WHO SHOULD I MOVE?

I WANTED TO SHOW YOU A TRICK TO HELP SOME OF YOU WITH VARIABLES AND EQUATIONS.

YOU KNOW, MAX, I ALWAYS GET CONFUSED ON WHAT NEEDS TO BE MOVED FIRST WHEN I'M SEPARATING VARIABLES AND NUMBERS IN AN EQUATION.

AND THAT'S EXACTLY WHAT THIS TRICK HELPS US WITH. YOU MIGHT THINK IT'S A LITTLE SILLY, BUT IT REALLY HELPS. LET'S TAKE A LOOK AT AN EXAMPLE.

$$x + 9 = 23$$

OK...WE HAVE x AS THE VARIABLE, AND 9 AND 23 AS THE NUMBERS.

YES, POE, AND TO HELP US DECIDE ON WHAT NEEDS TO BE MOVED WE CAN USE THE IDEA THAT NUMBERS AND VARIABLES (LETTERS) DO NOT LIKE EACH OTHER.

$$x + 9 \; | \; 23 \longrightarrow x + 9 \; | \; 23$$

I ALSO USE A WALL WHERE THE EQUAL SIGN IS TO SEPARATE THE EQUATION. NOW IF YOU LOOK AT THE PROBLEM YOU SEE WHO IS HAPPY AND WHO IS NOT.

I GET IT. THE 23 IS HAPPY, BECAUSE HE HAS NO VARIABLES NEXT TO HIM. THE x AND 9 ARE UPSET, BECAUSE THEY'RE ON THE SAME SIDE OF THE WALL.

WHICH MEANS WE NEED TO MOVE THE x OR THE 9, SO WHICH ONE IS IT GOING TO BE?

WELL...IF I MOVE THE x OVER TO THE 23'S SIDE, HE WILL NOT BE HAPPY ANYMORE. WHICH MEANS, I NEED TO MOVE THE 9. THAT SHOULD MAKE EVERYONE HAPPY.

$$x + 9 \; | \; 23$$
$$x + 9 \; | \; 23 \quad -9$$

I'M FINALLY ALONE AND AWAY FROM THOSE DISGUSTING NUMBERS.

$$x \; | \; 23 - 9$$
$$x = 14$$

WHAT WOULD YOU MOVE TO SOLVE THESE EQUATION?

1. $8 + y = 65$
   I WOULD MOVE THE __8__ .

2. $b \circ 7 = 63$
   I WOULD MOVE THE __7__ .

PRACTICE A

CHECK OUT THIS EXAMPLE BEFORE YOU BEGIN.

WHAT WOULD YOU MOVE TO SOLVE THIS EQUATION?

HELPFUL EXAMPLE

$$94 = h + 30 \longrightarrow 94 \; | \; h + 30$$

SINCE THE h AND 30 ARE NOT HAPPY I NEED TO SEPARATE THEM, BUT I NEED TO KEEP THE 94 HAPPY TOO. WHICH MEANS, <u>I WOULD MOVE THE 30 TO THE OTHER SIDE</u>.

WHAT WOULD YOU MOVE TO SOLVE EACH EQUATION?

1. $s - 15 = 72$
   $s - 15 \; | \; 72$
   I WOULD MOVE THE __15__ .

2. $56 = t \circ 8$
   $56 \; | \; t \circ 8$
   I WOULD MOVE THE __8__ .

3. $\dfrac{k}{5} = 20$
   $\dfrac{k}{5} \; | \; 20$
   I WOULD MOVE THE __5__ .

4. $32 + a = 88$
   I WOULD MOVE THE __32__ .

5. $45 = c - 14$
   I WOULD MOVE THE __14__ .

6. $6c = 42$
   I WOULD MOVE THE __6__ .

7. $\dfrac{w}{3} = 12$
   I WOULD MOVE THE __3__ .

8. $29 = y + 4$
   I WOULD MOVE THE __4__ .

9. $x - 20 = 26$
   I WOULD MOVE THE __20__ .

DESCRIBE HOW YOU WOULD CHANGE EACH EQUATION TO GET THE VARIABLE ALONE.

HELPFUL EXAMPLE

$$23 = e - 4 \longrightarrow 23 \; | \; e - 4 \quad +4$$

THE e AND 4 ARE NOT HAPPY, BUT I NEED TO KEEP THE 23 HAPPY TOO. I WOULD MOVE THE 4 BY ADDING BOTH SIDES BY 4.

ANSWER: ADD BOTH SIDES BY 4.

OPPOSITE OPERATIONS	
ADDITION	⟷ SUBTRACTION
MULTIPLICATION	⟷ DIVISION

DON'T FORGET, WHEN YOU MOVE A NUMBER TO THE OPPOSITE SIDE OF THE WALL (EQUATION) YOU NEED TO DO THE OPPOSITE OPERATION.

