

Mathematics
Grade-Level Expectations

Prekindergarten

Number and Number Relations

1. Count by ones to 10 (PK-CM-N3) (N-1-E) (N-3-E)
2. Count a set of 5 or fewer objects by establishing a 1-to-1 correspondence between number names and objects (PK-CM-N2) (N-1-E)
3. Identify an object's position as first or last (PK-CM-G3) (N-1-E)
4. Identify numerals 1 to 5 (PK-CM-N5) (N-1-E) (N-3-E)
5. Compare sets of objects using the words *same/different* and *more/less/fewer* (PK-CM-N1) (N-3-E) (N-7-E)

Measurement

6. Use comparative vocabulary in measurement settings (e.g., *long/longer, short/shorter, more/less, hotter/colder, heavier/lighter, bigger/smaller*) (PK-CM-M3) (M-1-E) (M-2-E) (M-3-E)
7. Use words such as *day, week, month, schedule, morning, noon, night* (PK-CM-M1) (M-2-E)

Geometry

8. Identify rectangles, squares, circles, and triangles using concrete models (G-2-E)
9. Sort concrete objects by an attribute (e.g., shape, size, color) (PK-CM-D1) (G-2-E) (D-1-E)
10. Use words that indicate direction and position of an object (e.g., up, down, over, under, above, below, beside, in, out, behind) (PK-CM-G3) (G-3-E)
11. Recognize and manipulate an object's position in space (e.g., blocks, assembling puzzles) (PK-CM-G3) (G-3-E) (G-4-E)

Data Analysis, Probability, and Discrete Math

12. Arrange objects or pictures of objects to make an object or picture graph (PK-CM-D2) (D-4-E)

Patterns, Relations, and Functions

13. Recognize and copy repeated patterns (e.g., concrete objects, songs, rhymes, and body movements) (PK-CM-P1) (PK-CM-P2) (P-1-E) (P-3-E)

Kindergarten

Number and Number Relations

1. Count by ones to 20 (N-1-E) (N-3-E)
2. Count a set of 20 or fewer objects by establishing a 1-to-1 correspondence between number names and objects (N-1-E) (N-3-E) (A-1-E)
3. Use the ordinal numerals 1st through 10th to discuss positions in ordered lists (N-1-E)
4. Identify the numerals for the numbers 0 through 20 (N-1-E) (N-3-E)
5. Using a number line or chart, identify the numbers coming before/after a given number and between 2 given numbers (N-1-E) (N-3-E) (A-1-E)
6. Identify pennies, nickels, and dimes and their values using the cent sign (*¢*) (N-1-E) (N-2-E) (N-6-E) (M-1-E)
7. Count forward and backward from a given number between 1 and 10 (N-3-E)
8. Compare sets containing 20 or fewer objects using the words *same/different* and *more/less/greater/fewer* (N-3-E) (N-1-E)
9. Use concrete objects to model simple real-life addition and subtraction problems (N-4-E)

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10. Use operational vocabulary (*add, subtract, join, remove, take away, put together*) to explore sets of objects (N-5-E)

Algebra

11. Use the words *same, different, equal, not equal, greater than, and less than* while using concrete objects for comparative models (A-1-E)
12. Model and act out story problems, physically or with objects, to solve whole number sentences with sums less than or equal to 6 (A-2-E)

Measurement

13. Use vocabulary such as: *yesterday, today, tomorrow, hours, weeks*, names of days, names of months; sequence events; and identify calendars and clocks as objects that measure time (M-1-E) (M-2-E) (M-5-E)
14. Measure and estimate length and capacity using non-standard units (e.g., sticks, paper clips, blocks, beans) (M-2-E) (M-3-E)
15. Use comparative and superlative vocabulary in measurement settings (e.g., *longest, shortest, most, hottest, heaviest, biggest*) (M-3-E) (M-1-E) (M-2-E)

Geometry

16. Name and identify basic shapes using concrete models (e.g., circles, squares, triangles, rectangles, rhombuses, balls, boxes, cans, cones) (G-2-E) (G-1-E) (G-4-E) (G-5-E)
17. Compare, contrast, and sort objects or shapes according to two attributes (e.g., shape and size, shape and color, thickness and color) (G-2-E)
18. Use words that indicate direction and position of objects and arrange an object in a specified position and orientation (e.g., *between, behind, above*) (G-3-E)
19. Investigate the results of combining shapes (using paper shapes, pattern blocks, tangrams, etc.) (G-3-E) (G-1-E)
20. Draw circles, squares, rectangles, and triangles (G-4-E)

Data Analysis, Probability, and Discrete Math

21. Collect and organize concrete data using tally mark charts (D-1-E)
22. Collect and organize data in a simple bar graph using pictures or objects (D-1-E) (D-2-E)
23. Sort, represent, and use information in simple tables and bar/picture graphs (D-2-E) (D-3-E)

Patterns, Relations, and Functions

24. Recognize, copy, name, create, and extend repeating patterns (e.g., ABAB, AABB, ABBA) using concrete objects, shapes, pictures, numbers, and sounds (P-1-E)

Grade 1

Number and Number Relations

1. Count to 100 by 1s, 5s, 10s, and 25s (N-1-E) (N-3-E) (N-4-E)
2. Read and write numerals to 100 (N-1-E)
3. Write number words for 0 to 19 (N-1-E) (N-3-E)
4. Use ordinal numbers through 31st as they relate to the calendar (N-1-E)
5. Model and read place value in word, standard, and expanded form for numbers through 99 (N-1-E)
6. Use region models and sets of objects to demonstrate understanding of the concept of halves (N-1-E)
7. Identify quarters, half-dollars, and their values (N-1-E) (N-2-E) (M-1-E)

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8. Find the value of a set of coins up to \$1.00, using one denomination of coin (N-2-E) (N-6-E) (M-1-E) (M-5-E)
9. Apply estimation strategies to estimate the size of groups up to 20 (N-2-E) (N-8-E)
10. Using a number line or chart, locate, compare, and order whole numbers less than 100 and identify the numbers coming before/after a given number and between 2 given numbers (N-3-E) (A-1-E)
11. From a given number between 1 and 100, count forward and backward (N-3-E)
12. Know the basic facts for addition and subtraction [0s, 1s, counting on and back 2s, doubles, doubles ± 1 , then 10s facts, and related turn-around (commutative) pairs] and use them to solve real-life problems (N-4-E) (N-6-E) (N-8-E)
13. Recognize and apply addition and subtraction as inverse operations (N-4-E)
14. Add and subtract 2-digit numbers using manipulatives (N-4-E) (N-7-E)
15. Recognize real-life situations as addition or subtraction problems (N-5-E) (N-4-E)
16. Given a number and number line/hundreds chart, identify the nearest ten (N-7-E)

