St. Louis Community College

WORKFORCE SOLUTIONS GROUP
ST. LOUIS COMMUNITY COLLEGE

ADULT LEARNING ACADEMY

Math
PRE-ALGEBRA

MoSTEM WINs

Debbie Char and Lisa Whetstine
Edited by Nicole McMeans
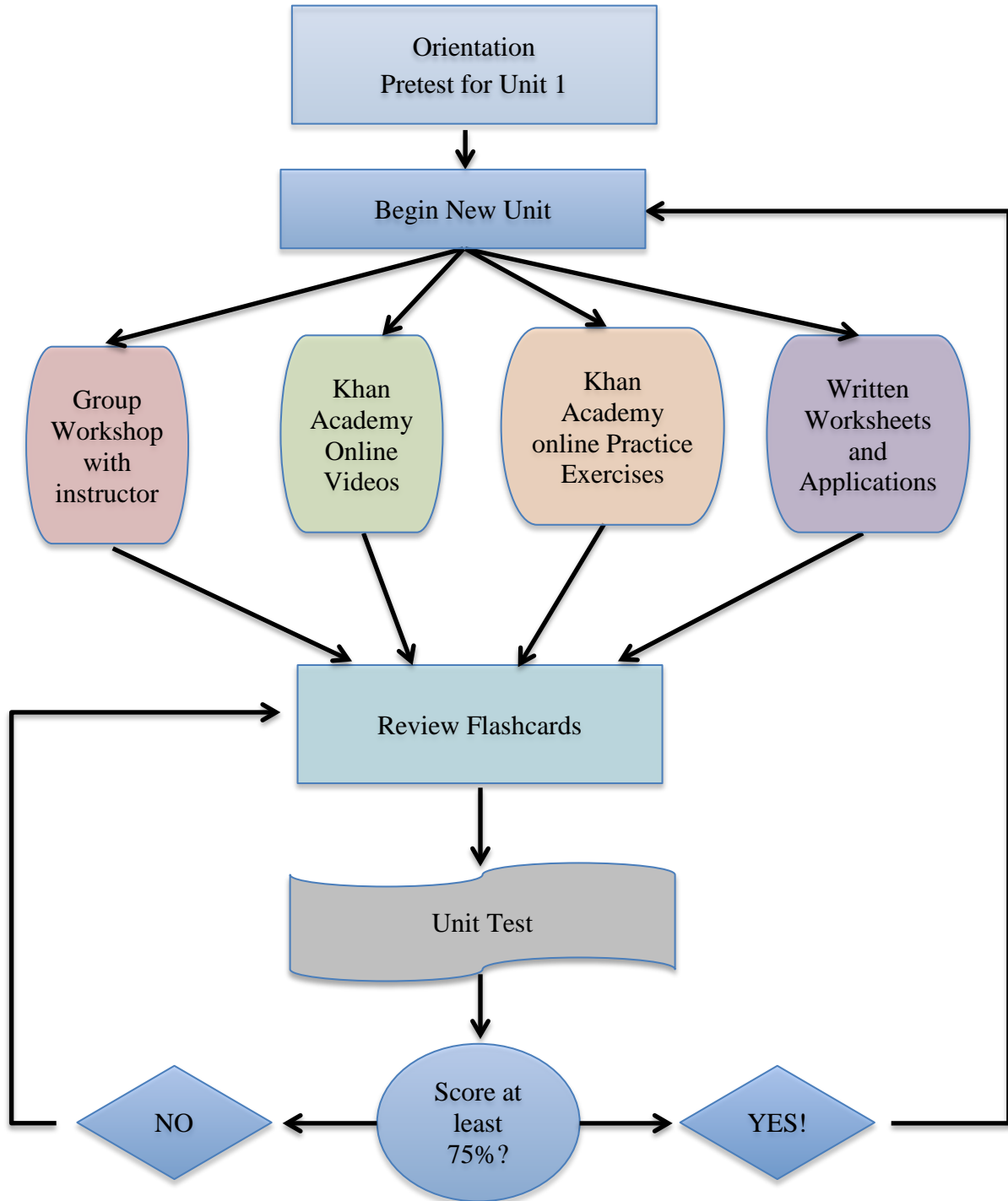St. Louis Community College
Fourth Version: 06/01/2015

Adult Learning Academy
Pre-Algebra
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		

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┌─────────────────────────┐
│      Orientation        │
│   Pretest for Unit 1    │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│      Begin New Unit     │◄──────────────────────┐
└─────────────────────────┘                       │
                                                  │
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- Group Workshop with instructor
- Khan Academy Online Videos
- Khan Academy online Practice Exercises
- Written Worksheets and Applications

Review Flashcards

Unit Test

Score at least 75%?

NO

YES!

Adult Learning Academy
Pre-Algebra Workbook
TABLE OF CONTENTS

Adult Learning Academy
Pre-Algebra Workbook
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 career pathway.

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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

1. **Write the words for these numbers:**

    a. 3,257,012

    b. 507,392,005

2. **Write the numbers:**

    a. ten billion, five hundred million, twenty-thousand three

    b. four million, four thousand, forty

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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

```
           20
          /  \
         2    10
             /  \
            2    5
```

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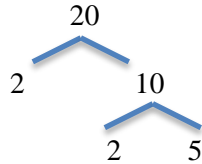
1. What are the FACTORS of 12? _____

2. What are the MULTIPLES of 12? _____

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

---

4. What are the FACTORS of 100? _____

5. What are the MULTIPLES OF 100? _____

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

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7. What are the FACTORS of 30? _____

8. What are the MULTIPLES of 30? _____

9. 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:

a. 2?

b. 3?

c. 4?

d. 5?

e. 6?

f. 9?

g. 10?

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

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

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

    a. $2^3 + 10 \cdot 3 - 16 \div (4 - 2)$

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

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

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

    e. $(5 + 3)^2$

    f. $5^2 + 3^2$

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

    a. Make this equal 29:

    $36 - 24 \div 3 + 1$

    b. Make this equal 5:

    $36 - 24 \div 3 + 1$

    c. Make this equal 30:

    $36 - 24 \div 3 + 1$

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	

Match each expression in the first column with an equivalent expression from the second column:

1. _____ 47 + 53   A. 49 • 2

2. _____ 800 – 799   B. 110 – 3

3. _____ 10 + 0   C. 348 – 98

4. _____ 6 • 8   D. 0 • 10

5 _____ 25 • 10   E. 1000 – 990

6. _____ 648 – 648   F. 4 • 12

7. _____ 99 + 8   G. 27 • 3

8. _____ 3 • 3 • 3 • 3   H. 3 + 3 + 3 + 3 + 3

9. _____ 5 • 3   I. 432 – 431

10. _____ 100 – 2   J. 4 • 25

1. A lab experiment requires the research technician to count the number of bacteria colonies in a culture every three hours for 12 hours. The first observation is done at 9:30 am. Record the time for each observation using 24-hour (military) time.

Observation Time (military time)	# of colonies of bacteria
1.	3
2.	120
3.	400
4.	1032
5.	

   a. How many new colonies did the technician find at 12:30 pm?

   b. How many new colonies did the technician find at 3:30 pm?

   c. During which three-hour period shown did the most new bacteria appear?

   d. If the technician observed 3890 new bacteria colonies on the final observation, what was the final number of colonies observed?

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2. A medical technician records vital signs every hour. A patient's pulse is 125 when she arrives, but as she rests, it goes down to 97, 89, 86, and then 80.

   a. What is the patient's mean heart rate? _____

   b. What is the patient's median heart rate? _____

   c. Is there a mode for the patient's heart rate? Why or why not?

---

3. Several computer applications require 233, 198, and 307 megabytes of memory. The computer has 700 megabytes of memory available. Can you download all three applications? Show your work!

4. At weigh stations, the weight of a truck's cargo is divided by the number of axles on the truck to find the number of pounds being carried per axle. Fill in the following table for the four trucks at a Missouri weigh station:

Truck	Cargo weight (lbs.)	# of Axles	Weight per axle (lbs.)
A	42,075	5	
B	30,500	5	
C	75,205		15,041
D		7	3,060

a. What is the total cargo weight being carried by the four trucks? _____

b. What is the mean cargo weight being carried by the four trucks? _____

c. What is the median weight per axle? _____

d. Round the cargo weight of truck A (42,075 lbs.) to the nearest:

ten pounds:_____ hundred pounds: _____ thousand pounds: _____

5. A computer can perform 600,000 operations in a second! How many operations can that computer perform in a minute? In an hour? Show how you figure this out!

6. A lab receives a grant for $10,000 for a 4-month project.

a. If the same amount of money is allocated for each month, how much money can be spent each month?

b. The first month involves some extra, unanticipated startup costs, so the group spends $3500 the first month. How much will be left for each remaining month?

c. The project ends up costing $3500 the first month and $2250 for each of the other three months. Did the project spend all of its grant? Did they overspend? Is there money left over? How much?

7. A crime scene measures 20 feet by 34 feet.

20 feet
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┌──────────────┐
│              │
│              │
└──────────────┘
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34 feet
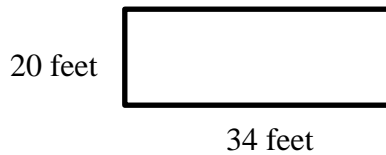
a. You need to cordon off the scene with crime scene tape around the edge to allow investigators to work. How many feet of tape will you need? (*Note: You are finding the PERIMETER of the rectangle. You can find it by adding up the lengths of ALL four of the sides.*)

b. Crime scene tape costs 39 cents per foot. How much will it cost to put tape around this scene?

c. You also need to have the canine unit sniff the scene for drugs. How many square feet does this crime scene have? (*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. A drug-sniffing dog needs about 17 seconds for each square foot of area. How long would it take a dog to sniff this crime scene?

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8. 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?

9. Graphics Practice

This gauge measures pressure two ways.

a. On the outer ring, what is the pressure in kilopascals?

b. On the inner ring, what is the pressure in pounds per square inch?

c. How far has this car driven?
Write your answer in WORDS!

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

e. On this thermometer, draw the needle pointing to a temperature of 82 degrees.
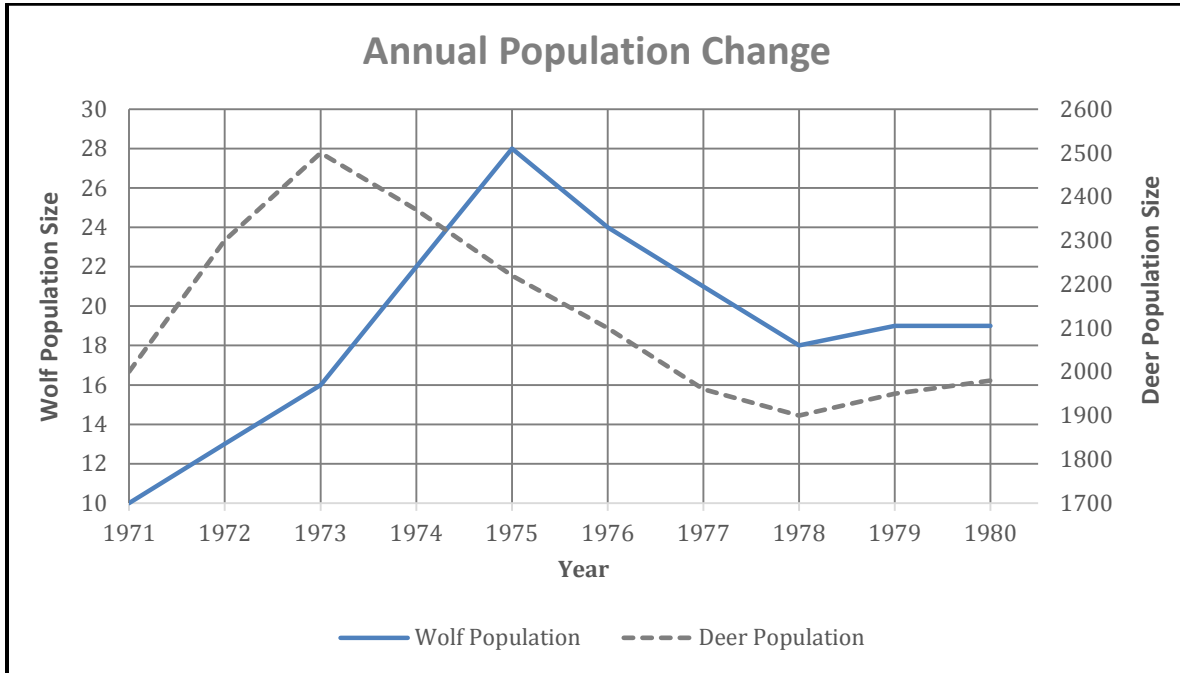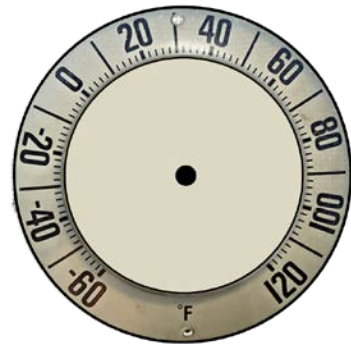
Using the graph above, answer these questions about deer and wolf populations:

f. During what year was each population at its peak? What was the population of each type of animal at its peak?

g. What has happened to these animal populations in the 10-year period shown? Describe the basic shape of the graphs, and the trends you see.

h. Based on what you see in the graph, what would you expect the wolf and deer populations to look like in the year 2000?

RESOURCES

Image used in questions 9a. and 9b.
dial2 by leapingllamas, is licensed under CC-BY 2.0

Image used in question 9c.
151517 by Scott (Skippy) is licensed under CC BY-SA 2.0; Modifications: Image lightened, red square added

Image used in question 9d.
Free Speedometer Vector by 123freevectors.com is licensed under CC BY-SA 3.0

Image used in question 9e. is a derivative of:
Muy Caliente! by corydalus which is licensed under CC BY-NC-SA 2.0

*MoSTEMWINs*

1.1 Place Value and Whole Numbers

1a. **three million, two hundred fifty-seven, twelve**
1b. **five hundred seven million, three hundred ninety-two thousand five**
2a. **10,500,020,003**
**2b.** **4,004,040**

1.2 Multiplication Table

X	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

1.3 Place Value and Whole Numbers

1. **1, 2, 3, 4, 6, and 12** (any order)
2. **12, 24, 36, 48, 60**, etc.
3. Prime factors = **3 x 2 x 2** (or 3 x 2^2)


Factor tree: 12 branches to 3 and 4; 4 branches to 2 and 2.
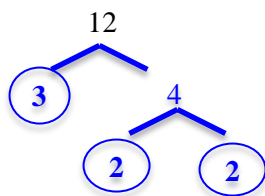
4. **1, 2, 4, 5, 10, 20, 25, 50, 100** (any order)
5. **100, 200, 300, 400, 500, 600**, etc.
6. Prime factors = **2 x 2 x 5 x 5** (There are many different ways to break down the tree but all will result in the same prime factors.)

