Addition & multiplication

dmeyer@math.ucsd.edu

Addition has several properties you've learned about already:

- There is an identity element for addition, which we call 0, that has no effect on any number a to which it is added: $a + 0 = a$.

- Addition is commutative; any two numbers a and b can be added in either order: $a + b = b + a$.

- Addition is associative; any three numbers a, b and c can be added in any order: $(a + b) + c = a + (b + c)$.

1. What is $1 + 2 + 3 + \cdots + 10$? Which properties of addition did you use to figure it out?

2. What is $123 + 456$? Which properties of addition did you use to figure it out?

Addition has another very important property:

- Every number a has an additive inverse, which we write as $-a$, so that the sum of these is 0: $a + (-a) = 0$.

3. What is the additive inverse of 3? Can you draw a number line that shows both 3 and its additive inverse?

4. What is the additive inverse of the additive inverse of 3? Why?

5. What is the additive inverse of 0?

Addition is related to multiplication by the distributive property:

- Any number a times the sum of two numbers b and c is the same as the sum of a times b and a times c: $a \times (b + c) = a \times b + a \times c$.

6. What is $500 + 400$? Did you use the distributive property to do this addition?

7. What is $2 \times \big(3 + (-3)\big)$? Can you use your answer and the distributive property to figure out what $2 \times (-3)$ is?

8. What is $(-2) \times \big(3 + (-3)\big)$? Can you use your answer and the distributive property to figure out what $(-2) \times (-3)$ is?