



IXL Skill Plan

North Carolina Standard Course of Study: Math 3



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NC.M3.N | Number and Quantity

NC.M3.N-CN The Complex Number System

Use complex numbers in polynomial identities and equations.

NC.M3.N-CN.9: Use the Fundamental Theorem of Algebra to determine the number and potential types of solutions for polynomial functions.

1. Fundamental Theorem of Algebra YS8

NC.M3.A | Algebra

NC.M3.A-APR Arithmetic with Polynomial and Rational Expressions

Understand the relationship between zeros and factors of polynomials.

NC.M3.A-APR.2: Understand and apply the Remainder Theorem.

1. Evaluate polynomials using synthetic division CHC

NC.M3.A-APR.3: Understand the relationship among factors of a polynomial expression, the solutions of a polynomial equation and the zeros of a polynomial function.

1. Solve polynomial equations ZCH
2. Find the roots of factored polynomials PVM
3. Write a polynomial from its roots BTU

Rewrite rational expressions.

NC.M3.A-APR.6: Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x), b(x), q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$.

1. Divide polynomials using long division YN5
2. Divide polynomials using synthetic division D6D
3. Simplify rational expressions 37N

NC.M3.A-APR.7: Understand the similarities between arithmetic with rational expressions and arithmetic with rational numbers.

NC.M3.A-APR.7.a: Add and subtract two rational expressions, $a(x)$ and $b(x)$, where the denominators of both $a(x)$ and $b(x)$ are linear expressions.

1. Add and subtract rational expressions FEX

NC.M3.A-APR.7.b: Multiply and divide two rational expressions.

1. Multiply and divide rational expressions MG2

NC.M3.A-SSE Seeing Structure in Expressions

Interpret the structure of expressions.

NC.M3.A-SSE.1: Interpret expressions that represent a quantity in terms of its context.

NC.M3.A-SSE.1.a: Identify and interpret parts of a piecewise, absolute value, polynomial, exponential and rational expressions including terms, factors,

1. Polynomial vocabulary DYB

coefficients, and exponents.

NC.M3.A-SSE.1.b: Interpret expressions composed of multiple parts by viewing one or more of their parts as a single entity to give meaning in terms of a context.

1. Factor using a quadratic pattern QKF
2. Factor by grouping HVT
3. Factor sums and differences of cubes NJV
4. Factor polynomials A2W
5. Interpret parts of quadratic expressions: word problems 9P2

NC.M3.A-SSE.2: Use the structure of an expression to identify ways to write equivalent expressions.

Variable expressions

1. Simplify variable expressions using properties PVC

Rational expressions

2. Simplify rational expressions 37N

Rational exponents

3. Simplify expressions involving rational exponents I 2VX
4. Simplify expressions involving rational exponents II U96

Radical expressions

5. Simplify radical expressions with variables I LQX
6. Simplify radical expressions with variables II QGZ
7. Simplify radical expressions using the distributive property QAX
8. Simplify radical expressions using conjugates FX7

Polynomial expressions

9. Factor using a quadratic pattern QKF
10. Factor sums and differences of cubes NJV
11. Factor polynomials A2W

Pascal's triangle and the Binomial Theorem

12. Pascal's triangle and the Binomial Theorem A7M
13. Binomial Theorem I CWS
14. Binomial Theorem II NEU

Write expressions in equivalent forms to solve problems.

NC.M3.A-SSE.3: Write an equivalent form of an exponential expression by using the properties of exponents to transform expressions to reveal rates based on different intervals of the domain.

NC.M3.A-CED Creating Equations

Create equations that describe numbers or relationships.

NC.M3.A-CED.1: Create equations and inequalities in one variable that represent absolute value, polynomial, exponential, and rational relationships and use them to solve problems algebraically and graphically.

1. Write absolute value equations from graphs A73
2. Write exponential functions: word problems DBW

NC.M3.A-CED.2: Create and graph equations in two variables to represent absolute value, polynomial, exponential and rational relationships between quantities.

1. Graph an absolute value function 23W
2. Match polynomials and graphs XJU
3. Match exponential functions and graphs PCX

NC.M3.A-CED.3: Create systems of equations and/or inequalities to model situations in context.

