ADULT LEARNING ACADEMY

PRE-ALGEBRA WORKBOOK

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

MoHealthWINs

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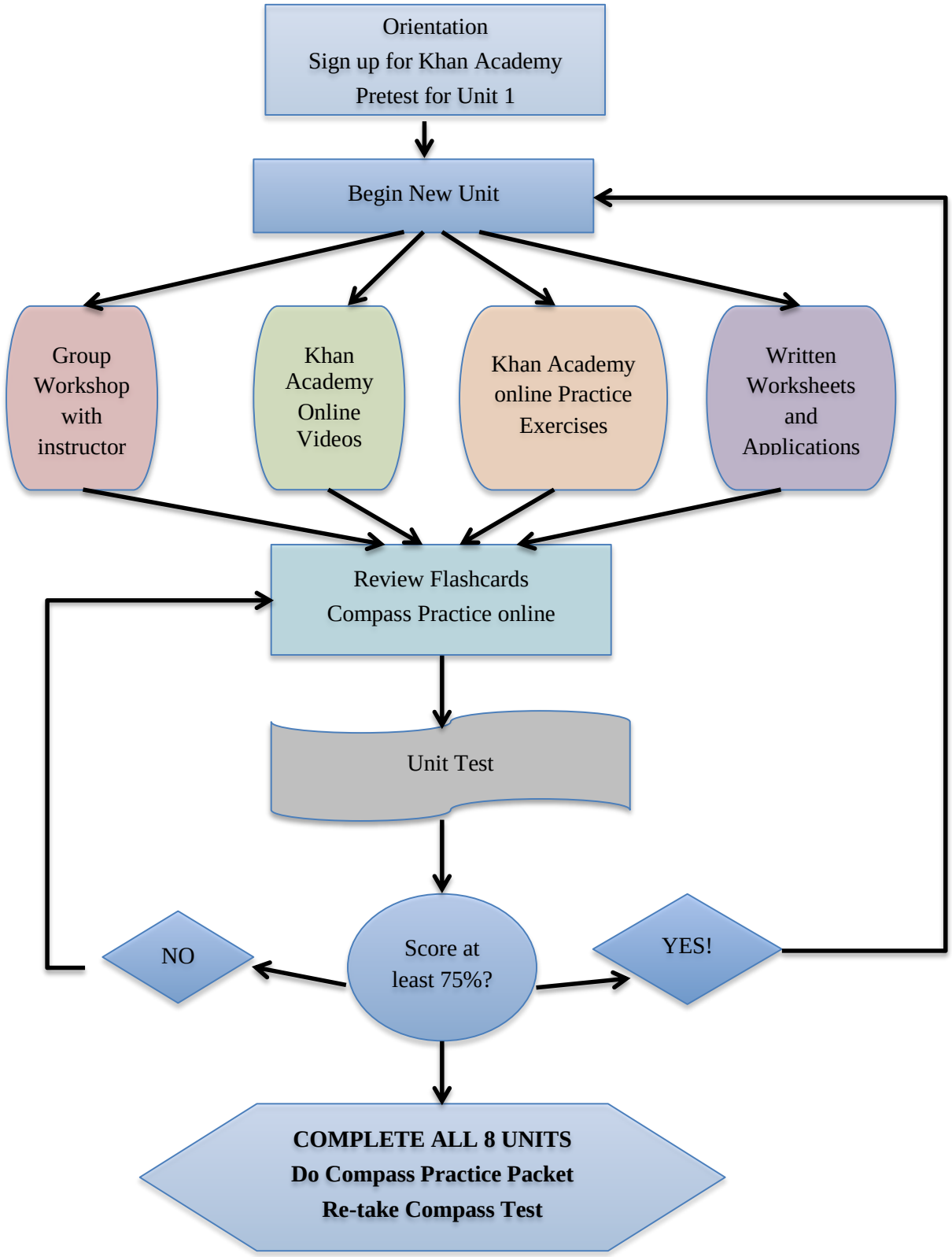
Adult Learning Academy
Pre-Algebra Workbook
STUDENT PROGRESS SHEET

Name: _____ Date started: _____

	DATE	SCORE
Unit 1: Operations on Whole numbers, average, military time		
Unit 2: Operations on Fractions		
Unit 3: Operations on Decimals		
Unit 4: Ratios and Proportions		
Unit 5: Percent		
Unit 6: Operations on Integers		
Unit 7: Variables, expressions, and equations		
Unit 8: The Metric System		
Retake Compass Test		

Adult Learning Academy
Pre-Algebra Workbook
COURSE FLOWCHART



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Pre-Algebra Workbook
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Unit 3: Decimals

Unit 4: Ratios & Proportions

Unit 5: Percentages

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Unit 8: The Metric System

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UNIT 1: WHOLE NUMBERS

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UNIT 1: WHOLE NUMBERS

LEARNING OBJECTIVES

1. **Place Value:**
   - ☐ Write and describe whole numbers up to billions
   - ☐ Order and compare whole numbers
   - ☐ Round whole numbers to the correct place value
2. **Operations with Whole Numbers:**
   - ☐ Add multi-digit whole numbers, with carrying
   - ☐ Subtract multi-digit whole numbers, with borrowing
   - ☐ Multiply multi-digit whole numbers, with carrying
   - ☐ Divide multi-digit whole numbers, with remainders
   - ☐ Follow order of operations rules when performing calculations
3. **Factors and Multiples:**
   - ☐ List the factors and multiples of whole numbers
   - ☐ Identify the prime factors of whole numbers
4. **Averages:**
   - ☐ Find the mean, median and mode for a given set of numbers
5. **Military Time:**
   - ☐ Perform conversions between standard time (12-hour clock) and military time (24-hour clock)
6. **Word Problems:**
   - ☐ Solve basic word problems using whole number arithmetic, including those involving area and perimeter, and applications to transportation careers.

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Adult Learning Academy
Pre-Algebra Workbook
UNIT 1 VIDEO & EXERCISE LIST

MO HEALTH WINS

Topic	Website	Videos	Exercises
Place Value	www.khanacademy.org	Place Value 1	Place Value
		Place Value 2	
		Place Value 3	
Addition	www.khanacademy.org	Addition 4	4-digit addition with carrying
Subtraction	www.khanacademy.org	Level 4 Subtraction	Subtraction with borrowing
			4-digit subtraction w/ borrowing
Multiplication	www.khanacademy.org	Multiplication 2: Mult. Tables	Basic Multiplication
		Example: Two-digit multiplication	Multiplication with Carrying
		Example: 2-digit times 2-digit	Multiplying 3 digits by 2 digits
			Multi-digit multiplication
Division	www.khanacademy.org	Division 2	Basic Division
		Ex: Expressing Division in Multiple Ways	Mult & Div Word Problems
Dividing by Zero	http://www.youtube.com/watch?v=2bjYoya_inQ		
Symbols and Properties	www.khanacademy.org	Commutative Law of Addition	Properties of Numbers 1
		Commutative Law of Multiplication	Distributive Property
		Distributive Property	
Greater Than (dots tech.)	http://www.youtube.com/watch?v=KHJyNzGGYLI		
	www.stlcc.edu	Blackboard Powerpoint	"Inequalities Game"
Factors and Multiples	www.khanacademy.org	Divisibility Tests for 2, 3, ...	Divisibility Tests
		Recognizing Divisibility	Divisibility 0.5
		Finding Factors of a number	Prime Numbers
		Prime Numbers	Composite Numbers
		Recognizing Prime Numbers	Prime Factorization
		Prime Factorization	Least Common Multiple
		Least Common Multiple (LCM)	Worksheet: Factors and multiples

Topic	Website	Videos	Exercises
Rounding Whole Numbers	www.khanacademy.org	Rounding Whole Numbers 1	Rounding Whole Numbers
		Rounding Whole Numbers 2	
		Rounding Whole Numbers 3	
Order of Operations	www.khanacademy.org	Introduction to Order of Operations	Order of Operations
		Order of Operations 1	Worksheet: Order of Operations
		More complicated Order of op ex.	
Military Time	http://www.youtube.com/watch?v=-Rf1qtdk5ag		Worksheet: Military Time
Averages	www.khanacademy.org	Statistics Intro:Mean, Median, Mode	Mean, Median, and Mode
		Example: Finding Mean, Med, Mode	Average Word Problems
Review of Unit 1	www.stlcc.edu	Blackboard Powerpoint	"Unit 1 Review Flashcards"
Compass Practice	http://www.hostos.cuny.edu/oaa/compass/pre-alg_prac13.htm		Measures of Central Tendency

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MathATube.com

Place Value Chart

Hundred-billions	Ten-billions	Billions	Hundred-millions	Ten-millions	Millions	Hundred-thousands	Ten-thousands	Thousands	Hundreds	Tens	Ones

Write the words for these numbers:

3,257,012

507,392,005

Write the numbers:

ten billion five hundred million twenty-thousand three

four million four thousand forty

Complete the following table.

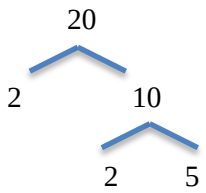
You may use the completed table during your unit tests.

	0	1	2	3	4	5	6	7	8	9	10	11	12
0													
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													

The **FACTORS** of 20 are 1, 2, 4, 5, 10, and 20.

The **MULTIPLES** of 20 are 20, 40, 60, 80, 100, 120, etc.

If we break 20 down into **PRIME FACTORS**, 20 = 2 x 2 x 5, or 2^2 x 5



****

What are the FACTORS of 12? _____

What are the MULTIPLES of 12? _____

Break 12 into its PRIME FACTORS by drawing a factor tree like the one above:

****

What are the FACTORS of 100? _____

What are the MULTIPLES OF 100? _____

Break 100 into its PRIME FACTORS by drawing a factor tree:

****

What are the FACTORS of 30? _____

What are the MULTIPLES of 30? _____

Break 30 into its PRIME FACTORS by drawing a factor tree:

Divisibility Rules Chart

A number is divisible by. . .		Divisible	Not Divisible
2	if the last digit is even (0, 2, 4, 6, or 8).	3,978	4,975
3	if the sum of the digits is divisible by 3.	315	139
4	if the last two digits form a number divisible by 4.	8,512	7,518
5	if the last digit is 0 or 5.	14,975	10,978
6	if the number is divisible by both 2 and 3	48	20
9	if the sum of the digits is divisible by 9.	711	93
10	if the last digit is 0.	15,990	10,536

Is the number 3,647,541 divisible by 2? 3? 4? 5? 6? 9? 10?

Simplify each expression. Each answer in the first column should match an answer in the second column.

$(8 - 5)^2$	$10 \div 10 \times 10$
$100 - 9(6 + 4)$	$(10 - 10)^5$
$100 \div 10 \bullet 2$	$5^2 - 6$
$10 - 5 \bullet 2$	$10 - 4 + 3$
$3^2 - 2^3$	$2 \times 5^2 - 1$
$5 + 2(10 - 3)$	$10^2 \div (10 \times 10)$
$(3 + 4)^2$	$20(10 - (4 + 5))$

1.6 Order of Operations Practice

A. Carefully evaluate each expression, noticing similarities and differences within pairs of problems:

1. $2^3 + 10 \bullet 3 - 16 \div (4 - 2)$

2. $2^3 + 10 \bullet 3 - 16 \div 4 - 2$

3. $63 - 5[9 - 4(10 - 8)]$

4. $63 - 5[(9 - 4)(10 - 8)]$

5. $(5 + 3)^2$

6. $5^2 + 3^2$

B. Insert parentheses (if necessary) to make the expression equal the given value:

Make this equal 29:	Make this equal 5:	Make this equal 30:
$36 - 24 \div 3 + 1$	$36 - 24 \div 3 + 1$	$36 - 24 \div 3 + 1$

Fill in the table so that each time is shown both ways. The first row is done for you.