Algebra

17. Use the equal sign (=) to express the relationship of equality (A-1-E)
18. Use objects, pictures, and number sentences to represent real-life problem situations involving addition and subtraction (A-1-E) (A-3-E) (N-7-E)
19. Use objects, pictures, and verbal information to solve for missing numbers (A-2-E) (N-7-E)

Measurement

20. Measure length to the nearest inch and centimeter using appropriate tools (M-1-E) (M-2-E)
21. Tell time to the hour and half-hour, and identify date, day, week, month, and year on a calendar (M-1-E) (M-2-E) (M-5-E)
22. Select appropriate non-standard units for linear measurement situations (e.g., sticks, blocks, paper clips) (M-2-E)
23. Compare the measure of objects to benchmarks (e.g., the width of a child's thumb is about a centimeter, the weight of a loaf of bread is about a pound, and the mass of a textbook is about a kilogram) (M-2-E)
24. Measure capacity using cups (M-2-E) (M-3-E) (M-1-E)
25. Identify the thermometer as a tool for measuring temperature (M-2-E)

Geometry

26. Compare, contrast, name, and describe attributes (e.g., corner, side, straight, curved, number of sides) of shapes using concrete models [circle, rectangle (including square), rhombus, triangle] (G-1-E) (G-2-E) (G-4-E)
27. Connect the informal language used for 3-dimensional shapes to their proper mathematical name (e.g., a ball is a sphere, a box is a rectangular prism, a can is a cylinder) (G-2-E)
28. Determine if a shape has a line of symmetry by folding (G-2-E)
29. Visualize, predict, and create new shapes by cutting apart and combining existing 2- and 3-dimensional shapes (G-3-E) (G-1-E)
30. Identify congruent shapes (i.e., same size and shape) in a variety of positions and orientations (G-3-E) (G-2-E)
31. Draw line segments (G-5-E)

Data Analysis, Probability, and Discrete Math

32. Given a set of data, construct and read information from bar graphs and charts (D-1-E) (D-2-E)

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33. Determine whether an object satisfies a simple logical classification rule (e.g., belongs and does not belong) (D-1-E)
34. Appropriately use basic probability vocabulary (e.g., *more likely to happen/less likely to happen, always/never, same as*) (D-5-E)

Patterns, Relations, and Functions

35. Identify, describe, and explain the patterns in repeating situations (adding the same number, e.g., 2, 5, 8, 11, or skip-counting) (P-1-E)
36. Explain patterns created with concrete objects, numbers, shapes, and colors (P-2-E)

Grade 2

Number and Number Relations

1. Model, read, and write place values for numbers through 999 in word, standard, and expanded form (N-1-E)
2. Model the concepts of thirds, fourths, fifths and sixths using regions, sets, and fraction words (e.g., one-third, three-fourths, five-sixths) (N-1-E)
3. Make reasonable estimates of the number of objects in a collection with fewer than 100 objects (N-2-E)
4. Count and write the value of amounts of money up to \$1.00 using ¢ and \$ (N-2-E) (N-6-E) (M-1-E) (M-5-E)
5. Read, write, compare, and order whole numbers through 999 using words, number lines, and models (N-3-E) (N-1-E)
6. From a given number, count forward and backward and count to 100 by 2s (N-3-E) (N-1-E) (N-4-E)
7. Know all basic facts for addition and subtraction and use them to solve real-life problems (N-5-E) (N-6-E) (N-7-E) (N-8-E) (N-9-E)
8. Recognize, select, connect, and use operations, operational words and symbols (+, –) for addition (join, part/part/whole) or subtraction (take away, comparison, missing addend, and set/subset) situations (N-6-E) (N-5-E)
9. Add and subtract 1- and 2-digit numbers (N-6-E) (N-7-E)
10. Round numbers to the nearest 10 or 100 and identify situations in which rounding is appropriate (N-7-E) (N-9-E)
11. Use the concept of one-to-several correspondence to trade single items for a greater quantity of items with unequal value (1 nickel for 5 pennies, 1 dime for 2 nickels) (N-9-E)

Algebra

12. Use number sentences to represent real-life problems involving addition and subtraction (A-1-E) (A-2-E)
13. Find the missing number in an equation involving addition or subtraction (e.g., $\# + 4 = 7$, $8 - \# = 3$) (A-2-E) (N-4-E)

Measurement

14. Measure and appropriately label measures of length and perimeter (i.e., inch, centimeter, foot), capacity (i.e., cup, quart, liter), and weight/mass (i.e., pound, kilogram) (M-1-E)
15. Read a thermometer in degrees Fahrenheit and Celsius and interpret the temperature (M-1-E)
16. Tell time to the nearest 5 minutes, and identify the time one hour before or after a given time (M-1-E) (M-3-E)

Mathematics
Grade-Level Expectations

17. Select and use appropriate tools and units to measure length, time, capacity, and weight (e.g., scales for pounds and kilograms; rulers for inches and centimeters; measuring containers for cup, quarts, and liters) (M-2-E)
18. Use non-standard units to cover a given region (M-2-E)
19. Estimate length in standard units (inch, foot, and centimeter) (M-3-E)
20. Compare units within the **same** system (inch is shorter than a foot, minute is shorter than an hour, day is shorter than a month, cup holds less than a quart) (M-3-E)

Geometry

21. Compare and contrast 3-dimensional shapes (i.e., sphere, cube, cylinder, cone, prism, pyramid) according to their attributes (e.g., number of faces, shape of faces) (G-2-E)
22. Identify a reduction or enlargement of a given shape (G-2-E)
23. Identify congruent 3-dimensional solids in a variety of positions and orientations (G-3-E) (G-4-E) (G-2-E)
24. Identify and draw horizontal and vertical line segments (G-5-E)

Data Analysis, Probability, and Discrete Math

25. Collect and organize data using observations, surveys, and experiments (D-1-E)
26. Construct and read line plots and tables (D-2-E)
27. Interpret pictographs in which each picture represents more than one object (D-2-E)
28. Generate questions that can be answered by collecting and analyzing data (D-3-E)
29. Solve logic problems involving two sets by using elementary set logic (i.e., *and*, *or*, and *is/is not* statements) (D-3-E)

Patterns, Relations, and Functions

30. Recognize, extend, create, and explain patterns of addition and subtraction as represented in charts and tables and in varied forms of skip-counting (P-1-E) (P-2-E)
31. Recognize, extend, create, and explain patterns that involve simple rotations or size changes with geometric objects (P-1-E) (P-2-E)
32. Recognize and apply patterns in problem-solving in other content areas and real-life situations (P-3-E) (N-9-E)

