Name: ______________________ Date: Dec 10 ______________ Hour: __Alg 1__

Unit 4 Day 8: When graphing doesn't work...

Focus Question: What is another strategy for finding solutions to systems when the answer is not easy to determine with a graph?

A. Solve the following system by graphing.

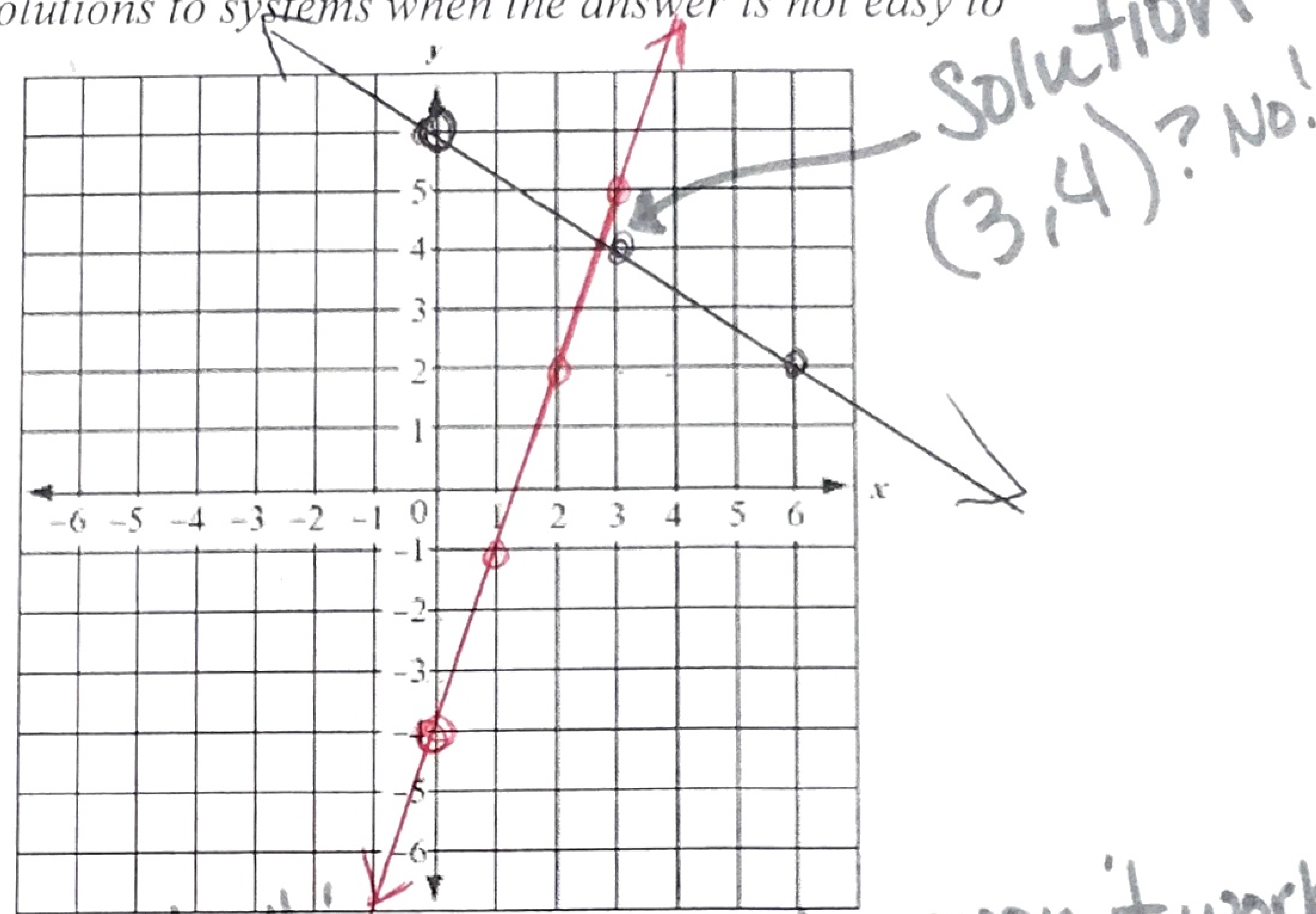
$3x - y = 4$ $\qquad$ $2x + 3y = 18$

$-3x \quad -3x$

$-y = -3x + 4$

$y = 3x - 4$ $\qquad$ $y = -\frac{2}{3}x + 6$

Check your solution.

