Mathematics Grade 8 Summary

In Grade 8, instructional time should focus on three critical areas: (1) formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations; (2) grasping the concept of a function and using functions to describe quantitative relationships; (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Algebraic Concepts

- Apply one or more properties of integer exponents to generate equivalent expressions. For example, $(3^2 \times 3^3)^{-2} = 1/(3^{10})$.
- Use square root and cube root symbols to represent the solutions to exponential equations. For example, if $x^2 = 30$ then $x = \pm\sqrt{30}$
- Estimate very large or very small numbers using multiplication by a power of 10. For example, the population of the United States is about 3×10^8 (300,000,000).
- Solve problems using scientific notation.
- Graph proportional relationships, interpreting the unit rate as the slope.
- Derive the equation $y = mx$ and the equation $y = mx + b$ for lines based on the slope and the y-intercept.
- Solve linear equations in one variable. For example, given the equation $3(x - 2) + 1 = 10$, the solution is $x = 5$.
- Solve and interpret the solution to a system of two linear equations. For example, given the linear system $3x + 2y = 18$ and $2x + 5y = 23$, the solution is $x = 4$ and $y = 3$.
- Determine whether a relation is a function. For example, $y = 3x + 2$ is a function because the graph of $y = 3x + 2$ passes the vertical line test.
- Compare properties of two different functions presented in different ways.
- Describe the functional relationship between two quantities using a graph.

Geometry

- Identify and apply the properties of rotations, reflections, and translations.
- Using coordinates, describe the effects of dilations, translations, rotations, and reflections on two-dimensional figures.
- Apply the converse of the Pythagorean Theorem to show that a triangle is a right triangle. For example, a triangle with side lengths 5 cm, 6 cm and 8 cm is **not** a right triangle because $5^2 + 6^2 \neq 8^2$.
- Apply the Pythagorean Theorem to find unknown side lengths in right triangles.
- Apply the Pythagorean Theorem to find the distance between two points in a coordinate plane. For example, the distance between (3, 7) and (6, 3) is 5 because $(3 - 6)^2 + (7 - 3)^2 = 5^2$.
- Apply formulas for the volumes of cones, cylinders, and spheres to solve problems.

Diagnostic Category Skills List

Numbers and Operations

- Determine whether a number is rational or irrational. For example, $\sqrt{18}$ is irrational because its decimal expansion (4.24264069 . . .) does not repeat.
- Convert a terminating or repeating decimal into a rational number. For example, 0.363636 . . . is equal to 36/99 which can be reduced to 4/11.
- Estimate the value of an irrational number without a calculator. For example, $\sqrt{20}$ is between 4 and 5 because it is between $\sqrt{16}$ and $\sqrt{25}$.
- Use rational approximations of irrational numbers to compare and order irrational numbers. For example, $\sqrt{35}$ is less than 6, and $2\sqrt{10}$ is more than 6, so $\sqrt{35} < 2\sqrt{10}$.
- Locate rational and irrational numbers on a number line.

Measurement, Data, and Probability

- Construct scatter plots to look at the relationship between two quantities.
- Find the line of best fit for scatter plots that show a linear association.
- Interpret the slope and the *y*-intercept of the line of best fit in the context of the problem.
- Construct and interpret a two-way table using relative frequencies.

Additional Materials and Resources can be found at:

http://www.pdesas.org/

or

https://pa.drcedirect.com/

July 2014

Mathematics
Grade 8
Grade Level Summary, Standards for Mathematical Practice, and Diagnostic Category Skills List

The Mathematics summary for grade 8 describes the performance in mathematics that students in grade 8 are expected to demonstrate. The standards for mathematical practice describe practices that students should develop across grades in their study of mathematics. The Diagnostic Category Skills List provides descriptions of skills that students can be expected to demonstrate within each Diagnostic Category while taking the Classroom Diagnostic Tools for Mathematics. While this list does not include every possible skill that students may encounter within the CDT, it does provide a representative sample for each diagnostic category. Additionally, mathematics instruction should not address these as discrete skills but rather incorporate them with the standards for mathematical practice as a part of an integrated curriculum.