

Tutorials are designed specifically for the Virginia Standards of Learning to prepare students for the Standards of Learning tests.

Math Tutorials offer targeted instruction, practice and review designed to develop computational fluency, deepen conceptual understanding, and apply mathematical practices. They automatically identify and address learning gaps down to elementary-level content, using adaptive remediation to bring students to grade-level no matter where they start. Students engage with the content in an interactive, feedback-rich environment as they progress through standards-aligned modules. By constantly honing the ability to apply their knowledge in abstract and real world scenarios, students build the depth of knowledge and higher order skills required to demonstrate their mastery when put to the test.

In each module, the Learn It and Try It make complex ideas accessible to students through focused content, modeled logic and process, multi-modal representations, and personalized feedback as students reason through increasingly challenging problems. The Review It offers a high impact summary of key concepts and relates those concepts to students' lives. The Test It assesses students' mastery of the module's concepts, providing granular performance data to students and teachers after each attempt. To help students focus on the content most relevant to them, unit-level pretests and posttests can quickly identify where students are strong and where they're still learning.

1. QUADRATIC FUNCTIONS

● ANALYZING GRAPHS OF QUADRATIC FUNCTIONS

- **F.AII.7.g** connections between and among multiple representations of functions using verbal descriptions, tables, equations, and graphs;
- **F.AII.7.a** domain, range, and continuity;
- **F.AII.7.e** intercepts;
- **F.AII.8** The student will investigate and describe the relationships among solutions of an equation, zeros of a function, x -intercepts of a graph, and factors of a polynomial expression.
- **F.AII.7.b** intervals in which a function is increasing or decreasing;
- **F.AII.7.c** extrema;
- **F.AII.7.d** zeros;
- **F.AII.7.f** values of a function for elements in its domain;
- **F.AII.7.h** end behavior;
- **F.AII.7.k** composition of functions algebraically and graphically.

● REPRESENTATIONS OF QUADRATIC FUNCTIONS

- **F.AII.7.a** domain, range, and continuity;
- **F.AII.7.g** connections between and among multiple representations of functions using verbal descriptions, tables, equations, and graphs;
- **F.AII.7.k** composition of functions algebraically and graphically.
- **F.AII.8** The student will investigate and describe the relationships among solutions of an equation, zeros of a function, x -intercepts of a graph, and factors of a polynomial expression.

2. SOLVING QUADRATIC EQUATIONS

● SOLVING QUADRATIC FUNCTIONS BY FACTORING

- **EO.AII.1.c** factor polynomials completely in one or two variables.
- **F.AII.7.g** connections between and among multiple representations of functions using verbal descriptions, tables, equations, and graphs;
- **F.AII.8** The student will investigate and describe the relationships among solutions of an equation, zeros of a function, x -

intercepts of a graph, and factors of a polynomial expression.

- **COMPLETING THE SQUARE**

- **F.AII.7.c** extrema;
- **F.AII.7.g** connections between and among multiple representations of functions using verbal descriptions, tables, equations, and graphs;
- **F.AII.8** The student will investigate and describe the relationships among solutions of an equation, zeros of a function, x-intercepts of a graph, and factors of a polynomial expression.

- **QUADRATIC FORMULA**

- **F.AII.7.g** connections between and among multiple representations of functions using verbal descriptions, tables, equations, and graphs;
- **F.AII.7.j** inverse of a function; and
- **EI.AII.3.b** quadratic equations over the set of complex numbers;
- **F.AII.8** The student will investigate and describe the relationships among solutions of an equation, zeros of a function, x-intercepts of a graph, and factors of a polynomial expression.

3. COMPLEX NUMBERS

- **COMPLEX NUMBERS**

- **EO.AII.2** The student will perform operations on complex numbers and express the results in simplest form using patterns of the powers of i .

- **COMPLEX NUMBERS AND QUADRATIC FUNCTIONS**

- **EI.AII.3.b** quadratic equations over the set of complex numbers;
- **F.AII.7.g** connections between and among multiple representations of functions using verbal descriptions, tables, equations, and graphs;

4. EXPONENTIAL FUNCTIONS

- **EXPONENTIAL FUNCTIONS**

- **F.AII.7.a** domain, range, and continuity;
- **F.AII.7.b** intervals in which a function is increasing or decreasing;
- **S.AII.9** The student will collect and analyze data, determine the equation of the curve of best fit in order to make predictions, and solve practical problems, using mathematical models of quadratic and exponential functions.