Factor tree: 100 branches to 25 and 4; 25 branches to 5 and 5; 4 branches to 2 and 2.
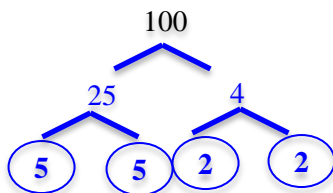
1.3 Place Value and Whole Numbers (cont.)

7. **1, 2, 3, 5, 6, 16, 30** (any order)
8. **30, 60, 90, 120, etc.**
9. Prime factors = **2 x 3 x 5** (Many different ways to break down tree, but always the same prime factors)

Factor tree: 30 branches to 5 and 6; 6 branches to 3 and 2.
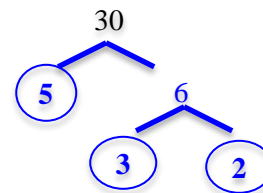
1.4 Divisibility Rules

a. **No**, since 3,647,541 does not end in 0, 2, 4, 6, or 8
b. **Yes**, since $3 + 6 + 4 + 7 + 5 + 4 + 1 = 30$, which is divisible by 3
c. **No**, since 41 is not divisible by 4
d. **No**, since 3,647,541 does not end in 0 or 5
e. **No**, since the number is not divisible by BOTH 2 and 3
f. **No**, since $3 + 6 + 4 + 7 + 5 + 4 + 1 = 30$, which is not divisible by 9
g. **No**, since the number does not end in 0

1.5 Order of Operations Matching

$(8 - 5)^2 = 9$	$10 \div 10 \times 10 = 1 \times 10 = 10$
$100 - 9(6 + 4) = 10$	$(10 - 10)^5 = 0$
$100 \div 10 \cdot 2 = 20$	$5^2 - 6 = 25 - 6 = 19$
$10 - 5 \cdot 2 = 0$	$10 - 4 + 3 = 6 + 3 = 9$
$3^2 - 2^3 = 9 - 8 = 1$	$2 \times 5^2 - 1 = 49$
$5 + 2(10 - 3) = 5 + 14 = 19$	$10^2 \div (10 \times 10) = 1$
$(3 + 4)^2 = 49$	$20(10 - (4 + 5)) = 20$

1.6 Order of Operations Practice

1a. $2^3 + 10 \cdot 3 - 16 \div (4 - 2)$
$2^3 + 10 \cdot 3 - 16 \div 2$
$8 + 10 \cdot 3 - 16 \div 2$
$8 + 30 - 8$
$= \mathbf{30}$

1.6 Order of Operations Practice (cont.)

1b. $2^3 + 10 \cdot 3 - 16 \div 4 - 2$
  $\mathbf{8} + 10 \cdot 3 - 16 \div 4 - 2$
  $8 + \mathbf{30} - \mathbf{4} - 2$
  $= \mathbf{32}$

1c. $63 - 5[9 - 4(10 - 8)]$
  $63 - 5[9 - 4(2)]$
  $63 - 5[9 - 8]$
  $63 - 5(1)$
  $= \mathbf{58}$

1d. $63 - 5[(9 - 4)(10 - 8)]$
  $63 - 5[5 \cdot 2]$
  $63 - 5(10)$
  $= \mathbf{13}$

1e. $(5 + 3)^2 = 8^2 = \mathbf{64}$

1f. $5^2 + 3^2 = 25 + 9 = \mathbf{34}$

2a. $36 - (\mathbf{24 \div 3}) + 1$ (or no parenthesis)

2b. $(\mathbf{36 - 24}) \div 3 + 1$

2c. $36 - 24 \div (\mathbf{3 + 1})$

1.7 Military Time

1:00 pm	1300
3:15 am	**0315**
11:10 pm	2310
5:27 pm	**1727**
9:00 am	0900
7:30 am	**0730**
2:39 pm	1439
9:38 pm	**2138**
1:21 pm	1321
1:10 am	**0110**

1.8 Unit 1 Quiz

1. J
2. I
3. E
4. F
5. C
6. D
7. B
8. G
9. H
10. A

1.9 Career Applications: STEM

1.

	Observation Time	# of Colonies of Bacteria
1.	**0930**	3
2.	**1230**	120
3.	**1530**	400
4.	**1830**	1032
5.	**2130**	**4922**

1a. $120 - 3 = \mathbf{117}$
1b. $400 - 120 = \mathbf{280}$
1c. From **6:30 – 9:30 pm**
1d. $3890 + 1032 = \mathbf{4922}$

2a. $(125 + 97 + 89 + 86 + 80) / 5 = 477/5 = \mathbf{95r2}$
2b. 80, 86, 89, 97, 125. **89** is the median
2c. No – each number appears only once

3. $233 + 198 + 307 = \mathbf{738}$, which is more than 700. So **no**, you cannot download all three applications with the memory available.

4.

Truck	Cargo weight	# of Axles	Weight per axle
A	42,075	5	**8415** (divide)
B	30,500	5	**6100** (divide)
C	75,205	**5** (divide)	15,041
D	**21,420** (mult.)	7	3,060

4a. **169,200 lbs**.
4b. **42,300 lbs**.
4c. **7257 ½ lbs. (or 7257.5)** – fractions and decimals to be studied in future units!
4d. ten pounds: **42,080**   hundred pounds: **42,100**
  thousand pounds: **42,000**
4e. $80,000 - 42075 = \mathbf{37,925 \ lbs}$.

5. Every minute has 60 seconds: $600,000 \times 60 = 36,000,000$ calculations in a minute.
  Every hour has 60 minutes: $36,000,000 \times 60 = \mathbf{2,160,000,000 \ calculations \ in \ an \ hour}$

6a. 10,000 divided by 4 = **$2500 per month**
6b. $10,000 - 3,500 = 6,500$ to spread over 3 months:
  $6500 / 3 = \mathbf{\$2166.67 \ per \ month}$
6c. $3500 + 2250(3) = 3500 + 6750 = \mathbf{10,250}$, which is **$250 over budget.**

7a. $20 + 34 + 20 + 34 = \mathbf{108 \ feet}$
7b. $108 \times 39 = \mathbf{4212 \ cents}$, or **$42.12**
7c. $20(34) = \mathbf{680 \ square \ feet}$
7d. $680 \times 17 = 11,560$ seconds or 192.7 minutes (over 3 hours)

8. AccuHealth is the least expensive

| Company	Initial Purchase Price	Monthly Service Cost	Total for a one year contract
Healthtech	$ 5000	$ 250	5000 + 12(250) = $8000
AccuHealth	$ 4350	$ 275	4350 + 12(275) = $7650
ChartCare	$ 3900	$ 319	3900 + 12(319) = $7728

9a. 6000

9b. about **850**

9c. one hundred fifty one thousand five hundred seventeen

9d. about **64 miles per hour**

9e. Each tiny line is 2 degrees, so your needle should point one tiny line past 80 degrees
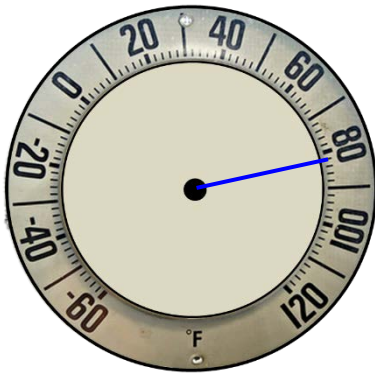
9f. Deer = 1973 (2500 deer); **Wolves = 1975** (28 wolves)

9g. The shapes are similar, but the deer seem to be 2 years in advance. Both populations have fallen sharply, but may be starting to grow again.

9h. answers will vary

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Adult Learning Academy
Pre-Algebra Workbook
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 transportation industry, and those involving area and perimeter

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MoSTEM WINS

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 Improper Fractions	www.khanacademy.org	Proper and Improper Fractions	Fractions on the Number Line 2
		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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1. Write five fractions that are equivalent to each number:

a.

$$\frac{1}{2}$$

b.

$$\frac{1}{4}$$

c.

$$\frac{3}{4}$$

d.

$$0$$

e.

$$1$$

f.

$$2$$

2. Fill in the blanks:

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.

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Pre-Algebra Workbook
2.2 COLORING MATCHING: EQUIVALENT FRACTIONS

Color all equivalent fractions the same color.

$\frac{150}{100}$

$\frac{1}{2}$

$\frac{4}{3}$

$\frac{12}{8}$

$\frac{10}{5}$

$\frac{3}{3}$

$\frac{0}{3}$

$1\frac{1}{2}$

$1\frac{1}{3}$

$\frac{3}{2}$

$\frac{16}{8}$

$\frac{0}{100}$

$\frac{3}{0}$

$\frac{50}{25}$

$\frac{100}{100}$

$\frac{20}{15}$

$\frac{2}{1}$

$\frac{50}{100}$

$\frac{15}{30}$

$\frac{75}{50}$

$\frac{400}{300}$

$\frac{50}{50}$

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.

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Pre-Algebra Workbook
2.4 FRACTION QUIZ

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1. Circle the GREATER number from each pair:

   a. $\dfrac{1}{3}$ $\quad$ $\dfrac{1}{4}$

   b. $\dfrac{3}{4}$ $\quad$ $\dfrac{4}{3}$

   c. $\dfrac{7}{8}$ $\quad$ $\dfrac{6}{8}$

   d. $\dfrac{11}{10}$ $\quad$ 1

   e. $\dfrac{1}{2}$ $\quad$ $\dfrac{3}{8}$

   f. $\dfrac{5}{5}$ $\quad$ $\dfrac{5}{1}$

2. Color the boxes as directed:

   a. Color $\dfrac{1}{3}$ of the candy bar:

   b. Color $\dfrac{2}{6}$ of the candy bar:

   c. Color $\dfrac{1}{2}$ of the candy bar:

3. Cross out the fraction that is UNDEFINED:

   $\dfrac{5}{0}$ $\quad$ $\dfrac{0}{5}$

4. What is half of $\dfrac{2}{3}$?

5. Circle ALL the fractions that equal one half:

   $\dfrac{2}{1}$ $\quad$ $\dfrac{1}{2}$ $\quad$ $\dfrac{8}{16}$ $\quad$ $\dfrac{10}{20}$

6. Simplify. Write your answer in simplest form:

   a. $\dfrac{1}{4} + \dfrac{3}{4}$

   b. $\dfrac{2}{3} - \dfrac{1}{4}$

   c. $\dfrac{2}{3} \bullet \dfrac{3}{4}$

   d. $\dfrac{2}{3} \div \dfrac{3}{4}$

   e. $1\dfrac{3}{4} + 2\dfrac{1}{3}$

   f. $1\dfrac{3}{4} \times 2\dfrac{1}{3}$

   g. $1\dfrac{3}{4} \div 2\dfrac{1}{3}$

Grew or shrunk?

1. $20 \times \frac{1}{10} =$ _____

2. $20 \times \frac{1}{2} =$ _____

3. $20 \times \frac{3}{4} =$ _____

4. $20 \times \frac{5}{5} =$ _____

5. $20 \times \frac{5}{4} =$ _____

Grew or shrunk?

6. $20 \div \frac{1}{10} =$ _____

7. $20 \div \frac{1}{2} =$ _____

8. $20 \div \frac{3}{4} =$ _____

9. $20 \div \frac{5}{5} =$ _____

10. $20 \div \frac{5}{4} =$ _____

OBSERVATIONS:

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

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

13. When you multiply a number by 1, it _____

14. When you divide a number by 1, it _____

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

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

1. About $\frac{1}{60}$ of live births is twins. $\frac{1}{3}$ of all twin births are identical twins.

    a. What fraction of live births are NOT twins?

    b. What fraction of twin births are fraternal (not identical) twins?

    c. In a year of 360 births at a particular hospital, how many set of twins would you expect? How many sets of identical twins?

2. About $\frac{3}{4}$ of the Earth's 200 million square mile surface is covered in water.

    a. How many million square miles of the Earth's surface are covered with water?

    b. How many million square miles of the Earth's surface are land?

3. The $\frac{5}{16}$ inch wrench is too small. The $\frac{7}{16}$ inch wrench is too big. Which size might work?

    a) ½ inch   b) $\frac{3}{8}$ inch   c) $\frac{1}{4}$ inch

4. Which is larger: a $\frac{7}{8}$ inch bolt or a $\frac{3}{4}$ inch bolt? By how much?

5. Fact: Cigarette smoke contains 4,800 chemicals. 69 of those 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?

6. Half of computer users use Chrome as their browser. $\frac{1}{4}$ of computer users use Internet Explorer, $\frac{1}{20}$ use Safari, and the rest use Firefox

   a. What fraction of computer users use Firefox as their browser?

   b. Out of 500 college students, how many would you expect to use Chrome? Internet Explorer? Safari? Firefox?

7. The gene for brown eyes (B) is dominant and the gene for blue eyes (b) is recessive. If a child inherits the gene for brown eyes (B) from both parents, their eyes will be brown (BB). If a child inherits the gene for brown eyes (B) from one parent and the gene for blue eyes (b) from the other parent, the child's eyes will be brown (Bb). The only way for the child to have blue eyes (bb) is to inherit the gene for blue eyes (b) from both parents.

   We can use a Punnett square to show the probability of the children's eye color. In the square below, the eye color probability for children whose parent's both have brown (Bb) eyes is shown:
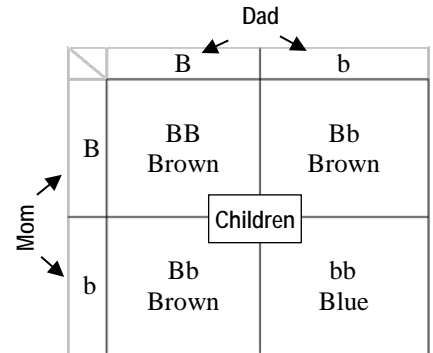
   a. What fraction of the children will have brown eyes?

   b. What fraction will have blue eyes?

   c. Out of 8 children in this family, how many would you expect to have brown eyes? Blue eyes?

	Dad B	Dad b
Mom B	BB Brown	Bb Brown
Mom b	Bb Brown	bb Blue

   (Children)

8. A zoo nutritionist uses the following recipe to feed the small mammals each day:

   $10\frac{3}{4}$ *cups chopped carrots* $5\frac{2}{3}$ *cups chopped lettuce* $7\frac{1}{2}$ *vitamin tablets*

   a. How much of each ingredient should he include in order to DOUBLE this recipe?

   b. How much of each ingredient should he include in order to cut this recipe in HALF?