Standard Time	Military Time
1:00 pm	1300
3:15 am	
	2310
5:27 pm	
	0900
7:30 am	
	1439
9:38 pm	
	1321
1:10 am	

1.8 HEALTHCARE APPLICATIONS

Scenario 1: 27-month-old Jasmine arrives at the hospital where you work at 1:15 pm with a fever, diarrhea, and vomiting. She has not eaten since 9:30 am.

a) How will you record Jasmine's time of arrival in her medical chart? _____

b) How will you record the time of Jasmine's last meal in her medical chart? _____

c) How old is Jasmine in years and months? _____

****

You take Jasmine's vital signs every hour. Her pulse is 125 when she arrives, but as she rests, it goes down to 97, 89, 86, and then 80.

d) What is Jasmine's mean heart rate? _____

e) What is Jasmine's median heart rate? _____

f) Is there a mode for Jasmine's heart rate? Why or why not? _____

****

Jasmine is given intravenous fluid. You monitor her body's intake and output and record them on her chart. Fill in the total of each:

	INTAKE (cubic cm)		OUTPUT (cubic cm)
Oral:	129	Urine:	237
Oral:	94	Emesis:	105
IV fluid:	250	Diarrhea:	128
TOTAL:		**TOTAL:**	

g) Write the < or > symbol in the blank: Jasmine's intake _____ Jasmine's output

****

At Jasmine's checkup last month, she weighed 14,105 grams.

h) Round her weight to the nearest thousand: _____

i) Now she weighs 13,249 grams. How much weight did Jasmine lose? _____

j) For her height, Jasmine should weigh about 15, 000 grams. How much would she need to gain in order to weigh this much? _____

Scenario I (continued):

k) Jasmine eats 12 meals while she is at the hospital. Each meal has about 450 calories.

She also eats 6 snacks with about 205 calories each. What is her total caloric intake during her hospital stay? _____

****

Jasmine's parents go to the hospital gift shop and buy her two puzzles at $4 each, three books at $7 each, and a nightgown for $14.

l) How much do they spend?

m) Jasmine's dad pays for the gifts with a $50 bill. How much change does he get?

****

Jasmine is in the hospital for three days. The total bill is $10,482.

n) If each day costs the same, how much is the bill for each day?

o) After her parents pay the $500 deductible, how much is left on the bill?

p) The insurance company agrees to pay $7500. Now how much is left on the bill?

q) Jasmine's parents will pay $50 per month until the rest of the bill is paid off. How long will it take?

Scenario II: The waiting room for a clinic where you will be working is a rectangle measuring 20 feet by 34 feet.

34 feet

a) You need to order a rail to go around the edge of the room that patients with walking difficulties can grab onto if necessary. How many feet of railing should you order?

(*Note: You are finding the PERIMETER of the rectangle. You can find it by adding up the lengths of ALL four of the sides*.)

b) Railing costs $39 per foot. How much will your rail cost?

c) You also need to order sound-absorbent ceiling tiles to create a quiet, calm atmosphere for your patients. The tiles are squares, 1 foot by 1 foot. How many of them will you need?

(*Note: You are finding the AREA of a rectangle. You can find it by multiplying the length of the rectangle by its width. Area is always measured in square units.)*

d) The tiles cost $17 per square foot. How much will your ceiling tiles cost?

e) A friend doing a similar project paid $10,800 for 600 square feet of ceiling tile using another company. Did your friend get a better deal? Explain why or why not.

f) What is the total cost for your ceiling tiles and railing? _____

g) If you pay this in three equal payments, how much will each payment be?

****

III. FACT: An average heart beats 100,000 times a day. Over a 70-year life span, how many times will the heart beat?

Scenario IV: You are working in patient care. These four patients need the same medication. Fill in the daily total for each patient, and the total amount of medicine you'll need to give to the group in a 24-hour period.

Patient	Dose	Frequency	Patient's Daily Total
Anderson	250 milligrams	3 times a day	
Brown	50 milligrams	6 times a day	
Chen	375 milligrams	2 times a day	
Davis	100 milligrams	4 times a day	

24-hour TOTAL: _____

a) Who gets the most medicine in a 24-hour period? _____

b) Who gets the least medicine in a 24-hour period? _____

****

c) Your co-worker's patient, Elderberry, gets a total of 450 milligrams each day, spread

over 6 doses. How many milligrams does Elderberry get per dose? _____

****

d) In a 24-hour day, how many hours apart are the doses for each patient?

Anderson gets medicine every_____ hours. Brown gets medicine every ____ hours.

Chen gets medicine every _____ hours. Davis gets medicine every _____ hours.

****

e) You give ALL four of your patients a dose of their medicine at 0900. Use military time to write the time of the next dose for each patient:

Anderson gets his next dose at _____ Brown gets her next dose at _____

Chen gets his next dose at _____ Davis gets her next dose at _____

****

f) If you give ALL four of your patients a dose of medicine at 0900, when will they all get medicine at the SAME TIME again? Show your thinking.

Scenario V: You need to decide which medical chart software will be a better deal for your office. Three companies are bidding for your business. Here are their quotes:

Company	Initial Purchase Price	Monthly Service Cost	Total for a one year contract
Healthtech	$ 5000	$ 250	
AccuHealth	$ 4350	$ 275	
ChartCare	$ 3900	$ 319	

Calculate the first-year cost of each company's product. Which company is the least expensive?

****

VI. Graphic Practice:

a) Does this patient have a fever? (Note: *Normal body temperature is 37 degrees Celcius*)

****

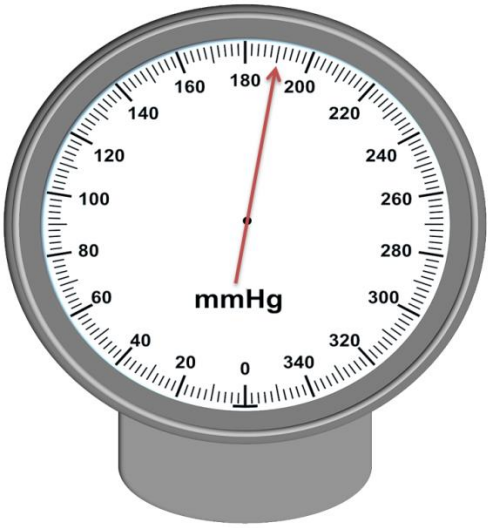
b) How far has this car driven? Write your answer in WORDS!

Graphic practice (continued):

c) How fast is this car going? Your answer will be labeled "miles per hour".

****

d) What is this blood pressure reading?



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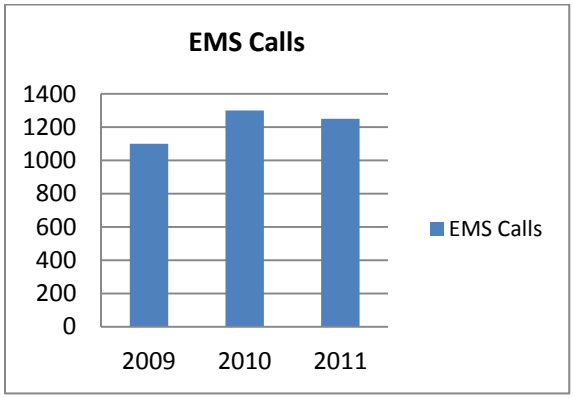
e) The following bar graph shows the number of calls to Emergency Medical Services in Knoxville, Iowa, in particular years:



Approximately how many calls were received in 2009?

Approximately how many calls were received in 2010?

About how many more EMS calls were made in 2010 than in 2009?

RESOURCES

Images used in VI. Graphic Practice

a) medical thermometer is available in the public domain

b) 151517 by Scott (Skippy) is licensed under CC BY-SA 2.0; Modifications: Image lightened, red square added

c) Free Speedometer Vector by 123freevectors.com is licensed under CC BY-SA 3.0

d) Blood Pressure Gauge is a derivative of Blood Pressure Diagnostics Sphygmomanometer which is available in the public domain under CC0 Public Domain

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UNIT 2: FRACTIONS

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UNIT 2: FRACTIONS

LEARNING OBJECTIVES

1. **Understanding & Identification:**
   - ☐ Recognize proper fractions, improper fractions, and mixed numbers
   - ☐ Identify the numerator and denominator of fractions; understand how they relate to part and whole
   - ☐ Plot Fractions on a number line
2. **Conversions & Comparisons:**
   - ☐ Recognize and write equivalent fractions
   - ☐ Reduce fractions and simplify to lowest possible terms
   - ☐ Convert between improper fractions and mixed numbers
   - ☐ Rewrite unlike fractions, using the lowest common denominator (LCD)
   - ☐ Describe, order and compare fractions
3. **Operations with Like and Unlike Fractions:**
   - ☐ Add fractions
   - ☐ Subtract Fractions
   - ☐ Multiply Fractions
   - ☐ Divide Fractions
   - ☐ Follow order of operations rules when performing calculations with fractions
4. **Operations with Mixed Numbers:**
   - ☐ Add mixed numbers
   - ☐ Subtract mixed numbers
   - ☐ Multiply mixed numbers
   - ☐ Divide mixed numbers
   - ☐ Follow order of operations rules when performing operations involving mixed number
5. **Word Problems:**
   - ☐ Solve basic word problems that use fractions and mixed numbers, including applications to the healthcare industry, and those involving area and perimeter

Topic	Website	Videos	Exercises
Understanding Fractions	www.khanacademy.org	Numerator, Denominator of a Fraction	Recognizing Fractions 0.5
		Identifying Fraction Parts	Recognizing Fractions
			Fractions on the Number line 1
			Fraction Word Problems 1
Equivalent Fractions	www.khanacademy.org	Equivalent Fractions	Simplifying Fractions
		Equivalent Fractions Example	Comparing Fractions 1
		Comparing Fractions	Equivalent Fractions
		Fractions in Lowest Terms	Equivalent Fractions 2
		Finding Common Denominators	Comparing Fractions 2
		Ordering Fractions	
		Comparing Fractions 2	
Add, Subtract Fractions	www.khanacademy.org	Adding Fractions w/ Like Denominators	Adding Frac. w/ Common Denom
		Subtracting Fractions	Subtract Frac. w/Common Denom
		Adding and Subtracting Fractions	Adding Fractions
		Adding Fractions w/ unlike denom	Subtracting Fractions
		Adding Fractions Ex. 1	Adding and Subtracting Fractions
Multiplying Fractions	www.khanacademy.org	Multiplying Fractions	Multiplying Fractions 0.5
		Multiplying Fractions Word Problem	Multip. Fractions Word Problems
Dividing Fractions	www.khanacademy.org	Dividing Fractions	Dividing Fractions 0.5
		Dividing Fractions Example	Dividing Fractions Word Problems
		Dividing Fractions Word Problems	
Mixed Numbers and	www.khanacademy.org	Proper and Improper Fractions	Fractions on the Number Line 2
Improper Fractions		Comparing Imp Frac & Mixed Numbers	Comparing Imp Frac & Mixed No.
		Mixed Numbers and Improper Frac.	Converting Mixed Numbers & I.F.
		Changing a Mixed Number to Imp Frac	

