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Warmup 12/(3+3)

1. Solve using the substitution method. When you finish, compare with others who are done. Help those who are stuck.

$$\begin{cases} 2x - 8y = 14 \\ x = 4y + 2 \end{cases}$$

p.247 (1 - 10, 14, 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. $\left(\frac{1}{4}, 5\frac{1}{2}\right)$
9. $\begin{cases} S + P = 15 \\ S = P + 7 \end{cases}$

   11 shirts, 4 pairs of pants

10. $\begin{cases} P + H = 49 \\ H = P + 11 \end{cases}$

    Horatio has 30 games, Preston has 19 games

14. Possible answers: When you don't have a graph, when the intersection point is off the graph, when the intersection point is a fraction, when the equations are simple and easy to work out without a graph.

15. The third one doesn't belong. Its solution is (-2, 1). The solution of the other three is (1, -2).

What would you do here???

- $2x + 2y = 18$
- $3x - 2y = 12$

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Solve Systems with Elimination

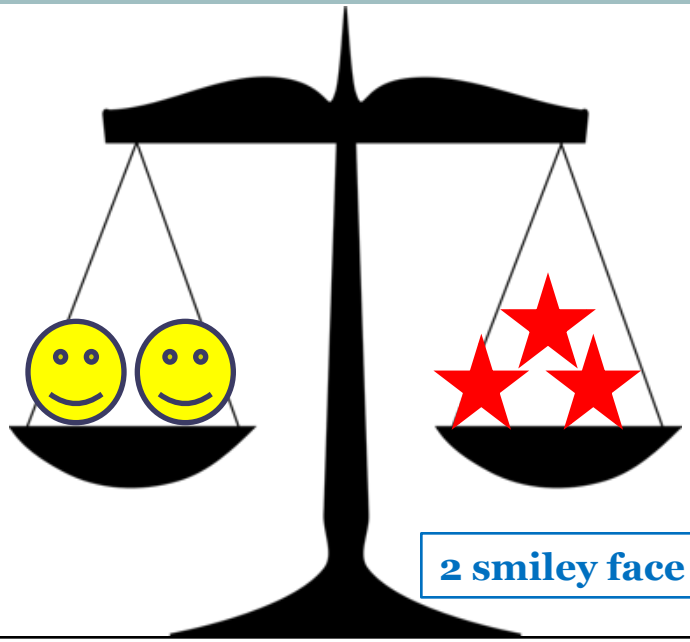
Objective:

- Use a new strategy (elimination) to solve systems of equations
  - Most useful when BOTH equations have x and y on the same side

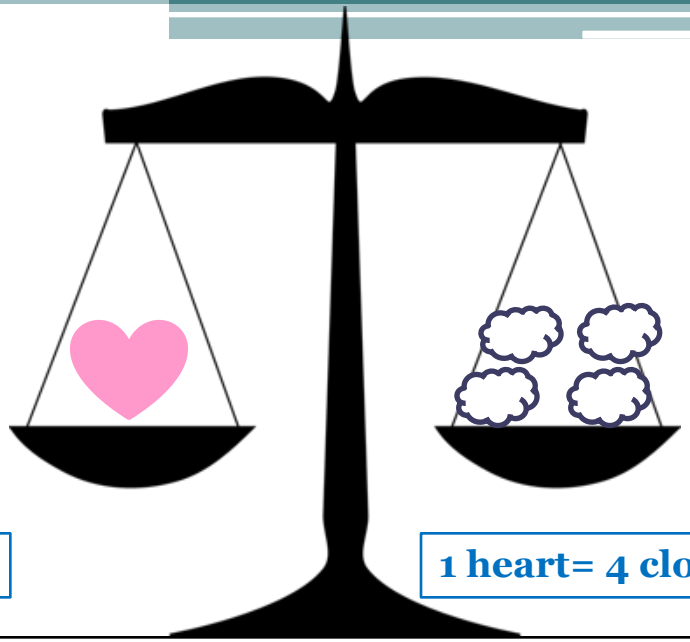
- Today, we are going to learn a strategy to solve systems where both equations are in STANDARD FORM, such as:

