formula for the area of a circle ($A = \pi r^2$). (7.G.B.4 - IE5)
8. Calculate area of a circle - Apply the formula for the area of a circle ($A = \pi r^2$) to solve problems. (7.G.B.4 - IF6)
9. Calculate area of parts of circles (semicircles, quarter circles) - Calculate the area of semicircles and quarter circles. (7.G.B.4 - IG7)
10. Solve real-world problems involving area and circumference of circles - Determine whether circumference or area is more appropriate for solving various real-world problems involving circles. (7.G.B.4 - IH8)
11. Calculate area of compound figures involving circles - Calculate the area of complex shapes that include fractions of circles or multiple circular components. (7.G.B.4 - II9)

Area, Volume, and Surface Area of Prisms

1. Find the area of triangles and quadrilaterals (review) - Review and apply formulas for the area of common two-dimensional shapes, including triangles, rectangles, parallelograms, and trapezoids. (7.G.B.6 - JA1)
2. Find the area of composite two-dimensional figures - Calculate the area of complex two-dimensional figures by decomposing them into simpler shapes like triangles, quadrilaterals, and parts of circles. (7.G.B.6 - JB2)
3. Calculate the surface area of cubes and right prisms using nets - Find the surface area of cubes and right prisms by visualizing or creating their nets and summing the areas of all faces. (7.G.B.6 - JC3)
4. Find the volume of right prisms - Calculate the volume of right prisms (including cubes and rectangular prisms) using the formula $V = Bh$, where B is the area of the base. (7.G.B.6 - JD4)
5. Find the volume of prisms with non-rectangular bases - Determine the volume of prisms with bases that are other polygons (e.g., triangular prisms) by decomposing them into simpler shapes or applying $V = Bh$. (7.G.B.6 - JE5)
6. Find the surface area of cubes and right prisms - Calculate the surface area of cubes and right prisms using nets or formulas. (7.G.B.6 - JF6)
7. Solve real-world problems involving area and volume of 2D and 3D objects - Solve real-world and mathematical problems that require calculating areas and volumes of two- and three-dimensional objects composed of various shapes. (7.G.B.6 - JG7)
8. Solve real-world problems involving surface area of 3D objects - Solve real-world problems that require calculating the surface area of three-dimensional objects, including cubes and right prisms, considering material costs or wrapping. (7.G.B.6 - JH8)
9. Determine when to use area, volume, or surface area in problem solving - Differentiate between scenarios where area, volume, or surface area is the appropriate measure to solve a real-world problem. (7.G.B.6 - JI9)

Statistics and Probability

Sampling and Inference

Understanding Samples

1. Populations and samples - Differentiate between a population and a sample in statistical contexts. (7.SP.A.1 - SA1)
2. Understand populations, samples, and why sampling might be used - Explain the concepts of populations and samples, and identify situations where sampling is appropriate for gathering information. (7.SP.A.1 - SB2)
3. Identify representative, random, and biased samples - Distinguish between representative, random, and biased samples and understand their implications for drawing valid inferences. (7.SP.A.1 - SC3)
4. Evaluate whether a sample is representative of a population using dot plots - Analyze dot plots of samples to evaluate whether they are representative of a given population. (7.SP.A.1 - SD4)
5. Recognize how random sampling leads to representative samples and valid inferences - Explain the importance of random sampling in producing representative samples and supporting valid statistical inferences about a population. (7.SP.A.1 - SE5)
6. Valid claims - Evaluate statistical claims to determine if they are valid based on whether the sample was representative and random. (7.SP.A.1 - SF6)

Making Inferences

1. Making inferences from random samples - Draw conclusions and make predictions about a population based on data from a random sample. (7.SP.A.2 - SG7)
2. Make inferences from multiple samples - Draw inferences about a population by analyzing and comparing multiple random samples of the same size, observing the variability in estimates. (7.SP.A.2 - SH8)
3. Estimating Population Proportions - Use proportions from random samples to infer information about a population, including proportions of a characteristic. (7.SP.A.2 - SI9)
4. More about Sampling Variability (Optional) - Compare distributions of sample means using dot plots to understand and gauge sampling variability. (7.SP.A.2 - TJ1)