		Changing an Imp Fract to a Mixed No.	
		Ordering Imp. Fractions & Mixed No.	
Topic	**Website**	**Videos**	**Exercises**
Mixed Number Add & Sub	www.khanacademy.org	Adding Mixed Numbers	Add/Subt Mixed Numbers 0.5
		Adding Mixed Nos. w/ Unlike Denom	Add/Subt Mixed Numbers 1
		Adding Mixed Nos. Word Problem	
		Subtracting Mixed Numbers	
		Subtracting Mixed Numbers 2	
		Subtracting Mixed Numbers Word Prob	
Mixed Number Mult & Div		Multiplying Fractions and Mixed Nos.	Multiplying Mixed Numbers 1
		Multiplying Mixed Numbers	
		Dividing Mixed Numbers	
		Dividing Mixed Numbers and Fractions	
Review of Unit 2	www.stlcc.edu	Blackboard PowerPoint	"Unit 2 Review Flashcards"
Compass Practice	http://www.hostos.cuny.edu/oaa/compass/pre-alg_prac2.htm		Fractions

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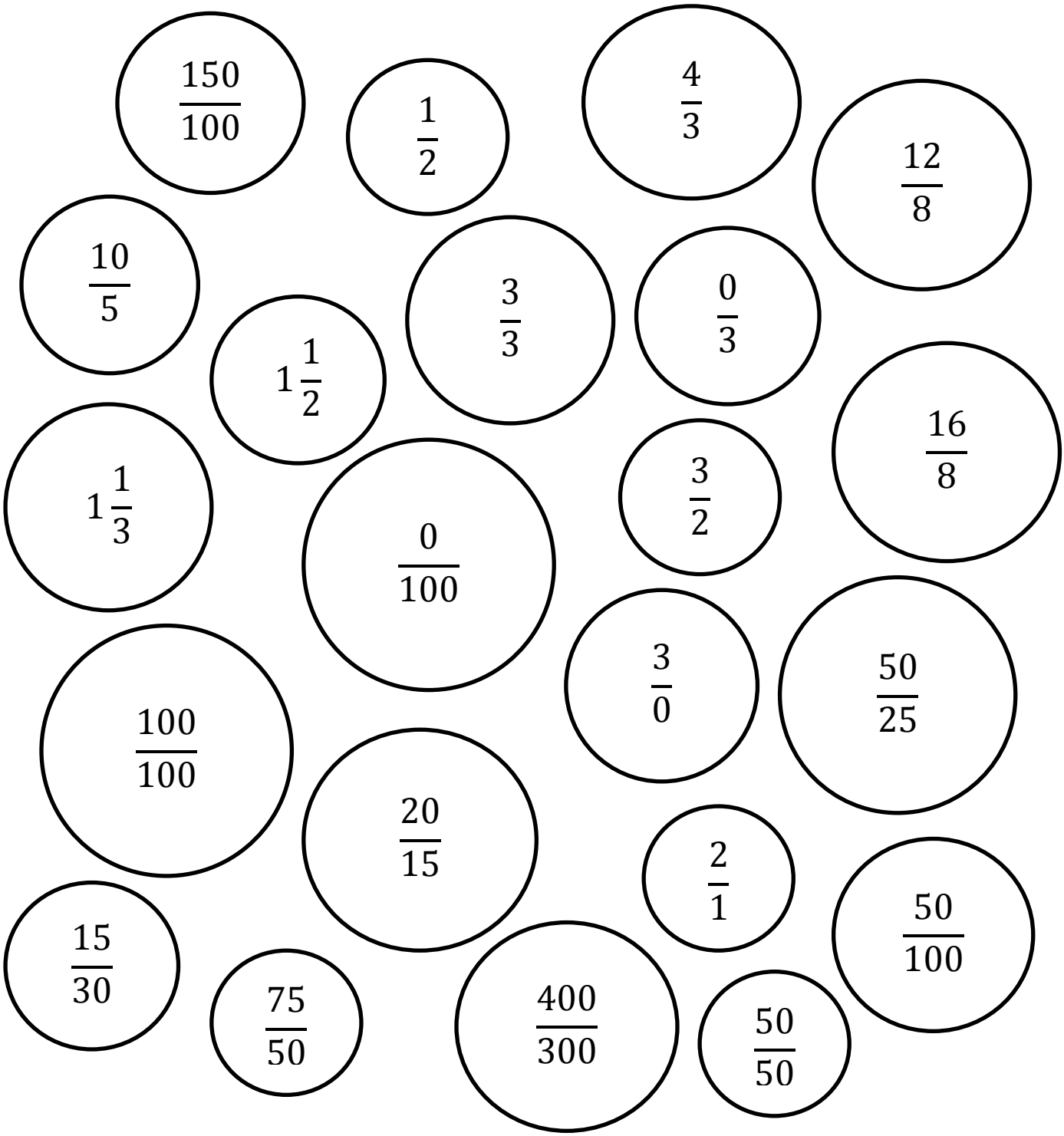
Write five fractions that are equivalent to each number:

$\frac{1}{2}$	$\frac{1}{4}$
$\frac{3}{4}$	0
1	2

To create equivalent fractions, M_____ the N_____ and the D_____ by the S_____ number. This is the same as multiplying the fraction by _____, which does not change its value.

Color all equivalent fractions the same color.



FRACTION RAP

When you're adding up or taking away fractions, don't be a hater!
Bottom number's got to be the same—COMMON DENOMINATOR!

Multiply fractions, no big problem
Top times top and bottom times bottom

Dividing fractions, easy as pie
Flip the second and multiply!

THE BIRTHDAY SONG:

You must have common denominators
You must have common denominators
To ADD or SUBTRACT,
You must have common denominators!

KFC

To Divide Fractions, remember... KFC!!

Keep the first fraction the same.

Flip the second fraction.

Change the division to multiplication.

1. Circle the GREATER number from each pair:

a) $\frac{1}{3}$ $\frac{1}{4}$

b) $\frac{3}{4}$ $\frac{4}{3}$

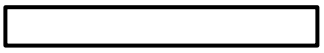
c) $\frac{7}{8}$ $\frac{6}{8}$

d) $\frac{11}{10}$ 1

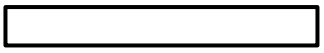
e) $\frac{1}{2}$ $\frac{3}{8}$

f) $\frac{5}{5}$ $\frac{5}{1}$

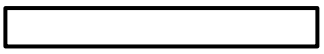
2. Color $\frac{1}{3}$ of the candy bar:



3. Color $\frac{2}{6}$ of the candy bar:



4. Color $\frac{1}{2}$ of the candy bar:



5. Cross out the fraction that is UNDEFINED:

$\frac{5}{0}$ $\frac{0}{5}$

6. What is half of $\frac{2}{3}$?

7. Circle ALL the fractions that equal one half:

$\frac{2}{1}$ $\frac{1}{2}$ $\frac{8}{16}$ $\frac{10}{20}$

8. Simplify. Write your answer in simplest form:

a) $\frac{1}{4} + \frac{3}{4}$

b) $\frac{2}{3} - \frac{1}{4}$

c) $\frac{2}{3} \cdot \frac{3}{4}$

d) $\frac{2}{3} \div \frac{3}{4}$

e) $1\frac{3}{4} + 2\frac{1}{3}$

f) $1\frac{3}{4} \times 2\frac{1}{3}$

g) $1\frac{3}{4} \div 2\frac{1}{3}$

Grew or shrunk?	Grew or shrunk?
$20 \times \frac{1}{10} =$ _____	$20 \div \frac{1}{10} =$ _____
$20 \times \frac{1}{2} =$ _____	$20 \div \frac{1}{2} =$ _____
$20 \times \frac{3}{4} =$ _____	$20 \div \frac{3}{4} =$ _____
$20 \times \frac{5}{5} =$ _____	$20 \div \frac{5}{5} =$ _____
$20 \times \frac{5}{4} =$ _____	$20 \div \frac{5}{4} =$ _____

OBSERVATIONS:

When you multiply a number by a fraction < 1, it _____

When you divide a number by a fraction < 1, it _____

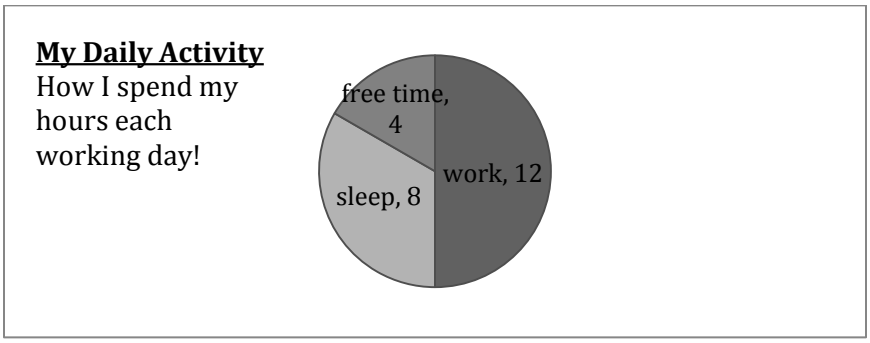
When you multiply a number by 1, it _____

When you divide a number by 1, it _____

When you multiply a number by a fraction > 1, it _____

When you divide a number by a fraction > 1, it _____

Scenario I: On the days when you are working as a CNA, this graph shows how your time breaks down for a 24-hour day:



a) Write each fraction and simplify:

What fraction of your time do you spend working?

What fraction of your time do you spend sleeping?

What fraction of your time do you have free?

Add the three fractions above. What is the total? Why does this total make sense?

****

b) According to the graph, what fraction of the day are you AWAKE?

****

c) What fraction of your DAY OFF do you spend working?

****

d) Your friend spends $\frac{1}{6}$ of her day at work. How long is her shift?

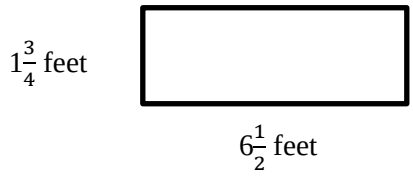
****

e) Your friend has $\frac{1}{5}$ of her day for free time. Who has more free time—you or her?

****

f) You spend $\frac{2}{3}$ of your work time doing direct patient care. How many hours is this?

Scenario II: The storage shelf at work measures $6\frac{1}{2}$ feet by $1\frac{3}{4}$ feet.



a) You decide to attach a rim to go around the edge of the shelf to keep items from falling off. How many feet of rim should you order?

(*Note: You are finding the PERIMETER of the rectangle. You can find it by adding up the lengths of ALL four of the sides*.)

b) Rim material costs $4 per foot. How much will your rim cost?

c) You also choose to buy water-resistant shelf paper to protect the surface of the shelf. A roll of shelf paper covers 5 square feet. How many of rolls will you need?

