



# ADULT LEARNING ACADEMY

## PRE-ALGEBRA WORKBOOK UNIT 1: WHOLE NUMBERS

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## MoHealthWINS

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**LEARNING OBJECTIVES****1. Place Value:**

- Write and describe whole numbers up to billions
- Order and compare whole numbers
- Round whole numbers to the correct place value

**2. Operations with Whole Numbers:**

- Add multi-digit whole numbers, with carrying
- Subtract multi-digit whole numbers, with borrowing
- Multiply multi-digit whole numbers, with carrying
- Divide multi-digit whole numbers, with remainders
- Follow order of operations rules when performing calculations

**3. Factors and Multiples:**

- List the factors and multiples of whole numbers
- Identify the prime factors of whole numbers

**4. Averages:**

- Find the mean, median and mode for a given set of numbers

**5. Military Time:**

- Perform conversions between standard time (12-hour clock) and military time (24-hour clock)

**6. Word Problems:**

- Solve basic word problems using whole number arithmetic, including those involving area and perimeter, and applications to transportation careers.

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

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



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MathATube.com

### Place Value Chart

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

Write the words for these numbers:

3,257,012

507,392,005

Write the numbers:

ten billion five hundred million twenty-thousand three

four million four thousand forty

Complete the following table.

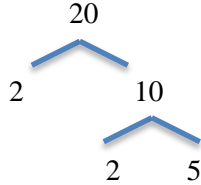
You may use the completed table during your unit tests.

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

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

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

If we break 20 down into **PRIME FACTORS**,  $20 = 2 \times 2 \times 5$ , or  $2^2 \times 5$



\*\*\*\*\*

What are the **FACTORS** of 12? \_\_\_\_\_

What are the **MULTIPLES** of 12? \_\_\_\_\_

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

\*\*\*\*\*

What are the **FACTORS** of 100? \_\_\_\_\_

What are the **MULTIPLES** OF 100? \_\_\_\_\_

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

\*\*\*\*\*

What are the **FACTORS** of 30? \_\_\_\_\_

What are the **MULTIPLES** of 30? \_\_\_\_\_

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



### Divisibility Rules Chart

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

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

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

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

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

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

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

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

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

5.  $(5 + 3)^2$

6.  $5^2 + 3^2$

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

Make this equal 29:

$36 - 24 \div 3 + 1$

Make this equal 5:

$36 - 24 \div 3 + 1$

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       |               |

**1.8 HEALTHCARE APPLICATIONS**

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

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

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

c) How old is Jasmine in years and months? \_\_\_\_\_

\*\*\*\*\*

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

d) What is Jasmine's mean heart rate? \_\_\_\_\_

e) What is Jasmine's median heart rate? \_\_\_\_\_

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

\*\*\*\*\*

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

|               | INTAKE (cubic cm) |               | OUTPUT (cubic cm) |
|---------------|-------------------|---------------|-------------------|
| Oral:         | 129               | Urine:        | 237               |
| Oral:         | 94                | Emesis:       | 105               |
| IV fluid:     | 250               | Diarrhea:     | 128               |
| <b>TOTAL:</b> |                   | <b>TOTAL:</b> |                   |

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

\*\*\*\*\*

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

h) Round her weight to the nearest thousand: \_\_\_\_\_

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

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

**Scenario I (continued):**

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

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

\*\*\*\*\*

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

l) How much do they spend?

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

\*\*\*\*\*

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

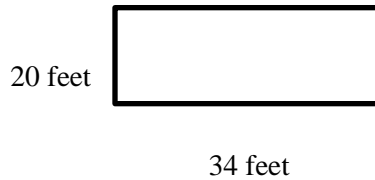
n) If each day costs the same, how much is the bill for each day?

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

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

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

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



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

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

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

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

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

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

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

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

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

\*\*\*\*\*

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

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

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

**24-hour TOTAL:** \_\_\_\_\_

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

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

\*\*\*\*\*

c) Your co-worker's patient, Elderberry, gets a total of 450 milligrams each day, spread over 6 doses. How many milligrams does Elderberry get per dose? \_\_\_\_\_

\*\*\*\*\*

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

Anderson gets medicine every \_\_\_\_\_ hours. Brown gets medicine every \_\_\_\_\_ hours.

Chen gets medicine every \_\_\_\_\_ hours. Davis gets medicine every \_\_\_\_\_ hours.

\*\*\*\*\*

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

Anderson gets his next dose at \_\_\_\_\_ Brown gets her next dose at \_\_\_\_\_

Chen gets his next dose at \_\_\_\_\_ Davis gets her next dose at \_\_\_\_\_

\*\*\*\*\*

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



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

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

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

\*\*\*\*\*

**VI. Graphic Practice:**

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



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



**Graphic practice (continued):**

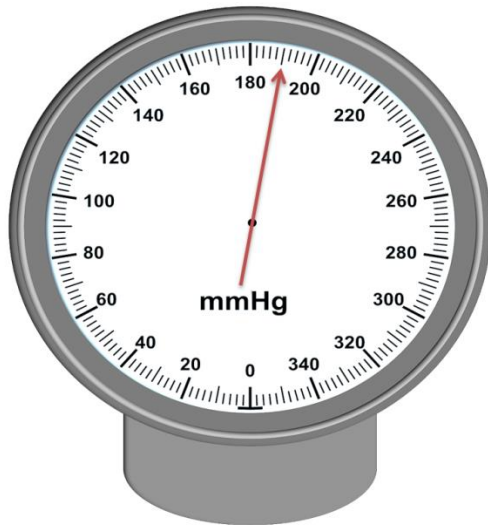
c) How fast is this car going? Your answer will be labeled “miles per hour”.



WWW.123FREEVECTORS.COM

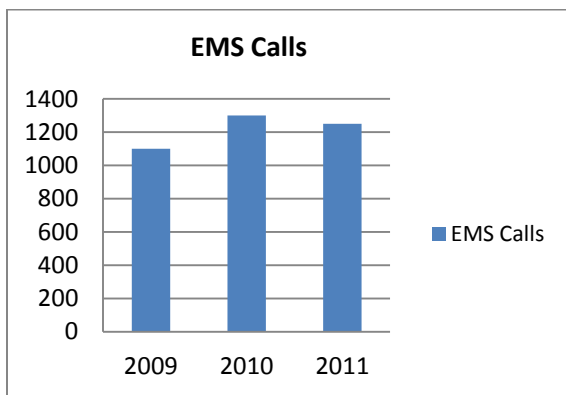
\*\*\*\*\*

d) What is this blood pressure reading?



\*\*\*\*\*

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



Approximately how many calls were received in 2009?

Approximately how many calls were received in 2010?

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

## RESOURCES

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Images used in VI. Graphic Practice

- a) [medical thermometer](#) is available in the public domain
- b) [151517](#) by [Scott \(Skippy\)](#) is licensed under [CC BY-SA 2.0](#); Modifications: Image lightened, red square added
- c) [Free Speedometer Vector](#) by [123freevectors.com](#) is licensed under [CC BY-SA 3.0](#)
- d) Blood Pressure Gauge is a derivative of [Blood Pressure Diagnostics Sphygmomanometer](#) which is available in the public domain under [CC0 Public Domain](#)