Distributive property of multiplication II

№1. At the beginning of the year, Ulyana had \$100 in her money box. In January she managed to save \$36, and in February another \$43. Calculate the total amount now in the money box in two different ways.

№2. Philip had €200 in his pocket. While walking in the park, he found €10 on the ground and then bought juice for €3. How much money did he have left afterwards? Solve it in two different ways.

№3. Harry Potter had 87 gold coins. How much money did he have left after buying a wand for 31 coins and a textbook for 15 coins? Solve it in two different ways.

The reasoning used in the previous three problems can be generalized by the following formulas:

$$+ (a \pm b) = a \pm b$$
$$- (a \pm b) = -a \mp b$$

That is, a minus sign before parentheses changes all signs when the brackets are expanded, whereas a plus sign leaves them unchanged.

This result also can be interpreted as follows. If there is a $+$ sign in front of the parentheses, it is as if we are multiplying the expression inside the parentheses by 1:

$$+(a \pm b) = (+1) \cdot (a \pm b) = (+1) \cdot a \pm (+1) \cdot b = a \pm b.$$

If there is a $-$ sign in front of them, we are multiplying by -1:

$$-(a \pm b) = (-1) \cdot (a \pm b) = (-1) \cdot a \pm (-1) \cdot b = -a \mp b.$$

№4. Simplify:

1. $(6y - 7x + 4) - (4y - 4x + 18)$;

2. $(3x + 9) + (-y - 15x - 40)$;

3. $(10b - 6a + 5) - (-11a + ab + 6)$;

4. $(13xy - 11x + 10y) - (-15x + 10xy - 15y)$;

5. $(14ac - 17ab + 5cb) + (20ab - 14cb)$.

№5. Simplify an expression and find its value:

1. $3x(x + 5) + 4xy(2y - 3)$,   if $x = -4$, $y = 0.5$;

2. $2a^2b(5a^2b - 3a - 2b^2) - 3ab(2a^2b - 4a + b^2)$,   if $a = 2$, $b = -1$.

№6. Prove that for any numbers the following equality holds: $(a + b)(c + d) = ac + ad + bc + bd$.

Remark: Remember that a, b, c, ... are just numbers, and therefore the result of adding such quantities is also a number.

№7. Simplify an expression:

1. $(x + y)(a + b)$;

2. $(a - 4)(a + 3) + (a + 5)(a - 2)$;

3. $(x + 5)(x - 4) - 2x(x + 1)$;

4. $(y + 6)(2y + 1) - (3y - 1)(5y + 2)$;

5. $(2m + 3n)(3m - 2n) - (4m + n)(m - 3n)$;

6. $(2a + b)(3c + 4a - b)$.