

What to bring to class:  
Ask students to bring PM  
4A and 5A.

## 1.5 - Multiplication

*Say:* What is multiplication?

We know  $3 \times 6 = 18$ .  
↑ ↑      ↓  
factors    product

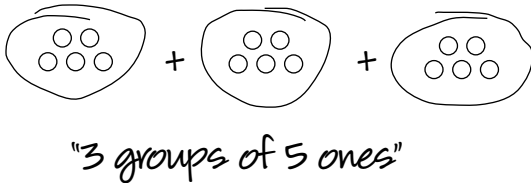
What does this mean?

Def: Multiplication of whole numbers is repeated addition.

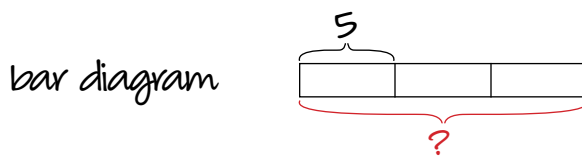
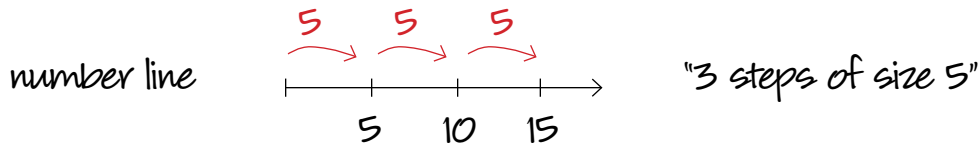
$$3 \times 5 = 3 \text{ groups of } 5 \text{ or } 5 + 5 + 5$$

Models:

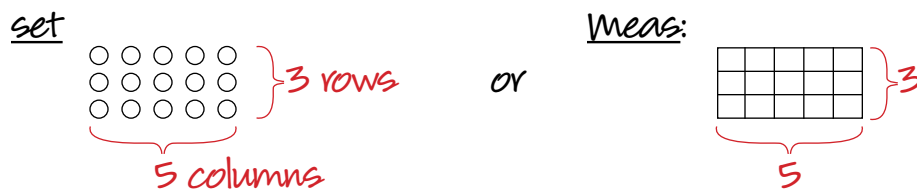
a) set Model:



b) Measurement:



c) Rectangular array:



"area model"

Multiplication properties: (just through examples at this stage)

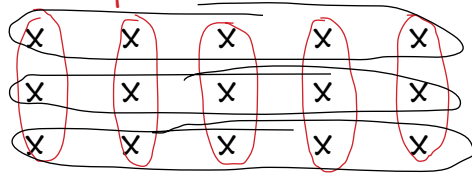
① Multiplication Identity (multiplication by 1)

what is  $\begin{cases} 5 \text{ groups of } 1? & 5 \times 1 = 1 + 1 + 1 + 1 + 1 = 5 \\ 1 \text{ group of } 5? & 1 \times 5 = 5 \end{cases}$

② Commutative Property:  $3 \times 5 = 5 \times 3$

Say: not obvious that 3 groups of 5 = 5 groups of 3  
 $5 + 5 + 5 = 3 + 3 + 3 + 3 + 3$

Clear from pic:



Rows = 3 groups of 5

columns = 5 groups of 3

\*not obvious from other models.

③ Associative Property:  $2 \times (3 \times 4) = (2 \times 3) \times 4$

$\begin{array}{|c|} \hline \cdot \\ \hline \cdot \\ \hline \cdot \\ \hline \end{array} \begin{array}{|c|} \hline \cdot \\ \hline \cdot \\ \hline \cdot \\ \hline \end{array} \begin{array}{|c|} \hline \cdot \\ \hline \cdot \\ \hline \cdot \\ \hline \end{array}$  2 rows of (3 x 4) dots

$\begin{array}{|c|} \hline \cdot \\ \hline \cdot \\ \hline \end{array} \begin{array}{|c|} \hline \cdot \\ \hline \cdot \\ \hline \end{array} \begin{array}{|c|} \hline \cdot \\ \hline \cdot \\ \hline \cdot \\ \hline \end{array}$  = (2 x 3) boxes of 4 dots

② & ③ together give the Any - order Property: A list of whole numbers can be multiplied in any order.

Ex:  $3 \times (4 \times 2) = 2 \times (3 \times 4) = (3 \times 2) \times 4$  etc.

Say: remember parentheses show which to mult. first.

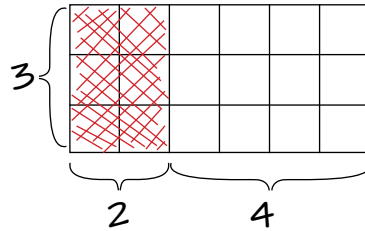
Last property involves multiplication & addition.

④ Distributive property:

shaded

$$3 \times (2 + 4) = (3 \times 2) + (3 \times 4)$$

unshaded



used with place value:

$$5 \times 13 = 5 \times (10 + 3) = 50 + 15 = 65$$

"13 fives = 10 fives + 3 fives"

Say: any - order & Distributive Properties are involved in most arithmetic calculations.

Teaching/Thinking Strategies (3 teaching phases)

A. Intro phase- (end of grade 1)

- a)  $\times 2$  doubles (know from add)
- b)  $\times 3$  (taught)
- c)  $\times 0, \times 1$  (natural)
- d)  $\times 10$  (place value)

B. Mental Math & Word Problems (2nd grade)

- a)  $\times 5$  - skip counting, mental math
- b) commutative prop - rect array
- c)  $\times 9$  - think  $6 \times 9 = 6 \times 10 - 6$  (mental math)
- d)  $3 \times 40, 20 \times 30$  - place value
- e) Practice using Any-order & Distributive props. - Much practice, models

C. Close topic (by end of 3rd grade)

a) squares  $3 \times 3, 4 \times 4, \dots, 9 \times 9$  - learned

b) Remaining facts - memorized.

ex.  $8 \times 7$

Say: knowing multiplication facts necessary for fluency. Short term memory freed up.

Mental Math:

- ①  $\times 4$     double twice     $17 \times 4 = 34 \times 2 = 68$   
②  $\times 8$     double 3 times     $16 \times 8 = 32 \times 4 = 64 \times 2 = 128$   
③  $\times 5$      $(1/2 \text{ number}) \times 10$   
              or  $\times 10$  then half

Practice:

$$5 \times 18$$

$$5 \times 42$$

$$242 \times 5$$

$$1282 \times 5$$

$$15 \times 5$$

$$43 \times 5$$

$$165 \times 5$$

④  $\times 9$

$$9 \times 7 = \text{think } 10 - 1 \quad 7(10 - 1) = 70 - 7 = 63$$

$$9 \times 13 = 13(10 - 1) = 130 - 13 = 117$$

$$9 \times 24 =$$

$$9 \times 130 =$$

HW

Read 1.5

HW #5

bring PM 3A to next class