(*Note: You are finding the AREA of a rectangle. You can find it by multiplying the length of the rectangle by its width. Area is always measured in square units.)*

****

III. FACT: Cigarette smoke contains 4,800 chemicals, 69 of which cause cancer.

a) What fraction of the chemicals in cigarette smoke are carcinogenic?

b) What fraction of the chemicals in cigarette smoke are non-carcinogenic?

Scenario IV: As a therapist's assistant, you need to make sure that patients get the exercise ordered by the therapist.

Your patient Fiona is supposed to get ¾ of an hour of exercise, 5 days per week. How much time should she spend exercising in a week?

This week, Fiona kept track of her hours of exercise in this table:

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
$\frac{3}{4}$	$\frac{1}{2}$	$\frac{2}{3}$	$\frac{1}{4}$	$1\frac{1}{2}$	0	0

How many hours did Fiona exercise this week?

How many *minutes* of exercise did Fiona get this week?

What fraction of Fiona's total exercise was done over the weekend?

Did Fiona get enough exercise this week? If not, how much more would she have needed to meet the therapist's recommendation?

What is the MEAN amount of time Fiona exercised each of the five weekdays? (Don't count the weekend!)

Fiona's best friend Sharona got half as much exercise as Fiona did this week. How many hours did Sharona exercise?

Scenario V: You are in charge of medication. Fill in the following table:

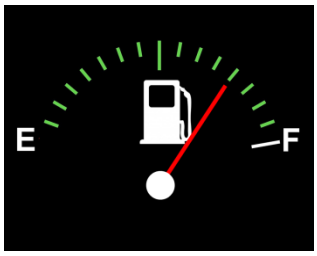
Patient Name	Number of Doses Per day	Number of Pills per dose	Total number of pills Per day
Foster	3	1 ½ tablets	
Grimes	7	¾ tablet	
Haike		1 ½ tablets	9 tablets
Iona		¾ tablet	6 ¾ tablets
Jones	5		17 ½ tablets
Koric	4		3 tablets

****

VI. Graphic Practice:

a) How much does the item weigh?

b) How full is the gas tank?



c) How long is the line segment?

Resources

Works used in VI. Graphic Practice

a) Fraction Scale by OER_Training is licensed under CC BY 4.0

b) Gas Gauge is a derivative of Fuel Gauge, which is available in the public domain under CC0 Public Domain

c) Line Segment is a derivative of 10cm ruler, which is available in the public domain

ADULT LEARNING ACADEMY

PRE-ALGEBRA WORKBOOK

UNIT 3: DECIMAL NUMBERS

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

MoHealthWINs

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Adult Learning Academy
Pre-Algebra Workbook

UNIT 3: DECIMAL NUMBERS

LEARNING OBJECTIVES

1. **Conceptualizing Decimals:**
   - ☐ Write and describe decimal numbers to ten-thousandths
   - ☐ Order and compare decimal numbers
   - ☐ Plot decimal numbers on a number line
   - ☐ Round decimal numbers to the correct place value

2. **Operations with Decimal Numbers:**
   - ☐ Add multi-digit decimal numbers, including carrying
   - ☐ Subtract multi-digit decimal numbers, including borrowing
   - ☐ Multiply multi-digit decimal numbers
   - ☐ Divide multi-digit decimal numbers
   - ☐ Multiply and divide decimal numbers by powers of ten
   - ☐ Follow order of operations rules when performing calculations with decimal numbers

3. **Conversions with Fractions:**
   - ☐ Convert Decimals to Fractions
   - ☐ Convert Fractions to Decimals

4. **Word Problems:**
   - ☐ Solve basic word problems using decimal number arithmetic, including those involving area and perimeter, and applications to the healthcare industry

Topic	Website	Videos	Exercises
Conceptualizing Decimals	www.khanacademy.org	Decimal Place Value	Understanding dec. place value
		Decimal Place Value 2	Decimals on the number line 1
		Comparing Decimals	Decimals on the number line 2
		Decimals on a Number Line	Converting Decimals to Frac. 1
		Points on a Number line	
		Decimals and Fractions	
Adding and Subt. Decimals	www.khanacademy.org	Adding Decimals	Adding Decimals 2
		Subtracting Decimals	Adding Decimals 0.5
		Subtracting Decimals Word Problem	Subtracting Decimals 0.5
			Subtracting Decimals
			Add/Sub Decimals Word Probs.
Multiplying Decimals	www.khanacademy.org	Multiplying Decimals	Multiplying Decimals
		Multiplying Decimals 3	Understanding Moving the decimal
		Multiplying a Decimal by a power of 10	
		Dividing a Decimal by a power of 10	
Dividing Decimals	www.khanacademy.org	Dividing Decimals	Dividing Decimals 0.5
		Dividing Decimals 2.1	Dividing Decimals 1
			Dividing Decimals 2

Topic	Website	Videos	Exercises
Converting Fractions to Dec	www.khanacademy.org	Converting Fractions to Decimals	Worksheet: Color the circles
		Converting Fractions to Decimals ex 1	
		Converting Fractions to Decimals ex 2	
Rounding Decimals	www.khanacademy.org	Rounding Decimals	Rounding numbers
		Estimation with Decimals	Estimation with Decimals
Review of Unit 3	www.stlcc.edu	Blackboard Powerpoint	"Unit 3 Review Flashcards"
Compass Practice	http://www.hostos.cuny.edu/oaa/compass/pre-alg_prac3.htm		Decimals

MoHealthWINs

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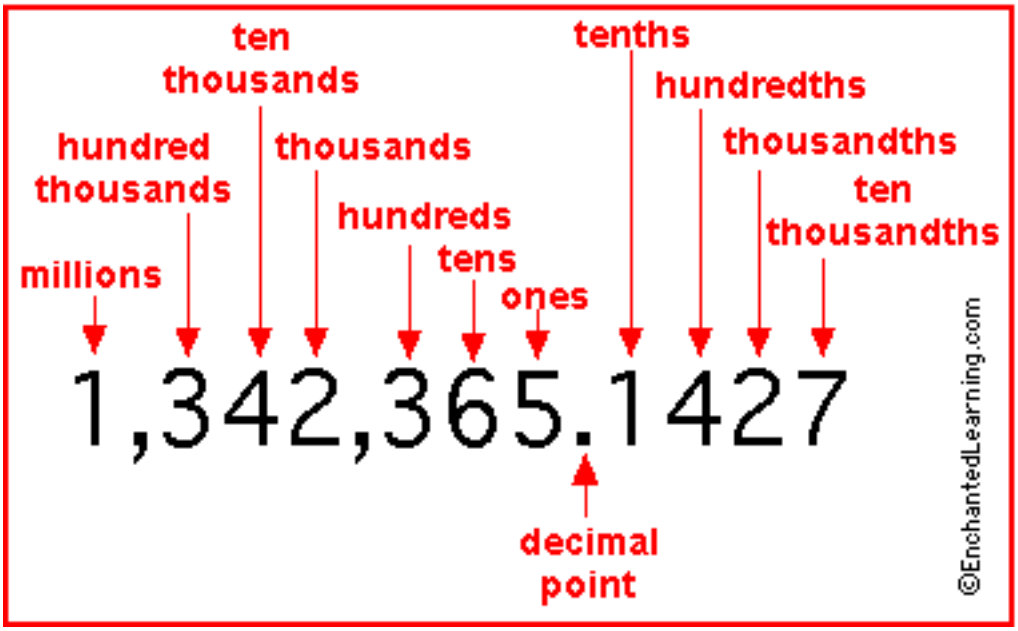
Place Value Chart including Decimals



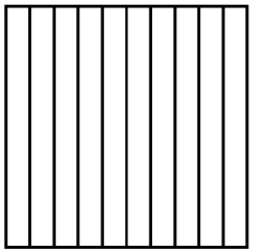
Song:
Happy Birthday

You must line up the decimal point,
You must line up the decimal point,
To ADD or SUBTRACT,
You must line up the decimal point!

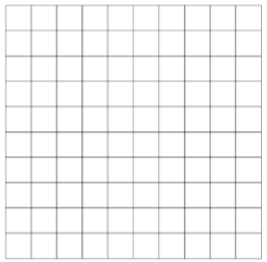
Shade the decimal numbers in the grids below. Compare the values of the numbers within each column.

Are these numbers the same or different? If different, which number is the biggest? Smallest?

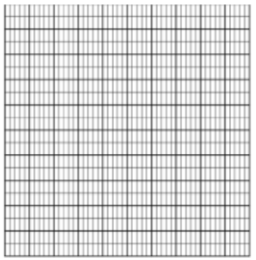
.6



.60

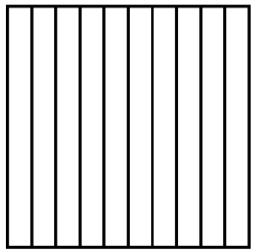


.600

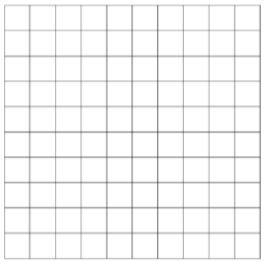


Are these numbers the same or different? If different, which number is the biggest? Smallest?

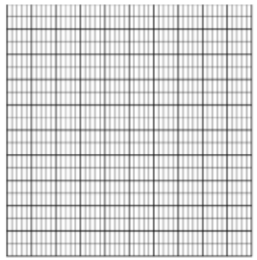
.4



.04

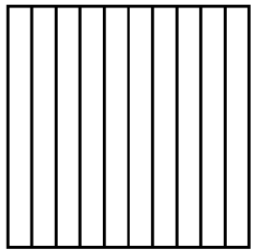


.004

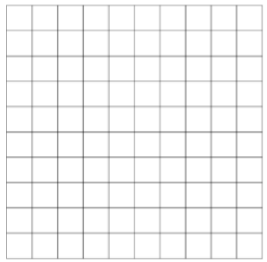


Are these numbers the same or different? If different, which number is the biggest? Smallest?