Grade 3

Number and Number Relations

1. Model, read, and write place value in word, standard, and expanded form for numbers through 9999 (N-1-E)
2. Read, write, compare, and order whole numbers through 9999 using symbols (i.e., $<$, $=$, $>$) and models (N-1-E) (N-3-E)
3. Use region and set models and symbols to represent, estimate, read, write, and show understanding of fractions through tenths (N-1-E) (N-2-E)
4. Use the concepts of associative and commutative properties of multiplication to simplify computations (N-4-E) (N-7-E)
5. Recognize and model multiplication as a rectangular array or as repeated addition (N-4-E) (N-7-E)
6. Recognize and model division as separating quantities into equal subsets (fair shares) or as repeated subtraction (N-4-E) (N-7-E)
7. Recognize and apply multiplication and division as inverse operations (N-4-E)
8. Recognize, select, connect, and use operations, operational words, and symbols (i.e., $+$, $-$, \times , \div) to solve real-life situations (N-5-E) (N-6-E) (N-9-E)
9. Know basic multiplication and division facts [0s, 1s, 2s, 5s, 9s, and turn-arounds (commutative facts), including multiplying by 10s] (N-6-E) (N-4-E)

Mathematics
Grade-Level Expectations

10. Calculate the value of a combination of bills and coins and make change up to \$5.00 (N-6-E) (M-1-E) (M-5-E)
11. Add and subtract numbers of 3 digits or less (N-6-E) (N-7-E)
12. Round to the nearest 1000 and identify situations in which such rounding is appropriate (N-7-E) (N-9-E)
13. Determine when and how to estimate, and when and how to use mental math, calculators, or paper/pencil strategies to solve addition and subtraction problems (N-8-E) (N-9-E)

Algebra

14. Use the symbols $<$, $>$, and \neq to express inequalities (A-1-E)
15. Use objects, pictures, numbers, symbols, and words to represent multiplication and division problem situations (A-1-E)
16. Use number sentences to represent real-life problems involving multiplication and division (A-1-E) (N-4-E)
17. Analyze and describe situations where proportional trades or correspondences are required (e.g., trade 2 pieces of candy for 3 pieces of gum, make equivalent actions on pans to keep balance scale in equilibrium, plan for the number of pieces of bread needed for x sandwiches) (A-1-E)
18. Use letters as variables in mathematical statements that represent real-life problems (e.g., $2 \times n = 8$) (A-2-E)

Measurement

19. Measure length to the nearest yard, meter, and half-inch (M-1-E)
20. Measure capacity using pints and gallons (M-1-E)
21. Measure weight using grams and ounces (M-1-E)
22. Find the perimeter of a geometric shape given the length of its sides (M-1-E)
23. Find the area in square units of a given rectangle (including squares) drawn on a grid or by covering the region with square tiles (M-1-E)
24. Find elapsed time involving hours and minutes, without regrouping, and tell time to the nearest minute (M-1-E) (M-5-E)
25. Select and use the appropriate standard units of measure, abbreviations, and tools to measure length and perimeter (i.e., in., cm, ft., yd., m), area (square inch, square centimeter), capacity (i.e., cup, pint, quart, gallon, liter), and weight/mass (i.e., oz., lb., g, kg, ton) (M-2-E)
26. Order a set of measures within the **same** system (M-3-E)
27. Compare U.S. and metric measurements using approximate reference points without using conversions (e.g., a meter is longer than a yard) (M-3-E) (M-4-E)
28. Estimate length, weight/mass, and capacity (M-3-E)

Geometry

29. Classify and describe 2- and 3-dimensional objects according to given attributes (triangle vs. quadrilateral, parallelogram vs. prism) (G-2-E) (G-1-E) (G-4-E)
30. Apply concepts of congruence, similarity, and symmetry in real-life situations (G-2-E)
31. Draw or reconstruct figures from visual memory or verbal descriptions (G-3-E)
32. Recognize and execute specified flips, turns, and slides of geometric figures using manipulatives and correct terminology (including *clockwise* and *counterclockwise*) (G-3-E)
33. Construct and draw rectangles (including squares) with given dimensions (e.g., grid paper, square tiles) (G-4-E)
34. Fold a 2-dimensional net into a 3-dimensional object (G-4-E) (G-1-E)

Mathematics
Grade-Level Expectations

35. Identify, give properties of, and distinguish among points, lines, line segments, planes, rays, and angles (G-5-E)
36. Identify and draw segments, rays, and lines that are perpendicular, parallel, and intersecting (G-5-E)
37. Identify, describe, and draw intersecting, horizontal, vertical, parallel, diagonal, and perpendicular lines, rays, and right angles in the real world (G-5-E) (G-6-E)
38. Find the length of a path (that does not include diagonals) between two points on a grid (G-6-E)

Data Analysis, Probability, and Discrete Math

39. Identify categories and sort objects based on qualitative (categorical) and quantitative (numerical) characteristics (D-1-E)
40. Read, describe, and organize a two-circle Venn diagram (D-1-E) (D-2-E)
41. Explain the word *average* and use it appropriately in discussing what is “typical” of a data set (D-1-E)
42. Match a data set to a graph, table, or chart and vice versa (D-2-E)
43. Represent and solve problems using data from a variety of sources (e.g., tables, graphs, maps, advertisements) (D-3-E)
44. Discuss chance situations in terms of *certain/impossible* and *equally likely* (D-5-E)
45. Use manipulatives to discuss the probability of an event (e.g., number cubes, spinners to determine what is most likely or least likely) (D-5-E)

Patterns, Relations, and Functions

46. Identify and model even and odd numbers with objects, pictures, and words (P-1-E)
47. Find patterns to complete tables, state the rule governing the shift between successive terms, and continue the pattern (including growing patterns) (P-1-E) (P-2-E)

Grade 4

Number and Number Relations

1. Read and write place value in word, standard, and expanded form through 1,000,000 (N-1-E)
2. Read, write, compare, and order whole numbers using place value concepts, standard notation, and models through 1,000,000 (N-1-E) (N-3-E) (A-1-E)
3. Illustrate with manipulatives when a number is divisible by 2, 3, 5, or 10 (N-1-E)
4. Know all basic facts for multiplication and division through 12×12 and $144 \div 12$, and recognize factors of composite numbers less than 50 (N-1-E) (N-6-E) (N-7-E)
5. Read, write, and relate decimals through hundredths and connect them with corresponding decimal fractions (N-1-E)
6. Model, read, write, compare, order, and represent fractions with denominators through twelfths using region and set models (N-1-E) (A-1-E)
7. Give decimal equivalents of halves, fourths, and tenths (N-2-E) (N-1-E)
8. Use common equivalent reference points for percents (i.e., $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and 1 whole) (N-2-E)
9. Estimate fractional amounts through twelfths, using pictures, models, and diagrams (N-2-E)
10. Solve multiplication and division number sentences including interpreting remainders (N-4-E) (A-3-E)
11. Multiply 3-digit by 1-digit numbers, 2-digit by 2-digit numbers, and divide 3-digit numbers by 1-digit numbers, with and without remainders (N-6-E) (N-7-E)
12. Count money, determine change, and solve simple word problems involving money amounts using decimal notation (N-6-E) (N-9-E) (M-1-E) (M-5-E)

