ADULT LEARNING ACADEMY

PRE-ALGEBRA WORKBOOK

UNIT 7: ALGEBRA

Debbie Char and Lisa Whetstine
St. Louis Community College
First Version: 01/12/2015

MoHealthWINs

This workforce solution was funded by a grant awarded by the U.S. Department of Labor's Employment and Training Administration. The solution was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including any information on linked sites and including, but not limited to, accuracy of the information or its completeness, timeliness, usefulness, adequacy, continued availability, or ownership.

Unless otherwise noted this MoHealthWINs material by St. Louis Community College is licensed under a Creative Commons Attribution 4.0 International License.

Adult Learning Academy
Pre-Algebra Workbook

UNIT 7: ALGEBRA

LEARNING OBJECTIVES

1. **Variables and Expressions:**
   - ☐ Differentiate between constants and variables; represent variables with letters, and identify like terms
   - ☐ Understand the difference between an expression and an equation
   - ☐ Simplify and evaluate algebraic expressions involving variables; distribute and combine like terms
   - ☐ Translate phrases into algebraic expressions and equations
   - ☐ Write expressions to represent area and perimeter of rectangles

2. **Equations:**
   - ☐ Use mathematical properties to solve basic linear equations involving a single variable
   - ☐ Check solutions by plugging answers into the original equation and evaluating each side of the equation
   - ☐ Solve one and two-step equations, including those involving fractions
   - ☐ Solve multi-step equations, including those involving distribution, and variables on both sides of the equation
   - ☐ Check solutions, by plugging answers into the original equations

3. **Word Problems:**
   - ☐ Set up and solve word problems involving direct translations, including applications to the healthcare industry

Topic	Website	Videos	Exercises
Variables and Expressions	www.khanacademy.org	Why All the Letters in Algebra?	Evaluating Expressions in 1 Var.
		What is a variable?	Combining Like Terms
		Why aren't we using the mult sign?	Comb. Like Terms w/Distribution
		Variables, Expressions, and equations	Writing Expressions
		Example: Evaluating an expression	
		Combining Like Terms	
		Comb. Like Terms & Distributive Prop	
		Combining Like Terms 1	
		Combining Like Terms 2	
Solving 1-step equations	www.khanacademy.org	Why do the same thing to both sides?	One-step Equation Intuition
		Simple equations	One-step Equations
		Representing a relationship w/ equation	One-step equations w/ multipli.
		One-step equation intuition	Equations w/ Var. on both sides
		1-step eq. intuition exercise intro	Worksheets: Solving Equations
		Solving one-step equations	
		Solving one-step equations 2	
		One-step Equations	
		Add/Sub the same thing from both sides	
		Intuition why we divide both sides	
Solving 2-step equations	www.khanacademy.org	Why we do the same... 2-step equations	Two-step equations
		Why we do the same... Multip-step	Multi-step equations w/ distrib.
		Two-step equations	Worksheets: Solving Equations
		Variables on both sides	
		Ex. 1 Variables on both sides	
		Ex. 2 Variables on both sides	
		Solving Equations w/ Distributive Prop	
		Ex. 1 Distributive Property to Simplify	
		Ex. 3 Distributive Property to Simplify	

Topic	Website	Videos	Exercises
Two-Step	http://www.youtube.com/watch?v=KBpNLjiv8pk		
Combining like terms	http://www.youtube.com/watch?v=fXD4DjSyoyo		
Variable on each side	http://www.youtube.com/watch?v=gQdH5PKWrPQ		
Distributive Property	http://www.youtube.com/watch?v=XfaWLVLfeJM		
Unit 7 Review Flashcards	www.stlcc.edu	Powerpoint on Blackboard	
Compass Review	http://www.hostos.cuny.edu/oaa/compass/pre-alg_prac7.htm		Radicals

MoHealthWINs

This workforce *solution was funded by a grant awarded by the U.S. Department of Labor's Employment and Training Administration. The solution* was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including any information on linked sites and including, but not limited to, accuracy of the information or its completeness, timeliness, usefulness, adequacy, continued availability, or ownership.

Unless otherwise noted this MoHealthWINs material by St. Louis Community College is licensed under a Creative Commons Attribution 4.0 International License.