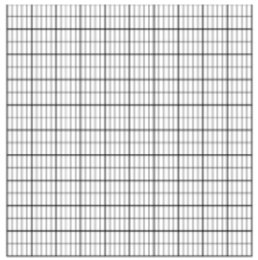
.3



.25



.205



Match the words with the correct numbers:

_____ 1. Fifty-six hundredths	A. .056
_____ 2. Fifty-six thousandths	B. 56,000
_____ 3. Fifty-six thousand	C. .56
_____ 4. Fifty and six hundredths	D. 5.06
_____ 5. Five hundred six thousandths	E. 50.06
_____ 6. Five and six hundredths	F. .506

7. Which number in the list above is the SMALLEST? _____

8. Which number is exactly the same as .56000? _____

9. Add together .56 + .506. What is the sum? _____

10. What is .56 - .506? The difference is _____

Grew or shrunk?	Grew or shrunk?
$20 \times .1 =$ _____	$20 \div .1 =$ _____
$20 \times .5 =$ _____	$20 \div .5 =$ _____
$20 \times .75 =$ _____	$20 \div .75 =$ _____
$20 \times 1.0 =$ _____	$20 \div 1.0 =$ _____
$20 \times 1.25 =$ _____	$20 \div 1.25 =$ _____

OBSERVATIONS:

When you multiply a number by a decimal < 1, it _____

When you divide a number by a decimal < 1, it _____

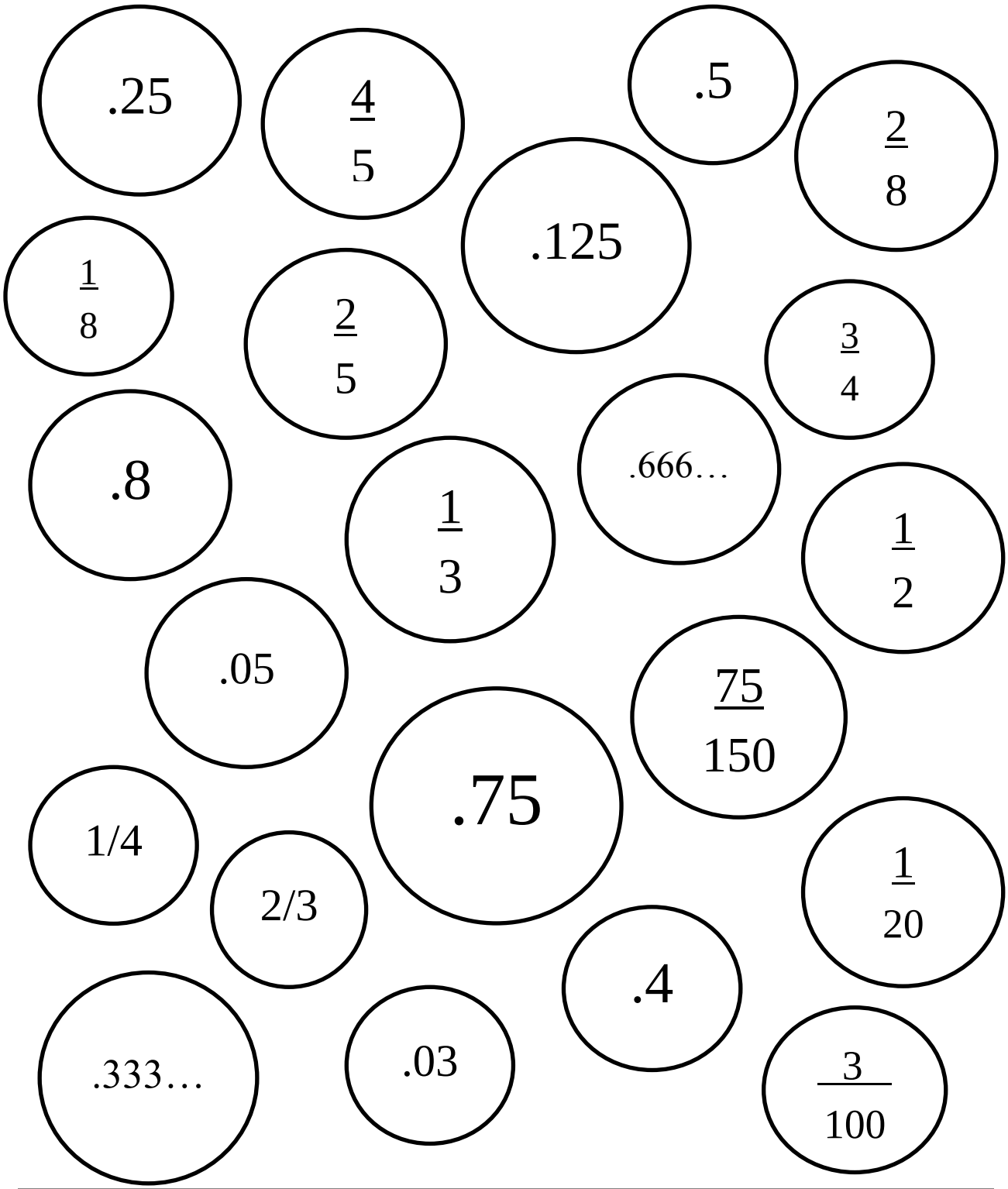
When you multiply a number by 1, it _____

When you divide a number by 1, it _____

When you multiply a number by a decimal > 1, it _____

When you divide a number by a decimal > 1, it _____

Color all equivalent fractions and decimals the same color.



Circle the larger number:

1. .507 or .51

2. .05 or .052

3. Write a number between 7.5 and 8.0:

4. Write a number between 7.5 and 7.6:

5. Write .07 as a fraction:

6. Write ½ as a decimal:

7. Add .99 + .1

8. Subtract .02 - .001

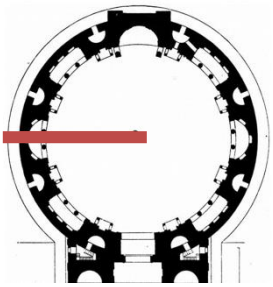
9. Multiply 3.5 x .1

10. Divide 3.5 ÷ .05

Scenario I: In 1957, Rochester Methodist Hospital built the first circular nursing unit. Each patient's room was the same distance from the nursing station in the center. Nurses could keep an eye on all of their patients at once and reach each patient quickly. This floor plan has been copied in hospitals all over the world.

Let's say that the center of the ward is 50.75 feet from the outer edge.

radius
50.75
feet



If you took a walk around the outer edge of the circular ward, how far would you walk?

(*Note: This measurement along the edge of a circle is called its* ***circumference****. To calculate the circumference of a circle, you can use the formula* $\boldsymbol{C = 2\pi r}$. *The number , pronounced "Pi", can be approximated as 3.14. To find the circumference, multiply 2 times π times the radius of the circle*).

****

The floor of this hospital unit needs to be treated with sealant for easy cleanup. How many square feet of floor are in the unit?

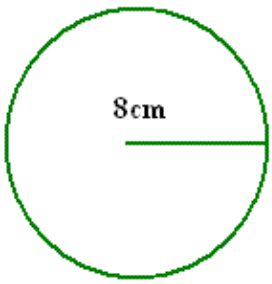
(*Note: This measurement of the inside surface of a circle is called its* ***area****. To calculate the area of a circle, you can use the formula* $\boldsymbol{A = \pi r^2}$. *Again, use 3.14 to approximate the number π. Square the radius by multiplying it by itself. Then multiply that result by π. Area is always measured in "square" units, even for a circle!)*

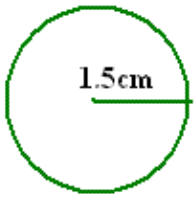
****

Calculate the circumference and the area of each circle below:

Circumference:

Area:





Circumference:

Area:

ALA Unit 3 (page 2)

Scenario II. Fill in the table for your patients'

medication needs for the day:

Patient	Number of grams of medicine per dose	Number of doses in 24 hours	Total medication in 24 hours
Zane	.25	8	
Yolanda	.5		1.5 grams
Xavier		4	3 grams
Walter	.25		.75 grams

****

Scenario III. A case of insulin syringes costs $ 12.69. A box of tongue depressors costs $15.75.

a) How much will 24 cases of insulin syringes cost?

b) There are 90 syringes in a case. How much does each syringe cost?

c) There are 500 tongue depressors in a box. How much does each individual tongue depressor cost?

d) You need to order 3 cases of syringes and 5 boxes of tongue depressors. How much will you pay?

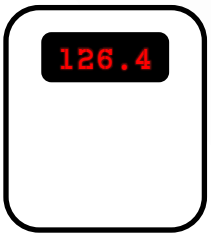
e) Another company offers 100 syringes for $13.50. Is this a better deal?

IV. Graphic Practice:

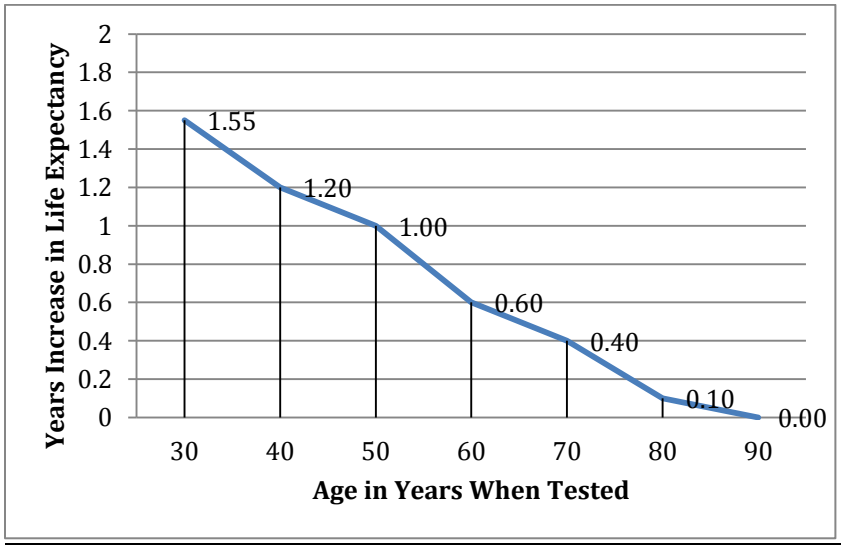
a) How many miles has this car driven? Notice that the 6 on the right has a white background. Write your answer in numbers and in words.

b) How many cubic centimeters (cc) of liquid are in the syringe?

c) Last checkup, this patient weighed 140 pounds. His current weight is shown on the scale below. How much weight did he lose?



d) The following line graph shows how screening for a disease increases life expectancy:



Approximate the increase in life expectancy if a person is tested at age 35.

Approximate the increase in life expectancy if a person is tested at age 60.

What is the **difference** between the two results you obtained above?

V: FACT: 7 out of every 100 men, as well as 1 out of every 1000 women, are color blind. Write each of these ratios as a decimal. Who is more prone to color blindness—men or women?

FACT: A marathon is 26.2 miles long. How long is a half-marathon?

****

VI. Graphic Practice

Blood Alcohol Level by Weight

Number of Drinks Consumed per Hour

Weight	1	2	3	4	5	6	7	8	9
100	.04	.08	.11	.15	.19	.23	.26	.30	.34
120	.03	.06	.09	.12	.16	.19	.22	.25	.28
140	.03	.05	.08	.11	.13	.16	.19	.21	.24
160	.02	.05	.07	.09	.12	.14	.16	.19	.21
180	.02	.04	.06	.08	.11	.13	.15	.17	.19
200	.02	.04	.06	.08	.09	.11	.13	.15	.17
220	.02	.03	.05	.07	.09	.10	.12	.14	.15
240	.02	.03	.05	.06	.08	.09	.11	.13	.14

a) Who has a higher blood alcohol level?

-- a 140-pound man who has had 4 drinks in the last hour
-- a 220-pound man who has had 5 drinks in the last hour

b) How many drinks would a 240-pound man have in an hour to have a blood alcohol level of .13?

c) How many drinks would a 100-pound man need to give him the same blood alcohol level as a 240-pound man who had 5 drinks in an hour?

Resources:

Scenario I.
Pantheon, Rome, floor plan, taken from taken from Georg Dehio/Gustav von Bezold: *Kirchliche Baukunst des Abendlandes*, is available in the public domain. Image cropped, red line added.

