

Developing Computational Fluency in Grade 3

Addition: Partial Sums

Many times it is easier to break apart addends. Often it makes sense to break them apart by their place value. Consider $248 + 345$

$$\begin{aligned} 248 &= 200 + 40 + 8 \\ 345 &= 300 + 40 + 5 \\ 500 + 80 + 13 &= 593 \end{aligned}$$

Sometimes we might use partial sums in different ways to make an easier problem. Consider $484 + 276$

$$\begin{aligned} 484 &= 400 + 84 \\ 276 &= 260 + 16 \\ 660 + 100 &= 760 \end{aligned}$$

Addition: Adjusting

We can adjust addends to make them easier to work with. We can adjust by giving a value from one addend to another.

Consider $326 + 274$. We can take 1 from 326 and give it to 274.

$$\begin{array}{r} 326 + 274 \\ -1 \quad +1 \\ \hline \end{array}$$

More Friendly Problem $\rightarrow 325 + 275 = 600$

Consider $173 + 389$. We can take 27 from 389 and give it to 173 to make 200.

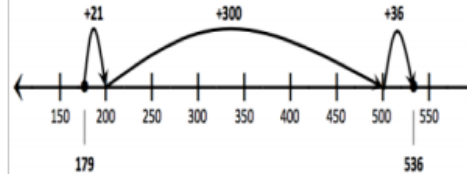
$$\begin{array}{r} 173 + 389 \\ +27 \quad -27 \\ \hline \end{array}$$

More Friendly Problem $\rightarrow 200 + 362 = 562$

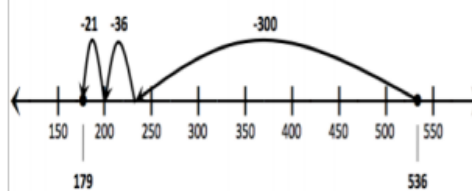
Subtraction: Count Up or Count Back

When subtracting, we can count back to find the difference of two numbers. In many situations, it is easier to count up.

Consider $536 - 179$



We can count up from one number to the other. The difference is $300 + 21 + 36$ or 357. (above)



We can count back from one number to the other. The difference is -300 (land at 236), -36 (land at 200), -21 (end at 179).

Subtraction: Adjusting

We can use "friendlier numbers" to solve problems. $4,000 - 563$ can be challenging to regroup. But the difference between these numbers is the same as the difference between $3,999 - 562$. Now, we don't need to regroup.

$$\begin{array}{r} \text{(Original problem)} \quad 4,000 \quad - \quad 563 = \\ \text{(Compensation)} \quad -1 \quad \quad -1 \\ \hline 3,999 \quad - \quad 562 = 3,437 \end{array}$$

What Is Multiplication?

Multiplication has different representations based on the context. Regardless of the representation, the product of any 2 factors remains the same. Representations for 3rd grade include:

Repeated Addition:

$$\begin{aligned} 6 + 6 + 6 + 6 \\ 4 + 4 + 4 + 4 + 4 + 4 \end{aligned}$$

These examples are for 6×4 .

Equal Groups / Sets:

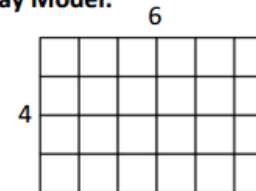
4 groups of 6 hearts



6 groups of 4 hearts



Area/Array Model:



$$\begin{aligned} 6 \times 4 &= 24 \text{ square units -or-} \\ 4 \times 6 &= 24 \text{ square units} \end{aligned}$$

The Commutative Property

This property allows us to reverse the order of factors. It is useful in many situations.

Examples above show that 6×4 is equal to 4×6 regardless of the representation.

Developing Computational Fluency in Grade 3

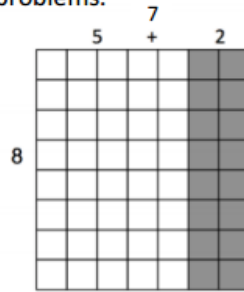
Thurgood Marshall Family Math Night

Multiplication: Area/Array Model

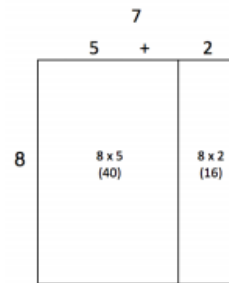
The area/array model for multiplication and the distributive property are used to solve multiplication problems.

Model for 8×7 :

$$\begin{aligned} 8 \times 7 &= \\ (8 \times 5) + (8 \times 2) &= \\ 40 + 16 &= \\ 56 & \end{aligned}$$



This is the same model without inner squares. It is considered an "open model."



Students move from area/array models to working with partial products and the distributive property.

$$\begin{aligned} 8 \times 7 \\ (8 \times 5) + (8 \times 2) \\ 40 + 16 \\ 56 \end{aligned}$$

Multiplication: Multiples of 10

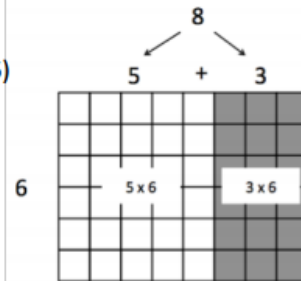
$$\begin{array}{ll} 3 \times 1 = 3 & 3 \times 4 = 12 \\ 3 \times 1 \text{ ten} = 3 \text{ tens} & 3 \times 4 \text{ tens} = 12 \text{ tens} \\ 3 \times 10 = 30 & 3 \times 40 = 120 \end{array}$$

The Distributive Property

This property allows us to break apart factors. It can make computation more efficient. It will be used later in algebra.

In 8×6 , we can break the 8 into $(5 + 3)$. 8×6 becomes $(5 \times 6) + (3 \times 6)$.

$$\begin{aligned} 8 \times 6 \\ (5 \times 6) + (3 \times 6) \\ 30 + 18 \\ 48 \end{aligned}$$



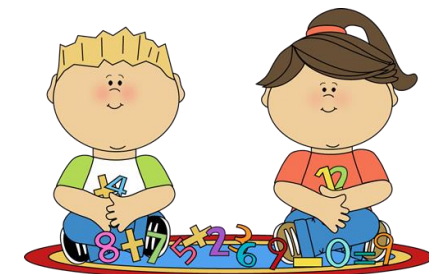
Division: Think Multiplication

Multiplication and division are related. When working with division, it sometimes makes sense to "think multiplication." $12 \div 4$ could be thought of as "4 times what equals 12."

How many groups of 4 are in 12 hearts?
What is $12 \div 4$?



What times 4 equals 12?
 $3 \times 4 = 12$ so there are 3 groups of 4 hearts.



Grade 3

Adapted from: <http://smart.wikispaces.hcps.org>
Howard County Public Schools