

Equivalent Algebraic Expressions: practice solutions, Grade 7 – download the PDF

Written solutions to the chapter problems. Check each step, then correct yourself.

1 Parts of an expression



- a. The terms are $7x$, $-4y$, and 9 .
- b. The coefficient of x is 7 and the coefficient of y is -4 (the sign belongs to the term).
- c. The constant term is 9 .

2 Combine like terms: one variable



- a. $6n + 4n = 10n$.
- b. $11p - 7p = 4p$.
- c. $3k + k = 3k + 1k = 4k$.
- d. $8t - 8t = 0$.

3 Simplify with constants



- a. $4x + 2x = 6x$ and $7 + 1 = 8$, so $6x + 8$.
- b. $9a - 3a = 6a$ and $5 - 2 = 3$, so $6a + 3$.
- c. $6b - b = 5b$ and $10 - 4 = 6$, so $5b + 6$.

4 Apply the distributive property



- a. $3x + 15$.
- b. $6y - 12$.
- c. $8a + 2$.
- d. $15 - 5m$.

5 True or false? Test with a number



- a. False. At $x = 2$: $4 \cdot 2 + 3 = 11$ but $7 \cdot 2 = 14$.
- b. True. Distributing gives $2x + 2$.
- c. False. At $x = 1$: $5 - 1 = 4$, not 5. Actually $5x - x = 4x$.
- d. False. At $x = 3$: $3 + 3 = 6$ but $3^2 = 9$. Actually $x + x = 2x$.

6 Factor a common number



- a. GCF is 4: $4(x + 2)$.
- b. GCF is 3: $3(3y - 2)$.
- c. GCF is 5: $5(2a + 3)$.
- d. GCF is 7: $7(m + 1)$.

7 Phone plan



- a. The cost is $25 + 3g$ dollars.
- b. $25 + 3 \cdot 5 = 25 + 15 = 40$. The cost is 40 dollars.

8 Several variables



- a. $5x + 2x = 7x$ and $-3y + 7y = 4y$, so $7x + 4y$.
- b. $-4a - 6a = -10a$ and $9 - 12 = -3$, so $-10a - 3$.
- c. $2.5k - 0.5k = 2k$ and $4 - 1.5 = 2.5$, so $2k + 2.5$.

9 Fraction coefficients



- a. $\frac{1}{2} + \frac{3}{2} = 2$, so $2x$.
- b. $\frac{2}{3} + \frac{1}{3} = 1$, so $y - 5$.
- c. $\frac{3}{4} - \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$, so $\frac{1}{2}a$.

10 Distribute with negatives and decimals



- a. $-2x - 12$.
- b. $-12y + 15$, because $-3 \cdot (-5) = 15$.
- c. $3a + 5$.
- d. $-m + 8$: the minus sign changes both signs.

11 Expand, then combine



- a. $3x + 12 + 2x = 5x + 12$.
- b. $10y - 5 - 4y = 6y - 5$.
- c. $2a + 6 + 3a - 3 = 5a + 3$.
- d. $4m + 8 - 2m - 10 = 2m - 2$.

12 Factor with several terms



- a. $6(2x + 3)$.
- b. $4(2y - 5)$.
- c. $5(3a + 5b)$.
- d. $3(2m - 3n + 4)$. Each check gives back the original expression.

13 Add and subtract expressions



- a. $5x - 3$.
- b. $4a + 4$.
- c. $6x + 7 - 2x - 3 = 4x + 4$.
- d. $8m + 2 - 10m + 6 = -2m + 8$.

14 Garden bed



- a. Area = $4(x + 7) = 4x + 28$ square meters.
- b. Perimeter = $2 \cdot 4 + 2(x + 7) = 8 + 2x + 14 = 2x + 22$ meters.
- c. For $x = 5$: area = $4 \cdot 12 = 48 \text{ m}^2$ and perimeter = $2 \cdot 5 + 22 = 32 \text{ m}$.

15 Which are equivalent?



Expanding gives $2(3x - 4) = 6x - 8$.

- a. Equivalent.
- b. Not equivalent: the second term should be $2 \cdot 4 = 8$.
- c. Equivalent: $2 \cdot 3x = 6x$.
- d. Not equivalent: $2 \cdot 3x$ is $6x$, not $5x$.

Answer: (a) and (c).

16 Find the mistake



- a. Sam multiplied only the first term. Correct: $4x + 12$.
- b. Lena subtracted 2 from 7 first, which breaks the order of operations (multiplication comes before subtraction). Correct: $7 - 2x - 2 = 5 - 2x$.

17 Theater tickets



- a. A child ticket costs $a - 5$. Total = $2a + 3(a - 5) = 2a + 3a - 15 = 5a - 15$.
- b. $5 \cdot 12 - 15 = 45$. Check: $2 \cdot 12 + 3 \cdot 7 = 24 + 21 = 45$. The family pays 45 dollars.

18 Perimeter of a triangle



- a. $(2x + 3) + (x + 5) + (3x - 1) = 6x + 7$ centimeters.
- b. $6 \cdot 4 + 7 = 31$. Check: the sides are 11, 9, and 11, and $11 + 9 + 11 = 31$. The perimeter is 31 cm.

19 Stickers

- a. $(5n + 12) - (2n + 5) = 5n + 12 - 2n - 5 = 3n + 7$.
- b. $3 \cdot 6 + 7 = 25$. Check: $42 - 17 = 25$. She has 25 stickers left.

20 Fully factored?

- a. $2(9x + 12) = 18x + 24$ and $6(3x + 4) = 18x + 24$.
- b. Ben's. The GCF of 18 and 24 is 6. Inside Ava's parentheses, $9x + 12$ still has the common factor 3.
- c. The GCF of 12, 30, and 18 is 6: $6(2a - 5b + 3)$.

21 Prove equivalence

- a. $3(2x + 1) - (x - 4) = 6x + 3 - x + 4 = 5x + 7$.
- b. $6x - 2 + 4x + 8 = 10x + 6$. The GCF is 2, so $10x + 6 = 2(5x + 3)$.

22 Two gyms

- a. $12(m + 1) + 8 = 12m + 12 + 8 = 12m + 20$, the same as $20 + 12m$.
- b. You pay 12 dollars for each of m months plus one extra month, and then an 8-dollar fee.
- c. $12 \cdot 6 + 20 = 92$. Both gyms cost 92 dollars for 6 months.

23 L-shaped patio

- a. Area = $10(x + 8) - 3x = 10x + 80 - 3x = 7x + 80$ square feet.
- b. $7 \cdot 5 + 80 = 115$. Check: $10 \cdot 13 - 15 = 130 - 15 = 115$. The area is 115 ft².

24 Find the missing number



a. The left side is $6x + 4k$, so $4k = 20$ and $k = 5$.

b. The left side is $5x + 3k$, so $3k = 12$ and $k = 4$.



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