Mathematics
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13. Determine when and how to estimate, and when and how to use mental math, calculators, or paper/pencil strategies to solve multiplication and division problems (N-8-E)
14. Solve real-life problems, including those in which some information is not given (N-9-E)

Algebra

15. Write number sentences or formulas containing a variable to represent real-life problems (A-1-E)
16. Write a related story problem for a given algebraic sentence (A-1-E)
17. Use manipulatives to represent the distributive property of multiplication over addition to explain multiplying numbers (A-1-E) (A-2-E)
18. Identify and create true/false and open/closed number sentences (A-2-E)
19. Solve one-step equations with whole number solutions (A-2-E) (N-4-E)

Measurement

20. Measure length to the nearest quarter-inch and mm (M-2-E) (M-1-E)
21. Describe the concept of volume, and measure volume using cubic in. and cubic cm and capacity using fl. oz. and ml (M-2-E) (M-3-E)
22. Select and use the appropriate standard units of measure, abbreviations, and tools to measure length and perimeter (i.e., in., cm, ft., yd., mile, m, km), area (i.e., square inch, square foot, square centimeter), capacity (i.e., fl. oz., cup, pt., qt., gal., l, ml), weight/mass (i.e., oz., lb., g, kg, ton), and volume (i.e., cubic cm, cubic in.) (M-2-E) (M-1-E)
23. Set up, solve, and interpret elapsed time problems (M-2-E) (M-5-E)
24. Recognize the attributes to be measured in a real-life situation (M-2-E) (M-5-E)
25. Use estimates and measurements to calculate perimeter and area of rectangular objects (including squares) in U.S. (including square feet) and metric units (M-3-E)
26. Estimate the area of an irregular shape drawn on a unit grid (M-3-E)
27. Use unit conversions within the same system to solve real-life problems (e.g., 60 sec. = 1 min., 12 objects = 1 dozen, 12 in. = 1 ft., 100 cm = 1 m, 1 pt. = 2 cups) (M-4-E) (N-2-E) (M-5-E)

Geometry

28. Identify the top, bottom, or side view of a given 3-dimensional object (G-1-E) (G-3-E)
29. Identify, describe the properties of, and draw circles and polygons (triangle, quadrilateral, parallelogram, trapezoid, rectangle, square, rhombus, pentagon, hexagon, octagon, and decagon) (G-2-E)
30. Make and test predictions regarding transformations (i.e., slides, flips, and turns) of plane geometric shapes (G-3-E)
31. Identify, manipulate, and predict the results of rotations of 90, 180, 270, and 360 degrees on a given figure (G-3-E)
32. Draw, identify, and classify angles that are acute, right, and obtuse (G-5-E) (G-1-E)
33. Specify locations of points in the first quadrant of coordinate systems and describe paths on maps (G-6-E)

Data Analysis, Probability, and Discrete Math

34. Summarize information and relationships revealed by patterns or trends in a graph, and use the information to make predictions (D-1-E)
35. Find and interpret the meaning of mean, mode, and median of a small set of numbers (using concrete objects) when the answer is a whole number (D-1-E)
36. Analyze, describe, interpret, and construct various types of charts and graphs using appropriate titles, axis labels, scales, and legends (D-2-E) (D-1-E)

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37. Determine which type of graph best represents a given set of discrete data (D-2-E) (D-1-E)
38. Solve problems involving simple deductive reasoning (D-3-E)
39. Use lists, tables, and tree diagrams to generate and record all possible combinations for 2 sets of 3 or fewer objects (e.g., combinations of pants and shirts, days and games) and for given experiments (D-3-E) (D-4-E)
40. Determine the total number of possible outcomes for a given experiment using lists, tables, and tree diagrams (e.g., spinning a spinner, tossing 2 coins) (D-4-E) (D-5-E)
41. Apply appropriate probabilistic reasoning in real-life contexts using games and other activities (e.g., examining fair and unfair situations) (D-5-E) (D-6-E)

Patterns, Relations, and Functions

42. Find and describe patterns resulting from operations involving even and odd numbers (such as even + even = even) (P-1-E)
43. Identify missing elements in a number pattern (P-1-E)
44. Represent the relationship in an input-output situation using a simple equation, graph, table, or word description (P-2-E)

Grade 5

Number and Number Relations

1. Differentiate between the terms *factor* and *multiple*, and *prime* and *composite* (N-1-M)
2. Recognize, explain, and compute equivalent fractions for common fractions (N-1-M) (N-3-M)
3. Add and subtract fractions with common denominators and use mental math to determine whether the answer is reasonable (N-2-M)
4. Compare positive fractions using number sense, symbols (i.e., $<$, $=$, $>$), and number lines (N-2-M)
5. Read, explain, and write a numerical representation for positive improper fractions, mixed numbers, and decimals from a pictorial representation and vice versa (N-3-M)
6. Select and discuss the correct operation for a given problem involving positive fractions using appropriate language such as *sum*, *difference*, *numerator*, and *denominator* (N-4-M) (N-5-M)
7. Select, sequence, and use appropriate operations to solve multi-step word problems with whole numbers (N-5-M) (N-4-M)
8. Use the whole number system (e.g., computational fluency, place value, etc.) to solve problems in real-life and other content areas (N-5-M)
9. Use mental math and estimation strategies to predict the results of computations (i.e., whole numbers, addition and subtraction of fractions) and to test the reasonableness of solutions (N-6-M) (N-2-M)
10. Determine when an estimate is sufficient and when an exact answer is needed in real-life problems using whole numbers (N-6-M) (N-5-M)
11. Explain concepts of ratios and equivalent ratios using models and pictures in real-life problems (e.g., understand that $\frac{2}{3}$ means 2 divided by 3) (N-8-M) (N-5-M)

Algebra

12. Find unknown quantities in number sentences by using mental math, backward reasoning, inverse operations (i.e., unwrapping), and manipulatives (e.g., tiles, balance scales) (A-2-M) (A-3-M)
13. Write a number sentence from a given physical model of an equation (e.g., balance scale) (A-2-M) (A-1-M)

Mathematics

Grade-Level Expectations

14. Find solutions to one-step inequalities and identify positive solutions on a number line (A-2-M) (A-3-M)

Measurement

15. Model, measure, and use the names of all common units in the U.S. and metric systems (M-1-M)
16. Apply the concepts of elapsed time in real-life situations and calculate equivalent times across time zones in real-life problems (M-1-M) (M-6-M)
17. Distinguish among the processes of counting, calculating, and measuring and determine which is the most appropriate strategy for a given situation (M-2-M)
18. Estimate time, temperature, weight/mass, and length in familiar situations and explain the reasonableness of answers (M-2-M)
19. Compare the relative sizes of common units for time, temperature, weight, mass, and length in real-life situations (M-2-M) (M-4-M)
20. Identify appropriate tools and units with which to measure time, mass, weight, temperature, and length (M-3-M)
21. Measure angles to the nearest degree (M-3-M)
22. Compare and estimate measurements between the U.S. and metric systems in terms of common reference points (e.g., l vs. qt., m vs. yd.) (M-4-M)
23. Convert between units of measurement for length, weight, and time, in U.S. and metric, within the same system (M-5-M)

