# Newsletter 2: Operation Cooperation Practice Problems

1. **Evaluate, using order of operations:**
   - **a.** $17 - 5 \times (3 - 1) =$
   - **b.** $10 + 101 \times 0 - 10 \div 2 =$
   - **c.** $4^2 - 7 \times 2$
   - **d.** $20 \div 2 \times (4 + 5)$
   - **e.** $100 - (2 \times (15 - 3))$

   **★ Solution:**
   a. $17 - 5 \times (3 - 1) = 7$
   b. $10 + 101 \times 0 - 10 \div 2 = 5$
   c. $4^2 - 7 \times 2 = 2$
   d. $20 \div 2 \times (4 + 5) = 90$
   e. $100 - (2 \times (15 - 3)) = 76$

2. **Which of the following values is largest?**
   - **a.** $2 + 0 + 2 + 3$
   - **b.** $2 \times 0 + 2 + 3$
   - **c.** $2 + 0 \times 2 + 3$
   - **d.** $2 + 0 + 2 \times 3$
   - **e.** $2 \times 0 \times 2 \times 3$

   **★ Solution:**
   ~~a. $2 + 0 + 2 + 3 = 7$~~
   ~~b. $2 \times 0 + 2 + 3 = 5$~~
   ~~c. $2 + 0 \times 2 + 3 = 5$~~
   **d.** $2 + 0 + 2 \times 3 = 8$
   ~~e. $2 \times 0 \times 2 \times 3 = 0$~~

**3. The incorrect statement**

$$-5 + 2 \times 6 - (-2) = 15$$

**can be corrected by adding 1 to one of the numbers. Which number is it?**

**★ Solution:** Calculate the left side of the equation: -5+2 × 6-(-2) actually equals 9.

Since 9 is six away from 15, we know the number that needs increasing is not the -5 or the -2; adding 1 to either of those would only change the result by 1. Looking at 2 × 6, which number should we increase by 1 in order to increase the product by 6? That number is 2.

Check: -5 + 3 × 6 - (-2) = 15. This works.

**4. Add parentheses to the equation to make a true statement. Use order of operations!**

a. $9 - 5 \times 2 - 4 = 3$
b. $9 - 5 \times 2 - 4 = 4$
c. $2 \times 9 - 6 + 4 = 8$
d. $2 \times 9 - 6 + 4 = 10$
e. $6 - 9 - 4 \times 2 = 5$

**★ Solution:**

a. $9 - (5 \times 2 - 4) = 3$
b. $(9 - 5) \times 2 - 4 = 4$
c. $2 \times 9 - (6 + 4) = 8$
d. $2 \times (9 - 6) + 4 = 10$
e. $6 - (9 - 4 \times 2) = 5$

**5. Define the operation 😍 as:**

$x$ 😍 $y = (x + y)^2 - 1$.

**a. If $x = 2$, what values of $y$ will give $x$ 😍 $y = 24$?**
**b. What is $5$ 😍 $(-3)$ 😍 $4$?**

**★ Solution:**

a. We plug in 2 for $x$. Use $x$ 😍 $y = (x + y)^2 - 1 = 24$.
$(2 + y)^2 - 1 = 24$.
$(2 + y)^2 = 25 \rightarrow (2 + y) = 5 \ or \ (2 + y) = -5$
$y = 3 \ or \ y = (-7)$
b. First calculate $5$ 😍 $(-3)$ .
$(5 - 3)^2 - 1 = 2^2 - 1 = 4 - 1 = 3$
Then calculate $3$ 😍 $4$.
$(3 + 4)^2 - 1 = 48$.

**6. In Addiatorsville, addition/subtraction go before multiplication/division in order of operations. What is the positive difference between the values in Addiatorsville and in our world of these expressions?**

a. $4 \times 5 - 3 \times 3$
b. $(6 - 3 \times 5)^2$
c. $8 \div 2 + (51 - 7^2) \times 3$

★ **Solution:**

a. Addiatorsville value: $4 \times 5 - 3 \times 3 = 4 \times 2 \times 3 = 24$
   Our world value: $4 \times 5 - 3 \times 3 = 20 - 9 = 11$
   Difference = $24 - 11 = 13$
b. Addiatorsville value: $(6 - 3 \times 5)^2 = (3 \times 5)^2 = 225$
   Our world value: $(6 - 3 \times 5)^2 = (6 - 15)^2 = (-9)^2 = 81$
   Difference = $225 - 81 = 144$
c. Addiatorsville value: $8 \div 2 + (51 - 7^2) \times 3 = 8 \div 2 + 2 \times 3 = 8 \div 4 \times 3 = 6$
   Our world value: $8 \div 2 + (51 - 7^2) \times 3 = 4 + 2 \times 3 = 4 + 6 = 10$
   Difference: $6 - 10 = (-4)$, so the positive difference is 4!

**7. If the operation ♦ is defined as:**

$s \blacklozenge t = s \times t - 2$

**What is the value of $(3 \blacklozenge 4) \blacklozenge (5 \blacklozenge 6)$ ?**

★ **Solution:** Let's start with $(3 \blacklozenge 4) = 3 \times 4 - 2 = 10$
Then calculate $(5 \blacklozenge 6) = 5 \times 6 - 2 = 28$
Then calculate $10 \blacklozenge 28 = 10 \times 28 - 2 = 280 - 2 = 278$
The final value is 278.

**8. Alicia was asked by her teacher to subtract 4 from a certain number and then divide the result by 8. Instead, she subtracted 8 and then divided the result by 4, giving an answer of 23. What would her answer have been had she worked the problem correctly?**

★ **Solution:** Here we have to work backwards to get Alicia's original starting number. If Alicia got 23 from dividing a number by 4, we should multiply by 4

and get $23 \times 4 = 92$. This was the result of subtracting 8 so we should add 8 and get 100. Now, 100 was her starting number. Let's do what her teacher asked.

$$(100 - 4) \div 8 = 96 \div 8 = 12.$$

**Her answer should have been 12.**