- **SOLVING EXPONENTIAL EQUATIONS**

- **F.AII.7.a** domain, range, and continuity;
- **F.AII.7.d** zeros;
- **F.AII.7.e** intercepts;
- **F.AII.7.i** vertical and horizontal asymptotes;
- **F.AII.7.k** composition of functions algebraically and graphically.
- **F.AII.8** The student will investigate and describe the relationships among solutions of an equation, zeros of a function, x-intercepts of a graph, and factors of a polynomial expression.

5. LOGARITHMIC EXPRESSIONS, EQUATIONS, AND FUNCTIONS

- **LOGARITHMIC FUNCTIONS**

- **F.AII.7.j** inverse of a function; and
- **F.AII.7.a** domain, range, and continuity;
- **F.AII.7.e** intercepts;
- **F.AII.7.i** vertical and horizontal asymptotes;

- **SOLVING LOGARITHMIC EQUATIONS**

- **F.AII.7.d** zeros;
- **F.AII.7.e** intercepts;
- **F.AII.7.j** inverse of a function; and
- **F.AII.7.k** composition of functions algebraically and graphically.
- **F.AII.8** The student will investigate and describe the relationships among solutions of an equation, zeros of a function, x-intercepts of a graph, and factors of a polynomial expression.

6. SEQUENCES

- **ARITHMETIC AND GEOMETRIC SEQUENCES**

- **F.AII.5** The student will investigate and apply the properties of arithmetic and geometric sequences and series to solve practical problems, including writing the first n terms, determining then n th term, and evaluating summation formulas. Notation will include r and a ?

- **SUMS OF GEOMETRIC SEQUENCES**

- **F.AII.5** The student will investigate and apply the properties of arithmetic and geometric sequences and series to solve practical problems, including writing the first n terms, determining then n th term, and evaluating summation formulas. Notation will include r and a ?

7. POLYNOMIAL FUNCTIONS AND FACTORING

- **GRAPHS OF POLYNOMIAL FUNCTIONS**

- **F.AII.7.a** domain, range, and continuity;
- **F.AII.7.b** intervals in which a function is increasing or decreasing;
- **F.AII.7.c** extrema;
- **F.AII.7.d** zeros;
- **F.AII.7.e** intercepts;
- **F.AII.7.f** values of a function for elements in its domain;
- **F.AII.7.h** end behavior;
- **F.AII.8** The student will investigate and describe the relationships among solutions of an equation, zeros of a function, x-intercepts of a graph, and factors of a polynomial expression.
- **F.AII.6.a** recognize the general shape of function families; and
- **F.AII.7.g** connections between and among multiple representations of functions using verbal descriptions, tables, equations, and graphs;
- **F.AII.7.i** vertical and horizontal asymptotes;

- **FACTORING SPECIAL CASES**

- **EO.AII.1.c** factor polynomials completely in one or two variables.

8. HIGHER ORDER POLYNOMIALS

- **FACTORING CUBIC POLYNOMIALS**

- **EO.AII.1.c** factor polynomials completely in one or two variables.
- **F.AII.8** The student will investigate and describe the relationships among solutions of an equation, zeros of a function, x-intercepts of a graph, and factors of a polynomial expression.

- **FACTORING HIGHER-ORDER POLYNOMIALS**

- **EO.AII.1.c** factor polynomials completely in one or two variables.

9. EXPONENTS AND SQUARE ROOTS

- **LAWS OF EXPONENTS**

- **EO.AII.1.a** add, subtract, multiply, divide, and simplify rational algebraic expressions;
- **EO.AII.1.b** add, subtract, multiply, divide, and simplify radical expressions containing rational numbers and variables, and expressions containing rational exponents; and
- **EI.AII.3.d** equations containing radical expressions.

- **ADVANCED PROPERTIES OF SQUARE ROOT EXPRESSIONS**

- **EO.AII.1.b** add, subtract, multiply, divide, and simplify radical expressions containing rational numbers and variables, and expressions containing rational exponents; and

10. RADICAL FUNCTIONS

- **ANALYZING GRAPHS OF SQUARE ROOT FUNCTIONS**

- **F.AII.6.b** use knowledge of transformations to convert between equations and the corresponding graphs of functions.
- **F.AII.7.a** domain, range, and continuity;
- **F.AII.7.j** inverse of a function; and

- **SOLVING SQUARE ROOT EQUATIONS**

- **EI.AII.3.d** equations containing radical expressions.

