1. Create your own system of equations that would have a solution of $(8,-3)$.
2. We are going to do a check for understanding to test how well you are doing with graphing and substitution. Get ready!

## p. 247 (1-10, 15)

1. $(1,6)$
2. $(-30,-18)$
3. $(-2,-12)$
4. $(15,30)$
5. $(7,11)$
6. $(4,1)$
7. $\left(\frac{1}{2}, 12 \frac{1}{2}\right)$
8. $\left(\frac{1}{4}, 5 \frac{1}{2}\right)$
$\{S+P=15$
9. $\left\{\begin{array}{l}S=P+7 \\ S=P+15\end{array}\right.$

$$
S=P+7
$$

11 shirts, 4 pairs of pants
10. $\left\{\begin{array}{l}P+H=49 \\ H=P+11\end{array}\right.$

Horatio has 30 games,
Preston has 19 games
15. The third one doesn't belong. Its solution is (-2, 1). The solution of the

$$
\text { other three is }(1,-2) \text {. }
$$ other three is $(1,-2)$.

## CFU

- Just checking in to see where you're at.
- No asking questions. Just do your best!


## Story Problem

- Jesse and Anders have 75 squirrels all together. Anders has 17 more squirrels than Jesse.
- Write and solve a system of equations to represent this situation.


## Story Problem

- Jesse and Anders have 100 squirrels all together. Anders has 4 times as many squirrels as Jesse.
- Write and solve a system of equations to represent this situation.

What would you do here???

- $2 \mathrm{x}+2 \mathrm{y}=18$
- $3 \mathrm{x}-2 \mathrm{y}=12$



## Solve Systems with Elimination

Converting Fractions and Decimals (1.1)
Solving $\mathrm{x}^{2}$ and $\mathrm{x}^{3}$ Equations (1.8)
Rational vs. Irrational (1.1)
Function Notation: $f(x)$
Worksheet: Graphing Functions
Slope
ctions - Looking for Patterns
Slope-Intercept Form
1 and 2 Step Equations
Equations w/ Variables on Both Sides
p. 17 Equations with no solution or Infinite Solutions
p. 18 Solving Systems by Graphing
p. 19 Solving Systems by Substitution
. 20 Solving Systems by Elimination

## Objective:

- Use a new strategy (elimination) to solve systems of equations
- Most useful when BOTH equations have x and y on the same side
- Today, we are going to learn a strategy to solve systems where both equations are in STANDARD FORM, such as:

$$
\begin{aligned}
& 2 x+y=18 \\
& 3 x-y=-3
\end{aligned}
$$

| SO: |
| :--- |
| - You can add 2 equations together and the third |
| equation will still be true. |
| - Ok...but how would that help me??? |
| $\mathbf{2 x + y = 1 8}$ |
| $+\mathbf{3 x - y = - 3}$ |
| $5 x+\mathbf{0 y}=\mathbf{1 5}$ |
| $5 x=15$ |
| $x=3$ |

- Now substitute the first variable back in to either equation to find the second. equation will still be true.

$$
\begin{gathered}
2 x+y=18 \\
+3 x-y=-3 \\
\hline 5 x+0 y=15 \\
5 x=15 \\
x=3
\end{gathered}
$$

## Together, with me:

$$
\begin{aligned}
& \mathbf{5 x - 2 y}=\mathbf{1 7} \\
& x+2 y=13
\end{aligned}
$$

## Try these:

$-3 x+y=6$

$$
3 x+2 y=30
$$

When you show me a
$10 x-y=5$ correct answer + work
$-6 x+y=-9$ for one of the problems, you may volunteer to put it on the board.
$4 x-2 y=30$
$-4 x+6 y=-38$

## MAIN IDEA:

- You can't completely solve an equation that still has 2 variables in it. There are unlimited solutions.
- You can solve an equation that has only 1 variable.
- Elimination Strategy:

1. Make sure you have opposite coefficients on a variable
2. Add the 2 equations together so that one of the variables gets "eliminated."
3. Solve for the first variable, then plug the answer back in to find the second

## Ok...when would adding equations

 together help me???$$
\begin{aligned}
& 9 \mathrm{a}+10 \mathrm{~b}=16 \\
& \mathbf{x}+\mathbf{y}=20 \\
& +4 a-6 b=28 \quad+2 x+2 y=40 \\
& 13 a+4 b=44 \quad 3 x+3 y=60 \\
& p+q=4 \\
& +\mathbf{p}-\mathbf{q}=-27 \\
& 2 \mathrm{p}=-23 \quad \$-4=11 \\
& \begin{array}{ll}
-4 m+2 n=5 & +?+7=\mathbf{1 2} \\
+4 m+3 n=10
\end{array} \quad \begin{array}{ll}
\mathbf{~}+\mathbf{?}+\mathbf{3}=\mathbf{2 3}
\end{array} \\
& 5 \mathbf{n}=15 \quad 5 x+6 y=37 \\
& \begin{array}{r}
+5 x+2 y=29 \\
\hline 10 x+8 y=66
\end{array}
\end{aligned}
$$

