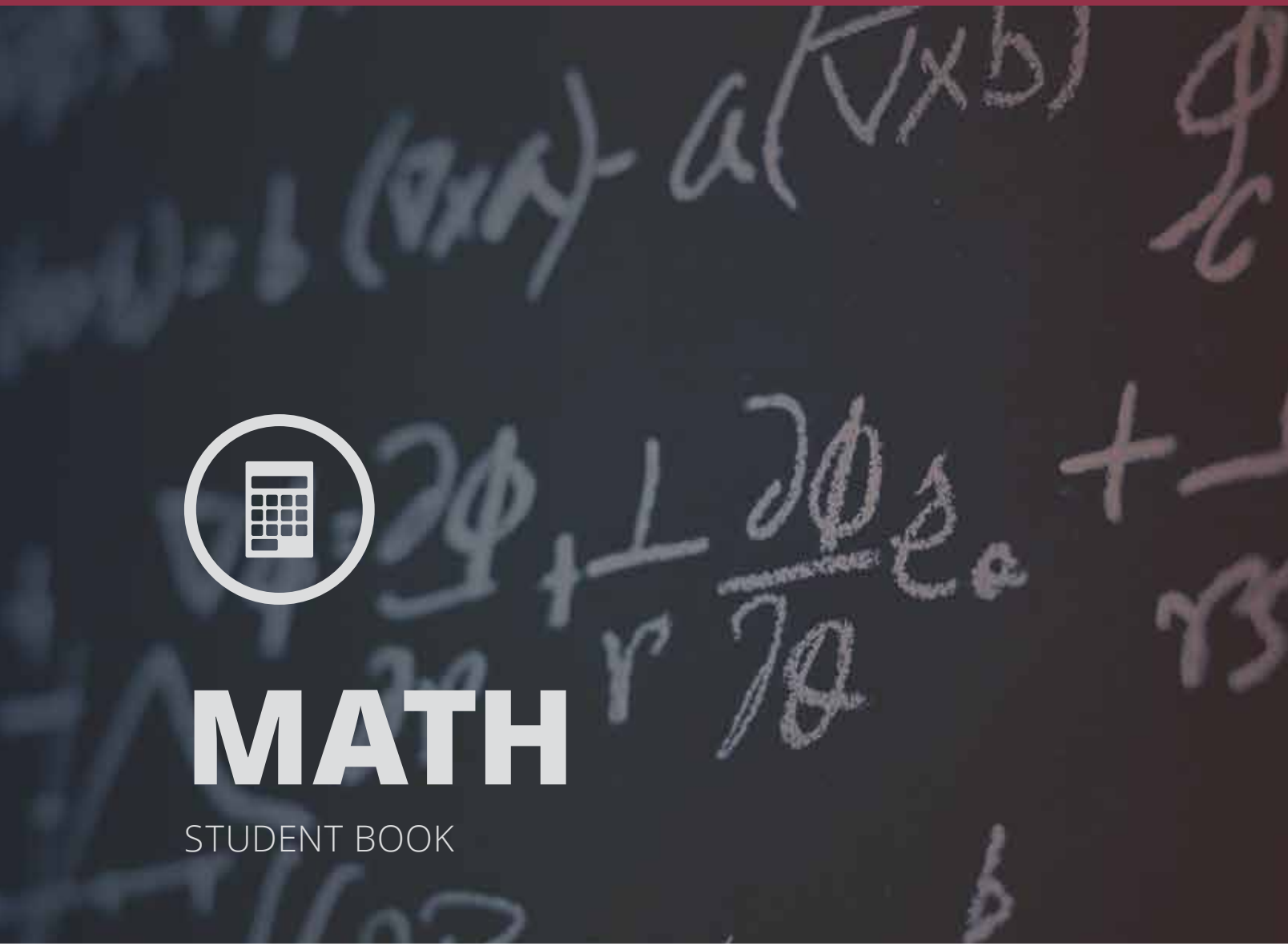
LIFEPAC®



MATH

STUDENT BOOK

11th Grade | Unit 10

Alpha Omega
PUBLICATIONS

MATH 1110
ALGEBRA II REVIEW

LIFEPAC Test is located in the center of the booklet. Please remove before starting the unit.

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Algebra II Review

Introduction

The second-year study of algebra is a continuation of many topics already studied in your first year of algebra. The use of sets, number properties, and the solutions to equations and word problems have continued to be important to your success in math.

After strengthening and adding depth to your previous skills, the Math 1100 series has contained new material for you to learn. Some new topics included in the Math 1100 series were: more complicated factoring, imaginary numbers, conic sections, exponential functions and logarithms, matrices, sequences and series, and the study of probability.

As you review by studying this LIFEPAC®, you might want to consult some of your previous Math LIFEPACs where the lessons were explained in more detail.

