NC Math 1 Study Guide

Unit 1: Equations and Inequalities	
Classifying Numbers	Whole, Integers, Rational, Irrational, Real
Properties	Commutative, associative, distributive
Solving Equations	Use inverse operations, clear fractions
Literal Equations/Formulas	Solve an equation for a given variable
Solving Proportions	Cross-multiply
Solving Inequalities	And/Or inequalities – show solutions on a number line; write solutions in inequality and interval notation; remember to flip the inequality when multiplying/dividing by a negative
Writing Equations to Solve Problems	Define variable, write equation using key words from problem, solve and make sure you answer question being asked.

Unit 2: Linear Functions	
Views of a Relation/Function	Mapping diagram, ordered pairs, table of values, graph, equation
Determining if a Relation is a Function	Vertical Line Test; In table or list of ordered pairs, make sure no x-values repeat
Continuous vs. Discrete Functions	-Continuous: points on graph are connected -Discrete: individual points on a graph not connected
Domain and Range	-Domain: x-values, independent variable, input -Range: y-values, dependent variable, output -Identify from ordered pairs, table, graph or situation; write in inequality and interval notation
Function Notation	Write functions using f(x) notation; evaluate functions using function notation Ex: Evaluate $f(x) = x^2 - 5$ for f(3).
Identifying Linear Functions	-Identify from table – has constant rate of change (change in y-values over change in x-values) -Identify from equation – has only x raised to the first power
Slope	**Formula:** $\frac{y_2 - y_1}{x_2 - x_1}$
Writing Linear Functions	Three Forms of a Linear Function: ➢ **Point-Slope** ----- $y-y_1 = m(x-x_1)$ m = slope (x_1, y_1) – point on line ➢ **Slope-Intercept** ----- $y = mx + b$ m = slope b = y-intercept ➢ **Standard Form** ----- $ax + by = c$ a, b, and c are all integers (no fractions); a is positive

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Writing Linear Functions from a Table	Identify slope (pick 2 points and use formula or find rate of change); find y-intercept (when x = 0)
Writing Linear Functions from a Graph	Identify slope (change in y/change in x) and y-intercept; put in slope-intercept form if y-intercept is obvious; if not plug a point and the slope into point-slope form
Writing Linear Functions from a Situation	Identify rate of change (change in dependent variable divided by change in independent variable); y-intercept – starting point
Writing Linear Functions given a point and slope	Use point slope form; from there change to slope-intercept or standard form if needed
Writing Linear Functions given two points	Use slope formula to find slope; then pick one point and use slope to plug into point-slope form; change to slope-intercept or standard form if needed
Finding x-and y-intercepts in Standard Form	- x-intercept (x, 0) – plug in 0 for y, solve for x - y-intercept (0, y) – plug in 0 for x, solve for y Can easily graph using these points as well.
Writing Equations of Parallel and Perpendicular Lines	-Parallel lines have the same slope -Perpendicular lines have opposite reciprocal slopes
Lines of Best Fit	Review notes on how to put data into calculator, calculate linear regression, put equation into y= to graph; turn on diagnostic Positive, negative, no correlations – correlation coefficients

Unit 3: Systems of Linear Equations and Inequalities	
Solving Linear Systems by Graphing	Graph both equations and find point of intersection
Solving Linear Systems by Substitution	Solve one equation for one variable (pick the easiest). Substitute into the other equation and solve. Then plug the answer you got back into either of the original equations to solve for the other variable.
Solving Linear Systems by Elimination	-Divide all terms in one or both equations by common factor to make numbers smaller if possible. -Line equations up on top of each other in standard form. If needed, multiply one or both equations in order to get one variable to be opposites. Add the 2 equations, eliminating one variable. Solve and substitute answer back into either of the original equations to solve for the other variable.
Writing a System of Equations to Solve a Problem	-Identify your unknowns and assign variables.

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	-Write 2 equations using relationships given in problem. -Solve your system by graphing, substitution or elimination. Make sure to answer question being asked!
Solving Linear Inequalities	-Graph line. $>$ or $<$ ---- use dotted line $\geq$ or $\leq$ ---- use solid line -Decide whether to shade above or below the line by picking a test point. -Solutions to inequality lie in shaded area and on solid lines.
Solving Systems of Linear Inequalities	-Graph both lines. $>$ or $<$ ---- use dotted line $\geq$ or $\leq$ ---- use solid line -Decide whether to shade above or below each line by picking a test point. -Solutions to system lie in ***overlapping*** shaded area and on solid lines.

