Algebra II Summary

Students extend their repertoire of functions to include polynomial, rational, trigonometric, and radical functions. Working closely with families of functions, students will apply their understanding of transformations. Students will model situations and solve equations including quadratics over the set of complex numbers and exponential equations using the properties of logarithms. Students will use descriptive statistics and probability as a tool for making inferences.

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.

Functions

- Analyze a set of data for a pattern and represent the pattern with a rule. For example, the pattern 4, 10, 28, 82, . . . can be described with the rule $3^n + 1$.
- Identify or extend a pattern in an arithmetic (4, 7, 10, 13, 16, . . .) or geometric (3, 6, 12, 24, 48, . . .) sequence.
- Determine the domain, range, or inverse of a relation. For example, the inverse of $f(x) = 3x - 6$ is $f^{-1}(x) = (1/3)x + 2$.
- Determine the intervals of increase and decrease, the x- and y-intercepts, zeros, and asymptotes of exponential, quadratic, or polynomial function. For example, the function $2x^3 + 3x^2 - 12x$ is decreasing over the interval $-2 < x < 1$, which can be found by graphing the function.
- Solve problems using the equation, graph, or table of a polynomial function. For example, the speed of a car on a roller coaster after t seconds can be determined by the equation $s = (-t/600)(t - 20)^2(t - 30)$. This means that the roller coaster has a speed of 0 after 20 seconds.
- Translate from the table, graph, or equation of a function to another representation of the function. For example, the function modeled by the table

x	0	1	2	3
f(x)	0	4	0	-12

is also modeled by the equation $f(x) = -4(x^2 - 2x)$.

Non-Linear Expressions and Equations

- Use exponential expressions to represent rational numbers. For example, $1/4{,}000 = 2.5 \times 10^{-4}$.
- Simplify or evaluate expressions with exponents. For example, $(27/125)^{2/3} = 9/25$.
- Simplify or evaluate expressions with logarithms. For example, $\log_5 x - \log_5 y = \log_5(x/y)$.
- Factor and simplify polynomial and rational expressions. For example, $(x^4 + 3x^2 - 40)/(x^4 - 25) = x^2 + 8; \quad x \neq 5$.
- Solve quadratic equations. For example, the solutions to $x^2 - 2x = 3x - 4$ are $x = 1$ and $x = 4$.
- Solve rational equations or radical equations. For example, the solutions to $\sqrt{(x^2 + 21x)} = 14$ are $x = -28$ and $x = 7$.
- Use properties of exponents and logarithms to solve problems. For example, there are 400 fish in a lake and the population is expected to increase at a rate of 12% each year. This can be modeled by the expression $400e^{0.12y}$. It will be about 11 years before there are 1,500 fish in the lake.
- Use algebra to determine how a change in one variable relates to a change in another variable. For example, the volume of a cylinder is $V = \pi r^2 h$. When the radius is doubled, the volume becomes 4 times greater.
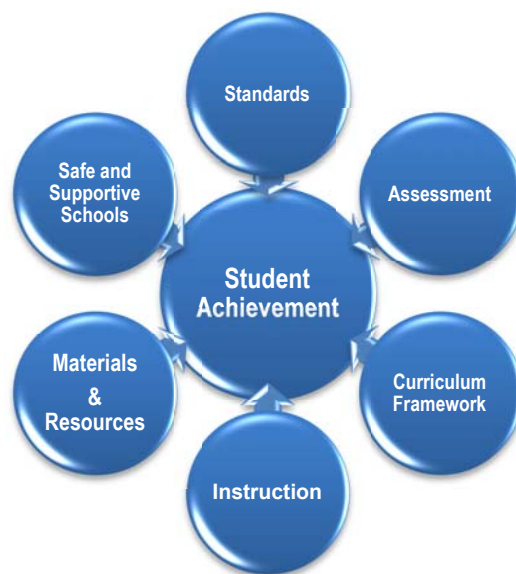
Diagnostic Category Skills List

Operations with Complex Numbers

- Use the imaginary unit ($i = \sqrt{-1}$) to simplify square roots. For example, $\sqrt{-45} = 3\,i\sqrt{5}$.
- Simplify expressions involving powers of i. For example, $5i^2 + 3i - 4 = 3i - 9$.
- Add and subtract complex numbers. For example, $9 - 2i - (3 + 6i) = 6 - 8i$.
- Multiply and divide complex numbers. For example, $(7 + 2i)(3 - 4i) = 29 - 22i$.

Data Analysis

- Find lines of best fit and curves of best fit to model data in scatter plots.
- Make predictions based on lines of best fit and curves of best fit.
- Use combinations, permutations, and the fundamental counting principle to solve problems involving probability. For example, determine that there are 60 unique combinations of ways to place the letters of "IGLOO."
- Convert between odds and probability. For example, the probability that Shana wins her tennis match is 0.6 (3/5). The odds of Shana winning her tennis match are 3 to 2.

Additional Materials and Resources can be found at:

http://www.pdesas.org/

or

https://pa.drcedirect.com/

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Algebra II Summary, Standards for Mathematical Practice, and Diagnostic Category Skills List

The Algebra II summary describes the performance in mathematics that students in Algebra II 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 Algebra II. 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.