11. RATIONAL EXPRESSIONS AND EQUATIONS

- **OPERATIONS WITH RATIONAL EXPRESSIONS**

- **EO.AII.1.a** add, subtract, multiply, divide, and simplify rational algebraic expressions;

- **SOLVING RATIONAL EQUATIONS**

- **EI.AII.3.c** equations containing rational algebraic expressions; and
- **F.AII.7.d** zeros;

12. RATIONAL FUNCTIONS

- **ANALYZING GRAPHS OF RATIONAL FUNCTIONS**

- **F.AII.6.a** recognize the general shape of function families; and
- **F.AII.7.f** values of a function for elements in its domain;
- **F.AII.7.g** connections between and among multiple representations of functions using verbal descriptions, tables, equations, and graphs;
- **F.AII.7.i** vertical and horizontal asymptotes;
- **F.AII.8** The student will investigate and describe the relationships among solutions of an equation, zeros of a function, x-intercepts of a graph, and factors of a polynomial expression.
- **EI.AII.3.c** equations containing rational algebraic expressions; and
- **F.AII.7.d** zeros;
- **F.AII.7.e** intercepts;
- **F.AII.7.a** domain, range, and continuity;

- **MODELING SITUATIONS WITH RATIONAL FUNCTIONS**

- **F.AII.7.e** intercepts;
- **F.AII.7.i** vertical and horizontal asymptotes;

13. NONLINEAR FUNCTIONS

- **ABSOLUTE VALUE FUNCTIONS**

- **F.AII.7.a** domain, range, and continuity;
- **EI.AII.3.a** absolute value linear equations and inequalities;
- **F.AII.6.a** recognize the general shape of function families; and
- **F.AII.7.j** inverse of a function; and

- **SYSTEMS OF NONLINEAR EQUATIONS**

- **EI.AII.4** The student will solve systems of linear-quadratic and quadratic-quadratic equations, algebraically and graphically.

14. DIRECT AND INVERSE VARIATION

- **INVERSE VARIATION**

- **S.AII.10** The student will represent and solve problems, including practical problems, involving inverse variation, joint variation, and a combination of direct and inverse variations.

- **MODELING SITUATIONS WITH DIRECT AND INVERSE VARIATION**

- **S.AII.10** The student will represent and solve problems, including practical problems, involving inverse variation, joint variation, and a combination of direct and inverse variations.

15. PARENT AND INVERSE FUNCTIONS

- **PARENT FUNCTIONS**

- **F.AII.6.a** recognize the general shape of function families; and
- **F.AII.7.a** domain, range, and continuity;
- **F.AII.7.e** intercepts;
- **F.AII.7.i** vertical and horizontal asymptotes;

- **INVERSE FUNCTIONS**

- **F.AII.7.j** inverse of a function; and

16. WORKING WITH FUNCTIONS

- **T TRANSFORMATIONS OF PARENT FUNCTIONS**

- **F.AII.6.b** use knowledge of transformations to convert between equations and the corresponding graphs of functions.
- **F.AII.7.a** domain, range, and continuity;

- **MULTIPLE T TRANSFORMATIONS OF PARENT FUNCTIONS**

- **F.AII.6.b** use knowledge of transformations to convert between equations and the corresponding graphs of functions.

17. STATISTICS AND PROBABILITY

- **NORMAL DISTRIBUTION**

- **S.AII.11.a** identify and describe properties of a normal distribution;
- **S.AII.11.c** apply properties of normal distributions to determine probabilities associated with areas under the standard normal curve.
- **S.AII.11.b** interpret and compare z-scores for normally distributed data; and

- **COMBINATIONS AND PERMUTATIONS**

- **S.AII.12** The student will compute and distinguish between permutations and combinations.

- **SCATTERPLOTS AND MODELING**

- **S.AII.9** *The student will collect and analyze data, determine the equation of the curve of best fit in order to make predictions, and solve practical problems, using mathematical models of quadratic and exponential functions.*