Systems of equations

1. Solve a system of equations by graphing: word problems T86
2. Solve a system of equations using substitution: word problems DKW
3. Solve a system of equations using elimination: word problems ARY
4. Solve a system of equations using any method: word problems ELG

Linear inequalities

5. Write two-variable linear inequalities: word problems LLV
6. Solve systems of linear inequalities by graphing KS6

NC.M3.A-REI Reasoning with Equations and Inequalities

Understand solving equations as a process of reasoning and explain the reasoning.

NC.M3.A-REI.1: Justify a solution method for equations and explain each step of the solving process using mathematical reasoning.

1. Solve linear equations: complete the solution N83

NC.M3.A-REI.2: Solve and interpret one variable rational equations arising from a context, and explain how extraneous solutions may be produced.

1. Solve rational equations CHP

Represent and solve equations and inequalities graphically.

NC.M3.A-REI.11: Extend an understanding that the x -coordinates of the points where the graphs of two equations $y=f(x)$ and $y=g(x)$ intersect are the solutions of the equation $f(x)=g(x)$ and approximate solutions using a graphing technology or successive approximations with a table of values.

1. Solve a system of equations by graphing M69
2. Solve a system of equations by graphing: word problems T86
3. Find the number of solutions to a system of equations P5A

NC.M3.F | Functions

NC.M3.F-IF Interpreting Functions

Understand the concept of a function and use function notation.

NC.M3.F-IF.1: Extend the concept of a function by recognizing that trigonometric ratios are functions of angle measure.

1. Find trigonometric ratios using the unit circle ZF7
2. Find trigonometric functions using a calculator SPL
3. Find trigonometric ratios using reference angles 9QB

NC.M3.F-IF.2: Use function notation to evaluate piecewise defined functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

Interpret functions that arise in applications in terms of the context.

NC.M3.F-IF.4: Interpret key features of graphs, tables, and verbal descriptions in context to describe functions that arise in applications relating two quantities to include periodicity and discontinuities.

1. Identify graphs: word problems MY6
2. Find properties of sine functions 2EK
3. Find properties of cosine functions F8Y
4. Graph sine and cosine functions A7V

Analyze functions using different representations.

NC.M3.F-IF.7: Analyze piecewise, absolute value, polynomials, exponential, rational, and trigonometric functions (sine and cosine) using different representations to show key features of the graph, by hand in simple cases and using technology for more complicated cases, including: domain and range; intercepts; intervals where the function is increasing, decreasing, positive, or negative; rate of change; relative maximums and minimums; symmetries; end behavior; period; and discontinuities.

Rational functions

1. Rational functions: asymptotes and excluded values 7JJ

Polynomial functions

2. Match polynomials and graphs XJU
3. Domain and range of polynomials Y86

Trigonometric functions

4. Find properties of sine functions 2EK
5. Graph sine functions 9NS
6. Find properties of cosine functions F8Y
7. Graph cosine functions KXG
8. Symmetry and periodicity of trigonometric functions YBJ

NC.M3.F-IF.9: Compare key features of two functions using different representations by comparing properties of two different functions, each with a different representation (symbolically, graphically, numerically in tables, or by verbal descriptions).

NC.M3.F-BF Building Functions

Build a function that models a relationship between two quantities.

NC.M3.F-BF.1: Write a function that describes a relationship between two quantities.

NC.M3.F-BF.1.a: Build polynomial and exponential functions with real solution(s) given a graph, a description of a relationship, or ordered pairs (include reading these from a table).

NC.M3.F-BF.1.b: Build a new function, in terms of a context, by combining standard function types using arithmetic operations.

1. Write a polynomial from its roots BTU

Evaluate functions

1. Evaluate functions PS2

Function operations

2. Add and subtract functions QQD

3. Multiply functions 49K

Composition of functions

4. Composition of linear functions: find a value MFV

5. Composition of linear functions: find an equation RSP

6. Composition of linear and quadratic functions: find a value P9T

7. Composition of linear and quadratic functions: find an equation EKJ

Build new functions from existing functions.

NC.M3.F-BF.3: Extend an understanding of the effects on the graphical and tabular representations of a function when replacing $f(x)$ with $k \cdot f(x)$, $f(x) + k$, $f(x + k)$ to include $f(k \cdot x)$ for specific values of k (both positive and negative).

Reflections

1. Reflections of functions PHV

Translations

2. Translations of functions F6J

Dilations

3. Dilations of functions NNY

Mixed transformations

4. Function transformation rules R7X
5. Transformations of functions RSN
6. Describe function transformations KT8

NC.M3.F-BF.4: Find an inverse function.

