Engaging with Numbers

with Cary Cermak-Rudolf
Roseburg Public Schools
ccermak@roseburg.k12.or.us

Learn how to recognize and get 3-5 students to utilize the Property of Operations and the meanings of multiplication and division. During this session we will do the math, observe videos, and think deeply about how to get students engaged in math in a way that is accessible and meaning for all students.

Play the Game-Multiplication Madness

- Play in Groups of 3
- You will need a game board, three dice, and counters
- Players take turns to roll the three dice. They check to see if the product of the three number is on the game board. If it is, they place a counter of their color on that number.
- The player who is the first to get three counters in a row is the winner.

Solve mentally:

12×15

Where do you see 12 x 15 in these problem strings?

2 x 15 x 6

(2 x 15) x 6

30 x 6

3 x 6 x 10

18 x 10 = 180

2 x 15 x 6

(2 x 15) x 6

2 x 15 = 30

30 x 3 =90

90 x 2 = 180

2 x 15 x 6

2 x (15 x 6)

15 x 6 = 90

90 x 2 = 180

Associative Property of Multiplication

- **Definition:** The associative property states that you can add or multiply regardless of how the numbers are grouped. By 'grouped' we mean 'how you use parenthesis'. In other words, if you are adding or multiplying it does not matter where you put the parenthesis. Add some parenthesis any where you like!.

- When you calculate in mathematics, you must work from left to right. However, if you would like to make life easier on yourself…USE THE PROPERTIES!!

Evoke the Associative Property to make life easier!

$$4 + 5 + 5 + 6 + 4 + 7 + 3 + 9 + 1 + 2 + 8$$

$$4 + (5 + 5) + (6 + 4) + (7 + 3) + (9 + 1) + (2 + 8)$$

$$4 + 10 + 10 + 10 + 10 + 10$$

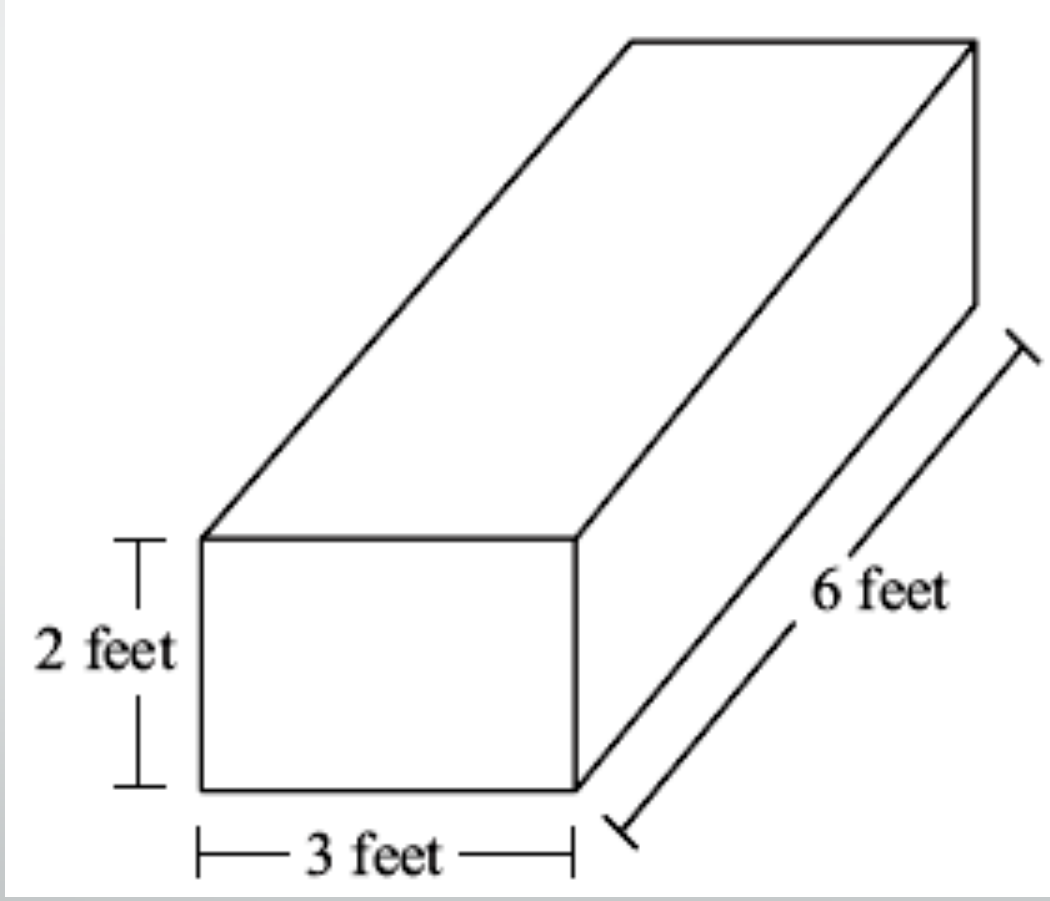
Use your knowledge of the Associative Property of Multiplication to explain the trick with the 10s:

$$8 \times 20$$

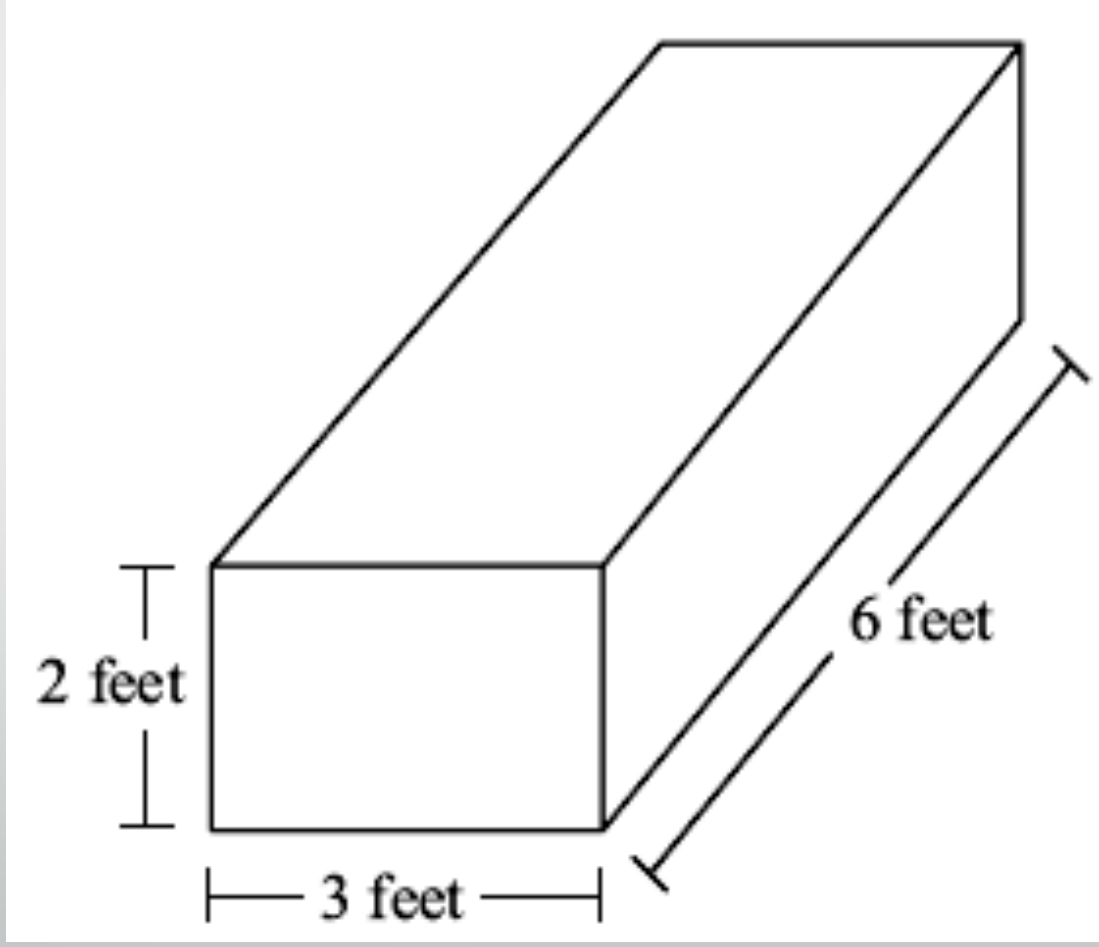
$$8 \times (2 \times 10)$$

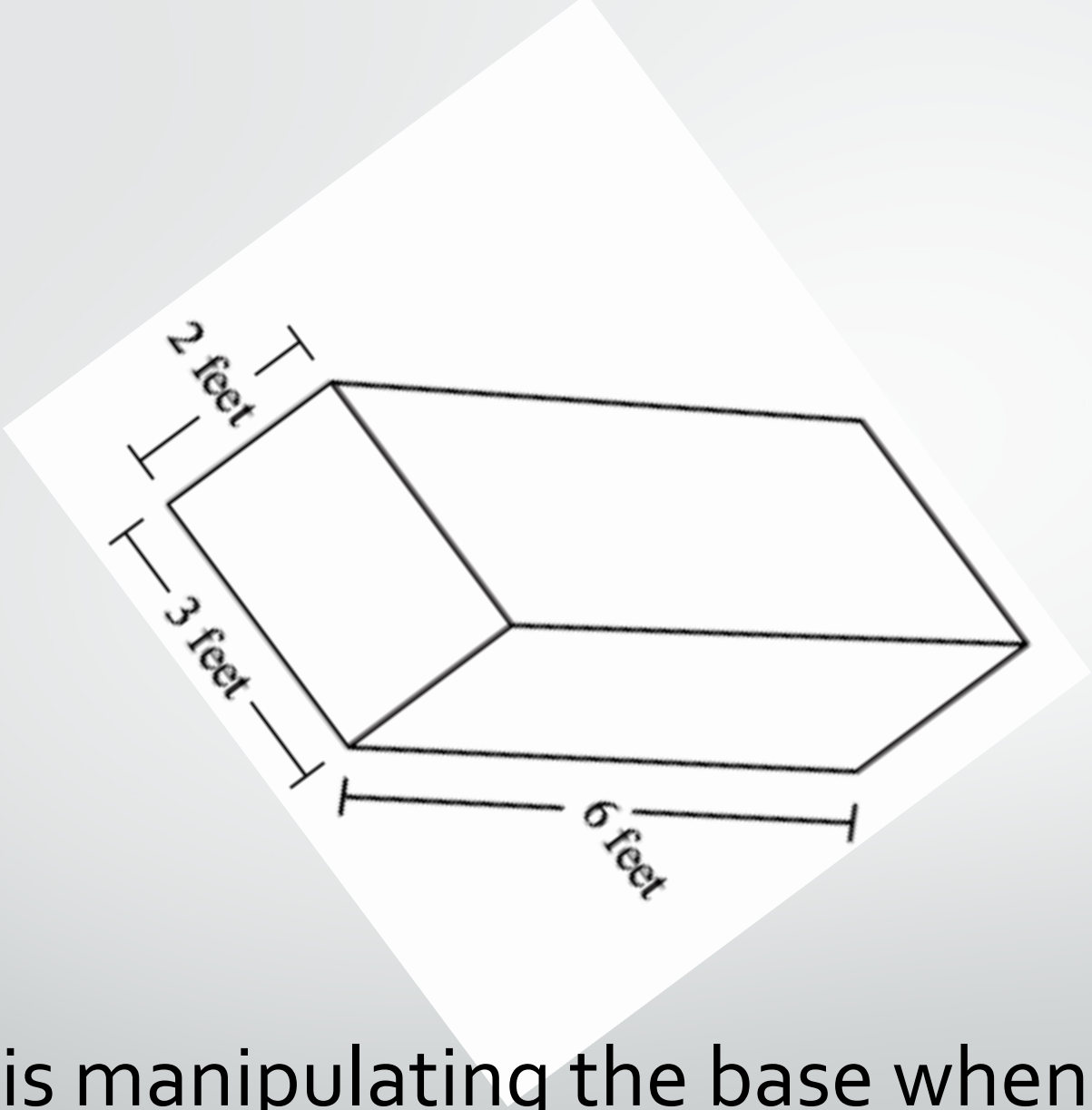
$$(8 \times 2) \times 10$$

What's the volume? (B x H)



What's the volume? (L x W x H)





How is manipulating the base when finding volume like using the associative property of multiplication?