9. On the days when you are working, this graph shows how your time breaks down for a 24-hour day:

My Daily Activity
How I spend my hours each working day!

free time, 4

work, 12
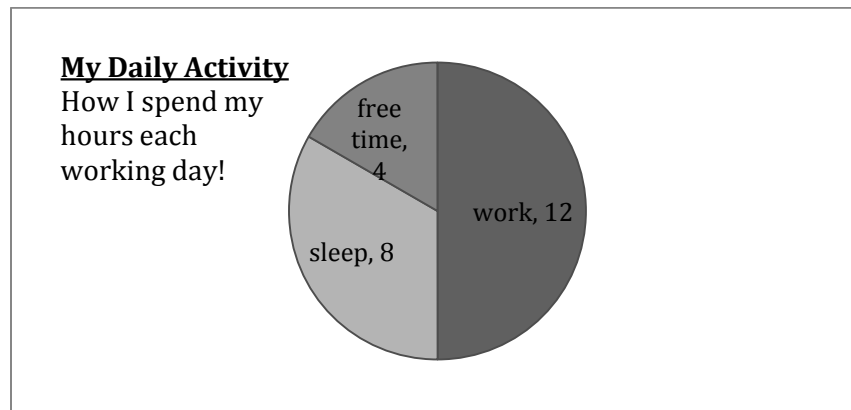
sleep, 8

Write each fraction and simplify:

a. What fraction of your time do you spend working?

b. What fraction of your time do you spend sleeping?

c. What fraction of your time do you have free?

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

e. According to the graph, what fraction of the day are you AWAKE?

f. What fraction of your DAY OFF do you spend working?

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

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

i. You spend $\frac{1}{3}$ of your work time on paperwork. How many hours is this?

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

$1\frac{3}{4}$ feet

$6\frac{1}{2}$ feet
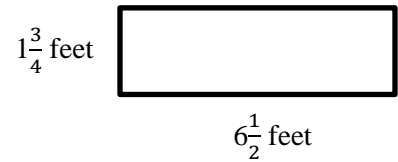
    a.   You decide to attach a rim to go around the edge of the shelf to keep items from falling off. How many feet of rim should you order? (*Note: You are finding the PERIMETER of the rectangle. You can find it by adding up the lengths of ALL four of the sides.*)

    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.*)

11. In an experiment measuring height, children grew ½ inch, $3\frac{5}{8}$ inches, and $1\frac{2}{3}$ inches in a year. What is the MEAN amount of growth for the three children?

12. Approximate:

a. How many pounds does the item weigh?   b. How full is the tank?   c.   How long is the line?
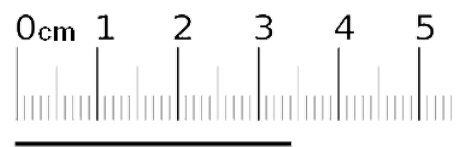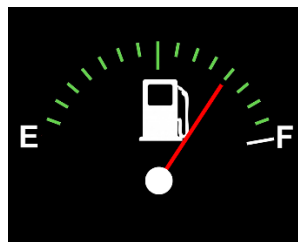
Resources

Image used in question 3
[Companion wrenches](#) by [Typhoon](#) is licensed under [CC BY-SA 3.0](#)

Image used in question 12a
[Fraction Scale](#) by [OER_Training](#) is licensed under [CC BY 4.0](#)

Image used in question 12b
[Gas Gauge](#) is a derivative of [Fuel Gauge](#), which is available in the public domain under [CC0 Public Domain](#)

Image used in question 12c
[Line Segment](#) is a derivative of [10cm ruler](#), which is available in the public domain

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2.1 Famous Equivalent Fractions

1a. $\frac{1}{2} = \frac{2}{4}, \frac{3}{6}, \frac{4}{8}, \frac{5}{10}, \frac{6}{12}$, **etc.**

1b. $\frac{1}{4} = \frac{2}{8}, \frac{3}{12}, \frac{4}{16}, \frac{5}{20}, \frac{6}{24}$, **etc.**

1c. $\frac{3}{4} = \frac{6}{8}, \frac{9}{12}, \frac{12}{16}, \frac{15}{20}, \frac{18}{24}$, **etc.**

1d. $0 = \frac{0}{2}, \frac{0}{3}, \frac{0}{4}, \frac{0}{5}, \frac{0}{6}$, **etc**

1e. $1 = \frac{2}{2}, \frac{3}{3}, \frac{4}{4}, \frac{5}{5}, \frac{6}{6}$, **etc**

1f. $2 = \frac{2}{1}, \frac{4}{2}, \frac{6}{3}, \frac{8}{4}, \frac{10}{5}$, **etc**

2. To create equivalent fractions **Multiply** the **Numerator** and the **Denominator** by the **Same** number. This is the same as multiplying the fraction by **1**, which does not change its value.

2.2 Color Matching Equivalent Fractions

$\frac{0}{3} = \frac{0}{100}$

$\frac{1}{2} = \frac{15}{30} = \frac{50}{100}$

$\frac{3}{3} = \frac{50}{50} = \frac{100}{100}$

$1\frac{1}{3} = \frac{4}{3} = \frac{20}{15} = \frac{400}{300}$

$1\frac{1}{2} = \frac{3}{2} = \frac{12}{8} = \frac{75}{50} = \frac{150}{50}$

$\frac{2}{1} = \frac{10}{5} = \frac{16}{8} = \frac{50}{25}$

* $\frac{3}{0}$ is undefined and does not have a match

2.4 Fractions Quiz

1a. $\frac{1}{3}$ 1b. $\frac{4}{3}$ 1c. $\frac{7}{8}$

1d. $\frac{11}{10}$ 1e. $\frac{4}{3}$ 1f. $\frac{7}{8}$

2.4 Fractions Quiz (cont.)

2a.

2b.

2c.

3. $\frac{5}{0}$

4. $\frac{1}{2} \cdot \frac{2}{3} = \frac{2}{6} = \frac{1}{3}$

5. $\frac{1}{2}, \frac{8}{16}, \frac{10}{20}$

6a. $\frac{4}{4} = 1$

6b. $\frac{8}{12} - \frac{3}{12} = \frac{5}{12}$

6c. $\frac{6}{12} = \frac{1}{2}$

6d. $\frac{2}{3} \times \frac{4}{3} = \frac{8}{9}$

6e. $1\frac{9}{12} + 2\frac{4}{12} = 3\frac{13}{12} = 4\frac{1}{12}$

6f. $\frac{7}{4} \times \frac{7}{3} = \frac{49}{12} = 4\frac{1}{12}$

6g. $\frac{7}{4} \div \frac{7}{3} = \frac{7}{4} \times \frac{3}{7} = \frac{21}{28} = \frac{3}{4}$

2.5 Incredible Growing and Shrinking Numbers

1. **Shrunk;** $\frac{20}{1} \times \frac{1}{10} = \frac{20}{10} = 2$

2. **Shrunk;** $\frac{20}{1} \times \frac{1}{2} = \frac{20}{2} = 10$

3. **Shrunk;** $\frac{20}{1} \times \frac{3}{4} = \frac{60}{4} = 15$

4. **Same;** $\frac{20}{1} \times \frac{5}{5} = \frac{100}{5} = 20$

5. **Grew;** $\frac{20}{1} \times \frac{5}{4} = \frac{100}{4} = 25$

2.5 Incredible Growing and Shrinking Numbers (cont.)

6. **Grew;** $20 \div \frac{1}{10} = \frac{20}{1} \times \frac{10}{1} = \frac{200}{1} = 200$

7. **Grew;** $20 \div \frac{1}{2} = \frac{20}{1} \times \frac{2}{1} = \frac{40}{1} = 40$

8. **Grew;** $20 \div \frac{3}{4} = \frac{20}{1} \times \frac{4}{3} = \frac{80}{3} = 26\frac{2}{3}$

9. **Same;** $20 \div \frac{5}{5} = \frac{20}{1} \times \frac{5}{5} = \frac{100}{5} = 20$

10. **Shrunk;** $20 \div \frac{5}{4} = \frac{20}{1} \times \frac{4}{5} = \frac{80}{5} = 16$

11. **shrinks**

12. **grows**

13. **stays the same**

14. **stays the same**

15. **grows**

15. **shrinks**

2.6 Career Applications: STEM

1a. $\frac{59}{60}$　　**1b.** $\frac{2}{3}$

1c. Remember that "of" means "multiply":
$\frac{1}{60}$ of $360 = \frac{1}{60} \cdot \frac{360}{1} =$ **6 sets of twins**

2a. $\frac{3}{4}$ of $200 = \frac{3}{4} \cdot \frac{200}{1}$
$= $ **150 million square miles**

2b. $\frac{1}{4}$ of 200 or $\frac{1}{4} \cdot \frac{200}{1}$
$= $ **50 million square miles**

(You could also have subtracted 200-150 to get the same answer!)

3. **b)** $\frac{3}{8}$ **inch** because $\frac{3}{8} = \frac{6}{16}$

4. $\frac{3}{4} = \frac{6}{8}$, so $\frac{7}{8} > \frac{3}{4}$
$\frac{7}{8} - \frac{3}{4} = \frac{7}{8} - \frac{6}{8} = \frac{1}{8}$ **inch larger**

2.6 Career Applications: STEM (cont.)

5a. $\frac{69}{4800} = \frac{23}{1600}$

5b. $\frac{4800-69}{4800} = \frac{4731}{4800} = \frac{1577}{1600}$

6a. $\frac{1}{2} + \frac{1}{4} + \frac{1}{20} = \frac{10}{20} + \frac{5}{20} + \frac{1}{20}$
$= \frac{16}{20}$ who use the other browswers,
So, $\frac{4}{20} = \frac{1}{5}$ **use Firefox**

6b. $\frac{1}{2}$ of $500 = $ **250 Chrome**
$\frac{1}{4} \cdot 500 = $ **125 Internet Explorer**
$\frac{1}{20} \cdot 500 = $ **25 Safari**
$\frac{1}{5} \cdot 500 = $ **100 Firefox**

7a. $\frac{3}{4}$

7b. $\frac{1}{4}$

7c. Brown: $\frac{3}{4}$ of $8 = \frac{3}{4} \cdot \frac{8}{1} = $ **6 children with brown eyes**
Blue: $\frac{1}{4}$ of $8 = \frac{1}{4} \cdot \frac{8}{1} = $ **2 children with blue eyes**

8. First, convert fractions to improper fractions:
$10\frac{3}{4}$ cups chopped carrots $= \frac{43}{4}$ cups
$5\frac{2}{3}$ cups chopped lettuce $= \frac{17}{3}$ cups
$7\frac{1}{2}$ vitamin tablets $= \frac{15}{2}$ tablets

8a. Multiply each improper fraction by $\frac{2}{1}$
Carrots: $\frac{43}{4} \cdot \frac{2}{1} = \frac{86}{4} = 21\frac{1}{2}$ **cups of carrots**
Lettuce: $\frac{17}{3} \cdot \frac{2}{1} = \frac{34}{3} = 11\frac{1}{3}$ **cups of lettuce**
Vitamins: $\frac{15}{2} \cdot \frac{2}{1} = \frac{30}{2} = $ **15 vitamins**

2.6 Career Applications: STEM (cont.)

8b. Divide each fraction by 2
(or multiply each by ½)

Carrots: $\frac{43}{4} \cdot \frac{1}{2} = \frac{43}{8} = \mathbf{5\frac{3}{8}}$ **cups of carrots**

Lettuce: $\frac{17}{3} \cdot \frac{1}{2} = \frac{34}{3} = \mathbf{2\frac{5}{6}}$ **cups of lettuce**

Vitamins: $\frac{15}{2} \cdot \frac{1}{2} = \frac{30}{2} = \mathbf{3\frac{3}{4}}$ **vitamins**

9a. $\frac{12}{24} = \mathbf{\frac{1}{2}}$ **of the day**

9b. $\frac{8}{24} = \mathbf{\frac{1}{3}}$ **of the day**

9c. $\frac{4}{24} = \mathbf{\frac{1}{6}}$ **of the day**

9d. $\frac{12}{24} + \frac{8}{24} + \frac{4}{24} = \frac{24}{24} = \mathbf{1, which\ is\ the\ entire\ day}$!

9e. You are awake for $\frac{16}{24} = \mathbf{\frac{2}{3}}$ **of your day**

9f. $\frac{0}{24} = \mathbf{0}$

9g. $\frac{1}{6}$ of $24 = \frac{1}{6} \cdot \frac{24}{1} = \mathbf{4\ hours}$

9h. $\frac{1}{5} > \frac{1}{6}$**, so your friend has more free time**

9i. $\frac{1}{3} \cdot \frac{12}{1} = \mathbf{4\ hours}$

10a. $1\frac{3}{4} + 6\frac{1}{2} + 1\frac{3}{4} + 6\frac{1}{2}$

$= 1\frac{3}{4} + 6\frac{2}{4} + 1\frac{3}{4} + 6\frac{2}{4}$

$= 14\frac{10}{4} = 14 + 2\frac{2}{4}$

$= \mathbf{16\frac{1}{2}}$ **feet**

10b. $16\frac{1}{2} \cdot 4 = \frac{33}{2} \cdot \frac{4}{1} = \mathbf{\$66}$

10c. $1\frac{3}{4} \cdot 6\frac{1}{2} = \frac{7}{4} \cdot \frac{13}{2} = \frac{91}{8}$

$= \mathbf{11\frac{3}{8}}$ **square feet = 3 rolls** (you can't
purchase only part of a roll!)

11. First, add all 3:

$\frac{1}{2} + \frac{29}{8} + \frac{5}{3} = \frac{12}{24} + \frac{87}{24} + \frac{40}{24} = \frac{139}{24}$

Then, divide by 3 (multiply by the reciprocal)

$\frac{139}{24} \cdot \frac{1}{3} = \frac{139}{72} = 1\frac{57}{72} = \mathbf{1\frac{19}{24}}$ **inches**

12a. about $\mathbf{7\frac{3}{4}}$ **lbs**.

12b. $\mathbf{\frac{3}{4}}$ **of a tank full**.

12c. $3\frac{4}{10} = \mathbf{3\frac{2}{5}}$ **centimeters**.