## Another legal math move...

- You are allowed to multiply an entire equation by any number.

$$
\begin{aligned}
& 2 x=10 \\
& 3(2 x=10) \\
& 6 x=30 \\
& \frac{1}{5} x+3=\frac{2}{5} x-4
\end{aligned}
$$

What could I multiply here?

$$
\begin{array}{r}
5 x+6 y=37 \\
+10 x-2 y=29 \\
\hline
\end{array}
$$

To eliminate " $x$ ", you could multiply the first equation by - 2 - You would have -iox and 1ox

OR
To eliminate " y ", you could multiply the second equation by 3 - You would have 6y and -6y

What would you multiply them by to make them opposites???

$$
\begin{array}{r}
3 \text { and } \mathbf{- 1} \\
\frac{\bullet 3}{3} \text { and }-3
\end{array}
$$

What would you multiply them by to make them opposites???

$$
\frac{\begin{array}{l}
1 \\
\cdot 5
\end{array}}{\frac{5}{5} \text { and }-5}
$$

What would you multiply them by to make them opposites???

## 2 and 6



What would you multiply them by to make them opposites???

$$
\frac{-5 \text { and }-10}{10 \text { and }-10}
$$

What would you multiply them by to make them opposites???

$$
\begin{aligned}
& -4 \text { and } 6 \\
& \bullet 3 \\
& \hline 12 \text { and }-12
\end{aligned}
$$

## Example: Multiplying One Equation

$$
\begin{aligned}
& -2 x+4 y=8 \longrightarrow-2 x+4 y=8 \\
& 4(3 x-y=3) \longrightarrow \frac{12 x-4 y=12}{10 x}=20 \quad \\
& x=2 \\
& \text { Find y: }-2 x+4 y=8 \\
& -2(2)+4 y=8 \\
& (2,3) \quad-4+\begin{array}{r}
4 y=8 \\
4 y=12
\end{array} \\
& y=3
\end{aligned}
$$

What would you multiply them by to make them opposites???


Don't write, just watch:
$6 \mathbf{a}+\mathrm{b}=15 \longrightarrow 6 \mathrm{a}+\mathrm{b}=15$
$2(-3 \mathbf{a}+4 b=6) \longrightarrow \frac{-6 a+8 b=12}{9 b=27}$
and the rest is the same...

Try it!
$x+4 y=5$
$x+2 y=1$
 Created by Troy Chumley Warmup $11 /(10+10+10)$

Solve the system of equations by elimination.

1. $\left\{\begin{array}{l}8 x-4 y=32 \\ 7 x+4 y=13\end{array}\right.$
2. Create a problem that equals 1. (For the date tomorrow) My favorite problem will earn 10 LiveSchool Points. (Call me over and show me your problem when you have it)

## Today's Objective

- Master yesterday's topic - Elimination
- Solve STORY PROBLEMS using elimination


## Example: Multiplying One Equation

$$
\begin{aligned}
& -2 x+4 y=8 \longrightarrow-2 x+4 y=8 \\
& 4(3 x-y=3) \longrightarrow \frac{12 x-4 y=12}{10 x}=20 \quad \\
& \mathrm{x}=2 \\
& \text { Find y: }-2 x+4 y=8 \\
& -2(2)+4 y=8 \\
& (2,3) \quad-4+\begin{array}{r}
4 y=8 \\
4 y=12
\end{array} \\
& y=3
\end{aligned}
$$

## HOMEWORK

- Elimination Worksheet
- EXTRA PRACTICE WORKSHEET PEOPLE - PLEASE KEEP WORKING ON THIS!!! COME IN FOR HELP IF YOU NEED IT!

What do you do when you CAN'T Eliminate right away???

- You need opposite coefficients, such as:
- $5 x$ and $5 x$
"3y and -3y
"-x and $x$
- Etc...

What do you do when you CAN'T Eliminate right away???

- How could you make it so that you have opposite coefficients?
$\left\{\begin{array}{c}5 x-2 y=1 \\ 4 x+4 y=12\end{array}\right.$


## What do you do when you CAN'T Eliminate right away???

- How could you make it so that you have opposite coefficients?
$\left\{\begin{array}{c}3 x+11 y=-35 \\ -x+3 y=5\end{array}\right.$


## What do you do when you CAN'T Eliminate right away???

- How could you make it so that you have opposite coefficients?
$=\left\{\begin{array}{c}-4 x+2 y=18 \\ 12 x-2 y=-34\end{array}\right.$

What do you do when you CAN'T
Eliminate right away???