Solve **18 x 4** using one of the following strategies:

18 x (2 x 2)

(18 x 2) x 2

18 x 2 = 36

36 x 2 = 72

18 x (2 + 2)

(18 x 2) + (18 + 2)

36 + 36

Which properties are you using for each one?

$18 \times (2 \times 2)$

$(18 \times 2) \times 2$

$18 \times 2 = 36$

$36 \times 2 = 72$

Associative Property of Multiplication

$18 \times (2 + 2)$

$(18 \times 2) + (18 + 2)$

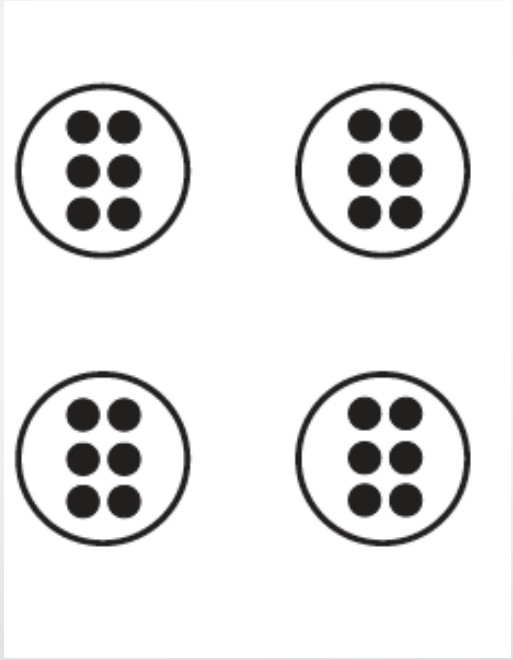
$36 + 36$

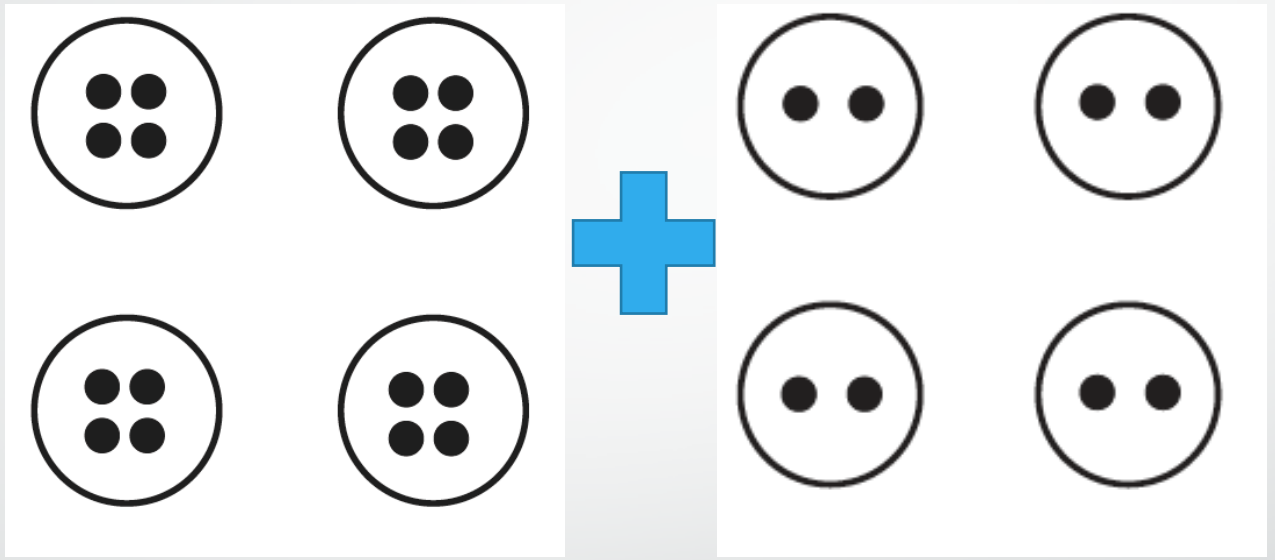
Distributive Property of Multiplication over addition