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 transportation 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
Converting Fractions to Dec	www.khanacademy.org	Converting Fractions to Decimals	Worksheet: Color the circles

Topic	Website	Videos	Exercises
		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

MoSTEMWINs

Place Value Chart including Decimals
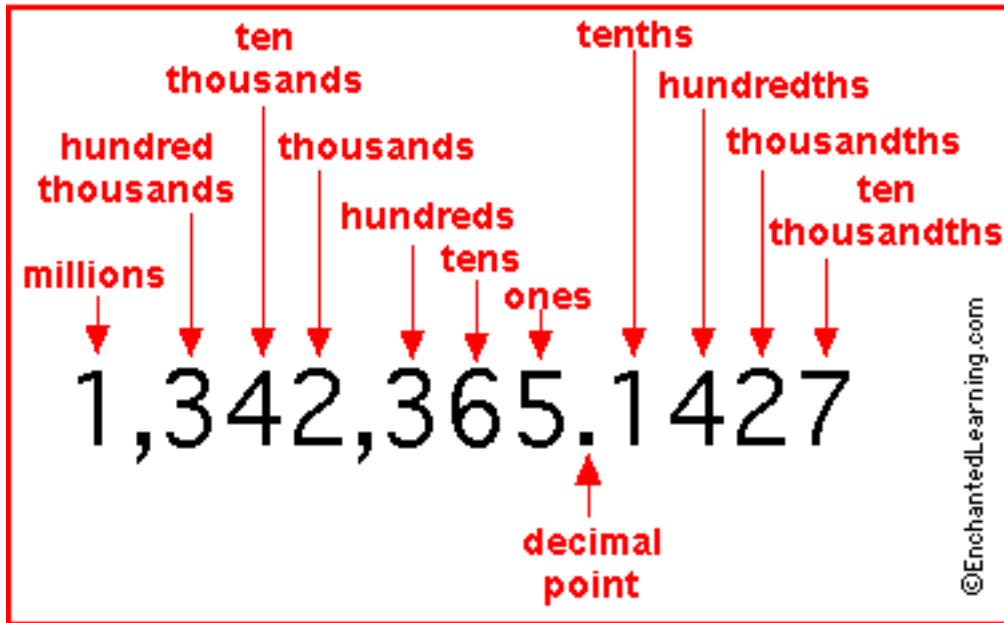
Song:
Happy Birthday

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!

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

A. Are these numbers the same or different? If different, which number is the biggest? Smallest?
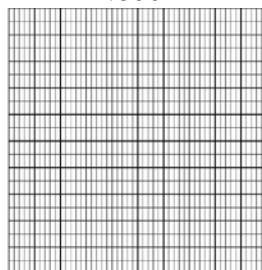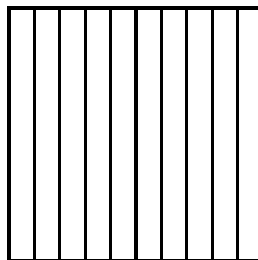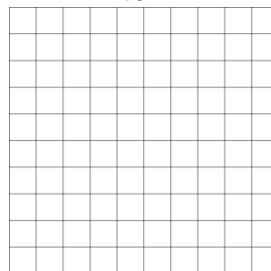
.6
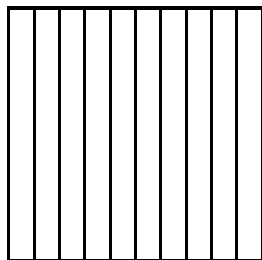
.60
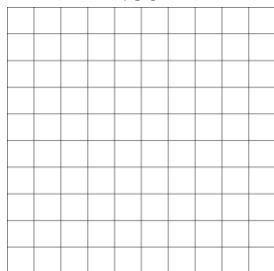
.600

B. Are these numbers the same or different? If different, which number is the biggest? Smallest?
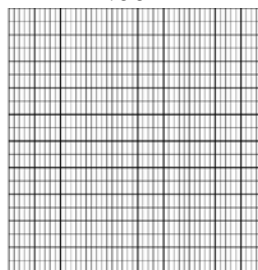
.4

.04
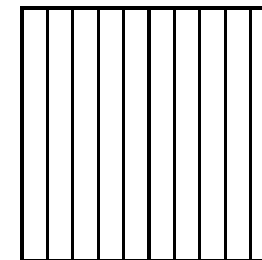
.004
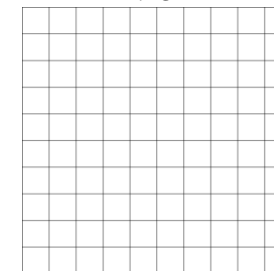
C. Are these numbers the same or different? If different, which number is the biggest? Smallest?

.3

.25

.205

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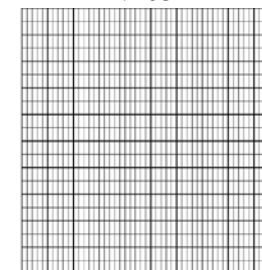
Match the words with the correct numbers:

_____ 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?

1. $20 \times .1 =$ _____

2. $20 \times .5 =$ _____

3. $20 \times .75 =$ _____

4. $20 \times 1.0 =$ _____

5. $20 \times 1.25 =$ _____

Grew or shrunk?

6. $20 \div .1 =$ _____

7. $20 \div .5 =$ _____

8. $20 \div .75 =$ _____

9. $20 \div 1.0 =$ _____

10. $20 \div 1.25 =$ _____

OBSERVATIONS:

11. When you multiply a number by a fraction < 1, it _____
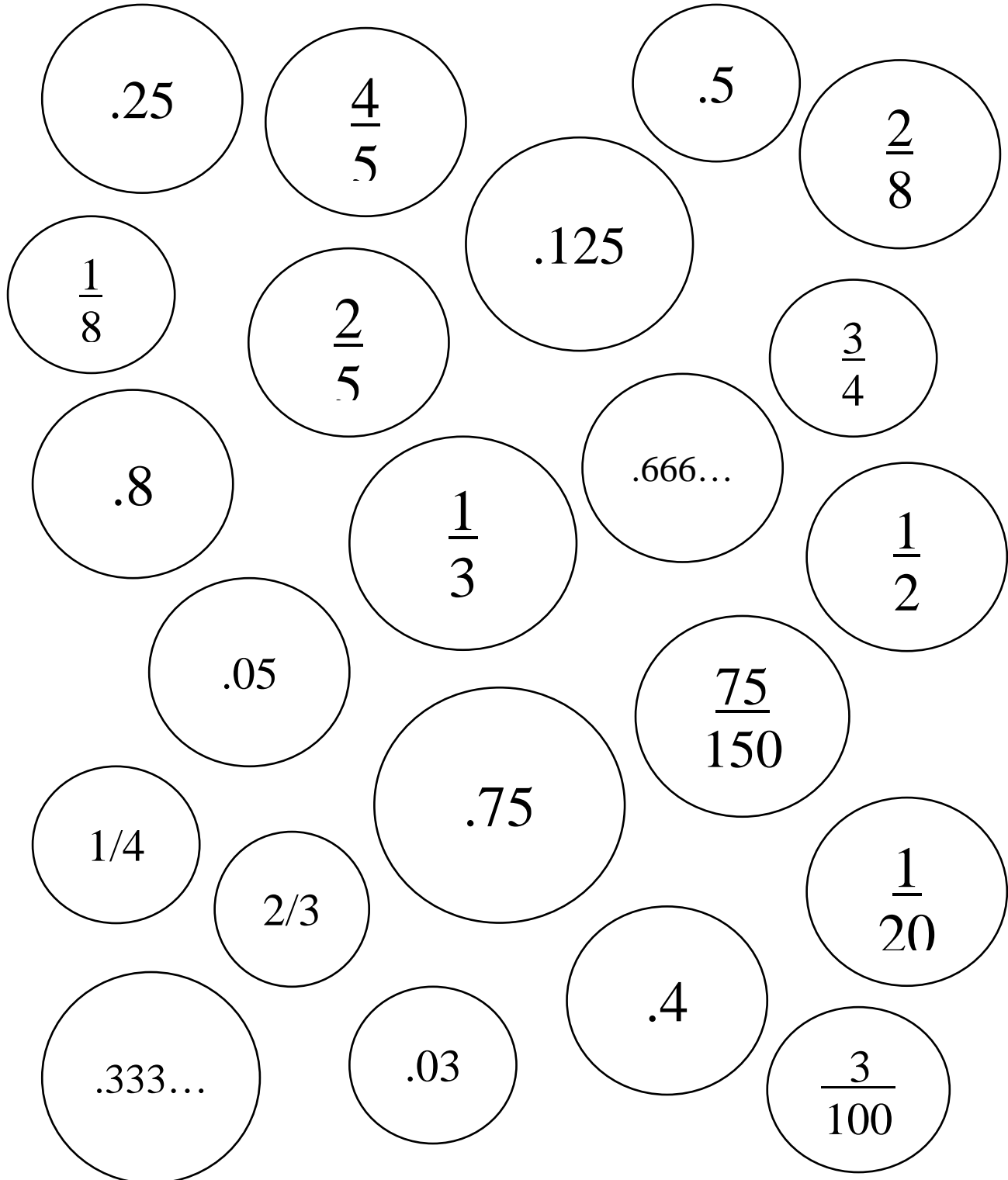
12. When you divide a number by a fraction < 1, it _____

13. When you multiply a number by 1, it _____

14. When you divide a number by 1, it _____

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

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

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Color all equivalent fractions and decimals the same color.

.25

$\frac{4}{5}$

.5

$\frac{2}{8}$

.125

$\frac{1}{8}$

$\frac{2}{5}$

$\frac{3}{4}$

.8

.666…

$\frac{1}{3}$

$\frac{1}{2}$

.05

$\frac{75}{150}$

1/4

.75

$\frac{1}{20}$

2/3

.4

.333…

.03

$\frac{3}{100}$

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:

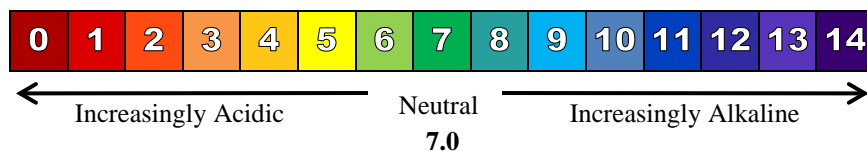5. Write .07 as a fraction:

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

1. pH is a scale from 0 – 14 measuring the hydrogen ion concentration of a solution. A pH of 7.0 is neutral. A pH less than 7.0 is acidic. A pH greater than 7.0 is basic (alkaline).

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |

← Increasingly Acidic   Neutral   Increasingly Alkaline →
                                 7.0

   Rank the following from most acidic to most alkaline (from lowest to highest pH). Then indicate which solutions are acids, which are bases (alkaline), and which are neutral.

Solution	pH
Human blood	7.365
Battery acid	1
Tap water	7.67
7-up soda	3.2
Pepsi	2.1
Surge soda	3.02
Coca Cola	2.15
Mountain Dew	3.22
Dr. Pepper	2.89
Diet Dr. Pepper	3.26
English Mountain Bottled Water	7.66
Fine Bottled Water	7.8
Pure Water	7.0
Ketchup	8.5
Urine	6.00
Milk	6.6
Wine	3.5
Toothpaste	9.9

Ranked List

(Lowest)   a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

g. _____
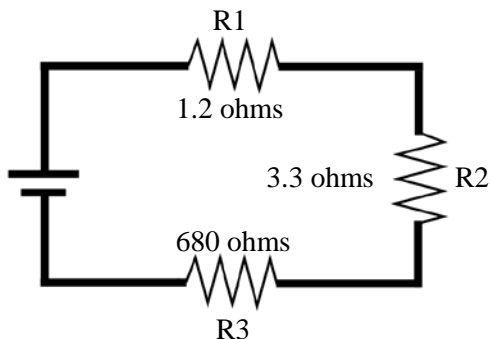
h. _____

i. _____

j. _____
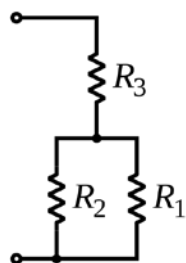
k. _____

l. _____

m. _____

n. _____

o. _____

p. _____

q. _____

(Highest)   r. _____

2. In a series circuit, total resistance is equal to the sum of individual resistances, measured in ohms. Find the total resistance in the diagram below by adding R1 + R2 + R3.

R1

1.2 ohms

3.3 ohms   R2

680 ohms

R3

3. In this series circuit, R1 is 25.9 ohms. R2 is 4.75 ohms. The total resistance is 120 ohms. What is the resistance of R3?

R_3

R_2 R_1

4. A computer can download a file in 3.29 seconds. How long would it take to download 4 similar-size files?

5. A computer took 82.25 seconds to download files at the same rate of 3.29 seconds each. How many files were downloaded?

6. A computer downloaded 12 files in 42.03 seconds. How long did each file take to download?

7. To create a safe helipad, there must be three concentric (all with the same center) circles. The innermost circle, the **Landing and Liftoff Area (LLA) must have a diameter of at least 15 meters**. The FATO surface needs to be capable of supporting the helicopter in case of a forced landing. The minimum size of the **FATO area is 35 meters diameter**. A Safety Area surrounding the FATO is an obstacle-free area, including the separation requirements between public areas and the helipad. The **Public Safety Area must have a minimum diameter of 60 meters**.

Public Safety Area
(60m diam.)

FATO
(35m diam.)

LLA
(15m diam.)

H
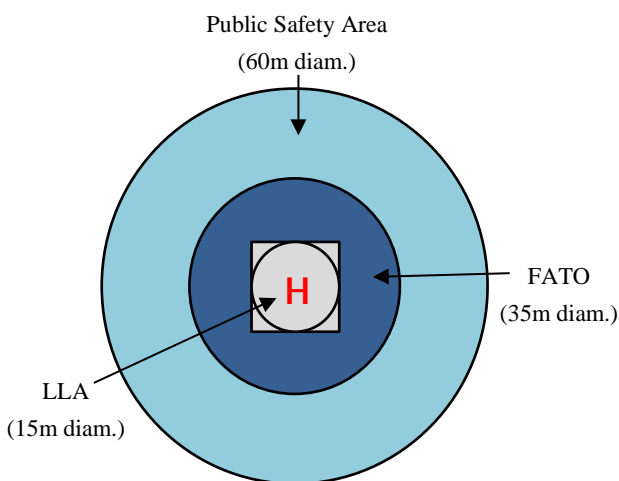
a. If you were to walk around the edge of each circle, how far would you walk? (Note: This measurement along the edge of a circle is called its circumference. To calculate the circumference of a circle, you can use the formula $C = \pi d$. The number π, pronounced "Pi", can be approximated as 3.14. To find the circumference, multiply π times the diameter of the circle).

b. What is the area of each circle? (Note: The measurement of the inside surface of a circle is called its area. To calculate the area of a circle, you can use the formula $A = \pi r^2$. Again, use 3.14 to approximate the number π. The radius is the measure from the center of the circle to its edge. The radius is half of the diameter. 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!)

8. 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.

9. The following table offers information about a drinker's weight, number of drinks consumed, and blood alcohol level.

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?

Man #1 – a 140-pound man who has had 4 drinks in the last hour

Man #2 – a 220-pound man who has had 5 drinks in the last hour

b. A blood alcohol level of .08 or higher is considered legally intoxicated. How many drinks in an hour would put YOU at or above the legal limit?