NC.M3.F-BF.4.a: Understand the inverse relationship between exponential and logarithmic, quadratic and square root, and linear to linear functions and use this relationship to solve problems using tables, graphs, and equations.

Exponential equations

1. Solve exponential equations using common logarithms 9F2
2. Solve exponential equations using natural logarithms KVL

Convert between exponential and logarithmic form

3. Convert between exponential and logarithmic form: rational bases TPA
4. Convert between natural exponential and logarithmic form 5KM
5. Convert between exponential and logarithmic form: all bases 8RK
6. Convert between exponential and logarithmic form SXD

Logarithmic functions

7. Graph logarithmic functions QEQ

NC.M3.F-BF.4.b: Determine if an inverse function exists by analyzing tables, graphs, and equations.

1. Identify inverse functions 9KT
2. Find inverse functions and relations ZRQ

NC.M3.F-BF.4.c: If an inverse function exists for a linear, quadratic and/or exponential function, f , represent the inverse function, f^{-1} , with a table, graph, or equation and use it to solve problems in terms of a context.

1. Find values of inverse functions from tables YLX
2. Find values of inverse functions from graphs Z5C
3. Graphs of inverse functions K2W

NC.M3.F-LE Linear, Quadratic, and Exponential Models

Construct and compare linear and exponential models and solve problems.

NC.M3.F-LE.3: Compare the end behavior of functions using their rates of change over intervals of the same length to show that a quantity increasing exponentially eventually exceeds a quantity increasing as a polynomial function.

NC.M3.F-LE.4: Use logarithms to express the solution to ab to the ct power = d where a , c , and d are numbers and evaluate the logarithm using technology.

1. Solve exponential equations using common logarithms 9F2
2. Solve exponential equations using natural logarithms KVL

NC.M3.F-TF Trigonometric Functions

Extend the domain of trigonometric functions using the unit circle.

NC.M3.F-TF.1: Understand radian measure of an angle as: The ratio of the length of an arc on a circle subtended by the angle to its radius. A dimensionless measure of length defined by the quotient of arc length and radius that is a real number. The domain for trigonometric functions.

1. Convert between radians and degrees EDC
2. Radians and arc length UA5

NC.M3.F-TF.2: Build an understanding of trigonometric functions by using tables, graphs and technology to represent the cosine and sine functions.

NC.M3.F-TF.2.a: Interpret the sine function as the relationship between the radian measure of an angle formed by the horizontal axis and a terminal ray on the unit circle and its y coordinate.

1. Quadrants ANN
2. Coterminal angles 7CV
3. Reference angles BRP
4. Find trigonometric ratios using the unit circle ZF7

NC.M3.F-TF.2.b: Interpret the cosine function as the relationship between the radian measure of an angle formed by the horizontal axis and a terminal ray on the unit circle and its x coordinate.

1. Quadrants ANN
2. Coterminal angles 7CV
3. Reference angles BRP
4. Find trigonometric ratios using the unit circle ZF7

Model periodic phenomena with trigonometric functions.

NC.M3.F-TF.5: Use technology to investigate the parameters, a , b , and h of a sine function, $f(x) = a \cdot \sin(b \cdot x) + h$, to represent periodic phenomena and interpret key features in terms of a context.

1. Graph sine functions 9NS
2. Graph translations of sine functions LCN

NC.M3.G | Geometry

NC.M3.G-GMD Geometric Measurement & Dimension

Explain volume formulas and use them to solve problems.

NC.M3.G-GMD.3: Use the volume formulas for prisms, cylinders, pyramids, cones, and spheres to solve problems.

1. Volume [BK9](#)
2. Volume of prisms and cylinders [N5F](#)
3. Volume of pyramids and cones [7J3](#)
4. Volume of spheres [62N](#)

Visualize relationships between two-dimensional and three-dimensional objects.

NC.M3.G-GMD.4: Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

1. Cross sections of three-dimensional figures [7Z4](#)
2. Solids of revolution [LKT](#)

NC.M3.G-CO Congruence

Prove geometric theorems.

NC.M3.G-CO.10: Verify experimentally properties of the centers of triangles (centroid, incenter, and circumcenter).

1. Construct the circumcenter or incenter of a triangle [EC6](#)
2. Construct the centroid or orthocenter of a triangle [X8X](#)

NC.M3.G-CO.11: Prove theorems about parallelograms. Opposite sides of a parallelogram are congruent. Opposite angles of a parallelogram are congruent. Diagonals of a parallelogram bisect each other. If the diagonals of a parallelogram are congruent, then the parallelogram is a rectangle.