IV. Graphics Practice
a) Awesome by Jason Carlin is licensed under CC BY-NC-SA 2.0; Cropped from original work.

b) Veneno rojo! by Adrián Afonso is licensed under CC BY-NC-SA 2.0

ADULT LEARNING ACADEMY

PRE-ALGEBRA WORKBOOK

UNIT 4: RATIOS AND PROPORTIONS

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

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Adult Learning Academy
Pre-Algebra Workbook

UNIT 4: RATIOS AND PROPORTIONS

LEARNING OBJECTIVES

1. **Ratios:**

   - ☐ Express ratios using 3 different types of notation: words, semicolons (**:**), and fractions
   - ☐ Place terms in the correct order when writing and converting ratios
   - ☐ Simplify ratios, including ratios involving fractions
   - ☐ Write equivalent ratios

2. **Proportions:**

   - ☐ Compare ratios and determine if they are true proportions
   - ☐ Solve proportion problems by setting up proportions and solving for unknown values
   - ☐ Use proportional reasoning to perform measurement conversions

3. **Word Problems:**

   - ☐ Set up and solve word problems involving ratios, rates and proportions, including applications to the healthcare industry

Adult Learning Academy
Pre-Algebra Workbook
UNIT 4 VIDEO & EXERCISE LIST

Topic	Website	Videos	Exercises
Ratios	www.khanacademy.org	Introduction to Ratios	Expressing Ratios as Fractions
		Ratios as Fractions in Simplest Form	Ratio Word Problems
		Simpifying Rates and Ratios	
Proportions	www.khanacademy.org	Writing Proportions	Writing Proportions
		Understanding Proportions	Proportions 1
	-		
Unit 4 Review Powerpoint	www.stlcc.edu	Unit 4 Review Flashcard Ppt on Blackboard	
Compass Practice	http://www.hostos.cuny.edu/oaa/compass/pre-alg_prac10.htm		Proportions

MoHealthWINs

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Adult Learning Academy
Pre-Algebra Workbook
4.1 MEASUREMENT CONVERSIONS

Use a reliable website to fill in these conversions. They will be helpful as you solve proportion problems.

1 pound = _____ ounces

1 gallon = _____ quarts

1 quart = _____ pints

1 quart = _____ ounces

1 cup = _____ ounces

1 tablespoon = _____ teaspoons

1 teaspoon = _____ milliliters

1 kilogram ≈ _____ pounds

1 foot = _____ inches

1 yard = _____ feet

1 mile = _____ feet

1 mile = _____ yards

1 inch ≈ _____ centimeters

I. The following are ratios of the number of patients to the number of nurses on a hospital floor. Simplify the ratio to determine how many patients per one nurse.

a) 40:4 _____

b) 55:11 _____

c) 168:14 _____

d) 52:13 _____

e) 48:8 _____

****

II. Check the following ratios to see if they are true proportions. Write yes or no on the line provided. (hint: cross multiply and compare products)

a) 50:30 = 5:3 _____

b) 100:4 = 25:1 _____

c) 16:15 = 8:7 _____

d) 90:45 = 9:5 _____

e) 18:3 = 9:1.5 _____

III. Healthcare workers who administer medicine must have a clear understanding of how to compute dosage calculations. A certain medicine must be administered in the ratio of 10 cc per every 25 pounds. Compute the amount of medicine (cc) needed for the following patients. Their weight in pounds is given. Round to the nearest tenth, if necessary.

a) 50 pounds _____

b) 100 pounds _____

c) 200 pounds _____

d) 8 pounds _____

e) 135 pounds _____

f) 57 pounds _____

g) 277 pounds _____

****

IV. Use proportional reasoning to convert each measurement:

a) 5 cups = _____ pints

b) 7 quarts = _____ gallons

c) 34 ounces = _____ pounds

d) 5 feet = _____ inches

e) 10 miles = _____ feet

f) 12 teaspoons = _____ tablespoons

g) 500 yards = _____ feet

h) 200 pounds = _____ kilograms

i) 10 pints = _____ quarts

V. Solve the following proportion problems by setting up a proportion and solving for the unknown. Show your work.

a) Two tablets of ulcer medication contain 250 milligrams of medication. How many milligrams are in eight tablets?

b) If a dose of 72 milligrams of medication is contained in 4 cc, 24 milligrams would be contained in how many cc?

c) If 15 grams of pure drug are contained in 150 milliliters, how many grams are contained in 50 milliliters?

d) A tablet contains 75 milligrams of medication. If a doctor orders 300 milligrams of medication for a patient, how many tablets should be given to the patient?

e) A tablet contains 30 milligrams of medication. If a doctor orders 15 milligrams of medication for a patient, how many tablets should be given to the patient?

VI. The following problems involve carbohydrates, fats, and protein. Use the information given below to complete the proportions.

Carbohydrates → 4 calories per 1 gram

Fats → 9 calories per 1 gram

Proteins → 4 calories per 1 gram

a) 27 calories of fat = _____ grams

b) 88 calories of protein = _____ grams

c) 360 calories of carbohydrates = _____ grams

d) _____ calories in 12 grams of protein

e) _____ calories in ½ gram of carbohydrates

g) _____ calories in 16.25 grams of fat

****

VII. Solve the following problems by setting up a proportion and solving for the unknown.

a) One cup of soup contains 450 milligrams of sodium. How much sodium would there be in one and a half cups of soup?

b) A ½ cup serving of fresh fruit contains 72 milligrams of potassium. If a person wanted to consume 288 milligrams of potassium, how many ½ cup servings would they need to eat?

c) If a can of soup has 2.5 servings, how many cans would be needed to serve 22 people?

d) If one serving of pasta salad contains 90 calories, how many calories are in 3.5 servings?

e) If a doctor ordered four ounces of prune juice four times a day for seven days, how many total ounces would be served to the patient?

f) Three out of ten people have high blood pressure. In a typical crowd of 400 people, how many would be likely to have high blood pressure?

g) A newborn baby weighing 5 pounds is in need of some medicine. The dosage for the medicine is 10cc (cubic centimeter) per 1 kilogram. The baby's weight on the chart is recorded in pounds and not in kilograms. If one kilogram = 2.2 pounds, how many cc of medicine should be given to the baby?'

ADULT LEARNING ACADEMY

PRE-ALGEBRA WORKBOOK

UNIT 5: PERCENTS

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

MoHealthWINs

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UNIT 5: PERCENTAGES

LEARNING OBJECTIVES

1. **Understanding Percentages:**
   - ☐ Recognize that percents express parts per 100
   - ☐ Represent percentages as parts of a whole using area models
2. **Converting Percents:**
   - ☐ Represent numbers as decimals, percentages, and fractions
   - ☐ Convert decimals to percents, and percents to decimals
   - ☐ Convert fractions to percents, and percents to fractions; write fractions in lowest terms
   - ☐ Order sets of numeric expressions that include decimals, percents, and fractions
3. **Solving Percent Problems:**
   - ☐ Calculate percentages
   - ☐ Identify the amount (part), base (whole), and percent in percentage problems; identify known and unknown information
   - ☐ Use proportions to solve for unknowns in percent problems
   - ☐ Perform calculations involving percentage increases and decreases
4. **Word Problems:**
   - ☐ Solve word problems involving percents, including simple interest problems and other applications to the healthcare industry

Adult Learning Academy
Pre-Algebra Workbook
UNIT 5 VIDEO & EXERCISE LIST

Topic	Website	Videos	Exercises
Understanding Percent	www.khanacademy.org	Describing the Meaning of Percent	Worksheet: Coloring Decimals
		Describing the Meaning of Percent 2	
Converting Percents		Representing # as Dec, %, and Fraction	Converting Percents to Decimals
		Converting Decimals to Percents Ex 1	Converting Decimals to Percents
		Converting Decimals to Percents Ex 2	
		Representing a # as Dec, %, Fraction 2	
		Ordering Numeric Expressions	
Solving Percent Problems	www.khanacademy.org	Identifying Percent Amount and Base	Discount Tax and Tip Word Probs
		Growing by a Percentage	Markup, Commission Word Probs
		Solving Percent Problems	
		Solving Percent Problems 2	
		Solving Percent Problems 3	
Use Proportions to solve %	http://www.youtube.com/watch?v=yl0Rb6T09VM		
Use Equation to solve %	http://www.youtube.com/watch?v=LkTYkHbUiU4		
Unit 5 Review Powerpoint	www.stlcc.edu	Unit 5 Flashcard Powerpoint on Blackboard	
Compass Practice	http://www.hostos.cuny.edu/oaa/compass/pre-alg_prac12.htm		Percent

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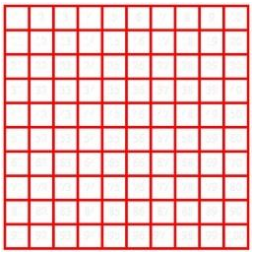
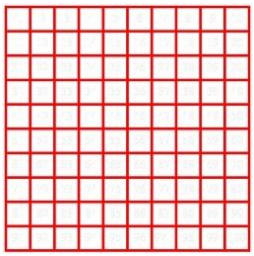
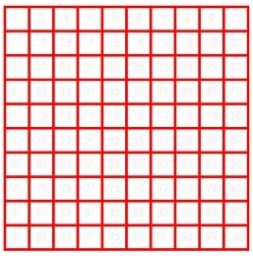
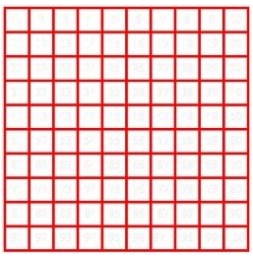
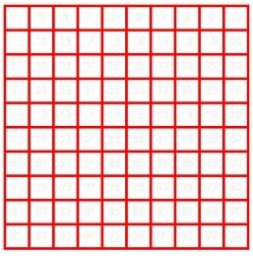
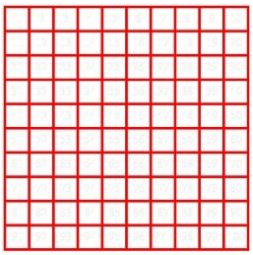
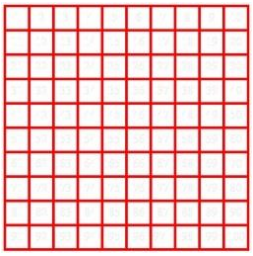
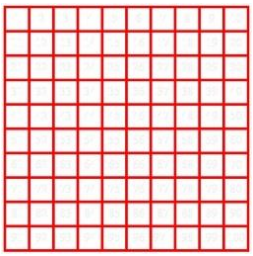
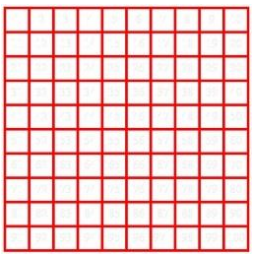
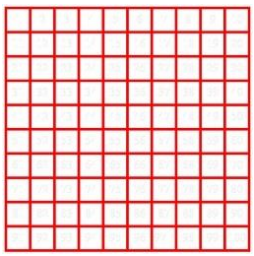
	1%		
		1/20	
			0.2
		1/4	
	50%		

SHADE	PERCENT	FRACTION	DECIMAL
		3/4	
			0.99
	100%		
	110%		
	0.5%		

Try to find the matches by doing the calculations in your head!
10% of 250
15% of 200
5% of 300
1% of 2000
20% of 150
100% of 25
200% of 7.5
.5% of 4000

1. Vicky got a 10% raise at the end of her first year on the job. She got a 15% raise at the end of her second year. Her total raise was 25% of her original salary.