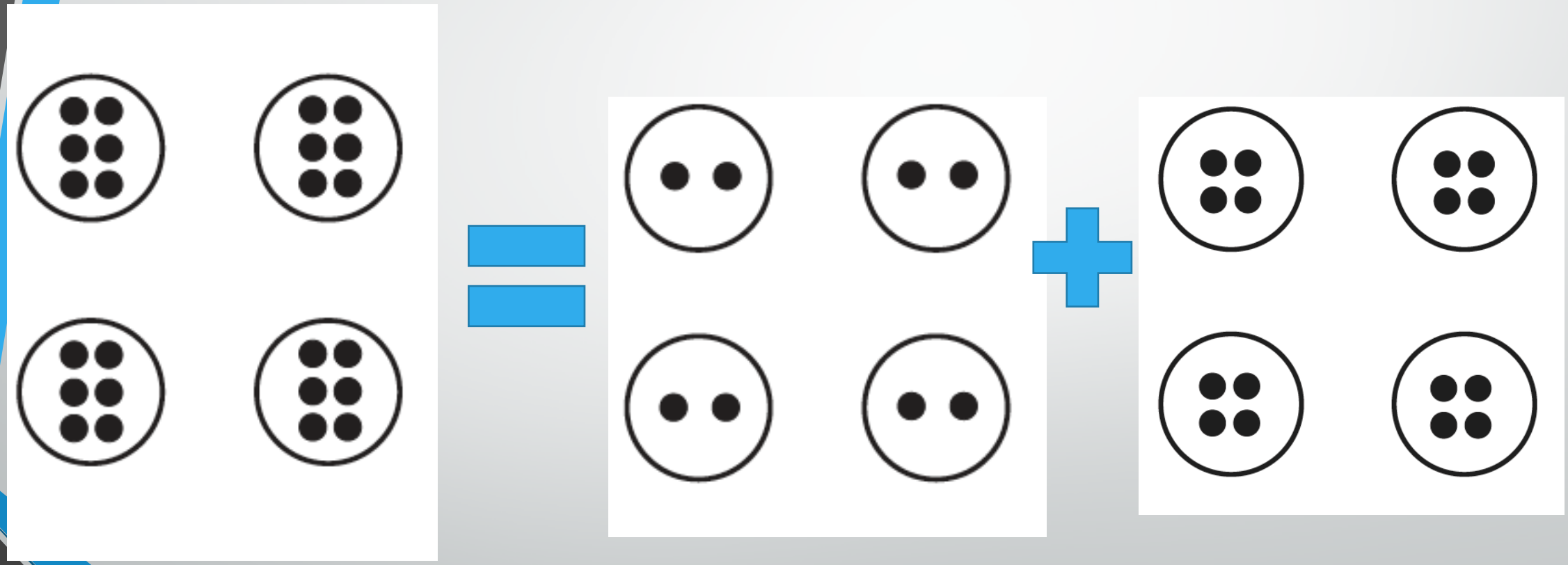
Distributive Property of Multiplication over Addition

- The distributive property lets you multiply a sum by multiplying each addend separately and then add the products.

- Or, I can chunk my groups to make it easier and then add them back up afterwards.