Geometry

24. Use mathematical terms to classify and describe the properties of 2-dimensional shapes, including circles, triangles, and polygons (G-2-M)
25. Identify and use appropriate terminology for transformations (e.g., *translation as slide*, *reflection as flip*, and *rotation as turn*) (G-3-M)
26. Identify shapes that have rotational symmetry (G-3-M)
27. Identify and plot points on a coordinate grid in the first quadrant (G-6-M)

Data Analysis, Probability, and Discrete Math

28. Use various types of charts and graphs, including double bar graphs, to organize, display, and interpret data and discuss patterns verbally and in writing (D-1-M) (D-2-M) (P-3-M) (A-4-M)
29. Compare and contrast different scales and labels for bar and line graphs (D-1-M)
30. Organize and display data using spreadsheets, with technology (D-1-M)
31. Compare and contrast survey data from two groups relative to the same question (D-2-M)
32. Represent probabilities as common fractions and recognize that probabilities fall between 0 and 1, inclusive (D-5-M)

Patterns, Relations, and Functions

33. Fill in missing elements in sequences of designs, number patterns, positioned figures, and quantities of objects (P-1-M)

Grade 6

Number and Number Relations

1. Factor whole numbers into primes (N-1-M)
2. Determine common factors and common multiples for pairs of whole numbers (N-1-M)
3. Find the greatest common factor (GCF) and least common multiple (LCM) for whole numbers in the context of problem-solving (N-1-M)

Mathematics
Grade-Level Expectations

4. Recognize and compute equivalent representations of fractions and decimals (i.e., halves, thirds, fourths, fifths, eighths, tenths, hundredths) (N-1-M) (N-3-M)
5. Decide which representation (i.e., fraction or decimal) of a positive number is appropriate in a real-life situation (N-1-M) (N-5-M)
6. Compare positive fractions, decimals, and positive and negative integers using symbols (i.e., $<$, $=$, $>$) and number lines (N-2-M)
7. Read and write numerals and words for decimals through ten-thousandths (N-3-M)
8. Demonstrate the meaning of positive and negative numbers and their opposites in real-life situations (N-3-M) (N-5-M)
9. Add and subtract fractions and decimals in real-life situations (N-5-M)
10. Use and explain estimation strategies to predict computational results with positive fractions and decimals (N-6-M)
11. Mentally multiply and divide by powers of 10 (e.g., $25/10 = 2.5$; $12.56 \times 100 = 1,256$) (N-6-M)
12. Divide 4-digit numbers by 2-digit numbers with the quotient written as a mixed number or a decimal (N-7-M)
13. Use models and pictures to explain concepts or solve problems involving ratio, proportion, and percent with whole numbers (N-8-M)

Algebra

14. Model and identify perfect squares up to 144 (A-1-M)
15. Match algebraic equations and expressions with verbal statements and vice versa (A-1-M) (A-3-M) (A-5-M) (P-2-M)
16. Evaluate simple algebraic expressions using substitution (A-2-M)
17. Find solutions to 2-step equations with positive integer solutions (e.g., $3x - 5 = 13$, $2x + 3x = 20$) (A-2-M)

Measurement

18. Measure length and read linear measurements to the nearest sixteenth-inch and mm (M-1-M)
19. Calculate perimeter and area of triangles, parallelograms, and trapezoids (M-1-M)
20. Calculate, interpret, and compare rates such as \$/lb., mpg, and mph (M-1-M) (A-5-M)
21. Demonstrate an intuitive sense of relative sizes of common units for length and area of familiar objects in real-life problems (e.g., estimate the area of a desktop in square feet, the average adult is between 1.5 and 2 meters tall) (M-2-M) (G-1-M)
22. Estimate perimeter and area of any 2-dimensional figure (regular and irregular) using standard units (M-2-M)
23. Identify and select appropriate units to measure area (M-3-M)

Geometry

24. Use mathematical terms to describe the basic properties of 3-dimensional objects (edges, vertices, faces, base, etc.) (G-2-M)
25. Relate polyhedra to their 2-dimensional shapes by drawing or sketching their faces (G-2-M) (G-4-M)
26. Apply concepts, properties, and relationships of points, lines, line segments, rays, diagonals, circles, and right, acute, and obtuse angles and triangles in real-life situations, including estimating sizes of angles (G-2-M) (G-5-M) (G-1-M)
27. Make and test predictions regarding tessellations with geometric shapes (G-3-M)
28. Use a rectangular grid and ordered pairs to plot simple shapes and find horizontal and vertical lengths and area (G-6-M)

Mathematics
Grade-Level Expectations

Data Analysis, Probability, and Discrete Math

29. Collect, organize, label, display, and interpret data in frequency tables, stem-and-leaf plots, and scatter plots and discuss patterns in the data verbally and in writing (D-1-M) (D-2-M) (A-3-M)
30. Describe and analyze trends and patterns observed in graphic displays (D-2-M)
31. Demonstrate an understanding of precision, accuracy, and error in measurement (D-2-M) (M-2-M)
32. Calculate and discuss mean, median, mode, and range of a set of discrete data to solve real-life problems (D-2-M)
33. Create and use Venn diagrams with two overlapping categories to solve counting logic problems (D-3-M)
34. Use lists, tree diagrams, and tables to determine the possible combinations from two disjoint sets when choosing one item from each set (D-4-M)
35. Illustrate and apply the concept of complementary events (D-5-M)
36. Apply the meaning of *equally likely* and *equally probable* to real-life situations (D-5-M) (D-6-M)

Patterns, Relations, and Functions

37. Describe, complete, and apply a pattern of differences found in an input-output table (P-1-M) (P-2-M) (P-3-M)
38. Describe patterns in sequences of arithmetic and geometric growth and now-next relationships (i.e., growth patterns where the next term is dependent on the present term) with numbers and figures (P-3-M) (A-4-M)

Grade 7

Number and Number Relations

1. Recognize and compute equivalent representations of fractions, decimals, and percents (i.e., halves, thirds, fourths, fifths, eighths, tenths, hundredths) (N-1-M)
2. Compare positive fractions, decimals, percents, and integers using symbols (i.e., $<$, \leq , $=$, \geq , $>$) and position on a number line (N-2-M)
3. Solve order of operations problems involving grouping symbols and multiple operations (N-4-M)
4. Model and apply the distributive property in real-life applications (N-4-M)
5. Multiply and divide positive fractions and decimals (N-5-M)
6. Set up and solve simple percent problems using various strategies, including mental math (N-5-M) (N-6-M) (N-8-M)
7. Select and discuss appropriate operations and solve single- and multi-step, real-life problems involving positive fractions, percents, mixed numbers, decimals, and positive and negative integers (N-5-M) (N-3-M) (N-4-M)
8. Determine the reasonableness of answers involving positive fractions and decimals by comparing them to estimates (N-6-M) (N-7-M)
9. Determine when an estimate is sufficient and when an exact answer is needed in real-life problems using decimals and percents (N-7-M) (N-5-M)
10. Determine and apply rates and ratios (N-8-M)
11. Use proportions involving whole numbers to solve real-life problems (N-8-M)

