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Lesson 3.4 Expanding Algebraic Expressions

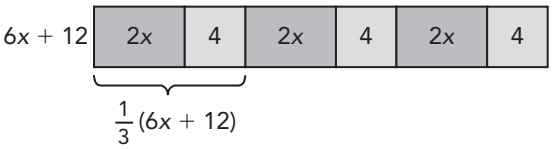
Expand the expression with fractional factors.

Example

$\frac{1}{3}(6x + 12)$

Method 1

Use a bar model.



From the bar model,

$\frac{1}{3}(6x + 12) =$ 2x + 4

Method 2

Use the distributive property.

$\frac{1}{3}(6x + 12) = \frac{1}{3}($ 6x $) + \frac{1}{3}($ 12 $)$ Use the distributive property.

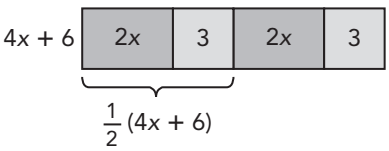
$=$ 2x + 4 Multiply.

Complete.

1. $\frac{1}{2}(4x + 6)$

Method 1

Use a bar model.



From the bar model,

$\frac{1}{2}(4x + 6) =$ _____ + _____

Method 2

Use the distributive property.

$\frac{1}{2}(4x + 6) = \frac{1}{2}($ _____ $) + \frac{1}{2}($ _____ $)$

$=$ _____ + _____

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Expand each expression with fractional factors.

2. $\frac{1}{4}(12x + 16)$

3. $\frac{1}{5}(10x + 35)$

4. $\frac{1}{3}(8m + 6)$

5. $\frac{1}{8}(7 + 3n)$

Expand the expression with decimal factors.

Example

$0.6(0.3x - 5)$

$0.6(0.3x - 5) = 0.6[0.3x + (-5)]$ Rewrite subtraction as a sum.

$= 0.6(\underline{0.3x}) + 0.6(\underline{-5})$ Use the distributive property.

$= \underline{1.8x} + (\underline{-3})$ Multiply.

$= \underline{1.8x} - \underline{3}$ Rewrite the expression.

Expand each expression with decimal factors.

6. $0.3(3x + 7)$

$0.3(3x + 7)$

$= 0.3(\_\_\_\_\_) + 0.3(\_\_\_\_\_)$

$= \_\_\_\_\_ + \_\_\_\_\_$

7. $0.9(2.1y - 2)$

8. $1.5(0.4p + 2.1)$

9. $1.3(3w - 1.1)$

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Expand each expression with negative factors.

Example

a) $-2\left(\frac{1}{4}a + \frac{1}{8}\right)$

$-2\left(\frac{1}{4}a + \frac{1}{8}\right) = (-2)\left(\frac{1}{4}a\right) + (-2)\left(\frac{1}{8}\right)$ Use the distributive property.

$= \left(-\frac{1}{2}a\right) + \left(-\frac{1}{4}\right)$ Multiply.

$= -\frac{1}{2}a + \frac{1}{4}$ Rewrite the expression.

b) $-\frac{1}{3}(-2x + 6y)$

$-\frac{1}{3}(-2x + 6y) = -\frac{1}{3}(-2x) + \left(-\frac{1}{3}\right)(6y)$ Use the distributive property.

$= \left(\frac{2}{3}x\right) + (-2y)$ Multiply.

$= \frac{2}{3}x - 2y$ Rewrite the expression.

c) $-(2.5m - 3.6)$

$-(2.5m - 3.6) = -1[2.5m + (-3.6)]$ Rewrite the expression.

$= -1(2.5m) + (-1)(-3.6)$ Use the distributive property.

$= -2.5m + 3.6$ Multiply.

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Complete.

10. $-3(-5a - 6)$

$= -3[-5a + (\_\_\_\_\_)]$

$= -3(\_\_\_\_\_) + (-3)(\_\_\_\_\_)$

$= \_\_\_\_\_$

11. $-\frac{1}{4}(4y + 7)$

$= -\frac{1}{4}(\_\_\_\_\_) + \left(-\frac{1}{4}\right)(\_\_\_\_\_)$

$= \_\_\_\_\_ + \_\_\_\_\_$

$= \_\_\_\_\_$

Expand each expression with negative factors.

