

Grade Eight

Number, Number Sense and Operations Standard

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| <i>Number and Number Systems</i> | <ol style="list-style-type: none">1. Use scientific notation to express large numbers and small numbers between 0 and 1.2. Recognize that natural numbers, whole numbers, integers, rational numbers and irrational numbers are subsets of the real number system.3. Apply order of operations to simplify expressions and perform computations involving integer exponents and radicals. |
| <i>Meaning of Operations</i> | <ol style="list-style-type: none">4. Explain and use the inverse and identity properties and use inverse relationships (addition/subtraction, multiplication/division, squaring/square roots) in problem solving situations.5. Determine when an estimate is sufficient and when an exact answer is needed in problem situations, and evaluate estimates in relation to actual answers; e.g., very close, less than, greater than. |
| Computation and Estimation | <ol style="list-style-type: none">6. Estimate, compute and solve problems involving rational numbers, including ratio, proportion and percent, and judge the reasonableness of solutions.7. Find the square root of perfect squares, and approximate the square root of non-perfect squares as consecutive integers between which the root lies; e.g., <input type="text"/> is between 11 and 12.8. Add, subtract, multiply, divide and compare numbers written in scientific notation. |

Measurement Standard

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| <i>Measurement Units</i> | <ol style="list-style-type: none">1. Compare and order the relative size of common U.S. customary units and metric units; e.g., mile and kilometer, gallon and liter, pound and kilogram.2. Use proportional relationships and formulas to convert units from one measurement system to another; e.g., degrees Fahrenheit to degrees Celsius. |
| <i>Use Measurement Techniques and Tools</i> | <ol style="list-style-type: none">3. Use appropriate levels of precision when calculating with measurements.4. Derive formulas for surface area and volume and justify them using geometric models and common materials. For example, find:<ol style="list-style-type: none">a. the surface area of a cylinder as a function of its height and radius; |

- b. that the volume of a pyramid (or cone) is one-third of the volume of a prism (or cylinder) with the same base area and height.
5. Determine surface area for pyramids by analyzing their parts.
6. Solve and determine the reasonableness of the results for problems involving rates and derived measurements, such as velocity and density, using formulas, models and graphs.
7. Apply proportional reasoning to solve problems involving indirect measurements or rates.
8. Find the sum of the interior and exterior angles of regular convex polygons with and without measuring the angles with a protractor.
9. Demonstrate understanding of the concepts of perimeter, circumference and area by using established formulas for triangles, quadrilaterals, and circles to determine the surface area and volume of prisms, pyramids, cylinders, spheres and cones. (Note: Only volume should be calculated for spheres and cones.)
5. Use conventional formulas to find the surface area and volume of prisms, pyramids and cylinders and the volume of spheres and cones to a specified level of precision.

Geometry and Spatial Sense Standard

Characteristics and Properties

1. Make and test conjectures about characteristics and properties (e.g., sides, angles, symmetry) of two-dimensional figures and three-dimensional objects.
2. Recognize the angles formed and the relationship between the angles when two lines intersect and when parallel lines are cut by a transversal.
3. Use proportions in several forms to solve problems involving similar figures (part-to-part, part-to-whole, corresponding sides between figures).

Spatial Relationships

4. Represent and analyze shapes using coordinate geometry; e.g., given three vertices and the type of quadrilateral, find the coordinates of the fourth vertex.

Transformations and Symmetry

5. Draw the results of translations, reflections, rotations and dilations of objects in the coordinate plane, and determine properties that remain fixed; e.g., lengths of sides remain the same under translations.
6. Draw nets for a variety of prisms, pyramids, cylinders and cones.

*Visualization
and Geometric
Models*

Patterns, Functions and Algebra Standard

Use Patterns, Relations and Functions

1. Relate the various representations of a relationship; i.e., relate a table to graph, description and symbolic form.
2. Generalize patterns and sequences by describing how to find the n th term.
3. Identify functions as linear or nonlinear based on information given in a table, graph or equation.
4. Extend the uses of variables to include covariants where y depends on x .

Use Algebraic Representations

5. Use physical models to add and subtract monomials and polynomials, and to multiply a polynomial by a monomial.
6. Describe the relationship between the graph of a line and its equation, including being able to explain the meaning of slope as a constant rate of change and y -intercept in real-world problems.
7. Use symbolic algebra (equations and inequalities), graphs and tables to represent situations and solve problems.
8. Write, simplify and evaluate algebraic expressions (including formulas) to generalize situations and solve problems.
9. Solve linear equations and inequalities graphically, symbolically and using technology.
10. Solve 2 by 2 systems of linear equations graphically and by simple substitution.
11. Interpret the meaning of the solution of a 2 by 2 system of equations; i.e., point, line, no solution.
12. Solve simple quadratic equations graphically; e.g., $y = x^2 - 16$.
13. Compute and interpret slope, midpoint and distance given a set of ordered pairs.
14. Differentiate and explain types of changes in mathematical relationships, such as linear vs. nonlinear, continuous vs. noncontinuous, direct variation vs. inverse variation.

Analyze Change

15. Describe and compare how changes in an equation affects the related graphs; e.g., for a linear equation changing the coefficient of x affects the slope and changing the constant affects the intercepts.
16. Use graphing calculators or computers to analyze change; e.g., interest compounded over time as a nonlinear growth pattern.

Data Analysis and Probability Standard

Data Collection

1. Use, create and interpret scatterplots and other types of graphs as appropriate.
2. Evaluate different graphical representations of the same data to determine which is the most appropriate representation for an identified purpose; e.g., line graph for change over time, circle graph for part-to-whole comparison, scatterplot for relationship between two variants.
3. Differentiate between discrete and continuous data and appropriate ways to represent each.

Statistical Methods

4. Compare two sets of data using measures of center (mean, mode, median) and measures of spread (range, quartiles, interquartile range, percentiles).
5. Explain the mean's sensitivity to extremes and its use in comparison with the median and mode.
6. Make conjectures about possible relationship in a scatterplot and approximate line of best fit.
7. Identify different ways of selecting samples, such as survey response, random sample, representative sample and convenience sample.
8. Describe how the relative size of a sample compared to the target population affects the validity of predictions.
9. Construct convincing arguments based on analysis of data and interpretation of graphs.
10. Calculate the number of possible outcomes for a situation, recognizing and accounting for when items may occur more than once or when order is important.

Probability

6. Demonstrate an understanding that the probability of either of two disjoint events occurring can be found by adding the probabilities for each and that the probability of one independent event following another can be found by multiplying the probabilities.