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

Image used in question 4
Series circuit by Mets501 is licensed under CC BY-SA 3.0; modifications: text added

Image used in question 5
Resistors in series and parallel by Omegatron is licensed under CC BY-SA 3.0

Image used in question 6
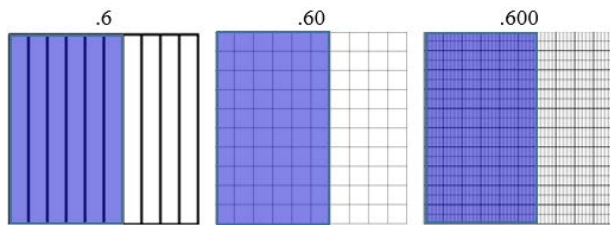Awesome by Jason Carlin is licensed under CC BY-NC-SA 2.0; Cropped from original work.

Unit 3: Decimal Numbers   3.7 Career Applications: STEM

3.2 Decimal Place Value Comparison

A. Same

B. Different; .4 > .04 > .004
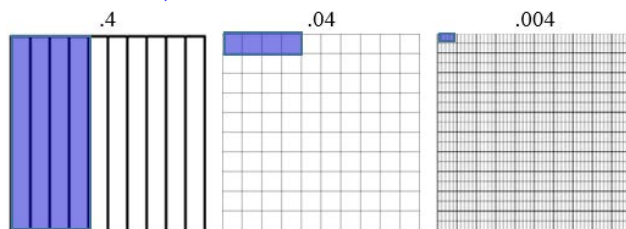
C. Different; .3 > .25 > .205
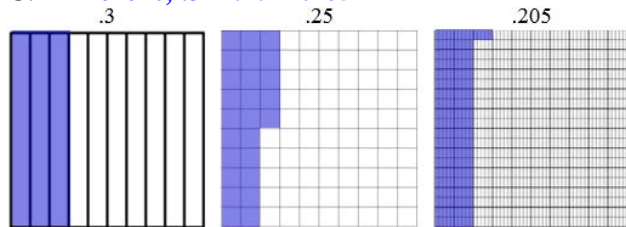
3.3 Decimal Quiz 1

1. **C**
2. **A**
3. **B**
4. **E**
5. **F**
6. **D**
7. **A; .056**
8. **C; .56**
9. **1.066**
10. **.054**

3.4 Incredible Growing and Shrinking Numbers

1. **Shrunk;** 20 x .1 = **2**
2. **Shrunk;** 20 x .5 = **10**
3. **Shrunk;** 20 x .75 = **15**

3.4 Incredible Growing and Shrinking (cont.)

4. **Same;** 20 x 1.0 = **20**
5. **Grew;** 20 x 1.25 = **25**
6. **Grew;** 20 ÷ .1 = **200**
7. **Grew;** 20 ÷ .5 = **40**
8. **Grew;** 20 ÷ .75 = **26.$\overline{66}$**
9. **Same;** 20 ÷ 1.0 = **20**
10. **Shrunk;** 20 ÷ 1.25 = **16**

3.5 Color Matching Equivalent Decimals & Fractions

$$\frac{3}{100} = .03$$

$$\frac{1}{20} = .05$$

$$\frac{1}{8} = .125$$

$$\frac{1}{4} = \frac{2}{8} = .25$$

$$\frac{1}{3} = .333 ...$$

$$\frac{2}{5} = .4$$

$$\frac{1}{2} = \frac{75}{150} = .5$$

$$\frac{2}{3} = .666 ...$$

$$\frac{3}{4} = .75$$

$$\frac{4}{5} = .8$$

3.6 Decimal Quiz 2

1. **.51**
2. **.052**
3. **7.6, 7.7, 7.8, 7.9, etc.** (*there are an infinite number of possibilities!*)
4. **7.51, 7.52, 7.53, 7.54, etc.** (*there are an infinite number of possibilities!*)
5. **$\frac{7}{100}$**
6. **.5**
7. **1.09**   *Hint: You must add up the decimal*
8. **.019**   *points to add or subtract ♫*
9. **.35**
10. **70**

3.7 Career Applications: STEM

1a. Battery Acid 1.0 (acid)
1b. Pepsi 2.1 (acid)
1c. Coca Cola 2.15 (acid)
1d. Dr. Pepper 2.89 (acid)
1e. Surge Soda 3.02 (acid)
1f. 7-Up Soda 3.2 (acid)
1g. Mountain Dew 3.22 (acid)
1h. Diet Dr. Pepper 3.26 (acid)
1i. Wine 3.5 (acid)
1j. Urine 6.0 (acid)
1k. Milk 6.6 (acid)
1l. Pure water 7.0 (neutral)
1m. Blood 7.365 (alkaline)
1n. English Mountain Water 7.66 (alkaline)
1o. Tap water 7.67 (alkaline)
1p. Fine Bottled Water 7.8 (alkaline)
1q. Ketchup 8.5 (alkaline)
1r. Toothpaste 9.9 (alkaline)

9a. Man #1 with .11 > Man#2 with .09
9b. Determined by your weight; answers will vary
9c. 2 drinks

2. $1.2 + 3.3 + 680.0 =$ **684.5 ohms**

3. $25.9 + 4.75 = 30.65$
$120.00 - 30.65 =$ **89.35 ohms**

4. $3.29 \times 4 =$ **13.16 seconds**

5. $82.25 \div 3.29 =$ **25 files**

6. $42.03 \div 12 =$ **3.5025 seconds per file**

7a. LLA: $3.14 \times 15 =$ **47.1 m**
FATO: $3.14 \times 35 =$ **109.9 m**
Safety: $3.14 \times 60 =$ **188.4 m**

7b. LLA: $r = 7.5$; $A = 3.14 \times 7.5 \times 7.5 =$ **176.625 m²**
FATO: $r = 17.5$; $A = 3.14 \times 17.5 \times 17.5 =$ **961.625 m²**
Safety: $r = 30$; $A = 3.14 \times 30 \times 30 =$ **2826 m²**

8. 48,151.1 miles
Forty-eight thousand one hundred fifty-one and six tenths miles

LEARNING OBJECTIVES

1. **Ratios:**

   ☐ Express ratios using 3 different types of notation: words, colons (**:**), 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 transportation industry

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	

MoSTEMWINs

Adult Learning Academy
Pre-Algebra Workbook
4.1 MEASUREMENT CONVERSIONS

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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

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MoSTEM
WINS

1. Gear ratio is the number of teeth each gear represents when two gears are used in a machine. For example, a pinion gear has 8 teeth and a spur gear has 28 teeth. The gear ratio is 8:28, which simplifies to 2:7. Simplify each gear ratio below:

    a. 40:4   _____

    b. 55:11   _____

    c. 168:14   _____

    d. 52:13   _____

    e. 48:8   _____

2. 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   _____

3. Which car below gets the highest MPG, or miles per gallon?

    Honda Civic
    Drove 224 miles on 7 gallons

    Toyota Corolla
    Drove 335 miles on 15 gallons

    Ford Fiesta
    Drove 620 miles on 20 gallons

4. In fluid mechanics, the MACH number is the ratio of the speed of an object to the speed of sound. The speed of sound is about 760 miles per hour.

   The Gulfstream G650, one of the fastest civil aircraft ever, flies at 800 miles per hour. What MACH is this? (round to the nearest tenth)

5. It took 3 ½ hours to drive 70 miles. About how long will it take to drive 100 miles?

6. It cost $2100 for 12 tires. How much would 18 tires cost?

7. Fuel for a 2-cycle engine requires a mixture of gas and oil. If you need 4 ounces of oil for every 128 ounces of gas, how much oil should be added to 32 ounces of gas?

8. 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

   f. _____ calories in 16.25 grams of fat

9. To estimate the number of fish in a lake, scientists cannot possibly count every fish. Instead, they use proportions. They cast a net, catch a bunch of fish, and tag each one. Then they release the tagged fish. Later, they come back to the same spot and put out their net again. They count the number of tagged fish in the net, compared to the number of total fish in the net. They use this ratio of tagged fish in the net to set up a proportion:

$$\frac{tagged\ fish\ in\ net\ (2nd\ catch)}{total\ fish\ in\ net\ (2nd\ catch)} = \frac{tagged\ fish\ in\ the\ area\ (from\ initial\ catch)}{total\ fish\ in\ the\ area}$$

a. Say that you caught and tagged 200 fish initially. The second time you cast the net, you caught 250 fish, and 25 of them were already tagged. How many fish do you estimate to be in the lake?

b. Say that you caught and tagged 500 fish initially. The second time you cast the net, you caught 200 fish, 10 of whom were tagged. Estimate the population of fish in the lake.

c. A biologist catches and tags 50 frogs in a marsh. The following week, she catches 25 frogs, and two of them have a tag. Estimate the population of frogs in the marsh.

10. 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?

11. An engineer must make accurate scale drawings before constructing full-size objects. In this drawing, the scale is 1:72. Thus, every inch in the drawing corresponds to 72 inches when the shuttle is built.

"TOP" ELEVATION
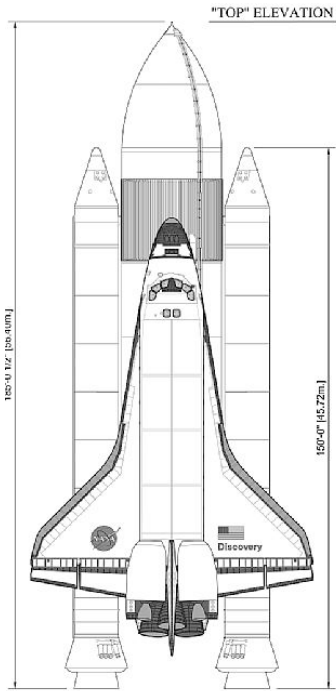
a. The nose cone is 1.25 inches long in the drawing. How long is it on the actual shuttle?

b. The actual shuttle has a wingspan of 78 feet. What should the wingspan be in the drawing? (Remember, there are 12 inches in a foot.)

12. 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.

a. 50 pounds   _____

b. 100 pounds   _____

c. 200 pounds   _____

d. 8 pounds   _____

e. 135 pounds   _____

f. 57 pounds   _____

g. 277 pounds   _____

ANSWER KEY

1a. **10:1**

1b. **5:1**

1c. **12:1**

1d. **4:1**

1e. **6:1**

2a. **Yes;** 50 x 3 = 30 x 5

2b. **Yes;** 100 x 1 = 4 x 25

2c. **No;** 16 x 7 ≠ 15 x 8

2d. **No;** 90 x 5 ≠ 45 x 9

2e. **Yes;** 18 x 1.5 = 3 x 9

3. Highest MPG is the **Honda Civic**
Honda Civic = 224 ÷ 7 = **32 MPG**
Toyota Corolla = 335 ÷ 15 = 22.3 MPG
Ford Fiesta = 620 ÷ 20 = 31 MPG

4. $\dfrac{760 \text{ mph}}{\text{Mach 1}} = \dfrac{800 \text{ mph}}{x}$; so 760x = 800

$x = \dfrac{800}{760} = $ **Mach 1.05**

5. $\dfrac{3.5 \text{ hours}}{70 \text{ miles}} = \dfrac{x \text{ hours}}{100 \text{ miles}}$; so 70x = 350

x = 5 hours

6. $\dfrac{\$2100}{12 \text{ tires}} = \dfrac{\$x}{18 \text{ tires}}$; so 12x = 37,800

x = \$3,150

7. $\dfrac{4 \text{ oz oil}}{128 \text{ oz gas}} = \dfrac{x \text{ oz oil}}{32 \text{ oz gas}}$; so 128x = 128

x = 1 oz oil

8a. $\dfrac{9 \text{ calories}}{1 \text{ gram fat}} = \dfrac{27 \text{ calories}}{x \text{ grams}}$; x = **3 grams**

8b. $\dfrac{4 \text{ calories}}{1 \text{ gram carbs}} = \dfrac{88 \text{ calories}}{x \text{ grams}}$; x = **22 grams**

8c. $\dfrac{4 \text{ calories}}{1 \text{ gram carbs}} = \dfrac{360 \text{ calories}}{x \text{ grams}}$; x = **90 grams**

8d. $\dfrac{4 \text{ calories}}{1 \text{ gram protein}} = \dfrac{x \text{ calories}}{12 \text{ grams}}$; **x = 48 calories**

8e. $\dfrac{4 \text{ calories}}{1 \text{ gram carbs}} = \dfrac{x}{.5 \text{ grams}}$; **x = 2 calories**

8f. $\dfrac{9 \text{ calories}}{1 \text{ gram fat}} = \dfrac{x}{16.25 \text{ grams}}$; **x = 146.25 calories**

9a. $\dfrac{25 \text{ tagged}}{250 \text{ total}} = \dfrac{200 \text{ } tagged}{x \text{ } total}$; so 25x = 200(250)

x = 50,000 ÷ 25 = **2000 total fish in the area**

9b. $\dfrac{10 \text{ } tagged}{200 \text{ } total} = \dfrac{500 \text{ } tagged}{x \text{ } total}$; so 10x = 200(500)

x = 100,000 ÷ 10 = **10,000 total fish in the area**

9c. $\dfrac{2 \text{ } tagged}{25 \text{ } total} = \dfrac{50 \text{ } tagged}{x \text{ } total}$; so 2x = 25(50)

x = **625 total frogs in the area**

10. $\dfrac{3 \text{ high BP}}{10 \text{ total}} = \dfrac{x \text{ high BP}}{400 \text{ } total}$; so 10x = 1200

x = **120 people with high BP**

11a. $\dfrac{1 \text{ } inch}{50 \text{ } miles} = \dfrac{3 \text{ } inches}{x \text{ } miles}$; **x = 150 miles**