Unit 4: Exponents and Exponential Functions	
Laws of Exponents	• Base raised to 0 power ---- always 1 • Base raised to negative exponent --- use reciprocal and make exponent positive • Multiplying powers with same base --- add exponents • Dividing powers with same base --- subtract exponents • Power to a Power --- multiply exponents • Raise all bases in parentheses to power outside parentheses
Writing Rational Exponents as Radicals	Base raised to fractional exponent --- power/root EX: $\sqrt{x} = x^{\frac{1}{2}}$ Simplify if possible. EX: $\sqrt{x^6} = x^{6/2} = x^3$
Writing Radicals with Rational Exponents	Power/root EX: $x^{5/2} = (\sqrt{x})^5$ or $\sqrt{x^5}$
Arithmetic Sequences	Represents a Linear Function Have a common difference **Explicit Formula:** $A(n) = a(1) + (n-1)(d)$
Geometric Sequences	Represents an Exponential Function Have a common ratio **Explicit Formula:** $A(n) = a(1) \cdot r^{n-1}$
Exponential Functions	$y = a \cdot b^x$

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	a represents starting point (when x = 0) b represents common ratio
Graphing Exponential Functions	Use transformations from parent function $y = a \cdot b^{(x-h)} + k$ *h* represents horizontal shift (x + h means shift to the left; x – h means shift to the right) *k* represents vertical shift of asymptote $a > 0$ represents exponential growth $a < 0$ represents exponential decay
Exponential Growth	**Formula:** $y = a \cdot (1 + r)^t$ *a* represents the initial amount *r* represents the rate of change (written as a decimal) *t* represents time
Exponential Decay	**Formula:** $y = a \cdot (1 - r)^t$ *a* represents the initial amount *r* represents the rate of change (written as a decimal) *t* represents time
Compound Interest	$A = P\left(1 + \frac{r}{n}\right)^{n \cdot t}$ *A* represents balance of investment *P* represents principal (starting amount) *r* represents the rate of annual interest (written as a decimal) *n* represents the number of times interest is compounded each year *t* represents time in years

Unit 5: Polynomials	
Naming Polynomials	Linear, Quadratic, Cubic, Quartic, Monomial, Binomial, Trinomial, Polynomial
Adding and Subtracting Polynomials	Combine like terms Subtraction – remember to distribute the -1 to 2nd polynomial
Multiplying Polynomials	Distribute each term in first polynomial to each term in second polynomial Use FOIL, a box or line up like terms to organize
Factoring Polynomials	Look for GCF! Factor out. Look for: 2 terms – difference of two squares 3 terms – make X; rewrite trinomial and factor by grouping 4 terms – factor by grouping

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Unit 6: Quadratic Functions	
Identifying from a Table of Values	Has common 2nd difference
Graphing Quadratic Functions in Vertex Form	**Vertex Form: $y = a(x - h)^2 + k$** a represents if the parabola opens up or down and if there is a vertical stretch or compression *h* represents horizontal shift (x + h means shift to the left; x – h means shift to the right) *k* represents vertical shift **vertex (h, k)** **Axis of Symmetry: x = h**
Graphing Quadratic Functions in Standard Form	**Standard form: $y = ax^2 + bx + c$** Vertex: $x = -\frac{b}{2a}$; plug x value back into equation to solve for y Axis of Symmetry: $x = -\frac{b}{2a}$ y-intercept: (0, *c*)
Solving Quadratic Equations by Graphing	Graph Function by hand or in calculator – find roots/zeros/x-intercepts No x-intercepts – no solution 1 x-intercept – 1 solution 2 x-intercepts – 2 solutions
Solving Quadratic Equations Using Square Roots	Only if there is no b-value! Isolate x^2 and then take the square root of both sides. Don't forget ±!
Solving Quadratic Equations by Factoring	Set equation equal to 0. Factor. Set each factor equal to 0 and solve.
Solving Quadratic Equations Using Quadratic Formula	Can be used to solve ANY quadratic function. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Solving Word Problems involving Quadratic Equations	Maximum/minimum height/amount – y-value of vertex Time at which maximum/minimum reached – x-value of vertex When object reaches the ground – x-intercept (solve related equation) - if no calculator – factor! - if calculator – graph!

Unit 7: Statistics and Geometry	
Linear, Quadratic, Exponential Models	➢ Linear Functions – common 1st difference ➢ Quadratic Functions – common 2nd difference ➢ Exponential Functions – common ratio

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	Find equation using Linear Regression, Quadratic Regression or Exponential Regression in calculator
Frequency Tables / Histograms	Interpret data using frequency table or histogram
Measure of Central Tendency	▪ Mean – average ▪ Mode – number occurring most often ▪ Median – middle number ▪ Range – difference in highest and lowest data values ▪ Standard Deviation – how the data varies from the mean; higher number means data is more spread out; lower number means data is closer together ▪ Outlier – a data value much greater or less than the other data values; how outliers affect measures of central tendency
Distance Formula	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ Use when you need to know the length of a segment/side of figure given coordinates
Midpoint Formula	$\left(\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2}\right)$
Identifying figures using parallel/perpendicular lines	Parallel lines – same slope Perpendicular lines – opposite reciprocal slopes Show any figure has a right angle by proving two of its sides have opposite reciprocal slopes.

max

min

$\frac{-b}{2a}$ ← vertex

Time: Y=