Objectives

Read these objectives. The objectives tell you what you will be able to do when you have successfully completed this LIFEPAC. When you have finished this LIFEPAC, you should be able to:

1. Use set concepts and number properties to simplify and evaluate variable expressions.
2. Solve and graph linear sentences and systems.
3. Solve application problems that lead to a linear equation or to a system of linear equations.
4. Perform basic operations with polynomials and factor polynomials completely.
5. Perform basic operations with algebraic fractions and solve equations that involve fractions.
6. Solve radical and quadratic equations.
7. Distinguish between and use rational numbers, irrational numbers, and imaginary numbers.
8. Use the distance formula, write equations, and graph all the conic sections.
9. Use exponential functions and logarithms.
10. Use matrices in computing and in solving linear equations.
11. Find sums and general terms for an arithmetic or geometric series.
12. Use formulas for permutations and combinations, and apply these formulas in determining probability.

Survey the LIFEPAC. Ask yourself some questions about this study and write your questions here.

1. INTEGERS, OPEN SENTENCES, AND GRAPHS

Relationships of numbers are very important in the study of all math. In this section of Math LIFEPAC 1110, you will work with relationships shown through a study of sets. Number relationships can also be shown in open sentences that may be used to symbolize a problem and solve it. Certain equations (linear equations) may be pictured by graphing on a coordinate system. These straight lines show various numerical relationships by their slopes, intercepts, and points of intersection.

Section Objectives

Review these objectives. When you have completed this section, you should be able to:

1. Use set concepts and number properties to simplify and evaluate variable expressions.
2. Solve and graph linear sentences and systems.
3. Solve application problems that lead to a linear equation or to a system of linear equations.

INTEGERS

The study of math includes the concept of set theory. Set theory uses sets of objects and the operations of intersection ($A \cap B$, elements in A and B) and union ($A \cup B$, elements in A or B) with these sets. Equal sets, subsets, and the empty set are terms that are applied to many mathematical discussions and problems.

Along with the concept of sets is the application of properties for real numbers and the equality relationship between elements of the set of real numbers. If a, b, and $c \in R$, the following statements are true.

PROPERTIES OF EQUALITY

Reflexive property:	$a = a$
Symmetric property:	If $a = b$, then $b = a$
Transitive property:	If $a = b$ and $b = c$, then $a = c$

PROPERTIES OF NUMBERS

Addition	Multiplication
Closure: If $a \in R$ and $b \in R$, then $a + b$ is a unique element of R.	Closure: If $a \in R$ and $b \in R$, then $a \cdot b$ is a unique element of R.
Commutative: $a + b = b + a$	Commutative: $a \cdot b = b \cdot a$
Associative: $a + (b + c) = (a + b) + c$	Associative: $a \cdot (b \cdot c) = (a \cdot b) \cdot c$
Identity: $a + 0 = a$	Identity: $a \cdot 1 = a$
Additive Inverse: $a + (-a) = 0$	Multiplicative Inverse: $a \cdot \frac{1}{a} = 1$
	Zero: $a \cdot 0 = 0$

The Distributive Property, $a \cdot (b + c) = (a \cdot b) + (a \cdot c)$, involves both multiplication and addition.

These addition and multiplication properties justify most of the work in simplifying algebraic expressions.

Model: Simplify the algebraic expression $2x - [3x - (6y + 2x) + 4y]$.

$2x - [3x - 6y - 2x + 4y]$
$2x - (x - 2y)$
$2x - x + 2y$
$x + 2y$

In many situations we must relate two numbers with different meanings. These numbers are called *ordered pairs* and any set of ordered pairs is called a *relation*. If the ordered pairs are restricted so that for the first element one and only one second element exists, the set is called a *function*.

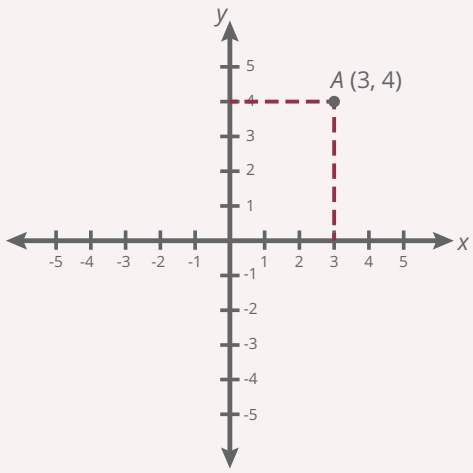
Model 1: An example of an ordered pair is (6, 5).

Model 2: An example of a relation A is {(3, 4), (3, 7), (6, 3), (4, 5)}.

Model 3: An example of a function B is {(1, 2), (2, 3), (4, 7), (8, 9)}.