11b. *think*: $\dfrac{1}{2}$ of 50 miles = **25 miles**

11c. $\dfrac{1 \text{ } in. \text{ } paper}{72 \text{ } in. \text{ } shuttle} = \dfrac{1.25 \text{ } in. \text{ } paper}{x \text{ } in. \text{ } shuttle}$; so x = 72(1.25)

x = **90 inches**

11d. $\dfrac{1 \text{ } in. \text{ } paper}{72 \text{ } in. \text{ } shuttle} = \dfrac{x \text{ } in. \text{ } paper}{78 \text{ } x \text{ } 12 \text{ } in. \text{ } shuttle}$; so 72x = 936

x = **13 inches on paper**

12a. $\dfrac{10 \text{ cc}}{25 \text{ lbs.}} = \dfrac{x \text{ cc}}{50 \text{ lbs.}}$; so $10(50) = 25x$

x = 20 cc

12b. $\dfrac{10 \text{ cc}}{25 \text{ lbs.}} = \dfrac{x \text{ cc}}{100 \text{ lbs.}}$; so $10(100) = 25x$

x = 40 cc

12c. $\dfrac{10 \text{ cc}}{25 \text{ lbs.}} = \dfrac{x \text{ cc}}{200 \text{ lbs.}}$; so $10(200) = 25x$

x = 80 cc

12d. $\dfrac{10 \text{ cc}}{25 \text{ lbs.}} = \dfrac{x \text{ cc}}{8 \text{ lbs.}}$; so $10(8) = 25x$

x = 3.2 cc

12e. $\dfrac{10 \text{ cc}}{25 \text{ lbs.}} = \dfrac{x \text{ cc}}{135 \text{ lbs.}}$; so $10(135) = 25x$

x = 54 cc

12f. $\dfrac{10 \text{ cc}}{25 \text{ lbs.}} = \dfrac{x \text{ cc}}{57 \text{ lbs.}}$; so $10(57) = 25x$

x = 22.8 cc

12g. $\dfrac{10 \text{ cc}}{25 \text{ lbs.}} = \dfrac{x \text{ cc}}{277 \text{ lbs.}}$; so $10(277) = 25x$

x = 110.8 cc

RESOURCES

Image used in question 1

[Gears](#) is available in the public domain under [CC0 Public Domain](#)

Images used in question 3

[Honda Civic 1.6 i-DTEC Elegance (IX, Facelift)](#) by [© M 93](#) is licensed under [CC-BY-SA-3.0 (DE)](#)

[2014 Toyota Corolla 1.8 LE (ZRE172), front left](#) by [Mr.choppers](#) is licensed under [CC BY-SA 3.0](#)

[2009-2010 Ford Fiesta (WS) Zetec 3-door hatchback 01](#) is available in the public domain

Image used in question 9a

[Lake Washington Ship Canal Fish Ladder pamphlet - male freshwater phase Steelhead](#) is available in the public domain under; image cropped and resized

Image used in question 9b

[Pickerel Frog](#) by [Brian Gratwicke](#) is licensed under [CC BY 2.0](#); cropped from original work

Image used in question 11

[Elevations of the Space Shuttle Launch Stack Assembly](#) is available in the public domain

MoSTEMWINs

Adult Learning Academy
Pre-Algebra Workbook
UNIT 5: PERCENTS

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 transportation industry

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

MoSTEMWINs

SHADE	PERCENT	FRACTION	DECIMAL
	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.

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1. Convert the following decimals to percents.

   a. .75   _____

   b. .9   _____

   c. .07   _____

   d. 3.98   _____

   e. .0085   _____

   f. .902   _____

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

   a. 25%   _____

   b. 3%   _____

   c. 150%   _____

   d. 700%   _____

   e. .08%   _____

   f. 9 ½ %   _____

3. Find each amount:
   a. 100% of 60   _____   f. 15% of 60   _____

   b. 50% of 60   _____   g. 150% of 60   _____

   c. 25% of 60   _____   h. 200% of 60   _____

   d. 10% of 60   _____   i. 300% of 60   _____

   e. 20% of 60   _____   j. 1000% of 60   _____

4. Solve the following percent problems. Show work.
   a. What is 25% of 300?

   e. 18 is what percent of 150?

   b. What is 70% of 20?

   f. .5 is what percent of 4?

   c. What is 350% of 80?

   g. 50% of 224 is what number?

   d. 100 is what percent of 400?

   h. 225% of 50 is what number?

5. The following pie chart shows how water is used in an average household.

a. The average household uses 400 gallons of water each day. How many gallons do we use for each activity?

b. What percent of water is used for cooking, drinking, or showering?

c. What percent of water is NOT used for laundry or dishes?

d. Based on the percentage here, what suggestions would you make to cut down on water usage?

6. Earth's atmosphere is a mixture of gases: 78% nitrogen, 21% oxygen, .9% argon, and .03% carbon dioxide.

   a. Find the sum of these percents.

   b. What percent of the atmosphere is made up of water vapor and trace gases, the only components not mentioned above?

Percentage of Households with Internet Access

19.70% 25.40% 30.00% 41.60% 42.90% 47.20%

□2007 □2008 □2009 □2010 □2011 □2012
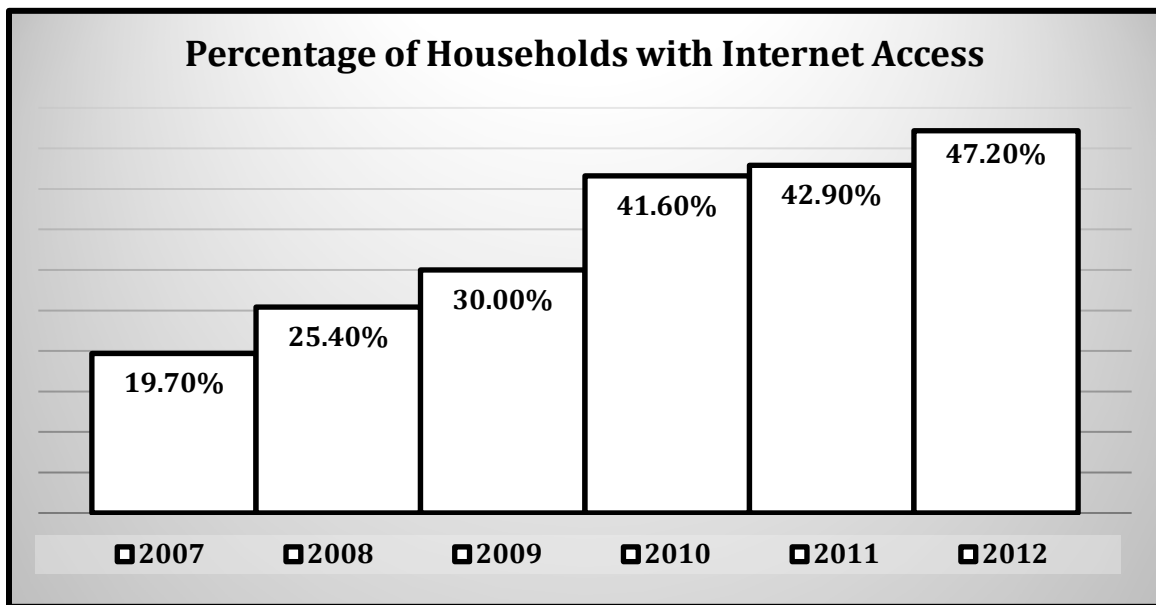
7. The bar graph above shows the percentage of households with access to the internet from 2007 to 2012.

   a. In a state with 1.5 million households in 2012, how many would you expect to have access to the Internet?

   b. In 2009, a state had 40,000 households with access to the Internet. Estimate the number of households in that state.

8. According to the Bureau of Labor Statistics, in 2012, the median wage for a female computer and information systems manager was \$79,404. This was 87.8% of what their male counterparts were being paid. How much were male computer and information systems managers being paid?

9. According to the Bureau of Labor Statistics, in 2012, 33% of all American computer systems analysts were women. 145,000 women were doing this job. How many men were doing the same job?

10. According to www.internetworldstats.com, as of June 30, 2014, North America had 310,322,257 of its 353,860,227 people using the Internet. What percent of people in North America were using the Internet?

11. In a laboratory experiment, 28 out of 75 patients improved when given the test drug. What percent of patients improved?

12. In a laboratory experiment, a plant grew from 11 inches to 15 inches tall. By what percent did the plant's height increase over the course of the experiment?

13. One year, a cherry tree produced 15 kilograms of fruit. The drought caused a 20% decrease in yield the next year. How many kilograms of fruit did the tree produce that year?

14. A pH meter costs $165.

    a. The lab gets a 15% discount. How much will the meter cost?

    b. There is an 8.5% tax on the meter. Using your result from part a) above with the 15% discount, but adding in the tax, how much will the meter cost?

    c. It costs $7.50 to ship your meter. Using the result from part b) above, the shipping cost is what percent of the meter's cost?

15. As shown on the right, a campaign has raised $81,412 of its $175,000 goal.

    a. What percent of the goal has been raised so far?

175,000
155,000
140,000
125,000
110,000
95,000
80,000   **$81,412**
65,000
50,000
35,000
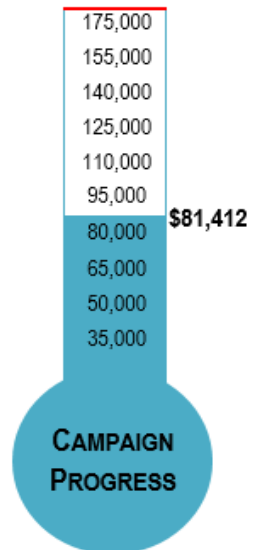
    b. What percent remains to be raised?

CAMPAIGN PROGRESS

ANSWER KEY

1a. **75%**

1b. **90%**

1c. **7%**

1d. **398%**

1e. **.85%**

1f. **90.2%**

2a. **.25**

2b. **.03**

2c. **1.5**

2d. **7**

2e. **.0008**

2f. **.095**

3a. **60**

3b. **30**

3c. **1.5**

3d. **6**

3e. **12**

3f. **9**

3g. **90**

3h. **120**

3i. **180**

3j. **600**

4a. $x = .25(300)$ so **x = 75**

4b. $x = .7(20)$ so **x = 14**

4c. $x = 3.5(80)$ so **x = 280**

4d. $100 = x(400)$ so **x = .25 = 25%**

4e. $18 = x(150)$ so $x = 18/150 = .12$ **= 12%**

4f. $.5 = x(4)$ so $x = .5/4 = .125$ **= 12.5%**

4g. $.5(224) =$ **112**

4h. $2.25(50) =$ **112.5**

5a. $.4(400) =$ **160 gal for toilet**

$.05(400) =$ **20 gal for cooking & drinking**

$.2(400) =$ **80 gal for laundry & dishes**

$.35(400) =$ **140 gal for showers**

5b. $35\% + 5\% =$ **40%**

5c. $100\% - 20\% =$ **80%**

5d. Shorter showers? Low-flush toilets? Answers will vary.

6a. $78\% + 21\% + .9\% + .03\% =$ **99.3%**

6b. $100\% - 99.3\% =$ **.07%**

7a. 47.2% of 1.5 million $= .472(1,500,000)$

$=$ **708,000 households**

7b. 40,000 = 30% of what number?

$40,000 = .3x$ $x = 40,000/.3 =$ **133,333 households**

8. 79,404 = 87.8% of what number? $79,404 = .878x$

$x = 79,404/.878 =$ **$90,437 (rounded to nearest $)**

9. 145,000 = 33% of all analysts $145,000 = .33x$

$x = 145,000/.33 = 439,394$ total analysts (rounded)

$439,394 - 145,000 =$ **294,394 male analysts**

10. 310,322,257 = what % of 353,860,227

$310,322,257 = x(353,860,227)$

$x = 310,322,257/353,860,227 = .8769$ so **about 88%**

11. $28/75 = .3733$ so **about 37%**

12. Plant grew 4 inches; 4 = what % of original 11 in.

$4 = x(11)$ $x = 4/11$ $x = .3636$ so **about 36%**

13. Tree lost 20% of 15 kilograms or $.2(15) = 3$ kg

$15 - 3 =$ **12 kg fruit the next year**

14a. $165 - 15\%$ of $165 or $165 - .15(165) =$

$165 - 24.75 =$ **$140.25**

14b. $140.25 + 8.5\%$ of $140.25 or $165 + .085(140.25)$

$140.25 + 11.92 =$ **$152.17** (rounded)

14c. $7.50 is what % of $152.17   or $7.5 = x(152.17)$

$x = 7.5/152.17 = .049$ so **about 5%**

15a. $81,412 = what % of $175,000 or $81,412 = x(175,000)$

$x = 81,412/175,000 = .465$ so **about 47%**

* this makes sense since it is just under half of the goal

15b. $100\% - 47\% =$ **53%**

5.1 EQUIVALENT FRACTIONS, DECIMALS, AND PERCENTS

SHADE	PERCENT	FRACTION	DECIMAL
	1%	1/100	.01
	5%	1/20	.05
	20%	1/5	0.2
	25%	1/4	.25
	50%	1/2	.5

SHADE	PERCENT	FRACTION	DECIMAL
	75%	3/4	.75
	99%	99/100	0.99
	100%	1	1.00
	110%	1 1/10	1.1
	0.5%	5/1000 or 1/200	.005

5.2 MATCHING PERCENTAGES

10% of 250 =	**25**
15% of 200 =	**30**
5% of 300 =	**15**
1% of 2000 =	**20**
20% of 150 =	**30**
100% of 25 =	**25**
200% of 7.5 =	**15**
.5% of 4000 =	**20**

5.3 PERCENTS - SENSE OR NONSENSE?

1. **Nonsense**
2. **Nonsense**
3. **Sense**
4. **Nonsense**
5. **Sense**
6. **Nonsense**
7. **Nonsense**
8. **Nonsense**
9. **Nonsense**

5.4 Career Applications: STEM

1a. **75%**
1b. **90%**
1c. **7%**
1d. **398%**
1e. **.85%**
1f. **90.2%**

2a. **.25**
2b. **.03**
2c. **1.5**
2d. **7**
2e. **.0008**
2f. **.095**

3a. **60**
3b. **30**
3c. **1.5**
3d. **6**
3e. **12**

5.4 Career Applications: STEM (cont.)

3f. **9**

3g. **90**

3h. **120**

3i. **180**

3j. **600**

4a. $x = .25(300)$ so **x = 75**

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 = 708,000 households

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 $15 - 3 =$ **12 kg fruit the next year**

14a. $165 – 15\%$ of 165 or $165 - .15(165) =$

 $165 – 24.75 =$ **$140.25**

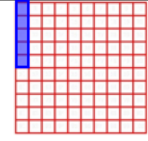**14b.** $140.25 + 8.5\%$ of 140.25 or $165 + .085(140.25)$
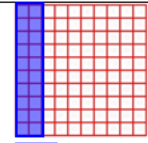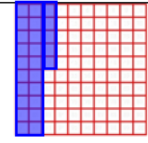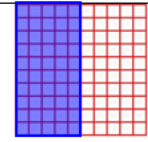
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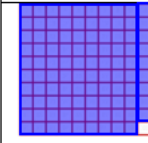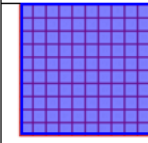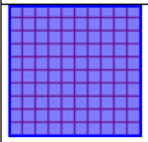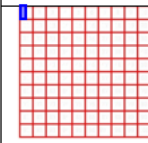
 $x = 81,412/175,000 = .465$ so **about 47%**

 this makes sense since it is just under half of the goal

15b. $100\% - 47\% =$ **53%**

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 STEM industry

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

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To ADD Integers: **EXAMPLES:**

Positive + Positive = $4 + 5 =$

Negative + Negative = $-4 + (-5) =$

Positive + Negative: $4 + (-5) =$
That DEPENDS on which number
has the larger absolute value! $-4 + 5 =$

                                             $-5 + 5 =$

To SUBTRACT Integers: **EXAMPLES:**

ADD the OPPOSITE! $4 - 5 =$

                                             $4 - (-5) =$

Remember that subtracting a
negative is the same as $-4 - 5 =$
adding a positive!