5. Generate a random sample and use it to make population inferences - Perform a simple random sampling procedure and use the collected data to make inferences about the larger population. (7.SP.A.2 - TK2)

Analyzing Data

Measures of Center and Spread

1. Calculate mean, median, mode, and range - Calculate measures of center (mean, median, mode) and measures of variability (range) for numerical data sets. (7.SP.B.4 - TL3)
2. Interpret charts and graphs to find mean, median, mode, and range - Extract information from charts and graphs to determine measures of center and spread. (7.SP.B.4 - TM4)
3. Mean, median, mode, and range: find the missing number - Solve problems to find a missing number in a data set given its mean, median, mode, or range. (7.SP.B.4 - TN5)
4. Changes in mean, median, mode, and range - Analyze how changes in data points affect the mean, median, mode, and range. (7.SP.B.4 - TO6)
5. Calculate quartiles and interquartile range - Calculate quartiles and the interquartile range (IQR) for a set of numerical data. (7.SP.B.4 - TP7)
6. Identify an outlier - Identify outliers in a data set and understand their potential impact on measures of center and spread. (7.SP.B.4 - TQ8)
7. Calculate mean absolute deviation - Calculate the mean absolute deviation (MAD) for a set of numerical data. (7.SP.B.3 - TR9)

Comparing Populations

1. Comparing distributions - Informally compare the visual overlap of two numerical data distributions, assessing similarities in variability and measuring the difference in centers. (7.SP.B.3 - UM1)
2. Justify differences between populations based on their means expressed as a multiple of the mean absolute deviation - Assess the difference between the centers of two distributions by expressing it as a multiple of a measure of variability (e.g., MAD). (7.SP.B.3 - UM2)
3. Compare populations using measures of center and spread - Draw informal comparative inferences about two populations using their measures of center

(mean, median) and measures of variability (range, IQR, MAD) from random samples. (7.SP.B.4 - UM3)

4. Estimating Population Measures of Center - Use the mean and MAD of a sample to infer characteristics about the center of a population. (7.SP.B.4 - UM4)

5. Compare populations using samples and reasoning about variability - Apply reasoning about measures of center and spread to determine if two populations are meaningfully different based on their samples. (7.SP.B.4 - UM5)

Probability

Understanding Probability

1. Comparing probabilities - Compare the likelihood of different chance events based on their probabilities (values between 0 and 1). (7.SP.C.5 - UP6)

2. Describe the likelihood of events and order events from least likely to most likely - Qualitatively describe the likelihood of events (impossible, unlikely, equally likely, likely, certain) and order them based on their probability. (7.SP.C.5 - UP7)

3. Simple probability (uniform model) - Develop a uniform probability model by assigning equal probability to all outcomes and use it to find probabilities of events. (7.SP.C.7.a - UP8)

4. List the sample space of a chance experiment and calculate probability when all outcomes are equally likely - Identify all possible outcomes in a sample space and calculate theoretical probabilities for equally likely events. (7.SP.C.7 - UP9)

5. Simulate real-world situations with simple experiments to reflect event probabilities - Design and conduct simple simulations to model real-world chance events and estimate their probabilities. (7.SP.C.7 - VA1)

6. Sample spaces of simple events - Identify all possible outcomes for simple chance events. (7.SP.C.7 - VB2)

7. Probability of simple events - Calculate the probability of simple events. (7.SP.C.7 - VC3)

8. Make predictions using theoretical probability - Use theoretical probability to make predictions about the frequency of events. (7.SP.C.7 - VD4)

9. Probability models (non-uniform from observed frequencies) - Develop a probability model (which may not be uniform) by observing and analyzing frequencies from data generated by a chance process. (7.SP.C.7.b - VE5)
10. Probability of simple events and opposite events - Calculate probabilities of simple events and their complements (opposite events). (7.SP.C.7.b - VF6)
11. Probability of mutually exclusive events and overlapping events - Distinguish between and calculate probabilities of mutually exclusive and overlapping events. (7.SP.C.7.b - VG7)

