

Grade 7 · Equivalent Expressions · Worksheet Answer Key

Common Core 7.EE.A.1, 7.EE.A.2 · mathovore.fr

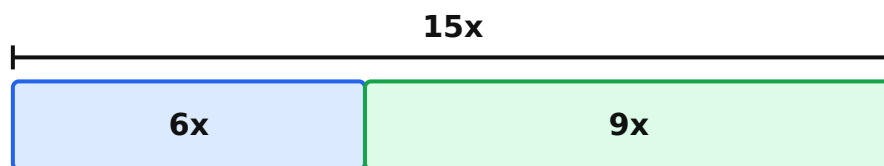
Every solution below shows each step, so compare your method as well as your final answer. Final answers are in bold. When an answer differs from yours, substitute a number for the variable in both expressions: equivalent expressions always give the same value.

Grade 7 Common Core: 7.EE.A.1 · 7.EE.A.2

Problem 1: Combine like terms

Both terms have the variable x , so add the coefficients: $6+9=15$.

$$6x+9x=15x$$



The coefficients add: $6 + 9 = 15$.

Problem 2: Algebra tiles

Group the x tiles: $3x+4x=7x$. Group the unit tiles: $2+5=7$.

$$3x+2+4x+5=7x+7$$



Group the like tiles: 7 x tiles and 7 units.

Problem 3: Collect terms and constants

Group the like terms: $(7y+2y)+(4-9)$.

$$7y+2y=9y \text{ and } 4-9=-5.$$

$$7y+4+2y-9=9y-5$$

Check with $y = 1$: $7+4+2-9=4$ and $9-5=4$.

Problem 4: Expand with the distributive property

Multiply 5 by each term inside the parentheses: $5 \cdot x = 5x$ and $5 \cdot 6 = 30$.

$$5(x+6)=5x+30$$

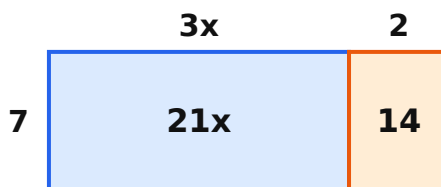


The two areas are $5x$ and 30.

Problem 5: Area model for expanding

Left area: $7 \times 3x = 21x$. Right area: $7 \times 2 = 14$.

Add the areas: $7(3x+2) = 21x+14$



The areas are $21x$ and 14.

Problem 6: Test equivalence with a table

Substitute each value. For $x = 1$: $2(1+3) = 8$, $2(1)+6 = 8$, and $2(1)+3 = 5$. The other columns follow the same way.

Expression	$x = 1$	$x = 2$	$x = 3$	$x = 4$
$2(x + 3)$	8	10	12	14
$2x + 6$	8	10	12	14
$2x + 3$	5	7	9	11

The first two rows match.

$2(x+3)$ and $2x+6$ give the same value in every column. By the distributive property,

$2(x+3)=2x+6$, so they are **equivalent**.

$2x+3$ is always 3 less, so it is **not equivalent** to the other two.

Problem 7: Expand with a negative factor

$$-3 \cdot 2x = -6x \text{ and } -3 \cdot (-4) = +12.$$

$$-3(2x-4) = -6x+12$$

Check with $x=1$: $-3(-2)=6$ and $-6+12=6$.

Problem 8: Expand and combine

a. $6 \times 2y = 12y$ and $6 \times (-3) = -18$. $12y-18$

b. $-2 \times 5 = -10$ and $-2 \times (-3a) = 6a$. $-10+6a$

c. $4(x+2) = 4x+8$ and $3(x-1) = 3x-3$. Add: $4x+3x=7x$ and $8-3=5$. $7x+5$

Problem 9: Factor out the greatest common factor

The common factors of 12 and 18 are 1, 2, 3 and 6; the greatest is 6.

$$12x \div 6 = 2x \text{ and } 18 \div 6 = 3.$$

$$12x+18 = 6(2x+3)$$



Height 6, widths 2x and 3.

Problem 10: Factor out a common factor

a. GCF of 15 and 25 is 5. $5(3a+5)$

b. GCF of 8 and 12 is 4. $4(2x-3)$

c. GCF of 18 and 54 is 18. $18(m+3)$

d. Factor out -3 : $-6y = -3 \times 2y$ and $-9 = -3 \times 3$. $-3(2y+3)$

Problem 11: Subtract an expression

Subtracting changes the sign of each term in the second expression: $3x+8-x+5$.

$$3x-x=2x \text{ and } 8+5=13.$$

$$(3x+8)-(x-5)=2x+13$$

Check with $x=1$: $11-(-4)=15$ and $2+13=15$.

Problem 12: Subtract and simplify

- a. Distribute the minus sign: $7x+3-2x-9=5x-6$. $5x-6$
- b. $2m-5-m+8=m+3$. $m+3$
- c. $10-3a-4+a=6-2a$. $6-2a$

Problem 13: Rational coefficients

Distribute: $\frac{2}{3} \cdot 9x = 6x$ and $\frac{2}{3} \cdot (-6) = -4$, so the expression is $6x-4+x$.

