

Algebra 1 – Exam Study Guide – Formulas & Key Concepts

Pre-Algebra Concepts/Maintaining Basic Skills

- Order of Operations – Parenthesis, Exponents, Multiply/Divide (L-R), Add/Subtract (L-R)
- +, -, Mult./Div. Pos. & Neg. Numbers (whole #, decimals, fractions)
- Solving simple equations like one or 2-step eq.
- Graphing – coordinate plane, x-axis, y-axis, origin, quadrants, ordered pair, coordinates, x-coordinate, y-coordinate
- Solving proportions by cross multiplying (cross products)
$$\frac{\text{is}}{\text{of}} = \frac{\%}{100} \quad \frac{\text{part}}{\text{total}} = \frac{\%}{100}$$
- Pythagorean Theorem (rt triangle)
- Basic measurements like inches, feet, days, months, year

Solving Equations

- GOAL: Get variable by itself!
- Word Problems – always define variables first and highlight important info in the prob.
- Transforming Formulas/Solving for a variable (GOAL: Get the variable by itself!)

Solving Inequalities

- **If you multiply/divide by a negative, you must flip the inequality!**
- < less than > greater than
- ≤ less than or equal to
- ≥ greater than or equal to
- < or > open circle
- ≤ or ≥ closed circle

Graph & Functions

- relation – a set of ordered pairs – not always a function
- function-for every x, there's only one y (vertical line test)
- domain (x) & range (y); input (x) & output (y); independent (x) & dependent (y)
- using a table to graph (table in the calculator!)
- functions rule/function notation: $f(x)$
- arithmetic sequence: $A(n) = a + (n-1)d$
a is 1st term in the sequence
n is term number (like 5th term, 8th term, ...)
d is common difference (what's being +)

Linear Equations and Their Graphs

- rate of change & slope $m = \frac{y_2 - y_1}{x_2 - x_1}$
- slope-intercept form (slope m and y-intercept b) $y = mx + b$
- point-slope form (a point (x, y) , and a slope) $y - y_1 = m(x - x_1)$
- parallel lines – same slope, different y-intercepts
- perpendicular lines – slopes are opposite reciprocals (if you multiply the slopes together, they make -1)
- scatter plots & lines of best fit (Text p318-320) calculator steps (STAT... EDIT... CALC)

Systems of Equation & Inequalities

- the solution to a system is a pt (,)-intersection!
- parallel lines never intersect – no solution
- the same line always intersects – infinitely many solutions
- 3 ways to solve:
graphing, substitution, and elimination
- graphing linear inequalities (test point to shade)
- < or > dotted line ≤ or ≥ solid line
- graphing systems of linear inequalities

Exponents & Exponential Functions

- Translating verbal expressions to algebraic expression & vice versa (lesson 1-1 in text)
- anything to the 0 power = 1
- negative exponents move to denominator/numerator – make positive exponent
- multiplying like-bases → add exponents
- dividing like-bases → subtract exponents
- raising an exponent to a power → multiply exponents
- make sure to get rid of all negative and zero exponents (and reduce fractions) for final answer!

Exponents & Exponential Functions

- geometric sequence: $A(n) = a \cdot r^{n-1}$
a is the 1st term
r is the common ratio (what's being mult. by)
n is the term # (like 4th term, 7th term, ...)
- exponential growth and decay (Text p437-440)
 $y = a \cdot b^x$
a is the initial amount
b is the growth or decay factor
growth (add % to 100% and change to dec.)
decay (subtract % from 100% and change to dec.)

Polynomials and Factoring

- add and subtracting polynomials (don't change the exp.- only add or subtract coefficients)
- standard form of a polynomial (highest to lowest power)
- naming polynomials by degree
(constant, linear, quadratic, cubic, nth degree) & number of terms (monomial, binomial, trinomial, poly. w/ ___ terms)
- multiplying polynomials (DISTRIBUTIVE PROPERTY!)
FOIL for binomial times binomial
- factoring polynomials:
*GCF (any # of terms)
*guess-n-check or box method (3 terms)
*diff. of perf. sq. (2 terms w/ minus & perf. sq.)
- special cases (square of a binomial & difference of squares)

Data Analysis and Statistics

Measures of Central Tendency:

Mean, Median, Mode

Range, lower/upper quartiles (Q1 & Q2)

Interquartile Range, Outliers

Box-n-whisker plot

Histogram

2-way frequency table (understanding relative frequency)

Dot plot

Interpreting scatterplots

Graphing Calculator Tips: Remember you can use STAT... EDIT... CALC

1. Enter data into L1 and then to find mean, median, Q1, Q3, standard deviation...
choose #1: 1-Var Stats
2. To find the best equation for a given data (make sure to enter data in L1 and L2 and turn on diagnostic to get the correlation value---go to MODE and do down to STATDIAGNOSTICS and move cursor to ON... make sure to press ENTER)

Choose #4 for linear equation

Choose #5 for quadratic equation

Choose #0 for exponential equation

Make sure to write down the r^2 value for each one if you are trying to find the best equation (look for the one closest to 1 or -1).

3. If you are given a set of data (like in a table) and it tells you that there's a **line of best fit**, then you want to get the **linear equation** to help you getting the answer to the question.
4. If you are given an equation (like a quadratic equation), you can enter it in $y = \dots$. Looking at the table (or the graph) may help you answer the question. Or you may have to go to 2nd, TRACE (CALC) and do the ZERO (where it crosses the x-axis), MIN, MAX, INTERSECT (need 2 equations for this).

Remember under ZOOM, you can ZOOM IN or OUT, ZSTANDARD gives you the standard screen from -10 to 10, ZOOM FIT also is another option.

Quadratic Equations & Functions

- $y = ax^2 + bx + c$ (graph gives you a parabola)
- axis of symmetry (vertical line) $x = \frac{-b}{2a}$
 $x = \#$
coordinate of vertex (either min. or max.)
- solving quadratic equations (where the function crosses the x-axis)
***zero-product property (factor and set each factor equal to zero)

***quadratic formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

***square root method (isolate squared var. and when taking square root-answers are $\pm \#$)
(only 2 terms-no bx term)

Radical Expressions and Equations

- Midpoint Formula - $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$
- Distance Formula - $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
- To prove if a quadrilateral is a rectangle, square, rhombus, or parallelogram:
**Find distance for each side and find the slope for each side

Changing from radical form to exponential (rational exponent) form and vice versa

Radical form	Exponent form
$\sqrt{25}$	$= 25^{\frac{1}{2}}$
$\sqrt[3]{27}$	$= 27^{\frac{1}{3}}$
$\sqrt[4]{16}$	$= 16^{\frac{1}{4}}$

Recursive formulas (Explicit formulas are in chapters 5 and 8 of the textbook... arithmetic and geometric sequences)

Volume of cylinder, cone, sphere, pyramid (formulas will be given; know how to solve when volume is given and you have to solve for a missing radius or height)