Experimental and Theoretical Probability

1. Experimental probability - Calculate the experimental probability of a chance event based on collected data and observed frequencies. (7.SP.C.6 - VH8)
2. Making predictions with probability - Use experimental or theoretical probability to make predictions about the approximate relative frequency of future events. (7.SP.C.6 - VI9)
3. Determine the likelihood of an event using results from previous experiments - Use data from past experiments to estimate the likelihood of future events. (7.SP.C.6 - WA1)
4. Generalize that the cumulative relative frequency approaches the probability of an event as experiments are repeated - Understand and apply the concept of the law of large numbers, where relative frequency converges to theoretical probability over many trials. (7.SP.C.6 - WB2)
5. Use results from repeated experiments to estimate the probability of an event - Calculate and use estimated probabilities based on the results of repeated chance experiments. (7.SP.C.6 - WC3)
6. Make predictions using experimental probability - Use experimental probability to predict outcomes in a series of future events. (7.SP.C.6 - WD4)
7. Use collected data to find probabilities and make predictions - Analyze collected data to determine probabilities and make predictions about future occurrences. (7.SP.C.6 - WE5)
8. Probability models - Construct and use probability models to determine the probabilities of events, and compare these to observed frequencies, identifying potential discrepancies. (7.SP.C.7 - WF6)

Compound Events

1. Probabilities of compound events - Calculate the probabilities of compound events using organized lists, tables, and tree diagrams. (7.SP.C.8 - WG7)
2. Sample spaces for compound events - Identify all possible outcomes for compound chance events. (7.SP.C.8 - WH8)
3. The counting principle - Apply the fundamental counting principle to determine the total number of outcomes for compound events. (7.SP.C.8 - WI9)
4. Understand probability of compound events as a fraction of sample space - Understand that the probability of a compound event is the ratio of favorable outcomes to the total outcomes in the sample space. (7.SP.C.8.a - XA1)
5. Represent sample spaces for compound events (lists, tables, trees) - Create organized lists, tables, and tree diagrams to represent the sample spaces for compound events. (7.SP.C.8.b - XB2)
6. Identify outcomes for compound events described in everyday language - Given a compound event described verbally, identify all the specific outcomes in the sample space that constitute that event. (7.SP.C.8.b - XC3)
7. Use simulation to estimate the probability of multi-step events - Design and execute simulations to estimate probabilities of multi-step events. (7.SP.C.8 - XD4)
8. Find sample space using tables, trees, or organized lists, and determine total possible outcomes for compound events - Systematically list and determine all possible outcomes (sample space) for compound events using tables, tree diagrams, or organized lists. (7.SP.C.8 - XE5)
9. Use sample space to calculate the probability of an event in multi-step experiments - Calculate the probability of events in multi-step experiments by analyzing their sample spaces. (7.SP.C.8 - XF6)
10. Design and perform a multi-step simulation to estimate probability of a compound event - Plan and carry out multi-step simulations to approximate the probability of compound events. (7.SP.C.8 - XG7)
11. Sample spaces for compound events - Identify all possible outcomes for compound chance events. (7.SP.C.8 - XH8)
12. Compound events: find the number of outcomes - Determine the total number of possible outcomes for compound events. (7.SP.C.8 - XI9)

13. Compound events: find the number of sums - Determine the number of possible sums when combining outcomes from two events. (7.SP.C.8 - YA1)

14. Find the number of outcomes: word problems - Solve word problems that require finding the total number of outcomes for compound events. (7.SP.C.8 - YB2)

15. Probability of compound events - Calculate the probability of compound events. (7.SP.C.8 - YC3)

16. Which simulation represents the situation? - Identify appropriate simulations to model given real-world chance situations. (7.SP.C.8 - YD4)

17. Identify independent and dependent events - Distinguish between independent and dependent events. (7.SP.C.8 - YE5)

18. Probability of independent and dependent events - Calculate probabilities of independent and dependent compound events. (7.SP.C.8 - YF6)