$5x + 3x$

$5x - 3x$

$3x - 5x$

$x + x$

$x - x$

$x \square x$

$x \div x$

$x + y$

$3x + 3y + 5x - y$

$5(x - 2)$

$3(x + 1)$

$5(x - 1) + 3(x + 2)$

$3x + 5 - (2x + 1)$

$3x + 5 - (2x - 1)$

$3x + 5(2x - 1)$

$3x - 5(2x - 1)$

$7 - 3(2x - 1)$

$7 - 3(2x + 1)$

EXPRESSION (SIMPLIFY if possible)

$x + x + x$

$3(x - 4)$

$5x - x$

$2 - x$

$x - 5 - 3$

$7 - 2(x + 1)$

$7 - 2(x - 1)$

$4x - \frac{1}{2}x$

EQUATION (SOLVE)

$x + x + x = 12$

$3(x - 4) = 5$

$5x - x = -20$

$2 - x = -6$

$x - 5 - 3 = 80$

$7 - 2(x + 1) = -1$

$7 - 2(x - 1) = -1$

$4x - \frac{1}{2}x = 7$

1) x + 3 = 15

2) x – 4 = 20

3) 6y = 48

4) $\frac{a}{3} = 12$

5) w + 100 = – 300

6) x – 12 = -20

7) -6y = 48

8) $\frac{a}{3} = -9$

9) -5 = x + 4

10) 5x = 7

11) ½ x = 12

12) ¾ x = 18

13) 7x = 7

14) $x - \frac{1}{2} = \frac{3}{2}$

15) -x = -7

16) 5x = 0

1) $2x + 1 = 7$

2) $3x - 1 = 11$

3) $-2x + 1 = 9$

4) $-5x - 1 = 9$

5) $5 + 3x = 17$

6) $7 - 3x = 13$

7) $7 = 5 + 2x$

8) $10 - 3x = 13$

9) $\frac{x+4}{3} = 10$

10) $\frac{x-7}{5} = 2$

11) $-4a + 2 = 2$

12) $\frac{w}{3} - 10$

1) $x + 3x = 12$

2) $5x - 3x + 2 = 12$

3) $3x - 5x + 2 = 12$

4) $5(x - 2) = 20$

5) $3(x + 1) = 15$

6) $-2(x + 4) = 16$

7) $3x = x + 4$

8) $4x = 2x + 10$

9) $-5x + 3 = -4x$

10) $x - 5 = 2x$

11) $2(x + 1) = x - 3$

12) $-2(x + 1) = 3x - 7$

I. Scenario: A baby weighed 7 pounds at birth. How much would she weigh if...

...she gained 2 pounds from her birth weight? _____

... she lost 2 pounds from her birth weight? _____

... she doubled her birth weight? _____

... she weighed only half her birth weight? _____

... her weight stayed the same as her birth weight? _____

Now we'll generalize to any baby: a baby weighed **X** pounds at birth. Match each algebraic expression with its description in words:

The baby gained 2 pounds.	X – 2
The baby lost 2 pounds.	X
The baby doubled her birth weight.	X + 2
The baby weighs only half of what she did at birth.	2X
The baby's weight stayed the same as her birth weight.	X ÷ 2

****

II. Scenario: A patient's initial pulse was X beats per minute. Write an algebraic expression for the patient's pulse for each description below.

a) The patient's pulse dropped by 5 beats. _____

b) The patient's pulse rose by 5 beats. _____

c) The patient's pulse doubled. _____

d) The patient's pulse is only half as fast as it was originally. _____

e) The patient's pulse is 30 less than it was originally. _____

f) The patient's pulse is 30 greater than it was originally. _____

III. Scenario: Aisha is A years old. Bakir is B years old. Write an algebraic expression for each description:

a) Aisha's age next year: _____

b) Bakir's age two years ago: _____

c) Aisha's age in 10 years: _____

d) The sum of Aisha's and Bakir's ages: _____

e) Twice Aisha's age: _____

f) Half of Bakir's age: _____

g) The mean (average) of Aisha's and Bakir's ages: _____

h) If A > B, who is older? _____ How much older? _____

Using the variable A to represent Aisha's age and the variable B to represent Bakir's age, write an EQUATION for each description (use an = sign!). Then solve the equation!

i) In three years, Aisha will be 21. How old is she now?

j) Five years ago, Bakir was 15. How old is he now?

k) Twice Aisha's age is 48. How old is she?

l) Half of Bakir's age is 12. How old is he?

m) If you double Aisha's age and add 5, you get 35. How old is she?

n) Aisha is three years older than Bakir. The sum of their ages is 23. How old are they?

o) Aisha is twice as old as Bakir. The sum of their ages is 30. How old are they?

IV. Write an equation and solve:

a) Callie has 3 more patients to care for than Walter does. Walter has 5 patients. How many does Callie have?

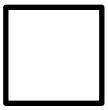
b) The perimeter of the rectangular operating room is 170 feet. The length is 5 feet more than the width. What are the dimensions of the operating room?

c) The perimeter of the rectangular staff lounge is 150 feet. The length is twice the width. What are the dimensions of the lounge?

d) Insurance will pay half of the cost of the operation, after the patient pays the $100 deductible. The operation costs $1500. How much will insurance pay?

****

V**. Graphic Practice**: Write an expression for the perimeter and the area of each.

X inches 
X inches

Perimeter: _____

Area: _____

X feet
X + 3 feet

Perimeter: _____

Area: _____

X miles
2X miles

Perimeter: _____

Area: _____