2. This month, Sasha paid 45% of her Mastercard bill of $620 and 50% of her Visa bill of $380. All-together, she paid 95% of her credit card bills this month.

3. George spent 25% of his salary on food and 40% on housing. Therefore, he spent 65% of his salary on food and housing.

4. Among Forest Park students, 65% work part-time, 25% work full time, and 15% are not currently employed.

5. In Clean City, the fine for various polluting activities is a certain percentage of one's monthly income. The fine for smoking is 40%, for driving a gas-guzzling car is 50%, and for littering is 30%. Mr. Schmutz committed all three polluting crimes in one day and was fined 120% of his salary.

6. A loaf of bread is 97% fat free. If I only eat 97% of the bread, I won't consume any fat.

7. 25%, or one out of every four eggs, contains salmonella. If I only use three eggs in my omelet, I'll be safe.

8. A low-fat brownie recipe is 50% fat free. If I double the recipe, the result will be 100% fat free.

9. A sweater is on sale at 75% off. I also have a 25% coupon. Thus, the sweater is free.

I. Convert the following decimals to percents.

a) .75 _____

b) .9 _____

c) .07 _____

d) 3.98 _____

e) .0085 _____

f) .902 _____

****

II. Convert the following percents to decimals. Remember 100% = 1

a) 25% _____

b) 3% _____

c) 150% _____

d) 700% _____

e) .08% _____

f) 9 ½ % _____

****

III. Solve.

a) 100% of 60 _____

b) 50% of 60 _____

c) 25% of 60 _____

d) 10% of 60 _____

e) 20% of 60 _____

f) 15% of 60 _____

g) 150% of 60 _____

h) 200% of 60 _____

i) 300% of 60 _____

j) 1000% of 60 _____

IV. Use proportions to solve the following percent problems. Show your work.

a) What is 25% of 300?

b) What is 70% of 20?

c) What is 350% of 80?

d) 100 is what percent of 400?

e) 18 is what percent of 150?

f) .5 is what percent of 4?

g) 50% of 224 is what number?

h) 12% of 3 is what number?

i) 225% of 50 is what number?

V. Use proportions to solve the following percent problems.

a) Twenty grams of drug are contained in 50 mL of solution. What is the percent strength of this solution?

Set up: $\frac{20\ g}{50\ mL} = \frac{x\ g}{100 mL}$ Solve for x.

b) Ten grams of drug are contained in 90 mL of solution. What is the percent strength of this solution? (round to the nearest tenth)

c) Three grams of drug are contained in 10 mL of solution. What is the percent strength of this solution?

d) If a ratio of 5:25 is given for a solution, what percent strength is this solution?

****

VI. Solve the following percent problems involving discounts.

a) What is the net price of a surgical instrument that has an original price of $300 with a discount of 25%?

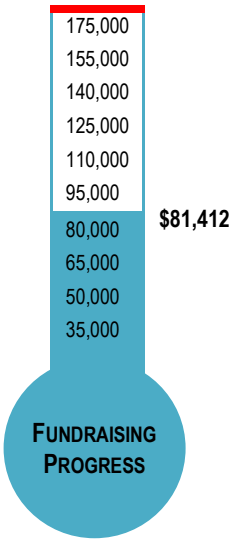
b) The price for one case of medicine is $75.00**.** Your pharmacy is ordering three cases and will receive a 12% discount. What is the amount of the discount? What is the net cost for all three cases of the medicine?

c) The total amount for a hospital bill is $7,500.00. The patient will have to pay $500 and then 20% of the remaining bill. How much of the bill will the patient have to pay?

d) If a medical supply company gave a 20% discount on walkers, and the NET price (after the discount) was $400.00, what was the price of the walker **before** the discount was taken?

VII. Graphics Practice:

a)



What percent of its goal has this medical research fundraiser reached?

What percent remains to be raised?

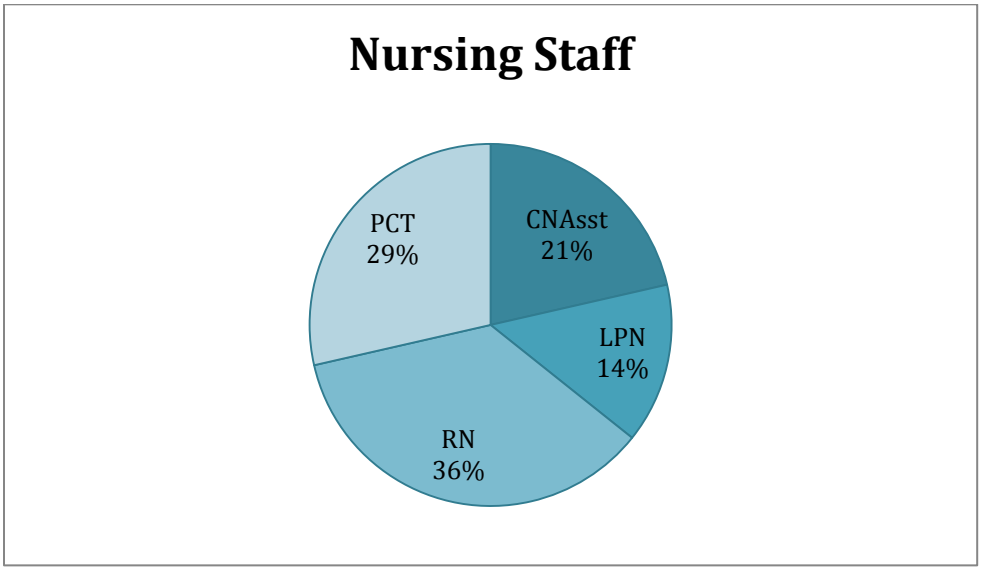
b) The hospital in the graph below has 70 nurses. How many of each type are there?

Patient Care Technician:

Certified Nurse Assistant:

Licensed Practical Nurse:

Registered Nurse:



ADULT LEARNING ACADEMY

PRE-ALGEBRA WORKBOOK

UNIT 6: INTEGERS

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

MoHealthWINs

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Adult Learning Academy
Pre-Algebra Workbook
UNIT 6: INTEGERS

LEARNING OBJECTIVES

1. **Integer Basics:**
   - ☐ Write and describe signed numbers
   - ☐ Order and compare integers, using appropriate symbols to express inequalities

2. **Operations with Integers**
   - ☐ Add positive and negative integers
   - ☐ Subtract positive and negative integers
   - ☐ Multiply positive and negative integers
   - ☐ Divide positive and negative integers

3. **Absolute Value:**
   - ☐ Define *absolute value*, find the absolute value of any integer, and evaluate expressions involving absolute value
   - ☐ Order and compare absolute values; use appropriate symbols to express inequalities

4. **Exponents, Roots, and Scientific Notation:**
   - ☐ Evaluate integers with roots and exponents
   - ☐ Apply the basic rules of exponents, including rules for positive and negative base numbers, and raising numbers to the zero and first power
   - ☐ Write numbers in scientific notation
   - ☐ Convert numbers in scientific notation to standard notation

5. **Order of Operations:**
   - ☐ Use the order of operations rules to perform calculations involving integers, absolute values, and exponents

6. **Word Problems:**
   - ☐ Solve basic word problems that involve signed numbers, including applications to the healthcare industry

St. Louis Community College

Adult Learning Academy
Pre-Algebra Workbook
UNIT 6 VIDEO & EXERCISE LIST

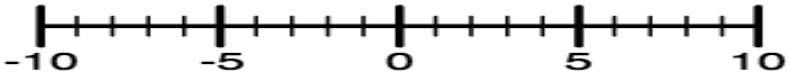
MO HEALTH WINS.org

Topic	Website	Videos	Exercises
Negative Number Basics	www.khanacademy.org	Negative Numbers Introduction	Number Line 2
		Ordering Negative Numbers	Ordering Negative Numbers
			Number Line 3
Adding Integers	www.khanacademy.org	Example: Adding Negative Numbers	Adding Negative Numbers
		Ex: Adding integers w/ diff. signs	
Subtracting Integers	www.khanacademy.org	Why subtracting neg is adding positive	Adding and Subtracting Neg Num.
	www.stlcc.edu	Subtracting Integers PPT on Blackboard	
		Adding/Sub Negative Numbers	
Multiplying/Dividing Neg #	www.khanacademy.org	Multiplying Pos and Neg Numbers	Mult/Div Negative Numbers
		Why Neg x Neg is positive	Negative Number Word Probs
		Dividing Pos and Neg Numbers	
		Example: Mult #'s w/ diff signs	
		Mult and Div Negative numbers	
Absolute Value	www.khanacademy.org	Absolute Value and Number Lines	Finding Absolute Values
		Absolute Value 1	Comparing Absolute Values
		Absolute Value of Integers	
		Comparing Absolute Values	
Exponents	www.khanacademy.org	Level 1 Exponents	Positive and Zero Exponents
		Understanding Exponents 2	
Scientific Notation	www.khanacademy.org	Scientific Notation	Scientific Notation
		Scientific Notation 1	
Square Roots	www.khanacademy.org	Understanding Square Roots	Square Roots
Unit 6 Review Flashcards	www.stlcc.edu	Powerpoint on Blackboard	
Compass Review	http://www.hostos.cuny.edu/oaa/compass/pre-alg_prac4.htm		Signed Numbers

To ADD Integers:	**EXAMPLES:**
Positive + Positive =	4 + 5 =
Negative + Negative =	-4 + (-5) =
Positive + Negative: That DEPENDS on which number has the larger absolute value!	4 + (-5) = -4 + 5 = -5 + 5 =

To SUBTRACT Integers:	**EXAMPLES:**
ADD the OPPOSITE!	4 – 5 = 4 – (-5) =
Remember that subtracting a negative is the same as adding a positive!	-4 – 5 = -4 – (-5) =

To MULTIPLY or DIVIDE Integers:	**EXAMPLES:**
Positive x Positive =	10 x 5 =
Positive ÷ Positive =	10 ÷ 5 =
Negative x Negative =	-10 x (-5) =
Negative ÷ Negative =	-10 ÷ (-5) =
Positive x Negative =	10 x (-5) =
Positive ÷ Negative =	10 ÷ (-5) =
Negative x Positive =	-10 x 5 =
Negative ÷ Positive =	-10 ÷ (5) =



1. On the number line above,
   a) Draw a star where -6 would be.
   b) Draw a heart where -3 would be.
   c) Draw a smiley face where the OPPOSITE of -8 would be.

2. What is the absolute value of -127?

3. Simplify:

a) $-7 + 0$ b) $-7 + -3$ c) $-7 + 8$ d) $-8 + 7$

e) $|7 + -3|$ f) $0 - 3^2$ g) $-5 + 2(-3)$ h) $(1 - 5)^2$

i) $\sqrt{81}$ j) $6 - (-8)$ k) $|-6 \times 7|$ l) -9^2

4. Write in scientific notation:

a) 45,700,000 b) .00039

5. Write in standard notation:

a) 5.4×10^{-6}
b) 5.2×10

I. Scientific Notation: For each of the following facts, write the number in scientific notation.

* There are an average of 140,000 hairs on a person's head.

