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The Most Comprehensive Review of Algebra I

By

Reza Nazari

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CREATING EQUATIONS	**A.CED**
A.CED Create equations that describe numbers or relationships.	
A.CED.1 Create equations and inequalities in one variable and use them to solve problems. Include equations and inequalities arising from linear, quadratic, simple rational, and exponential functions. a. Focus on applying linear and simple exponential expressions. (A1, M1) b. Focus on applying simple quadratic expressions. (A1, M2)	
A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. a. Focus on applying linear and simple exponential expressions. (A1, M1) b. Focus on applying simple quadratic expressions. (A1, M2)	
A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.	
CREATING EQUATIONS	**A.CED**
Create equations that describe numbers or relationships.	
A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. a. Focus on formulas in which the variable of interest is linear or square.	
REASONING WITH EQUATIONS AND INEQUALITIES	**A.REI**
Understand solving equations as a process of reasoning and explain the reasoning.	
A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	
Solve equations and inequalities in one variable.	
A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. **A.REI.4** Solve quadratic equations in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. b. Solve quadratic equations as appropriate to the initial form of the equation by inspection, e.g., for $x^2 = 49$; taking square roots; completing the square; applying the quadratic formula; or utilizing the Zero-Product Property after factoring. c. Derive the quadratic formula using the method of completing the square.	

Solve systems of equations.
A. REI. 5 Verify that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. **A. REI. 6** Solve systems of linear equations algebraically and graphically. a. Limit to pairs of linear equations in two variables. (A1, M1) **A. REI. 7** Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$.
Represent and solve equations and inequalities graphically.
A. REI. 10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). **A. REI. 11** Explain why the x-coordinates of the points where the graphs of the equation $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, making tables of values, or finding successive approximations. **A. REI. 12** Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Functions Standards
INTERPRETING FUNCTIONS **F.IF**
Understand the concept of a function and use function notation.
F. IF. 1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$. **F. IF. 2** Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. **F. IF. 3** Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1, f(n + 1) = f(n) + f(n - 1)\, for\, n \geq 1$.
Interpret functions that arise in applications in terms of the context.
F. IF. 4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include the following: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. b. Focus on linear, quadratic, and exponential functions.

F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.

b. Focus on linear, quadratic, and exponential functions. (A1, M2)

Analyze functions using different representations.

F.IF.7 Graph functions expressed symbolically and indicate key features of the graph, by hand in simple cases and using technology for more complicated cases. Include applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate.

a. Graph linear functions and indicate intercepts. (A1, M1)
b. Graph quadratic functions and indicate intercepts, maxima, and minima. (A1, M2)
c. Graph simple exponential functions, indicating intercepts and end behavior. (A1, M1)

F.IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. (A2, M3)

i. Focus on completing the square to quadratic functions with the leading coefficient of 1. (A1)

b. Use the properties of exponents to interpret expressions for exponential functions. (A2, M3)

i. Focus on exponential functions evaluated at integer inputs. (A1, M2)

INTERPRETING FUNCTIONS **F.IF**

Analyze functions using different representations.

F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum. (A2, M3)

b. Focus on linear, quadratic, and exponential functions. (A1, M2)

BUILDING FUNCTIONS **F.BF**

Build a function that models a relationship between two quantities.

F.BF.1 Write a function that describes a relationship between two quantities.

a. Determine an explicit expression, a recursive process, or steps for calculation from context.

i. Focus on linear and exponential functions. (A1, M1)

ii. Focus on situations that exhibit quadratic or exponential relationships. (A1, M2)

Chapter 1: Fundamentals and Building Blocks



Math Topics that you'll learn in this Chapter:

- ✓ Adding and Subtracting Integers
- ✓ Multiplying and Dividing Integers
- ✓ Translate Phrases into an Algebraic Statement
- ✓ Order of Operations
- ✓ Integers and Absolute Value
- ✓ Proportional Ratios
- ✓ Similarity and Ratios
- ✓ Percent Problems
- ✓ Percent of Increase and Decrease
- ✓ Discount, Tax, and Tip
- ✓ Simple Interest
- ✓ The Distributive Property
- ✓ Approximating Irrational Numbers

Adding and Subtracting Integers

Solve.

1) $-(9)+15=$ ____

2) $15-(-11-9)=$ ____

3) $(-10)+(-6)=$ ____

4) $(-10)+(-6)+7=$ ____

5) $-(23)+19=$ ____

6) $(-7+5)-9=$ ____

7) $28+(-32)=$ ____

8) $(-11)+(-9)+5=$ ____

9) $25-(8-7)=$ ____

10) $-(29)+17=$ ____

11) $(-38)+(-3)+29=$ ____

12) $15-(-7+9)=$ ____

13) $24-(8-2)=$ ____

14) $(-7+4)-9=$ ____

15) $(-17)+(-3)+9=$ ____

16) $(-26)+(-7)+8=$ ____

17) $(-9)+(-11)=$ ____

18) $8-(-23-13)=$ ____

19) $(-16)+(-2)=$ ____

20) $25-(7-4)=$ ____

21) $23+(-12)=$ ____

22) $(-18)+(-6)=$ ____

23) $17-(-21-7)=$ ____

24) $-(28)-(-16)+5=$ ____

25) $(-9+4)-8=$ ____

26) $(-28)+(-6)+17=$ ____

27) $-(21)-(-15)+9=$ ____

28) $(-31)+(-6)=$ ____

29) $(-18)+(-10)+13=$ ____

30) $(-30)+(-11)+12=$ ____

31) $-(28)-(-10)+6=$ ____

32) $6-(-16-11)=$ ____

Multiplying and Dividing Integers

Solve.

1) $(-6) \times (-7) =$ _____

2) $8 \times (-5) =$ _____

3) $48 \div (-8) =$ _____

4) $(-72) \div 9 =$ _____

5) $(4) \times (-6) =$ _____

6) $(-9) \times (-11) =$ _____

7) $(10) \div (-5) =$ _____

8) $144 \div (-12) =$ _____

9) $(10) \times (-2) =$ _____

10) $(-8) \times (-2) \times 5 =$ _____

11) $(8) \div (-2) =$ _____

12) $45 \div (-15) =$ _____

13) $(5) \times (-7) =$ _____

14) $(-6) \times (-5) \times 4 =$ _____

15) $(12) \div (-6) =$ _____

16) $(14) \div (-7) =$ _____

17) $196 \div (-14) =$ _____

18) $(27 - 13) \times (-2) =$ _____

19) $125 \div (-5) =$ _____

20) $66 \div (-6) =$ _____

21) $(-6) \times (-5) \times 3 =$ _____

22) $(15 - 6) \times (-3) =$ _____

23) $(32 - 24) \div (-4) =$ _____

24) $72 \div (-6) =$ _____

25) $(-14 + 8) \times (-7) =$ _____

26) $(-3) \times (-9) \times 3 =$ _____

27) $84 \div (-12) =$ _____

28) $(-12) \times (-10) =$ _____

29) $22 \times (-3) =$ _____

30) $(-2) \times (-6) \times 5 =$ _____

31) $(24) \div (-3) =$ _____

32) $(-15) \div (3) =$ _____