10. $4y = 24$
    I WOULD *DIVIDE BOTH SIDES BY 4.*

11. $14 + t = 34$
    I WOULD *SUBTRACT BOTH SIDES BY 14.*

12. $56 = h - 23$
    I WOULD *ADD BOTH SIDES BY 23.*

13. $27 = d + 8$
    I WOULD *SUBTRACT BOTH SIDES BY 8.*

14. $16 = \dfrac{n}{4}$
    I WOULD *MULTIPLY BOTH SIDES BY 4.*

15. $z - 8 = 12$
    I WOULD *ADD BOTH SIDES BY 8.*

PRACTICE B

SOLVE .

HELPFUL EXAMPLE

$$u - 13 = 30$$
$$u - 13 \; | \; 30 \longrightarrow u - 13 \; | \; 30 \quad +13 \quad +13$$
$$u - 0 = 43$$
$$u = 43$$

THE 30 IS HAPPY, BUT THE u AND THE 13 ARE NOT. IF WE MOVE THE u TO THE 30'S SIDE IT WILL NOT BE HAPPY ANYMORE, SO WE NEED TO MOVE THE 13.

SEE, EVERYONE'S HAPPY NOW. I LIKE HAPPY!

SOLVE EACH EQUATION.

1. $\dfrac{r}{2} = 12$
   $r = 24$

2. $54 = t + 12$
   $t = 42$

3. $g - 10 = 31$
   $g = 41$

4. $26 + d = 43$
   $d = 17$

5. $17 = v - 18$
   $v = 35$

6. $13h = 39$
   $h = 3$

7. $x - 31 = 48$
   $x = 79$

8. $90 = b \circ 10$
   $b = 9$

9. $\dfrac{n}{8} = 6$
   $n = 48$

10. $28 = f + 12$
    $f = 16$

11. $46 + x = 94$
    $x = 48$

12. $37 = w - 27$
    $w = 64$

13. $28 = 4h$
    $h = 7$

14. $44 = 19 + k$
    $k = 25$

15. $9h = 81$
    $h = 9$

WHO SHOULD I MOVE? - PART 2

NOW LET'S TAKE A LOOK AT TWO STEP EQUATIONS.

TWO STEP EQUATIONS MEAN YOU HAVE TO MOVE TWO THINGS TO SOLVE.

$$3x - 5 = 13$$

IF WE ADD THE WALL AND THE FACES WE CAN EASILY SEE WHO IS NOT HAPPY.

$$3x - 5 \; | \; 13$$

THIS IS A LITTLE TRICKIER. WE NOW HAVE THREE UNHAPPY FACES.

SO WHO ARE WE SUPPOSE TO MOVE FIRST?

ALWAYS MOVE THE NUMBER THAT IS FARTHEST AWAY FROM THE VARIABLE.

I GET IT. OUT OF ALL THE UNHAPPY ONES THE 5 IS THE FARTHEST AWAY FROM THE x.

$$3x - 5 \; | \; 13 \quad +5 \quad +5$$
$$3x - 0 \; | \; 18$$
$$3x \; | \; 18$$

AND WE DO THE OPPOSITE OPERATION OF SUBTRACTION, WHICH IS ADDITION.

NOW WE ONLY HAVE TWO UNHAPPY FACES. SO WE NEED TO MOVE THE 3 OR THE x.

$$3x \; | \; 18$$

THAT'S EASY...SINCE THE 18 IS HAPPY WE HAVE TO MOVE ANOTHER NUMBER TO IT'S SIDE, WHICH MEANS WE NEED TO MOVE THE 3.

AND WE DO THE OPPOSITE OPERATION OF MULTIPLICATION, WHICH IS DIVISION.

$$3x \; | \; 18 \quad \div 3 \quad \div 3$$
$$1x \; | \; 6$$
$$x = 6$$

THIS IS AS SIMPLE AS 1, 2, 3.
1. DRAW WALL AND FACES.
2. MOVE UNHAPPY NUMBER THAT IS NOT ATTACHED TO VARIABLE.
3. MOVE UNHAPPY NUMBER THAT IS CLOSEST TO VARIABLE.

ON THIS EQUATION, WHAT WOULD YOU MOVE FIRST? WHAT WOULD YOU MOVE SECOND?

$$\dfrac{n}{8} + 2 = 10$$

FIRST I WOULD MOVE THE __2__ .

THEN I WOULD MOVE THE __8__ .

PRACTICE C

REMEMBER, YOU WANT TO MOVE THE NUMBER THAT IS **NOT** ATTACHED TO THE VARIABLE FIRST.