$$2x + y = 18$$

$$3x - y = -3$$

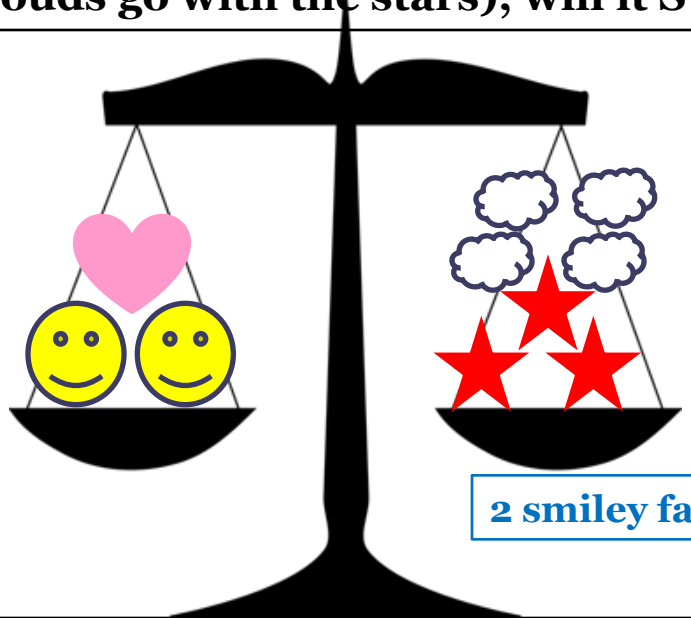


2 smiley face = 3 star



1 heart= 4 cloud

<u>IMPORTANT Q:</u> If I combine the two balance scales together (hearts go with the smiley faces, clouds go with the stars), will it STILL be balanced???



2 smiley face + 1 heart= 3 star + 4 cloud

SO:

- You can **add** 2 equations together and the third equation will still be true.
- Ok…but how would that help me???

$$2x + y = 18$$

$$+\ 3x - y = -3$$

$$5x + 0y = 15$$

$$5x = 15$$

$$x = 3$$

- Now substitute the first variable back in to either equation to find the second.

$2x + y = 18 \longrightarrow 2(3) + y = 18 \longrightarrow 6 + y = 18$

$3x - y = -3 \longrightarrow 3(3) - y = -3 \longrightarrow 9 - y = -3$

either way… $y = 12$

Together, with me:

$$5x - 2y = 17$$

$$x + 2y = 13$$

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 either x or y.
  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

Try these:

$-3x + y = 6$

$3x + 2y = 30$

$10x - y = 5$

$-6x + y = -9$

$4x - 2y = 30$

$-4x + 6y = -38$

When you show me a correct answer + work for one of the problems, you may volunteer to put it on the board.

Ok…when would adding equations together help me???

$$9a + 10b = 16$$
$$+\ 4a - 6b = 28$$
$$13a + 4b = 44$$

$$x + y = 20$$
$$+\ 2x + 2y = 40$$
$$3x + 3y = 60$$

$$p + q = 4$$
$$+\ p - q = -27$$
$$2p = -23$$

$$-4m + 2n = 5$$
$$+\ 4m + 3n = 10$$
$$5n = 15$$

$$\$ - 4 = 11$$
$$+\ ? + 7 = 12$$
$$\$ + ? + 3 = 23$$

$$5x + 6y = 37$$
$$+\ 5x + 2y = 29$$
$$10x + 8y = 66$$

Obvious question:

- What happens if you don't have opposite coefficients???

$$x + y = 20$$
$$+ 2x + 2y = 40$$

$$9a + 10b = 16$$
$$+ 4a - 6b = 28$$

$$5x + 6y = 37$$
$$+ 5x + 2y = 29$$

Another legal math move…

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

$$2x = 10$$

$$3(2x = 10)$$

$$6x = 30$$

$$\frac{1}{5}x + 3 = \frac{2}{5}x - 4$$

What could I multiply here?

$$5x + 6y = 37$$
$$+\ 10x - 2y = 29$$

To eliminate "x", you could multiply the first equation by -2

- **You would have -10x and 10x**

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???

3 and **-1**

$\bullet 3$

---

3 and -3

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

-2 and **8**

- **4**

---

8 and -8

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

1 and **-5**

- **5**

---

5 and -5

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

$$3 \text{ and } 3$$

$$\bullet -1$$

---

3 and -3

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

2 and **6**

- **-3**

-6 and 6

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

-5 and **-10**

- **-2**

---

10 and -10

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

-2 and **3**

•3 **•2**

-6 and 6

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

-4 and **6**

•3 •2

12 and -12

Don't write, just watch:

$$6a + b = 15 \longrightarrow 6a + b = 15$$

$$2(-3a + 4b = 6) \longrightarrow -6a + 8b = 12$$

$$9b = 27$$

and the rest is the same…

Example: Multiplying One Equation

$-2x + 4y = 8 \longrightarrow -2x + 4y = 8$

$4(3x - y = 3) \longrightarrow 12x - 4y = 12$

$$10x = 20$$

$$x = 2$$

Find y: $-2x + 4y = 8$

$-2(2) + 4y = 8$

$-4 + 4y = 8$

$4y = 12$

$y = 3$

$$(2, 3)$$

Try it!

$$x + 4y = 5$$

$$x + 2y = 1$$

Homework:

- 30 Minutes of ALEKS
- + make some progress on your packet!!!