Group Work 1

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PART I

Addition

Addition is bringing two or more numbers (or things) together to make a new total. This is the easiest definition to understand because it is the process of combining two groups to make one larger sum.

A + B = C

1 + 1 = 2

There are three common properties that are extremely important to addition. These include the Associative and Commutative properties, and the Identity Property.

The Commutative property of addition means that no matter what order your numbers are in, when added, your sum will always be the same. So,

A + B = B + A

Both equations will always give the same results because of the commutative property.

The Associative Property of Addition means that when adding three or more numbers, the order that the numbers are added in does not matter. Just like the commutative property, the order of operations does not matter and the results will always be the same.

(A + B) + C = A + (B + C)

The Identity Property means that when adding zero to any number, that amount will not change.

A + 0 = 0 + A = A

The standard algorithm for addition deals greatly in place values. When doing addition, you start in the ones place. If the ones place creates an answer greater than 10, the tens place number is shifted while the ones place stays put. This is true for all of the place values. If in the tens place you reach a number greater than 100, you add the one hundred to the hundreds place while the tens place stays put.

$^{1}19$	$^{1}1^{1}27$
$\underline{+24}$	$\underline{+\ \ 76}$
43	203

Subtraction

Subtraction is the removing or “unpairing” of objects in a collection. It is the process of taking away numbers or objects from a whole to reach a smaller answer. Subtraction is anticommutative and not associative, both meaning that the order of subtraction completely changes your answer.

Since it is anticommutative meaning that if the numbers are reversed when subtracting the answer will be negative.

$A - B = -(B - A)$

And since subtraction is not associative, the order of operations is important so that your answer is not changed.

$(A - B) - C$ does not equal $A - (B - C)$

The standard algorithm for subtraction is also heavily based in place values. When subtracting, you are taking away numbers from the whole. When you come across a number that is too small to subtract in a certain place value, (for example 84-37), you "borrow" numbers from the larger place value. It is important to remember that when borrowing you are really talking, 10, 100, 1000, etc.

^{7}-8^{1}4

- 37

47

Since 7 cannot be subtracted from 4, you borrow one from the eight but that is actually 10 since the 8 is really 80 according to our place values. Then you add the 10 to the ones place creating 14, a number we can actually subtract 7 from. Since you borrowed the 10 from the 80, it now becomes 70. Now, you can actually subtract. 14 minus 7 is 7 and 70 minus 30 is 40 so your answer is 47.

Multiplication

Multiplications simplest definition is repeated addition. Also, the product A times B (A x B) can be interpreted as the number of objects in a groups of b objects each or vice versa. Multiplication has a large number of properties including commutative, associative, distributive, identity, and the property of zero.

The commutative property simply means that the order of multiplication does not matter.

$A \times B = B \times A$

The associative property means that if there is multiplication of three or more numbers, the order of operation does not change the answer.

$A \times (B \times C) = (A \times B) \times C$

The distributive property means that if you have operations inside of a parentheses and a number you are multiplying outside of the parentheses, the multiplier is applied to both numbers and those two sums are added.

$A \times (B + C) = (A \times B) + (A \times C)$

The identity property refers to any number being multiplied by the number one is itself.

$A \times 1 = A$

The property of zero means that any number times zero is zero.

A x 0 = 0

The standard algorithm for multiplication is much harder to explain. Multiplication is the repeated addition of one number. It is important to remember that, with the number being multiplied, each place value must be multiplied by the multiplier. So for example, when multiplying 27 by 3, both the 2 and the 7 have to be multiplied by the 3. As with addition, when you multiply the place value and you get to a number that exceeds 10, 100, 1000, etc. it must be carried over to the next place value and added when the multiplication is complete.

$^{+2}27$

$\underline{X\ 3}$

$\ 81$

So, 7 times 3 is 21. Since 21 is larger than 10, the 20 must be carried into the tens place while the 1 stays put. 3 times 2 is 6, but technically is this equation 6 is really 60. The 20 is then added to the 60 to create 80. And the whole answer is 81.

Division

There are many viable definitions for division. For example, division is how many times you can subtract B objects or numbers from the whole A. Or, division is the number C so that B x C = A. The only property for division is that it is right-distributive over addition and subtraction.

This means that $\frac{A+B}{C} = \frac{(A + B)}{C}$

The algorithm for division is also a little more complicated. Division is repeated subtraction, but you are not subtracting that number from your dividend every single time, you are actually subtracting some multiple of your divisor.

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   1 5 8
  ---------
4 | 6 3 2
  - 4 ↓
    2 3
    2 0 ↓
      3 2
      3 2
    -----
        0
```

Using the standard algorithm for long division, we can see that 4 can go into 6 once. So 4 is subtracted from 6 leaving 2. The 3 in the tens place is dropped down next to the 2 to create 23. 4 can fit into 23 five times, so 20 is subtracted from 23 leaving 3. The 2 in the ones place is dropped down next to the 3 to

create 32 and 4 can be subtracted from 32 eight times. By subtracting 32 from 32 we reach zero and our division is complete.

PART II

1. Carrie is at the grocery store and has two apples in her basket; William joins Carrie with three more apples. How many apples in total do William and Carrie have?

   HOW TO SOLVE: You start off with two apples from Carrie and William comes along with three more. The question asks how many apples in total do you now have. You would use addition and add together Williams and Carries apples to get your final answer.

2. Katie is at lunch and picking at her vegetables; Katie does not like peas mixed in with her carrots. On her plate there are ten vegetables in total. How many possibilities of carrots would you have left over if you took out the peas?

   HOW TO SOLVE: The problem says you have ten vegetables in total. If you need to find out how many carrots you would have left over if you took the peas away but you do not know the number you start off with you can start by subtracting one pea from the vegetables, two peas from the vegetables, and so on and so forth to get multiple probabilities for your answer.

3. Brian has to get shots in his arm once a week every month, assuming there are four weeks evenly in every month, how many shots does Brian get in one year?

   HOW TO SOLVE: There are twelve months in a year and if Brian gets one shot every week, assuming there are four weeks evenly in every month, you would end up having to multiple the weeks and months together. To get your answer multiply twelve by four.

PART III

1. Explain what means to “carry-over” while performing addition is.
2. Define what a number is.
3. Explain the standard algorithm of multiplication.
4. In multiplication axb=bxa. Explain why this is.
5. Why does the standard algorithm for addition work?
6. Give three “different” story problems whose solution is found via addition? Each problem should represent a different type (1- putting groups of things together, 2- A+B=?, 3- ?-B=C)
7. Define subtraction with the use of manipulatives.
8. Four airplanes traveled for a combined time of 7 hours 11 minutes and 52 seconds. If they all flew at the same speed, how long did each of them take to run their portion. Use only one of the standard algorithms to solve this problem.

9. Explain what a set is.
10. Name three of the seven operations of sets and explain what each operation does.