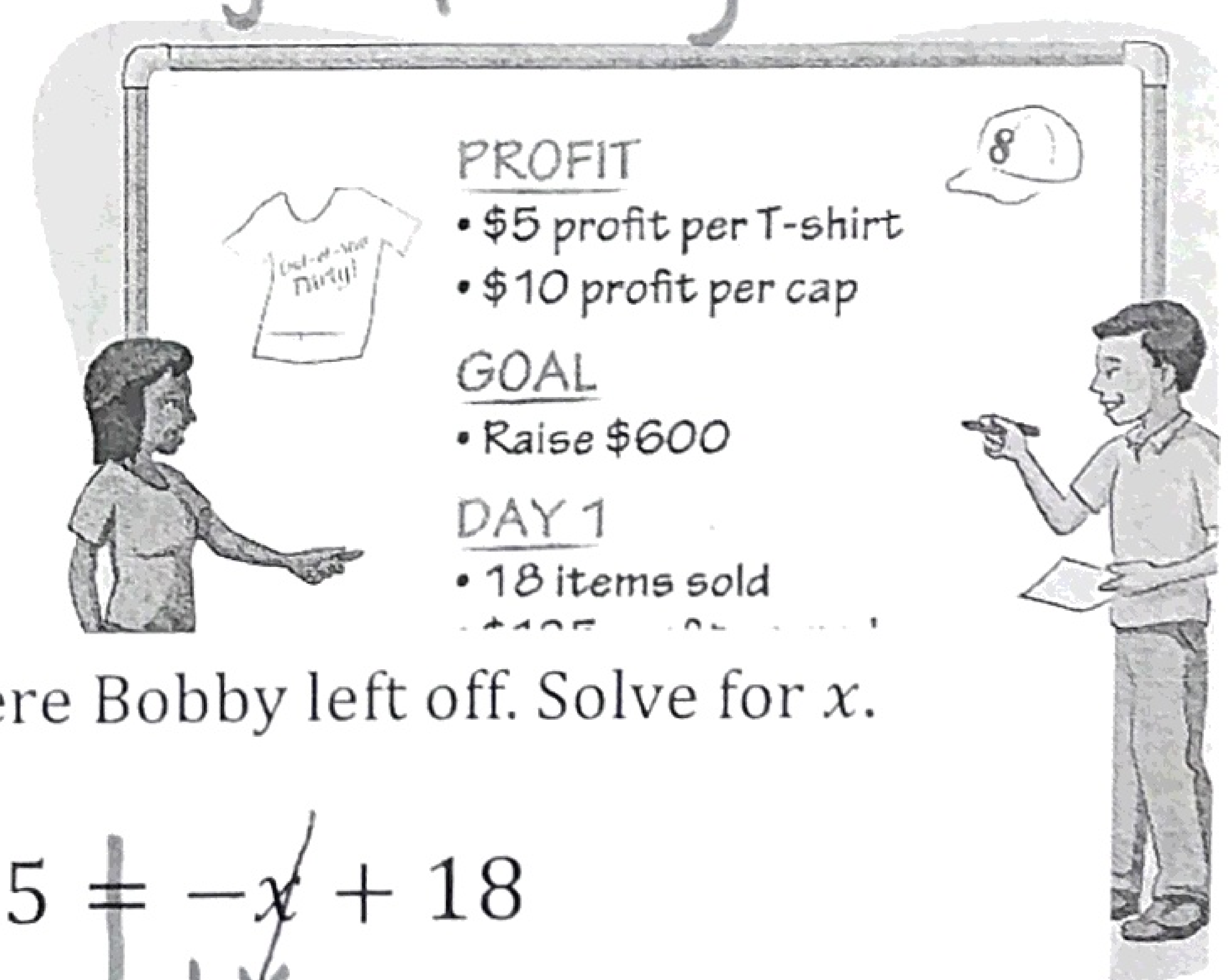


Caution: Some answers are not whole #'s so graphing won't work

B. Revisit the caps and t-shirt fundraiser.

The chart at right shows the T-shirt and cap sales for Day 1. Bobby wrote the following two equations to represent the relationship between the number of shirts sold, x, and the number of caps sold, y.