HELPFUL EXAMPLE

WHAT WOULD YOU MOVE TO SOLVE THIS EQUATION?

$$30 = 4h - 6 \longrightarrow 30 \;|\; 4h - 6$$

THE 4, *h*, AND 6 ARE NOT HAPPY. THE 6 IS THE FARTHEST AWAY FROM THE *h*, SO I WOULD FIRST MOVE IT OVER TO THE 30. THEN I WOULD MOVE THE 4.

ANSWER:
FIRST I WOULD MOVE THE __6__.
THEN I WOULD MOVE THE __4__.

WHAT WOULD YOU MOVE TO SOLVE EACH EQUATION?

1. $9e - 3 = 24$

FIRST I WOULD MOVE THE __3__.
THEN I WOULD MOVE THE __9__.

2. $18 = 5d + 8$

FIRST I WOULD MOVE THE __8__.
THEN I WOULD MOVE THE __5__.

3. $\dfrac{v}{6} - 2 = 2$

FIRST I WOULD MOVE THE __2__.
THEN I WOULD MOVE THE __6__.

4. $13 = 3 + \dfrac{a}{2}$

FIRST I WOULD MOVE THE __3__.
THEN I WOULD MOVE THE __2__.

5. $7d + 8 = 50$

FIRST I WOULD MOVE THE __8__.
THEN I WOULD MOVE THE __7__.

6. $6 + 3r = 12$

FIRST I WOULD MOVE THE __6__.
THEN I WOULD MOVE THE __3__.

DESCRIBE HOW YOU WOULD CHANGE EACH EQUATION TO GET THE VARIABLE ALONE.

HELPFUL EXAMPLE

$$2w + 8 = 14 \longrightarrow 2w + 8 \;|\; 14$$

THE 2, *w*, AND 8 ARE NOT HAPPY. THE 8 IS THE FARTHEST AWAY FROM THE *w*, SO I WOULD FIRST SUBTRACT BOTH SIDES BY 8. THEN I WOULD DIVIDE BOTH SIDES BY 2.

ANSWER:
FIRST I WOULD SUBTRACT BOTH SIDES BY 8.
THEN I WOULD DIVIDE BOTH SIDES BY 2.

1. $\dfrac{t}{4} - 6 = 14$

FIRST I WOULD *ADD BOTH SIDES BY 6.*
THEN I WOULD *MULTIPLY BOTH SIDES BY 4.*

2. $24 = 2x + 8$

FIRST I WOULD *SUBTRACT BOTH SIDES BY 8.*
THEN I WOULD *DIVIDE BOTH SIDES BY 2.*

3. $20 = 8f - 12$

FIRST I WOULD *ADD BOTH SIDES BY 12.*
THEN I WOULD *DIVIDE BOTH SIDES BY 8.*

4. $34 = 7 + \dfrac{k}{9}$

FIRST I WOULD *SUBTRACT BOTH SIDES BY 7.*
THEN I WOULD *MULTIPLY BOTH SIDES BY 9.*

PRACTICE D

SOLVE . $\quad \dfrac{d}{5} - 3 = 4$ **HELPFUL EXAMPLE**

STEP 1: DRAW WALL AND FACES.

$$\dfrac{d}{5} - 3 = 4$$

STEP 2: MOVE UNHAPPY NUMBER NOT ATTACHED TO VARIABLE.

OPPOSITE OF MINUS 3 IS PLUS 3

$$\begin{array}{c} \dfrac{d}{5} - 3 \;|\; 4 \\ + 3 \;|\; + 3 \\ \hline \dfrac{d}{5} - 0 \;|\; 7 \end{array}$$

STEP 3: MOVE UNHAPPY NUMBER CLOSEST TO VARIABLE.

OPPOSITE OF DIVIDE BY 5 IS MULTIPLY BY 5.

$$\begin{array}{c} \dfrac{d}{5} \;|\; 7 \\ \circ 5 \;|\; \circ 5 \\ 1d \;|\; 35 \end{array}$$

$$d = \underline{35}$$

SOLVE EACH EQUATION.

1. $\dfrac{z}{3} - 12 = 3$

$z = 45$

2. $6h - 4 = 2$

$h = 1$

3. $33 = 4c + 5$

$c = 7$

4. $17 = 13 + \dfrac{x}{4}$

$x = 16$

5. $14 + 2m = 28$

$m = 7$

6. $7 + \dfrac{y}{2} = 15$

$y = 16$

7. $20 = 8f - 12$

$f = 4$

8. $7 = 2 + \dfrac{n}{8}$

$n = 40$

9. $59 = 15 + 4u$

$u = 11$

10. $3 = \dfrac{b}{6} - 5$

$b = 48$

11. $\dfrac{k}{10} + 1 = 11$

$k = 100$

12. $7p + 11 = 46$

$p = 5$