1. Properties of parallelograms [LLK](#)
2. Proving a quadrilateral is a parallelogram [H89](#)

NC.M3.G-CO.14: Apply properties, definitions, and theorems of two-dimensional figures to prove geometric theorems and solve problems.

Properties of quadrilaterals

1. Properties of rhombuses [QVX](#)
2. Properties of squares and rectangles [R9M](#)
3. Properties of trapezoids [UC9](#)
4. Properties of kites [LZ9](#)
5. Properties of quadrilaterals: mixed practice [Q2R](#)

Proofs involving quadrilaterals

6. Proofs involving triangles and quadrilaterals [V7W](#)
7. Proofs involving quadrilaterals [P77](#)

NC.M3.G-C Circles

Understand and apply theorems about circles.

NC.M3.G-C.2: Understand and apply theorems about circles. Understand and apply theorems about relationships with angles and circles, including central, inscribed and circumscribed angles. Understand and apply theorems about relationships with line segments and circles including, radii, diameter, secants, tangents and chords.

Relationships in circles

1. Parts of a circle [4X2](#)
2. Circle measurements: mixed review [TFF](#)
3. Arcs and chords [P63](#)
4. Tangent lines [CFV](#)
5. Angles formed by chords, secants, and tangents [ZN9](#)
6. Segments formed by chords, secants, and tangents [HPE](#)

Inscribed angles

7. Inscribed angles [98U](#)

Angles in inscribed figures

8. Angles in inscribed right triangles [6DL](#)
9. Angles in inscribed quadrilaterals I [24Y](#)
10. Angles in inscribed quadrilaterals II [2Y5](#)

Perimeter of polygons with an inscribed circle

11. Perimeter of polygons with an inscribed circle [UJT](#)

NC.M3.G-C.5: Using similarity, demonstrate that the length of an arc, s , for a given central angle is proportional to the radius, r , of the circle. Define radian measure of the central angle as the ratio of the length of the arc to the radius of the circle, s/r . Find arc lengths and areas of sectors of circles.

1. Central angles and arc measures [VZX](#)
2. Arc length [7L9](#)
3. Area of sectors [XZQ](#)
4. Radians and arc length [UA5](#)

NC.M3.G-GPE Expressing Geometric Properties with Equations

Translate between the geometric description and the equation for a conic section.

NC.M3.G-GPE.1: Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.

Complete the square

1. Find properties of circles from equations in general form EAJ
2. Convert equations of circles from general to standard form D2H

Write equations and graph circles

3. Derive equations of circles using the Pythagorean theorem N5A
4. Graph circles from equations in standard form GVH
5. Write equations of circles in standard form using properties SHN

NC.M3.G-MG Modeling with Geometry

Apply geometric concepts in modeling situations.

NC.M3.G-MG.1: Apply geometric concepts in modeling situations: Use geometric and algebraic concepts to solve problems in modeling situations. Use geometric shapes, their measures, and their properties, to model real-life objects. Use geometric formulas and algebraic functions to model relationships. Apply concepts of density based on area and volume. Apply geometric concepts to solve design and optimization problems.

1. Minimum and maximum area and volume VX7
2. Calculate density, mass, and volume YKJ

NC.M3.S | Statistics and Probability

NC.M3.S-IC Making Inference and Justifying Conclusions

Understand and evaluate random processes underlying statistical experiments.

NC.M3.S-IC.1: Understand the process of making inferences about a population based on a random sample from that population.

1. Identify biased samples CH7

Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

NC.M3.S-IC.3: Recognize the purposes of and differences between sample surveys, experiments, and observational studies and understand how randomization should be used in each.

1. Experiment design BKR

NC.M3.S-IC.4: Use simulation to understand how samples can be used to estimate a population mean or proportion and how to determine a margin of error for the estimate.

1. Find confidence intervals for population means JVK
2. Find confidence intervals for population proportions QAD

NC.M3.S-IC.5: Use simulation to determine whether observed differences between samples from two distinct populations indicate that the two populations are actually different in terms of a parameter of interest.

1. Analyze the results of an experiment using simulations RLB

NC.M3.S-IC.6: Evaluate articles and websites that report data by identifying the source of the data, the design of the study, and the way the data are graphically displayed.