Algebra

12. Evaluate algebraic expressions containing exponents (especially 2 and 3) and square roots, using substitution (A-1-M)
13. Determine the square root of perfect squares and mentally approximate other square roots by identifying the two whole numbers between which they fall (A-1-M)

Mathematics Grade-Level Expectations

14. Write a real-life meaning of a simple algebraic equation or inequality, and vice versa (A-1-M) (A-5-M)
15. Match algebraic inequalities with equivalent verbal statements and vice versa (A-1-M)
16. Solve one- and two-step equations and inequalities (with one variable) in multiple ways (A-2-M)
17. Graph solutions sets of one-step equations and inequalities as points, or open and closed rays on a number line (e.g., $x = 5$, $x < 5$, $x \leq 5$, $x > 5$, $x \geq 5$) (A-2-M)
18. Describe linear, multiplicative, or changing growth relationships (e.g., 1, 3, 6, 10, 15, 21, ...) verbally and algebraically (A-3-M) (A-4-M) (P-1-M)
19. Use *function machines* to determine and describe the rule that generates outputs from given inputs (A-4-M) (P-3-M)

Measurement

20. Determine the perimeter and area of composite plane figures by subdivision and area addition (M-1-M) (G-7-M)
21. Compare and order measurements within and between the U.S. and metric systems in terms of common reference points (e.g., weight/mass and area) (M-4-M) (G-1-M)
22. Convert between units of area in U.S. and metric units within the **same** system (M-5-M)
23. Demonstrate an intuitive sense of comparisons between degrees Fahrenheit and Celsius in real-life situations using common reference points (M-5-M)

Geometry

24. Identify and draw angles (using protractors), circles, diameters, radii, altitudes, and 2-dimensional figures with given specifications (G-2-M)
25. Draw the results of reflections and translations of geometric shapes on a coordinate grid (G-3-M)
26. Recognize π as the ratio between the circumference and diameter of any circle (i.e., $\pi = C/d$ or $\pi = C/2r$) (G-5-M)
27. Model and explain the relationship between perimeter and area (how scale change in a linear dimension affects perimeter and area) and between circumference and area of a circle (G-5-M)
28. Determine the radius, diameter, circumference, and area of a circle and apply these measures in real-life problems (G-5-M) (G-7-M) (M-6-M)
29. Plot points on a coordinate grid in all 4 quadrants and locate the coordinates of a missing vertex in a parallelogram (G-6-M) (A-5-M)
30. Apply the knowledge that the measures of the interior angles in a triangle add up to 180 degrees (G-7-M)

Data Analysis, Probability, and Discrete Math

31. Analyze and interpret circle graphs, and determine when a circle graph is the most appropriate type of graph to use (D-2-M)
32. Describe data in terms of patterns, clustered data, gaps, and outliers (D-2-M)
33. Analyze discrete and continuous data in real-life applications (D-2-M) (D-6-M)
34. Create and use Venn diagrams with three overlapping categories to solve counting logic problems (D-3-M)
35. Use informal thinking procedures of elementary logic involving *if/then* statements (D-3-M)
36. Apply the fundamental counting principle in real-life situations (D-4-M)
37. Determine probability from experiments and from data displayed in tables and graphs (D-5-M)
38. Compare theoretical and experimental probability in real-life situations (D-5-M)

Mathematics
Grade-Level Expectations

Patterns, Relations, and Functions

39. Analyze and describe simple exponential number patterns (e.g., 3, 9, 27 or 3^1 , 3^2 , 3^3) (P-1-M)
40. Analyze and verbally describe real-life additive and multiplicative patterns involving fractions and integers (P-1-M) (P-4-M)
41. Illustrate patterns of change in length(s) of sides and corresponding changes in areas of polygons (P-3-M)

Grade 8

Number and Number Relations

1. Compare rational numbers using symbols (i.e., $<$, \leq , $=$, \geq , $>$) and position on a number line (N-1-M) (N-2-M)
2. Use whole number exponents (0-3) in problem-solving contexts (N-1-M) (N-5-M)
3. Estimate the answer to an operation involving rational numbers based on the original numbers (N-2-M) (N-6-M)
4. Read and write numbers in scientific notation with positive exponents (N-3-M)
5. Simplify expressions involving operations on integers, grouping symbols, and whole number exponents using order of operations (N-4-M)
6. Identify missing information or suggest a strategy for solving a real-life, rational-number problem (N-5-M)
7. Use proportional reasoning to model and solve real-life problems (N-8-M)
8. Solve real-life problems involving percentages, including percentages less than 1 or greater than 100 (N-8-M) (N-5-M)
9. Find unit/cost rates and apply them in real-life problems (N-8-M) (N-5-M) (A-5-M)

Algebra

10. Write real-life meanings of expressions and equations involving rational numbers and variables (A-1-M) (A-5-M)
11. Translate real-life situations that can be modeled by linear or exponential relationships to algebraic expressions, equations, and inequalities (A-1-M) (A-4-M) (A-5-M)
12. Solve and graph solutions of multi-step linear equations and inequalities (A-2-M)
13. Switch between functions represented as tables, equations, graphs, and verbal representations, with and without technology (A-3-M) (P-2-M) (A-4-M)
14. Construct a table of x - and y -values satisfying a linear equation and construct a graph of the line on the coordinate plane (A-3-M) (A-2-M)
15. Describe and compare situations with constant or varying rates of change (A-4-M)
16. Explain and formulate generalizations about how a change in one variable results in a change in another variable (A-4-M)

Measurement

17. Determine the volume and surface area of prisms and cylinders (M-1-M) (G-7-M)
18. Apply rate of change in real-life problems, including density, velocity, and international monetary conversions (M-1-M) (N-8-M) (M-6-M)
19. Demonstrate an intuitive sense of the relative sizes of common units of volume in relation to real-life applications and use this sense when estimating (M-2-M) (G-1-M)
20. Identify and select appropriate units for measuring volume (M-3-M)
21. Compare and estimate measurements of volume and capacity within and between the U.S. and metric systems (M-4-M) (G-1-M)
22. Convert units of volume/capacity within systems for U.S. and metric units (M-5-M)