$x + y = 18 \qquad 5x + 10y = 125$



Bobby's method of solving....

Write a system of two linear equations.

1) $x + y = 18$
2) $5x + 10y = 125$

Write both equations in slope-intercept form.

1) $x + y = 18$
$\quad -x \qquad -x$
$\quad y = -x + 18$

2) $5x + 10y = 125$
$\quad -5x \qquad -5x$
$\quad \frac{10y}{10} = \frac{-5x + 125}{10}$
$\quad y = -\frac{1}{2}x + 12.5$

Set the two equations equal to each other to make one linear equation.

1. Pick up where Bobby left off. Solve for x.

$-\frac{1}{2}x + 12.5 = -x + 18$

$+x \qquad\qquad +x$

$\frac{1}{2}x + 12.5 = 18$

$-12.5 \qquad -12.5$

$2 \cdot \frac{1}{2}x = 5.5 \cdot 2$

$\boxed{x = 11}$

2. Then find the related value of y by substituting the value of x into either of the equations in the system.

$x + y = 18 \qquad 5x + 10y = 125$

$11 + y = 18$

$-11 \qquad -11$

$\boxed{y = 7}$

3. What is Bobby's solution? (11 , 7)

C. Solving a System by Substitution

1. Why do you think Bobby's method work?

$\begin{cases} y = -x + 18 \\ y = -\frac{1}{2}x + 12.5 \end{cases}$

$-x + 18 = y = y = -\frac{1}{2}x + 12.5$

2. Bobby's method uses the principal of f(x)=g(x)because at a solution point, the outputs have to be equal. (The inputs also have the same value at the solution point, so you can do x = x if x is easier to isolate, but this is rare.) Practice using this method to solve the following systems algebraically.

a. $\begin{cases} 3x - y = 30 \\ x + y = 14 \end{cases}$ The solution to this system is (11 , 3)

$-3x \quad -3x$

$-y = -3x + 30$

$\frac{-y}{-1} = \frac{-3x}{-1} + \frac{30}{-1}$

$y = 3x - 30$

$-x \quad -x$

$y = -x + 14$

$-x + 14 = 3x - 30$ *

$+x \quad +x$

$14 = 4x - 30$

$+30 \quad +30$

$\frac{44}{4} = \frac{4x}{4}$

$\boxed{x = 11}$

b. $\begin{cases} f(x) = -\frac{1}{2}x + 2 \\ g(x) = x - 5 \end{cases}$ The solution to this system is ($\frac{14}{3}$, $-\frac{1}{3}$)

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$-\frac{1}{2}x + 2 = x - 5$

$+\frac{1}{2}x \quad +\frac{1}{2}x$

$2 = \frac{3}{2}x - 5$

$+5 \quad +5$

$\frac{2}{3} \cdot 7 = \frac{3}{2}x \cdot \frac{2}{3}$

$\boxed{\frac{14}{3} = x}$

$g\left(\frac{14}{3}\right) = \frac{14}{3} - 5$

$= \frac{14}{3} - \frac{15}{3}$

$= -\frac{1}{3}$

c. $\begin{cases} x - y = -5 \\ -2x + 2y = 10 \end{cases}$ The solution to this system is (_____ , _____)

d. $\begin{cases} f(x) = x - 5 \\ g(x) = x + 4 \end{cases}$ ~~The solution to this system is (_____ , _____)~~

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$x - 5 = x + 4$

$-x \quad -x$

$-5 = 4$

False so $\emptyset$

(parallel)