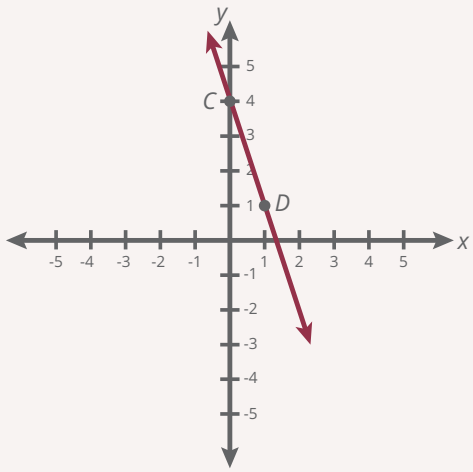
Graphing is done on a rectangular coordinate system when the first number of an ordered pair is used to measure distance to the right or left, and the second number is used to measure distance up or down. The first number is called the x-coordinate or *abscissa*, and the second number is called the y-coordinate or *ordinate*. Together, these numbers are called *coordinates*. The point located is the graph of an ordered pair. Relations and functions are also graphed. The graph of a linear equation is always a straight line.

Model 1:



Point *A* is the graph of the ordered pair (3, 4).

Model 2:



Line *CD* is the graph of $3x + y = 4$.

To simplify certain algebraic expressions, a knowledge of exponents and the rules for operating with them is necessary.

LAWS OF EXPONENTS

$a^m \cdot a^n = a^{m+n}$

$a^m \div a^n = a^{m-n}$

$(x^a)^b = x^{ab}$

With the Properties of Equality, Properties of Numbers, and Laws of Exponents, many algebraic expressions can be simplified.

Model 1: Simplify $x^2(x^3 - 4x^2 + 3)$

$$x^2(x^3 - 4x^2 + 3) = x^5 - 4x^4 + 3x^2$$

Model 2: Simplify $\frac{x^4}{x^3} \cdot (x^5)^2$

$$\frac{x^4}{x^3} \cdot (x^5)^2 = x \cdot x^{10} = x^{11}$$

Match the best description or example on the right with the term on the left.

1.1 _____ equal sets

1.2 _____ empty set

1.3 _____ intersection

1.4 _____ union

1.5 _____ Reflexive Property of Equality

1.6 _____ Symmetric Property of Equality

1.7 _____ Transitive Property

1.8 _____ Closure Property for Addition

1.9 _____ Commutative Property for Multiplication

1.10 _____ Distributive Property

1.11 _____ ordered pair

1.12 _____ relation, but not a function

1.13 _____ function

1.14 _____ straight line

1.15 _____ abscissa

1.16 _____ ordinate

1.17 _____ coordinates

1.18 _____ $a^m \cdot a^n$

1.19 _____ $a^m \div a^n$

1.20 _____ $(x^a)^b$

a. $a = a$

b. If $a \in R$ and $b \in R$, then $a + b \in R$.

c. (6, 3)

d. x^{ab}

e. {(8, 4), (4, 2), (2, 1)}

f. A ∪ B, the word "or"

g. {(2, 7), (3, 9), (5, 11), (2, 13)}

h. sets with the same elements

i. sets with the same number of elements

j. Ø or { }

k. $a + (b \cdot c) = (a + b)(a + c)$

l. graph of $2x + y = 7$

m. If $a = b$ and $b = c$, then $a = c$.

n. a^{m+n}

o. graph of $2x^2 + 3y = 9$

p. $a + b = b + a$

q. $a(b + c) = ab + ac$

r. 7 in (8, 7)

s. A ∩ B, the word "and"

t. 9 in (9, 4)

u. name for ordered pair in graphing

v. (8, 4, 7)

w. $a \cdot b = b \cdot a$

x. $a^{\frac{m}{n}}$

y. If $a = b$, then $b = a$.

z. a^{m-n}

Complete the following items dealing with sets.

1.21 List all the subsets of {3, 4, 7}.

_____

1.22 If set A = {3, 4, 7, 9} and set B = {8, 9, 10, 11}, list the elements:

a. for $A \cup B$ _____

b. for $A \cap B$ _____

1.23 If set C = {4, 9, 11, 13, 15}, list the elements for $A \cap (B \cup C)$. (Use sets A and B from Problem 1.22.)

_____

1.24 If set D = {9, 4, 3, 7}, does $A = D$? (Use set A from Problem 1.22.)

_____

Complete the following items dealing with properties and ordered pairs.

1.25 Multiply 14(22) mentally by taking 14(20 + 2).

_____

1.26 What property was used in Problem 1.25?

_____

1.27 List the elements of the function $F = \{(x, y) | 2x + y = 7\}$ if $x \in$ {positive integers less than 4} and $y \in$ {positive integers less than 8}.

_____

1.28 Explain how to graph the point (3, -4) on a rectangular coordinate system.

_____

_____

1.29 When $f(x) = 2x^2 + 3$, find $f(-3)$.

_____

Evaluate or perform the indicated operations. Simplify all answers.

1.30 8^0 _____

1.31 6^{-2} _____

1.32 $x^8 \cdot (2x)^3$ _____

1.33 $\frac{30x^4y^7}{5xy^2}$ _____

1.34 $r^8 \cdot (rs)^{-3}$ (write without negative exponent) _____

1.35 $(p^4y^7)^3$ _____

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