Mathematics Grade-Level Expectations

Geometry

23. Define and apply the *terms measure, distance, midpoint, bisect, bisector, and perpendicular bisector* (G-2-M)
24. Demonstrate conceptual and practical understanding of symmetry, similarity, and congruence and identify similar and congruent figures (G-2-M)
25. Predict, draw, and discuss the resulting changes in lengths, orientation, angle measures, and coordinates when figures are translated, reflected across horizontal or vertical lines, and rotated on a grid (G-3-M) (G-6-M)
26. Predict, draw, and discuss the resulting changes in lengths, orientation, and angle measures that occur in figures under a similarity transformation (dilation) (G-3-M) (G-6-M)
27. Construct polyhedra using 2-dimensional patterns (nets) (G-4-M)
28. Apply concepts, properties, and relationships of adjacent, corresponding, vertical, alternate interior, complementary, and supplementary angles (G-5-M)
29. Solve problems involving lengths of sides of similar triangles (G-5-M) (A-5-M)
30. Construct, interpret, and use scale drawings in real-life situations (G-5-M) (M-6-M) (N-8-M)
31. Use area to justify the Pythagorean theorem and apply the Pythagorean theorem and its converse in real-life problems (G-5-M) (G-7-M)
32. Model and explain the relationship between the dimensions of a rectangular prism and its volume (i.e., how scale change in linear dimension(s) affects volume) (G-5-M)
33. Graph solutions to real-life problems on the coordinate plane (G-6-M)

Data Analysis, Probability, and Discrete Math

34. Determine what kind of data display is appropriate for a given situation (D-1-M)
35. Match a data set or graph to a described situation, and vice versa (D-1-M)
36. Organize and display data using circle graphs (D-1-M)
37. Collect and organize data using box-and-whisker plots and use the plots to interpret quartiles and range (D-1-M) (D-2-M)
38. Sketch and interpret a trend line (i.e., line of best fit) on a scatterplot (D-2-M) (A-4-M) (A-5-M)
39. Analyze and make predictions from discovered data patterns (D-2-M)
40. Explain factors in a data set that would affect measures of central tendency (e.g., impact of extreme values) and discuss which measure is most appropriate for a given situation (D-2-M)
41. Select random samples that are representative of the population, including sampling with and without replacement, and explain the effect of sampling on bias (D-2-M) (D-4-M)
42. Use lists, tree diagrams, and tables to apply the concept of permutations to represent an ordering with and without replacement (D-4-M)
43. Use lists and tables to apply the concept of combinations to represent the number of possible ways a set of objects can be selected from a group (D-4-M)
44. Use experimental data presented in tables and graphs to make outcome predictions of independent events (D-5-M)
45. Calculate, illustrate, and apply single- and multiple-event probabilities, including mutually exclusive, independent events and non-mutually exclusive, dependent events (D-5-M)

Patterns, Relations, and Functions

46. Distinguish between and explain when real-life numerical patterns are linear/arithmetic (i.e., grows by addition) or exponential/geometric (i.e., grows by multiplication) (P-1-M) (P-4-M)

Mathematics
Grade-Level Expectations

47. Represent the n^{th} term in a pattern as a formula and test the representation (P-1-M) (P-2-M) (P-3-M) (A-5-M)
48. Illustrate patterns of change in dimension(s) and corresponding changes in volumes of rectangular solids (P-3-M)

Grade 9

Number and Number Relations

1. Identify and describe differences among natural numbers, whole numbers, integers, rational numbers, and irrational numbers (N-1-H) (N-2-H) (N-3-H)
2. Evaluate and write numerical expressions involving integer exponents (N-2-H)
3. Apply scientific notation to perform computations, solve problems, and write representations of numbers (N-2-H)
4. Distinguish between an exact and an approximate answer, and recognize errors introduced by the use of approximate numbers with technology (N-3-H) (N-4-H) (N-7-H)
5. Demonstrate computational fluency with all rational numbers (e.g., estimation, mental math, technology, paper/pencil) (N-5-H)
6. Simplify and perform basic operations on numerical expressions involving radicals (e.g., $2\sqrt{3} + 5\sqrt{3} = 7\sqrt{3}$) (N-5-H)
7. Use proportional reasoning to model and solve real-life problems involving direct and inverse variation (N-6-H)

Algebra

8. Use order of operations to simplify or rewrite variable expressions (A-1-H) (A-2-H)
9. Model real-life situations using linear expressions, equations, and inequalities (A-1-H) (D-2-H) (P-5-H)
10. Identify independent and dependent variables in real-life relationships (A-1-H)
11. Use equivalent forms of equations and inequalities to solve real-life problems (A-1-H)
12. Evaluate polynomial expressions for given values of the variable (A-2-H)
13. Translate between the characteristics defining a line (i.e., slope, intercepts, points) and both its equation and graph (A-2-H) (G-3-H)
14. Graph and interpret linear inequalities in one or two variables and systems of linear inequalities (A-2-H) (A-4-H)
15. Translate among tabular, graphical, and algebraic representations of functions and real-life situations (A-3-H) (P-1-H) (P-2-H)
16. Interpret and solve systems of linear equations using graphing, substitution, elimination, with and without technology, and matrices using technology (A-4-H)

Measurement

17. Distinguish between precision and accuracy (M-1-H)
18. Demonstrate and explain how the scale of a measuring instrument determines the precision of that instrument (M-1-H)
19. Use significant digits in computational problems (M-1-H) (N-2-H)
20. Demonstrate and explain how relative measurement error is compounded when determining absolute error (M-1-H) (M-2-H) (M-3-H)
21. Determine appropriate units and scales to use when solving measurement problems (M-2-H) (M-3-H) (M-1-H)
22. Solve problems using indirect measurement (M-4-H)

Mathematics
Grade-Level Expectations

Geometry

23. Use coordinate methods to solve and interpret problems (e.g., slope as rate of change, intercept as initial value, intersection as common solution, midpoint as equidistant) (G-2-H) (G-3-H)
24. Graph a line when the slope and a point or when two points are known (G-3-H)
25. Explain slope as a representation of “rate of change” (G-3-H) (A-1-H)
26. Perform translations and line reflections on the coordinate plane (G-3-H)

Data Analysis, Probability, and Discrete Math

27. Determine the most appropriate measure of central tendency for a set of data based on its distribution (D-1-H)
28. Identify trends in data and support conclusions by using distribution characteristics such as patterns, clusters, and outliers (D-1-H) (D-6-H) (D-7-H)
29. Create a scatter plot from a set of data and determine if the relationship is linear or nonlinear (D-1-H) (D-6-H) (D-7-H)
30. Use simulations to estimate probabilities (D-3-H) (D-5-H)
31. Define probability in terms of sample spaces, outcomes, and events (D-4-H)
32. Compute probabilities using geometric models and basic counting techniques such as combinations and permutations (D-4-H)
33. Explain the relationship between the probability of an event occurring, and the odds of an event occurring and compute one given the other (D-4-H)
34. Follow and interpret processes expressed in flow charts (D-8-H)