- How could you make it so that you have opposite coefficients?

$$
\left\{\begin{array}{c}
3 x+y=2 \\
3 x-2 y=32
\end{array}\right.
$$

## What do you do when you CAN'T

 Eliminate right away???- How could you make it so that you have opposite coefficients?

$$
=\left\{\begin{array}{c}
3 x+y=2 \\
-1(3 x-2 y=32)
\end{array} \rightarrow \begin{array}{c}
3 x+y=2 \\
-3 x+2 y=-32
\end{array}\right.
$$

## What do you do when you CAN'T

 Eliminate right away???- How could you make it so that you have opposite coefficients?

$$
=\left\{\begin{array} { c } 
{ x + 4 y = 2 0 } \\
{ - 1 ( x - 6 y = 1 5 ) }
\end{array} \rightarrow \left\{\begin{array}{c}
x+4 y=20 \\
-x+6 y=-15
\end{array}\right.\right.
$$

What do you do when you CAN’T Eliminate right away???

- How could you make it so that you have opposite coefficients?
$=\left\{\begin{array}{l}2(3 x+y=2) \\ 3 x-2 y=32\end{array} \rightarrow \begin{array}{c}6 x+2 y=4 \\ 3 x-2 y=32\end{array}\right.$


## What do you do when you CAN'T Eliminate right away???

- How could you make it so that you have opposite coefficients?
$=\left\{\begin{array}{l}x+4 y=20 \\ x-6 y=15\end{array}\right.$


## What do you do when you CAN'T Eliminate right away???

- How could you make it so that you have opposite coefficients?
$=\left\{\begin{array}{c}2 x+4 y=8 \\ -3 x-3 y=-9\end{array}\right.$

What do you do when you CAN'T Eliminate right away???

- How could you make it so that you have opposite coefficients?
$=\left\{\begin{array}{c}5 x+2 y=8 \\ 4 x-5 y=13\end{array}\right.$

What do you do when you CAN'T Eliminate right away???

- How could you make it so that you have opposite coefficients?
$=\left\{\begin{array}{c}3(2 x+4 y=8) \\ 2(-3 x-3 y=-9)\end{array} \rightarrow \begin{array}{c}6 x+12 y=24 \\ -6 x-6 y=-18\end{array}\right.$


## Try these...

No Multiplying
$\left\{\begin{array}{c}x+y=8 \\ -x+5 y=-20\end{array}\left\{\begin{array}{c}3 x+y=3 \\ -4 x-4 y=12\end{array}\right.\right.$

$$
(10,-2) \quad(3,-6) \quad(1,4)
$$

## Story problem

- Henry gets paid for doing chores. Last week, he did 2 loads of laundry and 3 loads of dishes, and his parents paid him $\$ 12$. The week before, he did 7 loads of laundry and 6 loads of dishes, and his parents paid him $\$ 33$. How much does Henry earn for doing each type of chore?

$$
\begin{array}{cc}
\mathbf{- 2}(2 L+3 D=12) \\
7 L+6 D=33
\end{array} \longrightarrow\left\{\begin{array}{cc}
-4 L-6 D=-24 \\
7 L+6 D-33 \\
3 L & =9
\end{array}\right\}\left(L=3, ~ \begin{array}{l}
\text { Doing the laundry is } \$ 3, \\
\text { doing the dishes is } \$ 2 .
\end{array}\right.
$$

$$
N=32, A=27
$$

Nate is 32 years old, Anne is 27 years old

## Story problem

- There are 14 total people at the Easter gathering adults and children. Each child found 4 Easter eggs and each adult found 3 Easter eggs. All together, 48 eggs were found. How many adults and children were at the gathering?

$$
\left\{\begin{array} { r l } 
{ A + C = 1 4 } \\
{ 3 A + 4 C = 4 8 }
\end{array} \longrightarrow \left\{\begin{array}{rl}
-3 A-3 C & =-42 \\
3 A+4 C & =48 \\
C & =6 \\
A & =8
\end{array}\right.\right.
$$

There were 6 children and 8 adults.

27 What is the solution to this system of linear equations?

$$
\begin{array}{r}
2 x-2 y=10 \\
x+4 y=30
\end{array}
$$

A $(10,5)$
B $(50,-5)$
C $(0,5)$
D $(10,-5)$
$(0,5)$

$$
(10,-5)
$$

## Homework

- Worksheet from yesterday

$$
\begin{aligned}
& 2 y-x=-8 \\
& 5 y+x=-6
\end{aligned}
$$

A 4
B 2
C -2
D -4