                                             $-4 - (-5) =$

To MULTIPLY or DIVIDE Integers: **EXAMPLES:**

Positive x Positive = $10 \times 5 =$

Positive ÷ Positive = $10 \div 5 =$

Negative x Negative = $-10 \times (-5) =$

Negative ÷ Negative = $-10 \div (-5) =$

Positive x Negative = $10 \times (-5) =$

Positive ÷ Negative = $10 \div (-5) =$

Negative x Positive = $-10 \times 5 =$

Negative ÷ Positive = $-10 \div (5) =$
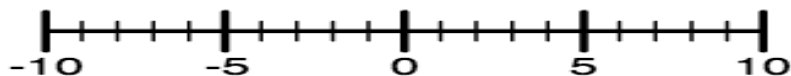
1. On the number line above,
   a) Draw a star where -6 would be.
   b) Draw a heart where -3 would be.
   c) Draw a smiley face where the OPPOSITE of -8 would be.

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 x 7 |

   l) -9^2

4. Write in scientific notation:

   a) 45,700,000

   b) .00039

5. Write in standard notation:

   a) 5.4 x 10^{-6}

   b) 5.2 x 10^4

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

    a. The largest human chromosome consists of approximately 220,000,000 base pairs.

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

    c. A gigabyte is over 1,000,000,000 bytes.

    d. A rhinovirus is .000000020 meters long.

    e. The probability of being killed in an airplane crash: .0000002

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

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

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

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

    d. The probability of being struck by lightning: 3.6×10^{-6}

    e. The probability of winning the lottery: 5.7×10^{-9}

    f. Looking at *d.* and *e.* above, which is more likely: winning the lottery or being struck by lightning?

3. Mount Everest is 29,029 feet high. The Mariana Trench has a spot that is 36,201 feet deep. What is the difference in elevation between these two places?

4. Air temperature falls 3.5 degrees for every 1000 feet rise in altitude. Fill in the table:

Ground Temperature (F)	Altitude	Temperature at that Altitude
80 degrees	13,000 feet	
20 degrees	12,000 feet	
-10 degrees	15,000 feet	
	13,000 feet	50 degrees
	10,000 feet	-20 degrees
25 degrees		-27.5 degrees

5. A wind chill chart shows how air temperature feels colder depending on wind speed.

Temperature (°F)

Wind (mph) \ Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: ☐ 30 minutes   ☐ 10 minutes   ☐ 5 minutes

a. Which feels colder: a 0-degree day with a 5mph wind, or a 10-degree day with a 15mph wind? How much colder does it feel?

b. On a 10-degree day, how high a wind speed will create a danger of frostbite within 30 minutes?

c. How fast of a wind on a 5-degree day is equivalent to a 10mph wind on a ⁻5-degree day?

RESOURCES

Image used in question 5

Wind chill is available in the public domain

Image used in questions 6 and 7

Thermometer_F_C_blank is used with the permission of Teacherfiles.com; color added in question 6.

MoSTEMWINs

6.1 INTEGER RULES

To ADD Integers	Examples
Positive + Positive = **Positive**	4 + 5 = **9**
Negative + Negative = **Negative**	-4 + (-5) = **-9**
Positive + Negative = **Depends on which number has the larger absolute value**	4 + (-5) = **-1**
	-4 + 5 = **1**
	-5 + 5 = **9**

To SUBTRACT Integers
ADD the OPPOSITE!

4 - 5 = **-1**

4 - (-5) = **9**

-4 - 5 = **-9**

-4 - (-5) = **1**

To MULTIPLY or DIVIDE Integers

Positive x Positive = **Positive**	10 x 5 = **50**
Positive ÷ Positive = **Positive**	10 ÷ 5 = **2**
Negative x Negative = **Positive**	-10 x (-5) = **50**
Negative ÷ Negative = **Positive**	10 ÷ (-5) = **2**
Positive x Negative = **Negative**	10 x (-5) = **-50**
Positive ÷ Negative = **Negative**	10 ÷ (-5) = **-2**
Negative x Positive = **Negative**	-10 x 5 = **-50**
Negative ÷ Positive = **Negative**	-10 ÷ 5 = **-2**

6.2 INTEGER QUIZ

1.
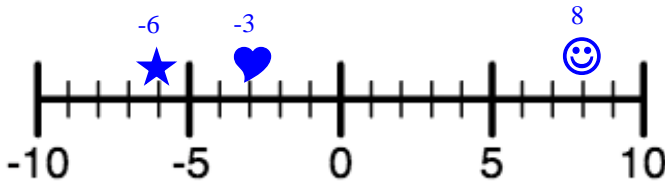
2. **127**

3a. **-7**   3b. **-10**   3c. **1**   3d. **-1**

3e. **-4**   3f. **-9**   3g. **-11**   3h. **16**

3i. **9**   3j. **14**   3k. **42**   3l. **-81**

6.2 INTEGER QUIZ (CONT.)

4a. 4.57×10^7

4b. 3.9×10^{-4}

5a. **.0000054**

5b. **52,000**

6.3 Career Applications: STEM

1a. 2.2×10^8
1b. 1.0×10^{11}
1c. 1.0×10^9
1d. 2.0×10^{-8}
1e. 2.0×10^{-7}

2a. **2,700,000,000**
2b. **.00000001**
2c. **30,000,000,000,000**
2d. **.0000036**
2e. **.0000000057**
2f. **Being struck by lightning is more likely**

3. $29,029 - (-36,201) = 29,029 + 36,201$
   $= \textbf{65,230 feet}$

4.

Ground Temperature (F)	Altitude	Temperature at that Altitude
80 degrees	13,000 feet	**80 - 3.5 (13) = 34.5 degrees**
20 degrees	12,000 feet	**20 – 3.5(12) = –22 degrees**
-10 degrees	15,000 feet	**–10 – 3.5(15) = –62.5 degrees**
95.5 degrees	13,000 feet	50 degrees
15 degrees	10,000 feet	-20 degrees
25 degrees	**15,000 feet**	-27.5 degrees

5a. 0 °F day with a 5mph wind feels like -11 °F
    15 °F day with a 25mph wind feels like -7 °F
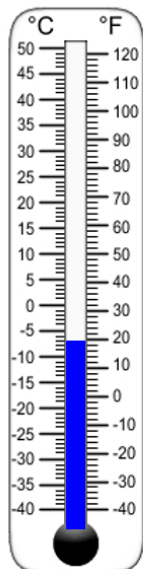   **0 °F day with a 5mph wind feels 4 degrees colder**
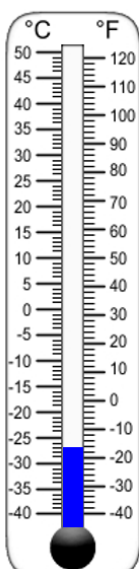
5b. **55 mph**

5b. **40 mph**

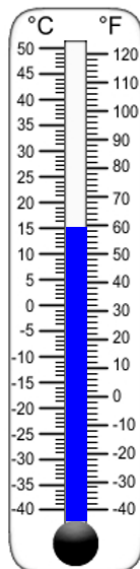6. **-7° Celsius**

6.3 Career Applications: STEM (cont.)

7.

a. -7° Celcius b. -7° Fahrenheit c. 15° Celsius d. -15° Celsius

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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 transportation 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	
Two-Step	http://www.youtube.com/watch?v=KBpNLjiv8pk		
Combining like terms	http://www.youtube.com/watch?v=fXD4DjSyoyo		

Topic	Website	Videos	Exercises
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

MoSTEMWINs

1. $3x + 2x$

2. $3x - 2x$

3. $2x - 3x$

4. $x + x$

5. $x - x$

6. $x \cdot x$

7. $x \div x$

8. $x + y$

9. $2x + 3y + 4x - y$

10. $5(x - 2)$

11. $3(x + 1)$

12. $4(x - 1) + 3(x + 2)$

13. $7x + 5 - (2x + 1)$

14. $7x + 5 - (2x - 1)$

15. $7x + 5(2x - 1)$

16. $7x - 5(2x - 1)$

17. $7 - 5(2x - 1)$

18. $7 - 5(2x + 1)$

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1. $x + 7 = 15$

2. $x - 13 = 20$

3. $8y = 48$

4. $\frac{a}{3} = 9$

5. $w + 100 = -200$

6. $x - 13 = -20$

7. $-8y = 48$

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

9. $-5 = x + 7$

10. $5x = 3$

11. $\frac{1}{2} x = 10$

12. $\frac{3}{4} x = 15$

13. $5x = 5$

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

15. $-x = -7$

16. $3x = 0$

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. $\frac{w}{3} - 10 = 0$

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

EXPRESSION (SIMPLIFY if possible)

1. $x + x + x$

2. $3(x - 4)$

3. $5x - x$

4. $2 - x$

5. $x - 5 - 3$

6. $7 - 2(x + 1)$

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

8. $4x - \frac{1}{2}x$

EQUATION (SOLVE)

9. $x + x + x = 12$

10. $3(x - 4) = 5$

11. $5x - x = -20$

12. $2 - x = -6$

13. $x - 5 - 3 = 80$

14. $7 - 2(x + 1) = -1$

15. $7 - 2(x - 1) = -1$

16. $4x - \frac{1}{2}x = 7$

1. A plant had 10 leaves at the start of an experiment. How many leaves would it have if:

    a. ... it grew 2 new leaves? _____

    b. ... it lost 2 leaves from the original? _____

    c. ... it doubled its original number of leaves? _____

    d. ... it lost half of its original leaves? _____

    e. ... the number of leaves stayed the same? _____

    Now we'll generalize to any number of leaves: a plant had **X** leaves at the start of the experiment. Match each algebraic expression with its description in words:

    f. The plant grew 2 new leaves. $X - 2$

    g. The plant lost 2 leaves. X

    h. The plant doubled its number of leaves. $X + 2$

    i. The plant has only half the number of leaves it started with. $2X$

    j. The number of leaves stayed the same. $X \div 2$

2. A computer has X megabytes of memory. Write an algebraic expression for the amount of memory compared to the original after each of the following situations:

    a. The computer used 50 megabytes of memory.   _____

    b. Deleting an application increased memory by 10 megabytes.   _____

    c. A new purchase doubled the memory.   _____

    d. Half of the original memory is left.   _____

    e. The computer has 30 megabytes less memory than originally.   _____

    f. The computer has 30 megabytes more memory than originally.   _____

3. 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?

4. 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 laboratory is 170 feet. The length is 5 feet more than the width. What are the dimensions of the lab?

   c. The perimeter of the business office is 150 feet. The length is twice the width. What are the dimensions of the office?

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

5. Write an expression for the perimeter and the area of each.

   a. X inches

       X inches

       Perimeter: _____

       Area: _____

   b. X feet

       X + 3 feet

       Perimeter: _____

       Area: _____

   c. X miles

       2X miles

       Perimeter: _____

       Area: _____

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MoSTEM WINs
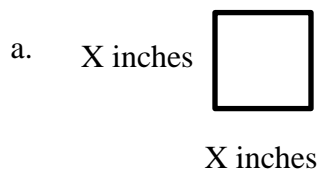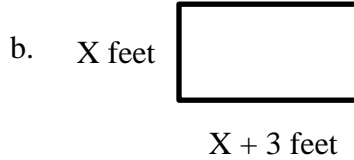
7.1 Simplifying Expressions

1. **5x**
2. **x**
3. **-1x or -x**
4. **2x**
5. **0**
6. **x²**
7. **1**
8. **x + y** (not like terms)
9. **6x + 2y**
10. **5x – 10**
11. **3x + 3**
12. 4x – 4 + 3x + 6
    = **7x + 2**
13. 7x + 5 – 2x – 1
    = **5x + 4**
14. 7x + 5 – 2x + 1
    = **5x + 6**
15. 7x + 10x – 5
    = **17x – 5**
16. 7x – 10x + 5
    = **-3x + 5**
17. 7 – 10x + 5
    = **12 – 10x**
18. 7 – 10x – 5
    = **2 – 10x**

7.2 Solving One-Step Equations

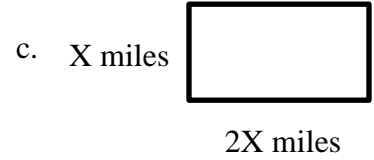1. x + 7 **- 7** = 15 **- 7**
   x = 15
2. x - 13 **+ 13** = 20 **+ 13**
   x = 33
3. 8y**/8** = 48**/8**   **y = 6**
4. ($\frac{a}{3}$)**3** = (9)**3**
   a = 27
5. w + 100 **- 100** = − 200 **– 100**
   w = -300
6. x – 13 **+ 13** = -20 **+ 13**
   x = -7

7.2 Solving One-Step Equations (cont.)

7. -8y**/-8** = 48**/-8**
   y = -6
8. ($\frac{a}{3}$)**3** = (−9)**3**
   a = -27
9. -5 – **7** = x + 7 **- 7**
   -12 = x or **x = -12**
10. 5x**/5** = 3**/5**
    x = 3/5
11. (½ x)**2/1** = (10)**2/1**
    x = 20
12. (¾ x)**4/3** = (15)**4/3**
    x = 60/3 = 20
13. 5x**/5** = 5**/5**   **x = 1**
14. x − $\frac{1}{2}$ + **$\frac{1}{2}$** = $\frac{3}{2}$ + **$\frac{1}{2}$**
    x = $\frac{4}{2}$ = 2
15. −x**/-1** = -7**/-1**   **x = 7**
16. 3x**/3** = 0**/3**   **x = 0**

7.3 Solving Two-Step Equations

1. 2x + 1 **- 1** = 7 **- 1**
   2x = 6
   2x/2 = 6/2   **x = 3**
2. 3x – 1 **+ 1** = 11 **+ 1**
   3x = 12
   3x/3 = 12/3
   x = 4
3. -2x + 1 **- 1** = 9 **- 1**
   -2x = 8
   -2x/-2 = 8/-2
   x = -4
4. -5x – 1 **+ 1** = 9 **+ 1**
   -5x = 10
   -5x/-5 = 10/-5
   x = -2
5. 5 + 3x – **5** = 17 – **5**
   3x = 12
   3x/3 = 12/3
   x = 4

7.3 Solving Two-Step Equations (cont.)

6. $7 - 3x - \mathbf{7} = 13 - \mathbf{7}$
  $-3x = 6$
  $-3x/-3 = 6/-3$
  x = -2

