

## Chapter 3 - Linear Equations and Functions

**3.1 Objective:** To find **solutions** of open sentences in **two variables** and to **solve** problems involving open sentences

### Agenda

- 1) Do Now (5 min)
- 2) Recognize Ordered Pairs as Solutions (5 min)
- 3) Define: Domain and Range (5 min)
- 4) Two Practice Problems (15 min)
- 5) Water Jug Problem
  - groups (10 min)
  - as a class (10 min)

***HW p. 104 #1, 3, 13, 15, 21, 25, 27, 33***

**\*\*Check answers in back. MUST SHOW CHECKS FOR FULL CREDIT**

## Chapter 3 - Linear Equations and Functions

**3.1 Objective:** To find **solutions** of open sentences in **two variables** and to **solve** problems involving open sentences

### DO NOW

#### SOLUTIONS:

In Ch. 1 and Ch. 2 we saw **solutions** to equations and inequalities with **one variable**:

Solve the following for x:

a)  $2x + 1 = 11$

b)  $2x + 1 > 11$

Now we'll consider equations with **two variables**.

**Solutions** are represented as **Ordered Pairs** : \_\_\_\_\_

ex)  $3x + 5y = 1$

Solutions are:  $(2, -1)$   $(-3, 2)$   $(7, -4)$  ...

Test them!

Sometimes we want a solution set for a certain "domain".

Domain = The set of values of the independent variable.  
(All possible values of x)

Range = The set of values of the dependent variable.  
(All possible value of y)

a) Solve  $-2x + y = -3$  if the domain is  $\{-1, 0, 2, 5\}$

b) I have to pay my dog-walker \$80. I have \$5 bills and \$20 bills. Find all the ways I can do this.

$$5(x) + 20(y) = 80$$


$$(0, 4)$$

$$(4, 3)$$

$$(8, 2)$$

$$(12, 1)$$

$$(16, 0)$$

 Die Hard Riddle (Explicit Language. Cut off video when they pick up jugs)



### THREE PUZZLETTES

We begin with three questions that turn out to be intimately connected.

#### PUZZLE 1:

ACTIVITY

Find two numbers to place in the boxes that make the equation true:

$$\square \times 3 + \square \times 5 = 1$$

Is there more than one solution to this puzzle?

#### PUZZLE 2: JUG FILLING

ACTIVITY

*One is handed a 3-gallon jug and a 5-gallon jug, neither possessing markings of any kind. Using these jugs is it possible to draw exactly one gallon of water from a well?*

As one is not given the means to measure the exact contents of a partially filled jug, there are essentially only three meaningful maneuvers:

1. Completely fill an empty jug from the well.
  2. Completely empty a full jug into the well.
  3. Pour water from one jug into another, completely filling or emptying one jug in the process.
- a) Find a solution to this problem.
  - b) Suppose, instead, one is given a 4-gallon jug and a 9-gallon jug (again with no markings). Explain how to obtain exactly one gallon of water from a well.
  - c) Is it possible to obtain one gallon of water using a 9-gallon jug and a 16-gallon jug?
  - d) Is it possible to obtain one gallon of water using a 9-gallon jug and a 21-gallon jug?

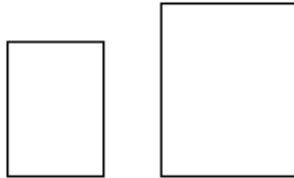
CURRICULUM CONNECTIONS  
Primes; Prime Factorization; Euclidean Algorithm

## Math 511 Jug Filling Exercise

You have a 3-gallon and a 5-gallon jug. By filling, transferring, and pouring out water from the jugs, you need to end up with EXACTLY 4 gallons. Show how this is possible.

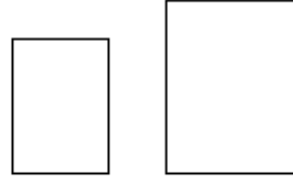
1. Fill in the appropriate line below, and draw a picture that shows the result:

- Fill the \_\_\_-gallon jug
- Transfer \_\_\_ gallons to the \_\_\_-gallon jug.
- Empty the \_\_\_-gallon jug.



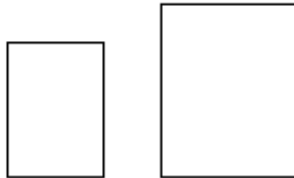
5.

- Fill the \_\_\_-gallon jug
- Transfer \_\_\_ gallons to the \_\_\_-gallon jug.
- Empty the \_\_\_-gallon jug.



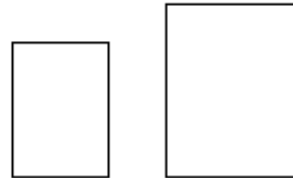
2.

- Fill the \_\_\_-gallon jug
- Transfer \_\_\_ gallons to the \_\_\_-gallon jug.
- Empty the \_\_\_-gallon jug.



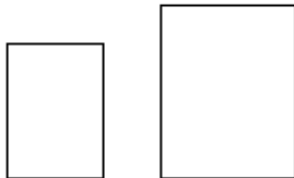
6.

- Fill the \_\_\_-gallon jug
- Transfer \_\_\_ gallons to the \_\_\_-gallon jug.
- Empty the \_\_\_-gallon jug.



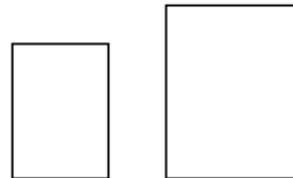
3.

- Fill the \_\_\_-gallon jug
- Transfer \_\_\_ gallons to the \_\_\_-gallon jug.
- Empty the \_\_\_-gallon jug.



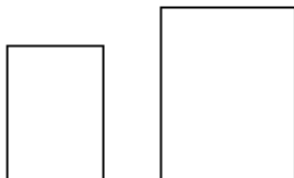
7.

- Fill the \_\_\_-gallon jug
- Transfer \_\_\_ gallons to the \_\_\_-gallon jug.
- Empty the \_\_\_-gallon jug.



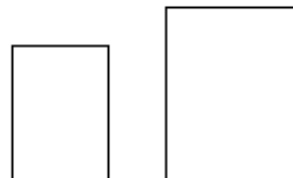
4.

- Fill the \_\_\_-gallon jug
- Transfer \_\_\_ gallons to the \_\_\_-gallon jug.
- Empty the \_\_\_-gallon jug.



8.

- Fill the \_\_\_-gallon jug
- Transfer \_\_\_ gallons to the \_\_\_-gallon jug.
- Empty the \_\_\_-gallon jug.



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