Combine $6x+x=7x$.

$$\frac{2}{3}(9x-6)+x=7x-4$$

Check with $x=3$: $\frac{2}{3}(21)+3=17$ and $21-4=17$.

Problem 14: Decimal and fraction coefficients

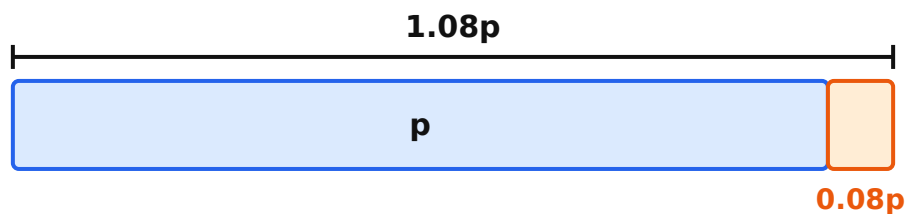
- a. $0.5 \times 6x = 3x$ and $0.5 \times 10 = 5$, so $3x+5+1.5x=4.5x+5$. $4.5x+5$
- b. $\frac{1}{3} \times 12x = 4x$ and $\frac{1}{3} \times 9 = 3$, so $4x+3-x=3x+3$. $3x+3$
- c. $\frac{3}{4} \times 8 = 6$ and $\frac{3}{4} \times (-4x) = -3x$, so $6-3x+x=6-2x$. $6-2x$

Problem 15: Sales tax at the school store

(a) $p+0.08p=1p+0.08p=1.08p$.

(b) $1.08(25)=27$, so the total is \$27.00.

(c) $1.08p=54$, so $p=54 \div 1.08=50$. The price is \$50. Check: $1.08(50)=54$.



The total is 1.08 times the price.

Problem 16: Discount, then tax

(a) $p-0.15p=0.85p$.

(b) Adding 8% tax means multiplying by 1.08: $1.08 \times 0.85p = 0.918p$.

(c) $0.918 \times 60 = 55.08$.

(d) $0.918 \times 100 = 91.8$, so the regular price is \$100.

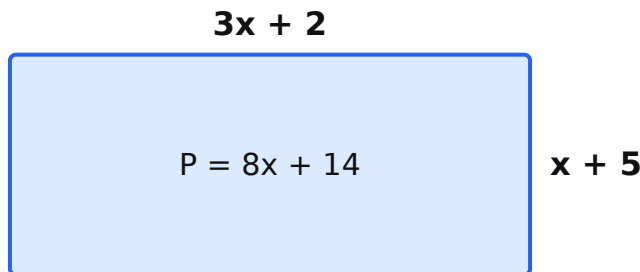
$0.85p$; $0.918p$; **\$55.08**; **\$100**.

Problem 17: Perimeter of a garden bed

(a) The perimeter is twice the length plus twice the width: $2(3x+2)+2(x+5)=6x+4+2x+10=8x+14$ feet.

(b) $8(3)+14=38$. **38 feet**.

Check: the sides are $3(3)+2=11$ ft and $3+5=8$ ft, and $2(11)+2(8)=38$.



Perimeter: $8x + 14$.

Problem 18: Perimeter of a triangular bed

(a) $(2x+3)+(x+7)+(3x-1)=(2x+x+3x)+(3+7-1)=6x+9$ feet.

(b) $6(4)+9=33$ ft. The sides are $2(4)+3=11$, $4+7=11$, and $3(4)-1=11$, so the bed is an equilateral triangle.

(c) Set $6x+9=45$. Then $6x=36$ and $x=6$. The sides are 15 ft, 13 ft, and 17 ft, and $15+13+17=45$.

$6x+9$; **33 ft (equilateral)**; $x=6$ with sides **15, 13, 17 ft**.

Problem 19: Three ways to write a gym bill

(a) Maya: $4(c+3)=4c+12$. Noah: $3(c+4)+c=3c+12+c=4c+12$.

(b) Ethan's $12+4c$ is $4c+12$ in a different order. All three equal $4c+12$, so they are **equivalent**.

(c) $4(9)+12=48$ and $4(5)+12=32$.

Equivalent; \$48 for 9 classes; \$32 for 5 classes.

Problem 20: Two ways to price a jersey

(a) Maya: $p-0.20p-5=0.80p-5$. Ethan: $0.80(p-5)=0.80p-4$.

(b) The expressions are **not equivalent**: $0.8p-5$ and $0.8p-4$ differ by 1 for every price.

(c) Maya: $0.8(40)-5=32-5=\$27$. Ethan: $0.8(40)-4=32-4=28$, which is \$28. Check Ethan directly: $0.8(35)=28$. Maya pays \$1 less.