* Your brain has approximately 100,000,000,000 (one hundred billion) cells.

* A rhinovirus is .000000020 meters long.

For each of the following facts, write the scientific notation as a standard number:

* The human heart beats approximately 2.7×10^{9} times in a lifetime.

* Human hair grows at about 1.0×10^{-8} miles per hour.

* There are about 3.0×10^{13} red blood cells in the human body.

****

II. Scenario: A patient's weight has fluctuated over the past six months:

STARTING WEIGHT:	**150.7 pounds**
1 month	2.9 pounds lost
2 months	1.3 pounds gained
3 months	4 pounds lost
4 months	3.2 pounds lost
5 months	3 ½ pounds gained
6 months	2 ¾ pounds lost

What is the patient's weight after 3 months? _____

What is the patient's weight after 6 months? _____

Did the patient gain or lose overall? How much? _____

III. Scenario: You run a medical office. Here is your account sheet for the past year. Fill in each of the blank spaces with the appropriate numbers.

Category	Frequency Per year	Amount	Expense or Income?	TOTAL
Cleaning	24	$225.50	Expense	
Space rental	12		Expense	$ 126,000
Supplies		$2,327.50	Expense	$19,965
Malpractice Insurance	12	$4,250.75	Expense	
Patient Payments	12	$10,000	Income	

How did your office do overall this year? Did you make money or lose money? How much?

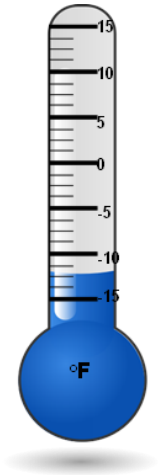
****

IV. Scenario: Fill in following table of temperature changes.

Beginning Temperature	Ending Temperature	Change from beginning to end
27.5 degrees	23.2 degrees	
-5.6 degrees	7.8 degrees	
83.1 degrees		100.6 degree decrease
	-14.1 degrees	7.9 degree decrease
	-12 degrees	5.2 degree increase

V. Graphic Practice:

a) What is the temperature on this thermometer?



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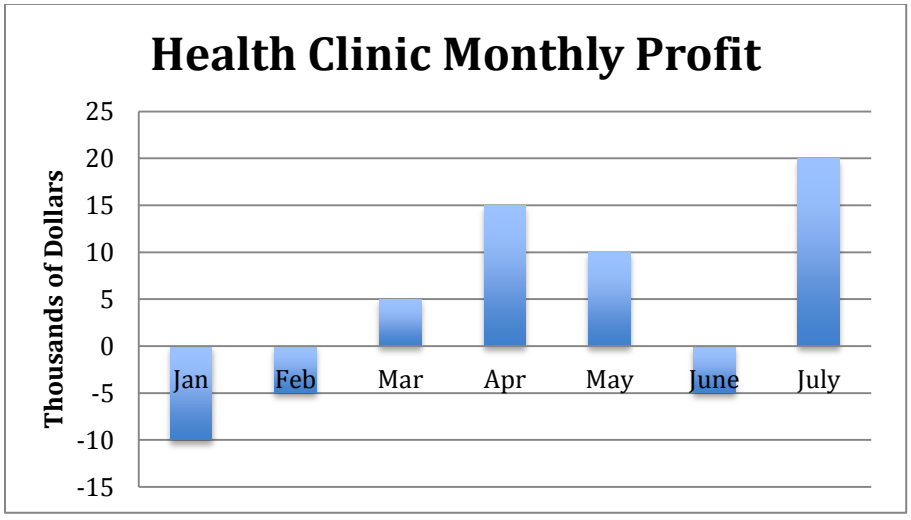
b) Use the graph below to answer the questions.



a) During which months did the clinic lose money?

b) Which month had the worst loss?

c) Which month showed the most improvement over the previous month?

d) Which month showed the worst drop over the previous month?

ADULT LEARNING ACADEMY

PRE-ALGEBRA WORKBOOK

UNIT 7: ALGEBRA

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

MoHealthWINs

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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

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$5x + 3x$

$5x - 3x$

$3x - 5x$

$x + x$

$x - x$

$x \square x$

$x \div x$

$x + y$

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

$5(x - 2)$

$3(x + 1)$

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

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

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

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

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

$7 - 3(2x - 1)$

$7 - 3(2x + 1)$

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?

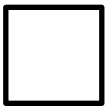
b) The perimeter of the rectangular operating room is 170 feet. The length is 5 feet more than the width. What are the dimensions of the operating room?

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: _____

ADULT LEARNING ACADEMY

PRE-ALGEBRA WORKBOOK

UNIT 8: METRIC SYSTEM

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St. Louis Community College
First Version: 01/12/2015

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Adult Learning Academy
Pre-Algebra Workbook

UNIT 8: METRIC SYSTEM

LEARNING OBJECTIVES

1. **Metric Prefixes:**
   - ☐ Know the basic units for measuring length, weight, volume, and temperature in the metric system
   - ☐ Know the meaning of metric prefixes and how they are related by powers of ten
   - ☐ List the metric prefixes in order from kilo to micro

2. **Metric Benchmarks:**
   - ☐ Identify metric benchmarks for length, weight/mass, volume, and temperature
   - ☐ Approximate the measures of everyday things using metric benchmarks
   - ☐ Approximate temperatures using metric benchmarks

3. **Converting in Metric:**
   - ☐ Convert units within the metric system
   - ☐ Understand the relationship between decimal point movement and powers of ten
   - ☐ Convert temperature from Fahrenheit to Celsius, and from Celsius to Fahrenheit

Adult Learning Academy
Pre-Algebra Workbook
UNIT 8 VIDEO & EXERCISE LIST

Topic	Website	Videos
Metric Prefixes	http://www.youtube.com/watch?v=2tcRNLHb0Yg	Wanda Sykes The Metric System
	http://www.youtube.com/watch?v=hCxDEB2t5Hc	Basics of Metric System Mathmanprice
	http://www.youtube.com/watch?v=83e3n83Re5s	Deirdre Flint The Metric System Song
	http://www.youtube.com/watch?v=KfrCaKyhwZk	Meters, Liters and Grams petehendley
	http://www.youtube.com/watch?v=PLhK9rat-NU	Think Metric by Amanda and Kimberly
Converting in Metric	http://www.youtube.com/watch?v=XS-8FCqYo5M	Metric Conversions Shortcut Method
	http://www.youtube.com/watch?v=pEDVddQvimI	Unit Conversion in the Metric System
Metric Temperature	www.khanacademy.org	Compare Celcius &Farenheit Temp Scales
		Converting Farenheit to Celcius
		Ex: Evaluate a Formula using Substitution
Unit 8 Review Flashcards	www.stlcc.edu	Powerpoint on Blackboard

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Metric Prefixes

KILO	HECTO	DEKA	BASE (UNIT)	DECI	CENTI	MILLI	X	X	MICRO
1000	100	10	1 gram liter meter	1/10	1/100	1/1000			1/1,000,000

****

Killer Whale	Hippo	Donkey		Dog	Cat	Mouse	Maggot? Mite?
King	Hector	Died		Drinking	Chocolate	Milk	
Kangaroos	Hop	Down	My	Driveway	Carrying	M&M's	

****

3.7 kilometers = _____ meters

20 milliliters = _____ liters

21.3 centigrams = _____ dekagrams

4.2 hectograms = _____ micrograms

50 deciliters = _____ kiloliters

Metric Length Benchmarks: Use a measuring tape.

1. Find a part of your body that is 1 centimeter long: _____
   (for many people, it's the width of their pinkie nail)

2. How high on your body is 1 meter? _____
   (for many people, it's their hip or bellybutton)

3. Measure from your shoulder blade across your back to your fingertips.
   How close is it to 1 meter? _____

4. How tall are you in centimeters? _____

****

Metric Mass/Weight Benchmarks: Use a scale.

5. What is the mass of your textbook in grams? _____

6. What is the mass of a pencil in grams? _____

7. What is the mass of a paperclip in grams? _____

8. At home, read the label on a bottle of pain reliever. How many mg of medicine is in each tablet? _____

****

Metric Temperature: Use a thermometer.

9. What is the temperature of the room in celcius? _____ in Farenheit? _____

10. What is your body temperature in celcius? _____ in Farenheit? _____

11. At what temperature does water freeze in celcius? _____ in Farenheit? _____

12. At what temperature does water boil in celcius? _____ in Farenheit? _____

I. Metric Sense: Circe the most reasonable measurement.

a) A healthy newborn baby might weigh

7 kilograms 70 grams 3 kilograms 70 pounds

b) You might wear shorts when the outdoor temperature is

30° F 35° C 80° C 212° F

c) Your bedroom might have a length of

5 feet 5 cm 5 kilometers 5 meters

d) If you are thirsty, you might drink this much water at one time:

1 milliliter 1 liter 1 gallon 1 dekaliter

e) You might take a warm shower in water that is

100° F 100° C 10° C 10° F

f) A basketball player might be this tall:

2 dekameters 2 centimeters 2 meters 2 decimeters

g) Your finger is about this long:

8 centimeters 8 inches 8 meters 8 millimeters

h) A jogger might run

10 meters 10 kilometers 10 liters 10 kilograms

i) An apple might weigh

30 grams 30 decigrams 30 dekagrams 30 kilograms

j) An infant might drink this much formula at one meal:

50 liters 50 milliliters 50 kiloliters 50 ounces

II. **From the Guinness Book of World Records** (www.guinnessworldrecords.com)

a) The longest tongue measures 9.8 centimeters from the tip to the middle of his closed top lip and was achieved by Stephen Taylor (United Kingdom), at Westwood Medical Centre, Coventry, United Kingdom, on 11 February 2009.

Stephen's tongue was _____ meters long.

Stephen's tongue was _____decimeters long.

Stephen's tongue was _____millimeters long.

Stephen's tongue was _____ micrometers long.

Stephen's tongue was _____ kilometers long.

Name an object that is about as long as Stephen's tongue:

****

b) The shortest female who ever lived was Pauline Musters, born in 1876 in the Netherlands. At nine years old, she was 55 cm tall and weighed only 1.5 kg.

Pauline was _____ millimeters tall and weighed _____ grams.

Pauline was _____ meters tall and weighed _____ milligrams.

Pauline was _____ decimeters tall and weighed _____ decigrams.

Pauline was _____ dekameters tall and weighed _____ dekagrams.

Name an object that is about as tall as Pauline was at 9 years old:

Name an object that weighs about as much as Pauline did:

How many of Stephen's tongue, laid end-to-end, would approximate Pauline's height?

III. What is the most appropriate measure?

Choose from among these:

micrometers, millimeters, centimeters, meters, kilometers, milliliters, liters, grams, milligrams, kilograms

Item to be measured	Most appropriate metric unit
Length of your pencil	
Distance between cities	
Mass (weight) of a large dog	
Amount of blood in a syringe	
Diameter of a freckle	
Length of a swimming pool	
Amount of medicine in a pill	
Amount of fat in a serving of food	
Amount of water in your bathtub	
The length of a DNA cell	

IV. Temperature benchmarks:

	Degrees Fahrenheit	Degrees Celcius
Water freezes		
Water boils		
Normal Human Body Temperature		