12. $-3\left(2x + \frac{1}{3}\right)$

13. $-5\left(\frac{3}{10}a - 2\right)$

14. $-\frac{1}{2}\left(-4x + \frac{1}{3}\right)$

15. $-0.6(-7x - 9)$

Expand and simplify the expression.

Example

$3(a + 2b) - 4b$

$3(a + 2b) - 4b = 3(\underline{a}) + 3(\underline{2b}) - \underline{4b}$ Use the distributive property.

$= \underline{3a} + \underline{6b} - \underline{4b}$ Multiply.

$= \underline{3a} + \underline{2b}$ Simplify.

Complete.

16. $4(2d + 3f) + 6d = 4(2d) + 4(\_\_\_\_\_) + \_\_\_\_\_$ Use the distributive property.

$= \_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_$ Multiply.

$= \_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_$ Group like terms.

$= \_\_\_\_\_ + \_\_\_\_\_$ Simplify.

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Expand and simplify each expression.

17. $4(g + 5h) + 3h$

18. $6x + 3(7y + x)$

Expand and simplify the expression.

Example

$-3\left(\frac{2}{3}x - 2\right) + 4x$

$-3\left(\frac{2}{3}x - 2\right) + 4x = -3[\underline{\frac{2}{3}x} + (\underline{-2})] + \underline{4x}$ Rewrite the expression.

$= (-3)\underline{\left(\frac{2}{3}x\right)} + (-3)(\underline{-2}) + \underline{4x}$ Use the distributive property.

$= \underline{-2x} + \underline{6} + \underline{4x}$ Multiply.

$= \underline{-2x} + \underline{4x} + \underline{6}$ Group like terms.

$= \underline{2x} + \underline{6}$ Simplify.

Complete.

19. $-2(1.5y - 1) - 2y$

$-2(1.5y - 1) - 2y = -2[1.5y + (\_\_\_\_\_)] - 2y$ Rewrite the expression.

$= -2(\_\_\_\_\_) + (-2)(\_\_\_\_\_) - \_\_\_\_\_$ Use the distributive property.

$= \_\_\_\_\_ + \_\_\_\_\_ - \_\_\_\_\_$ Multiply.

$= \_\_\_\_\_ - \_\_\_\_\_ + \_\_\_\_\_$ Group like terms.

$= \_\_\_\_\_ + \_\_\_\_\_$ Simplify.

Expand and simplify the expression.

20. $-4\left(\frac{1}{4}g - 2\right) - 3g$

21. $-4(1.5m - 3) + 6m$

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Expand and simplify the expression.

Example

$2(3a + 1) - (b + 2)$

$2(3a + 1) - (b + 2)$

$= 2(\underline{3a + 1}) + (\underline{-1})(\underline{b + 2})$ Rewrite the expression.

$= 2(\underline{3a}) + 2(\underline{1}) + (-1)(\underline{b}) + (-1)(\underline{2})$ Use the distributive property.

$= \underline{6a} + \underline{2} + \underline{(-b)} + \underline{(-2)}$ Multiply.

$= \underline{6a} + \underline{(-b)}$ Group like terms.

$= \underline{6a} - \underline{b}$ Remove parentheses and simplify.

Complete.

22. $3(2a + 4) - 2(b - 2)$

$3(2a + 4) - 2(b - 2)$

$= 3(2a + 4) + (\_\_\_\_\_)(\_\_\_\_\_ - \_\_\_\_\_)$ Rewrite the expression.

$= 3(\_\_\_\_\_) + 3(\_\_\_\_\_) + (\_\_\_\_\_)(\_\_\_\_\_) + (\_\_\_\_\_)(\_\_\_\_\_)$ Use the distributive property.

$= \_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_$ Multiply.

$= \_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_$ Group like terms.

$= \_\_\_\_\_$ Remove parentheses and simplify.

Expand and simplify the expression.

23. $4\left(\frac{1}{2}x - 3\right) - (y + 4)$

24. $-2(m - 4) - 2(2n - 2)$

25. $3(d + 7) - 2(3g - 2)$

26. $-6(p - 3) - (5q - 4)$