7. $7 - \mathbf{5} = 5 + 2x - \mathbf{5}$
  $2 = 2x$
  $2/2 = 2x/2$
  $1 = x$ **or x = 1**

8. $10 - 3x - \mathbf{10} = 13 - \mathbf{10}$
  $-3x = 3$
  $-3x/-3 = 3/-3$
  x = -1

9. $(\frac{x+4}{3})\mathbf{3} = (10)\mathbf{3}$
  $x + 4 - \mathbf{4} = 30 - \mathbf{4}$
  x = 26

10. $(\frac{x-7}{5})\mathbf{5} = (2)\mathbf{5}$
  $x - 7 + \mathbf{7} = 10 + \mathbf{7}$
  x = 17

11. $-4a + 2 - \mathbf{2} = 2 - \mathbf{2}$
  $-4a = 0$
  $-4a/-4 = 0/-4$
  a = 0

12. $\frac{w}{3} - 10 + \mathbf{10} = 0 + \mathbf{10}$
  $(\frac{w}{3})\mathbf{3} = (10)\mathbf{3}$
  w = 30

7.4 Solving Multi-Step Equations

1. $x + 3x = 12$
  $4x = 12$
  $4x/4 = 12/4$
  x = 3

2. $5x - 3x + 2 = 12$
  $2x + 2 = 12$
  $2x + 2 - \mathbf{2} = 12 - \mathbf{2}$
  $2x = 10$
  $2x/\mathbf{2} = 10/\mathbf{2}$
  x = 5

3. $3x - 5x + 2 = 12$
  $-2x + 2 = 12$
  $-2x + 2 - \mathbf{2} = 12 - \mathbf{2}$
  $-2x = 10$
  $-2x/\mathbf{-2} = 10/\mathbf{-2}$
  x = -5

7.4 Solving Multi-Step Equations (cont.)

4. $5(x - 2) = 20$
  $5x - 10 = 20$
  $5x - 10 + \mathbf{10} = 20 + \mathbf{10}$
  $5x = 30$
  $5x/\mathbf{5} = 30/\mathbf{5}$
  x = 6

5. $3(x + 1) = 15$
  $3x + 3 = 15$
  $3x + 3 - \mathbf{3} = 15 - \mathbf{3}$
  $3x = 12$
  $3x/\mathbf{3} = 12/\mathbf{3}$
  x = 4

6. $-2(x + 4) = 16$
  $-2x - 8 = 16$
  $-2x - 8 + \mathbf{8} = 16 + \mathbf{8}$
  $-2x = 24$
  $-2x/\mathbf{-2} = 24/\mathbf{-2}$
  x = -12

7. $3x - \mathbf{x} = x + 4 - \mathbf{x}$
  $2x = 4$
  $2x/\mathbf{2} = 4/\mathbf{2}$
  x = 2

8. $4x - \mathbf{2x} = 2x + 10 - \mathbf{2x}$
  $2x = 10$
  $2x/\mathbf{2} = 10/\mathbf{2}$
  x = 5

9. $-5x + 3 + \mathbf{5x} = -4x + \mathbf{5x}$
  $3 = 1x$ **or x = 3**

10. $x - 5 - \mathbf{x} = 2x - \mathbf{x}$
  $-5 = x$ **or x = -5**

11. $2(x + 1) = x - 3$
  $2x + 2 = x - 3$
  $2x + 2 - \mathbf{2} = x - 3 - \mathbf{2}$
  $2x = x - 5$
  $2x - \mathbf{x} = x - 5 - \mathbf{x}$
  x = - 5

12. $-2(x + 1) = 3x - 7$
  $-2x - 2 = 3x - 7$
  $-2x - 2 + \mathbf{7} = 3x - 7 + \mathbf{7}$
  $-2x + 5 = 3x$
  $-2x + 5 + \mathbf{2x} = 3x + \mathbf{2x}$
  $5 = 5x$
  $5/\mathbf{5} = 5x/\mathbf{5}$
  $1 = x$ **or x = 1**

7.5 Expressions & Equations

1. $3x$

2. $3x - 12$

3. $4x$

4. $2 - x$ (not like terms)

5. $x - 8$

6. $7 - 2x - 2$
  $= 5 - 2x$

7. $7 - 2x + 2$
  $= 9 - 2x$

8. $3\frac{1}{2}x$ or $3.5x$

9. $3x = 12$
  $x = 12/3 = 4$

10. $3x - 12 = 5$
  $3x = 17$
  $x = 17/3 = 5\ 2/3$ or 5.666

11. $4x = -20$
  $x = -20/4 = -5$

12. $-x = -8$
  $-x/-1 = -8/-1$ so $x = 8$

13. $x - 8 = 80$ so $x = 88$

14. $7 - 2x - 2 = -1$
  $5 - 2x = -1$
  $-2x = -6$
  $x = -6/-2 = 3$

15. $7 - 2x + 2 = -1$
  $9 - 2x = -1$
  $-2x = -10$
  $x = -10/-2 = 5$

16. $3.5x = 7$
  $x = 7/3.5 = 2$

7.6 Career Applications: STEM

1a. **12**

1b. **8**

1c. **20**

1d. **5**

1e. **10**

1f. $X + 2$

1g. $X - 2$

1h. $2X$

1i. $X/2$

1j. X

7.6 Career Applications: STEM (cont.)

2a. $x - 50$

2b. $x + 10$

2c. $2x$

2d. $x/2$ or $.5x$ or $1/2x$

2e. $x - 30$

2f. $x + 30$

3a. $A + 1$

3b. $B - 2$

3c. $A + 10$

3d. $A + B$

3e. $2A$

3f. $B/2$

3g. $(A + B)/2$ or $1/2(A + B)$

3h. Aisha; $A - B$ years

3i. $A + 3 = 21$ so $A = 18$ years old

3j. $B - 5 = 15$ so $B = 20$ years old

3k. $2A = 48$ so $A = 24$ years old

3l. $B/2 = 12$ so $B = 24$ years old

3m. $2A + 5 = 35$ so $A = 15$ years old

3n. $A + B = 23$ *and* $A = B + 3$
  so $(B + 3) + B = 23$
  $B = 10$ years *and* $A = 10 + 3 = 13$ years

3o. $A + B = 30$ *and* $A = 2B$
  so $2B + B = 30$
  $B = 10$ years *and* $A = 2(10) = 20$ years

4a. let x = Callie's # of patients
  $x = 5 + 3$
  $x = 8$ so Callie has 8 patients

4b. Let width = w and length = $w + 5$
  perimeter = sum of all four sides
  so $w + (w + 5) + w + (w + 5) = 170$
  $4w + 10 = 170$ $4w = 160$ so $w = 40$
  width = 40 feet and **length = 40 + 5 = 45**
  feet

4b. Let width = w and length = $2w$
  perimeter = sum of all four sides
  so $w + 2w + w + 2w = 150$
  $6w = 150$ so $w = 25$
  width = 25 feet and **length = 2(25) = 50 feet**

4d. Let x = the amount insurance will pay
  $x = .5(1500 - 100)$
  $x = .5(1400)$
  $x = \$700$

7.6 Career Applications: STEM (cont.)

5a. Perimeter = **4x inches**   Area = x^2 **square inches**

5b. Perimeter = **4x + 6 feet**   Area = $x^2 + 3x$ **square feet**

5c. Perimeter = **6x miles**   Area = $2x^2$ **square miles**

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

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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 Celsius &Fahrenheit Temp Scales
		Converting Fahrenheit to Celsius
		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 Celsius? _____ in Fahrenheit? _____

10. What is your body temperature in Celsius? _____ in Fahrenheit? _____

11. At what temperature does water freeze in Celsius? _____ in Fahrenheit? _____

12. At what temperature does water boil in Celsius? _____ in Fahrenheit? _____

1. **WHAT MAKES 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.   The length of a car might be

    4.6 kilograms   4.6 meters   4.6 millimeters   4.6 kilometers

    j.   The gas tank of a car might hold

    45 liters   45 kiloliters   45 milliliters   45 grams

    k.   A car might go this far on a tank of gas:

    482 centimeters   482 liters   482 kilometers   482 meters

l. A carpentry nail might be this long:

4 meters   4 centimeters   4 grams   4 millimeters

m. A carpentry nail might weigh

3 kilograms   3 micrograms   3 liters   3 grams

n. The head of a carpentry nail might have this diameter:

2 kilometers   2 dekameters   2 millimeters   2 inches

o. The speed limit on a Canadian highway might be

96 miles/hour   9.6 kilometers/hour   96 kilometers/hour   96 feet/second

p. Your car steering wheel might have this diameter:

40 centimeters   40 inches   40 millimeters   40 decimeters

2. A **byte** is the fundamental unit of measurement for data. The Metric System allows us to use other prefixes to describe extremely large numbers. Look these up online:

a. How many bytes are in a **kilobyte**?

b. How many bytes are in a **megabyte**?

c. How many bytes are in a **gigabyte**?

d. How many bytes are in a **terabyte**?

e. How many bytes are in a **petabyte**?

3. Metric prefixes can also describe extremely small objects. Look these up online:

a. How many **nanograms** are in a gram?

b. How many **picograms** are in a gram?

4. The metric system prefixes can also be used for time:

a. How long is a **millisecond**?

b. How long is a **kilosecond**?

c. How long is a **nanosecond**?

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

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.

a. Stephen's tongue was _____ meters long.

b. Stephen's tongue was _____decimeters long.

c. Stephen's tongue was _____millimeters long.

d. Stephen's tongue was _____ micrometers long.

e. Stephen's tongue was _____ kilometers long.

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

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.

g. Pauline was _____ millimeters tall and weighed _____ grams.

h. Pauline was _____ meters tall and weighed _____ milligrams.

i. Pauline was _____ decimeters tall and weighed _____ decigrams.

j. Pauline was _____ dekameters tall and weighed _____ dekagrams.

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

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

6. 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	

7. Temperature benchmarks:

Kelvin is a temperature scale designed so that zero degrees K is defined as absolute zero (at absolute zero, a hypothetical temperature, all molecular movement stops - all actual temperatures are above absolute zero) and the size of one unit is the same as the size of one degree Celsius. To find temperature on a Kelvin scale, just add 273 degrees to the Celsius temperature. In Algebra, the formula is: $K = C + 273$

	Degrees Fahrenheit	Degrees Celsius	Degrees Kelvin
Water freezes			
Water boils			
Normal Human Body			

8. Circle the GREATER quantity from each pair:

    a.   one mile   one kilometer

    b.   one quart   one liter

    c.   one yard   one meter

    d.   one inch   one centimeter

    e.   one pound   one kilogram

    f.   one ounce   one gram

9. Switching from one measurement system to another:

    Here are some common equivalents between the Metric and American systems:

        1 inch ≈ 2.54 centimeters   1 kilogram ≈ 2.2 pounds
        1 kilometer ≈ .62 miles   1 quart ≈ .96 liter

Use proportions (remember Unit 4?) to change from one system to the other:

    a.   150 pounds ≈ _____ kilograms

    b.   63 inches ≈ _____ centimeters

    c.   10 miles ≈ _____ kilometers

    d.   4 quarts ≈ _____ liters

    e.   25 kilograms ≈ _____ pounds

    f.   30 centimeters ≈ _____ inches

    g.   10 kilometers ≈ _____miles

    h.   5 liters ≈ _____ quarts

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UNIT 8 ANSWER KEY

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8.1 Metric Prefixes

1. **3700 meters**
2. **.02 liters**
3. **0.0213 dekagrams**
4. **4,200,000,000 micrograms**
5. **.005 kiloliters**

8.2 Living Metric!

Answers for questions 1 – 9 will vary
10. Celsius = **37**   Fahrenheit = **98.6**
11. Celsius = **0**   Fahrenheit = **32**
12. Celsius = **100**   Fahrenheit = **212**

8.3 Career Applications: STEM

1a. **3 kilograms**
1b. **35° C**
1c. **5 meters**
1d. **1 liter**
1e. **100° F**
1f. **2 meters**
1g. **8 centimeters**
1h. **10 kilometers**
1i. **4.6 meters**
1j. **45 liters**
1k. **482 kilometers**
1l. **4 centimeters**
1m. **3 grams**
1n. **2 millimeters**
1o. **96 kilometers/hour**
1p. **40 centimeters**

2a. **1000 bytes**
2b. **1,000,000 bytes (one million or 10^6)**
2c. **1,000,000,000 bytes (one billion or 10^9)**
2d. **1,000,000,000,000 bytes (one trillion or 10^{12})**
2e. **1,000,000,000,000,000 bytes (one quadrillion or 10^{15})**

8.3 Career Applications: STEM

3a. *A nanogram is 10^{-9} or .000000001 (one billionth) of a gram, so...*
   1 gram = 1,000,000,000 nanograms
3b. *A picogram is 10^{-12} or .000000000001 (one trillionth) of a gram, so ...*
   1 gram = 1,000,000,000,000 picograms

4a. **.001 seconds (or 1/1000th of a second)**
4b. **1000 seconds**
4c. **.000000001 seconds (or one billionth of a second)**

5a. **.098 meters**
5b. **.98 decimeters**
5c. **98 millimeters**
5d. **98,000 micrometers**
5e. **.000098 kilometers**
5f. *answers will vary*
5g. **550 millimeters; 1500 grams**
5h. **.55 meters; 1,500,000 milligrams**
5i. **5.5 decimeters; 15,000 decigrams**
5j. **.055 dekameters; 150 dekagrams**
5k. *answers will vary*
5l. *answers will vary*

6.

Item to be measured	Most appropriate metric unit
Length of your pencil	**centimeter**
Distance between cities	**kilometers**
Mass (weight) of a large dog	**kilograms**
Amount of blood in a syringe	**milliliter**
Diameter of a freckle	**millimeters**
Length of a swimming pool	**meters**
Amount of medicine in a pill	**micrograms**
Amount of fat in a serving of food	**grams**
Amount of water in your bathtub	**liters**
The length of a DNA cell	**micrometers**

8.3 Career Applications: STEM (cont.)

7.

	Degrees Fahrenheit	Degrees Celsius	Degrees Kelvin
Water freezes	**32**	**0**	**273**
Water boils	**212**	**100**	**373**
Human Body	**98.6**	**37**	**310**

8a. **one mile**

8b. **one liter**

8c. **one meter**

8d. **one inch**

8e. **one kilogram**

8f. **one ounce**

9a. **368.2 kilograms**

9b. **160 centimeters**

9c. **16.1 kilometers**

9d. **4.2 liters**

9e. **55 pounds**

9f. **11.8 inches**

9g. **6.2 miles**

9h. **4.8 quarts**

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Unit 8: The Metric System   Unit 8 Answer Key