Patterns, Relations, and Functions

35. Determine if a relation is a function and use appropriate function notation (P-1-H)
36. Identify the domain and range of functions (P-1-H)
37. Analyze real-life relationships that can be modeled by linear functions (P-1-H) (P-5-H)
38. Identify and describe the characteristics of families of linear functions, with and without technology (P-3-H)
39. Compare and contrast linear functions algebraically in terms of their rates of change and intercepts (P-4-H)
40. Explain how the graph of a linear function changes as the coefficients or constants are changed in the function’s symbolic representation (P-4-H)

Grade 10

Number and Number Relations

1. Simplify and determine the value of radical expressions (N-2-H) (N-7-H)
2. Predict the effect of operations on real numbers (e.g., the quotient of a positive number divided by a positive number less than 1 is greater than the original dividend) (N-3-H) (N-7-H)
3. Define *sine*, *cosine*, and *tangent* in ratio form and calculate them using technology (N-6-H)
4. Use ratios and proportional reasoning to solve a variety of real-life problems including similar figures and scale drawings (N-6-H) (M-4-H)

Algebra

5. Write the equation of a line of best fit for a set of 2-variable real-life data presented in table or scatter plot form, with or without technology (A-2-H) (D-2-H)
6. Write the equation of a line parallel or perpendicular to a given line through a specific point (A-3-H) (G-3-H)

Mathematics
Grade-Level Expectations

Measurement

7. Find volume and surface area of pyramids, spheres, and cones (M-3-H) (M-4-H)
8. Model and use trigonometric ratios to solve problems involving right triangles (M-4-H) (N-6-H)

Geometry

9. Construct 2- and 3-dimensional figures when given the name, description, or attributes, with and without technology (G-1-H)
10. Form and test conjectures concerning geometric relationships including lines, angles, and polygons (i.e., triangles, quadrilaterals, and n -gons), with and without technology (G-1-H) (G-4-H) (G-6-H)
11. Determine angle measurements using the properties of parallel, perpendicular, and intersecting lines in a plane (G-2-H)
12. Apply the Pythagorean theorem in both abstract and real-life settings (G-2-H)
13. Solve problems and determine measurements involving chords, radii, arcs, angles, secants, and tangents of a circle (G-2-H)
14. Develop and apply coordinate rules for translations and reflections of geometric figures (G-3-H)
15. Draw or use other methods, including technology, to illustrate dilations of geometric figures (G-3-H)
16. Represent and solve problems involving distance on a number line or in the plane (G-3-H)
17. Compare and contrast inductive and deductive reasoning approaches to justify conjectures and solve problems (G-4-H) (G-6-H)
18. Determine angle measures and side lengths of right and similar triangles using trigonometric ratios and properties of similarity, including congruence (G-5-H) (M-4-H)
19. Develop formal and informal proofs (e.g., Pythagorean theorem, flow charts, paragraphs) (G-6-H)

Data Analysis, Probability, and Discrete Math

20. Show or justify the correlation (match) between a linear or non-linear data set and a graph (D-2-H) (P-5-H)
21. Determine the probability of conditional and multiple events, including mutually and non-mutually exclusive events (D-4-H) (D-5-H)
22. Interpret and summarize a set of experimental data presented in a table, bar graph, line graph, scatter plot, matrix, or circle graph (D-7-H)
23. Draw and justify conclusions based on the use of logic (e.g., conditional statements, converse, inverse, contrapositive) (D-8-H) (G-6-H) (N-7-H)
24. Use counting procedures and techniques to solve real-life problems (D-9-H)
25. Use discrete math to model real life situations (e.g., fair games, elections) (D-9-H)

Patterns, Relations, and Functions

26. Generalize and represent patterns symbolically, with and without technology (P-1-H)
27. Translate among tabular, graphical, and symbolic representations of patterns in real-life situations, with and without technology (P-2-H) (P-3-H) (A-3-H)

Grades 11–12

Number and Number Relations

1. Read, write, and perform basic operations on complex numbers (N-1-H) (N-5-H)
2. Evaluate and perform basic operations on expressions containing rational exponents (N-2-H)

Mathematics

Grade-Level Expectations

3. Describe the relationship between exponential and logarithmic equations (N-2-H)

Algebra

4. Translate and show the relationships among non-linear graphs, related tables of values, and algebraic symbolic representations (A-1-H)
5. Factor simple quadratic expressions including general trinomials, perfect squares, difference of two squares, and polynomials with common factors (A-2-H)
6. Analyze functions based on zeros, asymptotes, and local and global characteristics of the function (A-3-H)
7. Explain, using technology, how the graph of a function is affected by change of degree, coefficient, and constants in polynomial, rational, radical, exponential, and logarithmic functions (A-3-H)
8. Categorize non-linear graphs and their equations as quadratic, cubic, exponential, logarithmic, step function, rational, trigonometric, or absolute value (A-3-H) (P-5-H)
9. Solve quadratic equations by factoring, completing the square, using the quadratic formula, and graphing (A-4-H)
10. Model and solve problems involving quadratic, polynomial, exponential, logarithmic, step function, rational, and absolute value equations using technology (A-4-H)

Measurement

11. Calculate angle measures in degrees, minutes, and seconds (M-1-H)
12. Explain the unit circle basis for radian measure and show its relationship to degree measure of angles (M-1-H)
13. Identify and apply the unit circle definition to trigonometric functions and use this definition to solve real-life problems (M-4-H)
14. Use the Law of Sines and the Law of Cosines to solve problems involving triangle measurements (M-4-H)

Geometry

15. Identify conic sections, including the degenerate conics, and describe the relationship of the plane and double-napped cone that forms each conic (G-1-H)
16. Represent translations, reflections, rotations, and dilations of plane figures using sketches, coordinates, vectors, and matrices (G-3-H)

Data Analysis, Probability, and Discrete Math

17. Discuss the differences between samples and populations (D-1-H)
18. Devise and conduct well-designed experiments/surveys involving randomization and considering the effects of sample size and bias (D-1-H)
19. Correlate/match data sets or graphs and their representations and classify them as exponential, logarithmic, or polynomial functions (D-2-H)
20. Interpret and explain, with the use of technology, the regression coefficient and the correlation coefficient for a set of data (D-2-H)
21. Describe and interpret displays of normal and non-normal distributions (D-6-H)
22. Explain the limitations of predictions based on organized sample sets of data (D-7-H)
23. Represent data and solve problems involving Euler and Hamiltonian paths (D-9-H)

Patterns, Relations, and Functions

24. Model a given set of real-life data with a non-linear function (P-1-H) (P-5-H)
25. Apply the concept of a function and function notation to represent and evaluate functions (P-1-H) (P-5-H)
26. Represent and solve problems involving n^{th} terms and sums for arithmetic and geometric series (P-2-H)

Mathematics
Grade-Level Expectations

27. Compare and contrast the properties of families of polynomial, rational, exponential, and logarithmic functions, with and without technology (P-3-H)
28. Represent and solve problems involving the translation of functions in the coordinate plane (P-4-H)
29. Determine the family or families of functions that can be used to represent a given set of real-life data, with and without technology (P-5-H)