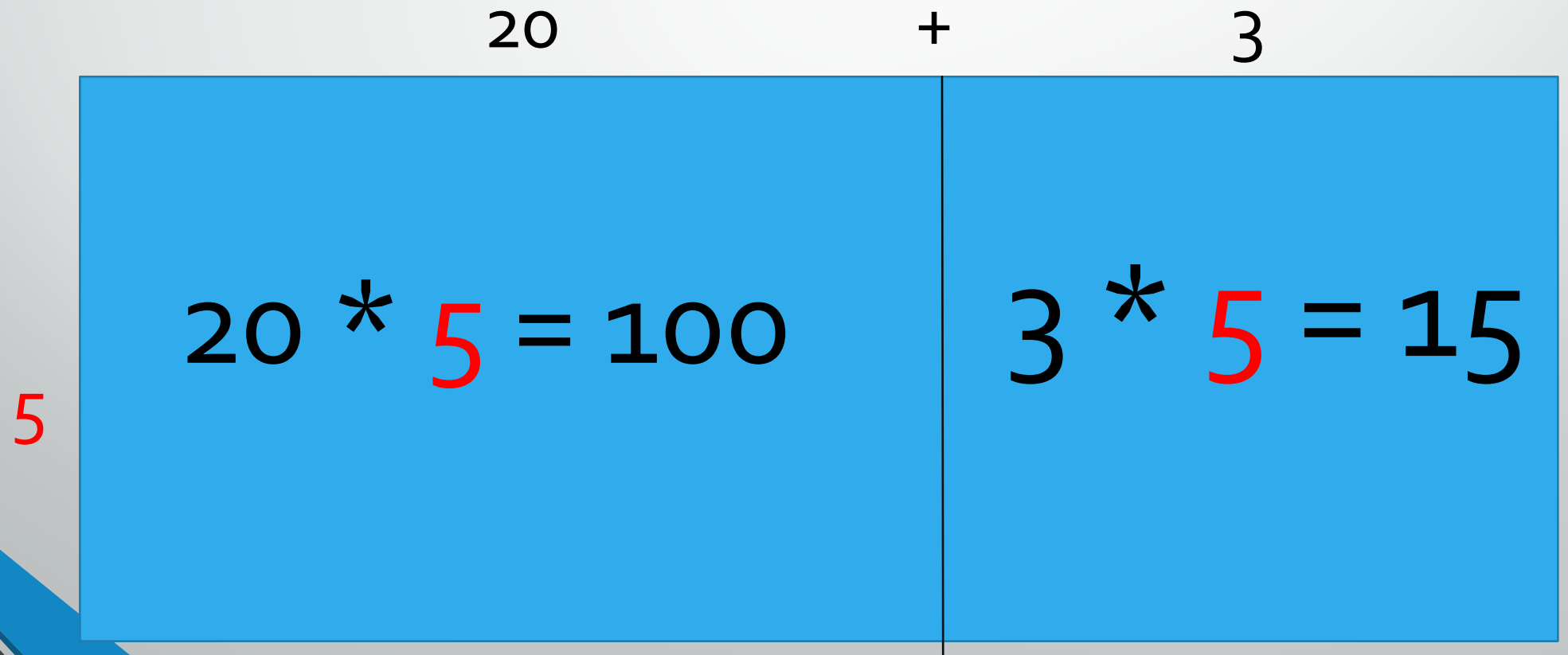




23 x 5

5

23 x 5



23 x 5

23

5

100 + 15 = **115**

Solve:

$96 \div 4$

Observational Lens:

1. Look for what these students intuitively understand.
2. Which property are these students attempting to use?
3. What does each student need to explore more to master this property?

Which property did they attempt to use?

The Distributive Property of Division over Addition!

Where do you see the properties?

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#31	1	OA	B	1	3.OA.B.5	7

Decide whether each expression is equal to 4×12.
Select Yes or No for each expression.

	Yes	No
$4 \times (10 + 2)$	☐	☐
$(4 \times 10) + 2$	☐	☐
$4 + (10 \times 2)$	☐	☐

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#14	1	OA	C	1	3.OA.C.7	N/A

Decide whether each equation is true or false.

Click True or False for each equation.

	True	False
$8 \times 2 = 4 \times 6$	☐	☐
$7 \times 3 = 3 \times 7$	☐	☐
$5 \times 6 = 3 \times 10$	☐	☐

Item	Claim	Domain	Target	DOK	CCSS-MC	CCSS-MP
#4	3	OA	F	2	3.OA.B	2, 4

Which expression is equal to 6×3, and why?

Ⓐ $6 + 3$, because the numbers are in the same order

Ⓑ $6 \div 3$, because division and multiplication are inverse operations

Ⓒ $3 + 6$, because the order of the numbers does not matter in addition

Ⓓ 3×6, because the order of the numbers does not matter in multiplication