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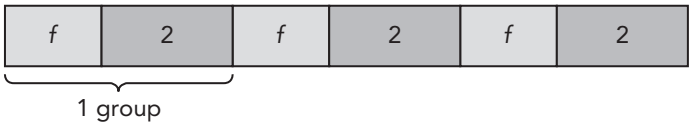
Lesson 7.4 Expanding and Factoring Algebraic Expressions

Expand each expression.

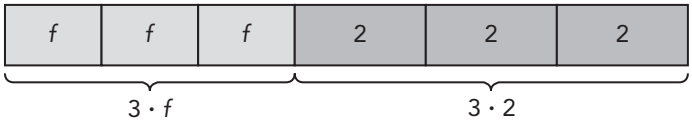
Example

$3(f + 2)$

$3(f + 2)$ means 3 groups of $(f + 2)$:



1 group



$3 \cdot f$ $3 \cdot 2$

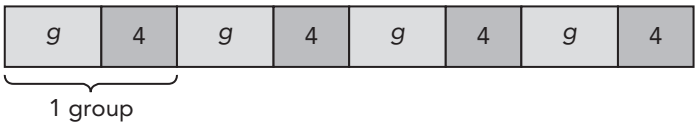
$3(f + 2) = 3 \cdot (f + 2)$

$= \underline{3 \cdot f} + \underline{3 \cdot 2}$

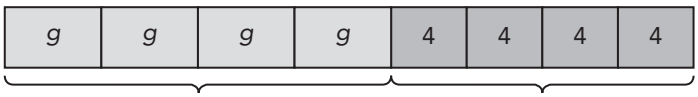
$= \underline{3f + 6}$

$3(f + 2)$ is the same as $3 \cdot (f + 2)$.
$3 \cdot (f + 2)$
$= (f + 2) + (f + 2) + (f + 2)$
$= f + f + f + 2 + 2 + 2$
$= 3f + 6$

1. $4(g + 4)$



1 group



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$4(g + 4) = 4 \cdot (g + 4)$

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

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

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2. $2(h + 7)$

3. $9(k - 4)$

4. $6(7s + 9)$

5. $3(9c - 6)$

State whether each pair of expressions is equivalent.

6. $6(2u + 3)$ and $6u + 18$ _____

7. $3(2h - 5)$ and $6h - 15$ _____

8. $8(g + 2)$ and $16 + 8g$ _____

9. $7(2k - 4)$ and $28 - 14k$ _____

Factor each expression.

Example

$4y + 2$

The factors of $4y$ are:

$1 \cdot 4y$

$2 \cdot \underline{2y}$

$4 \cdot \underline{1y}$

The factors of 2 are:

$1 \cdot 2$

The common factor of $4y$ and 2 is $\underline{2}$.

$4y = \underline{2} \cdot \underline{2y}$

$2 = \underline{2} \cdot \underline{1}$

$4y + 2 = \underline{2} \cdot \underline{2y} + \underline{2} \cdot \underline{1}$

$= \underline{2(2y + 1)}$

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10. $3d + 9$

The factors of $3d$ are:

$1 \cdot 3d$

$3 \cdot$ _____

The factors of 9 are:

$1 \cdot 9$

$3 \cdot$ _____

$9 \cdot$ _____

The common factor of $3d$ and 9 is _____.

$3d =$ _____ $\cdot$ _____

$9 =$ _____ $\cdot$ _____

$3d + 9 =$ _____ $\cdot$ _____ $+$ _____ $\cdot$ _____

$=$ _____

11. $24g + 8$

12. $21b - 7$

13. $45h + 5$

14. $54z - 6$

State whether each pair of expressions is equivalent.

15. $22s + 18$ and $2(11s + 9)$ _____

16. $6h + 15$ and $3(2h - 5)$ _____

17. $20p + 14$ and $4(5p + 3)$ _____

18. $15f - 9$ and $5(3f - 9)$ _____

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Simplify each expression. Then factor the expression.

Example

$9m + 19 + 4m + 7$

$= \underline{9m} + \underline{4m} + \underline{19} + \underline{7}$ — Identify like terms. Change the order of terms to collect like terms.

$= \underline{13m} + \underline{26}$ — Simplify.

$= \underline{13(m + 2)}$ — Factor.

19. $6p + 2 + 4p + 13$

$= \_\_\_\_ + \_\_\_\_ + \_\_\_\_ + \_\_\_\_$ — Identify like terms. Change the order of terms to collect like terms.

$= \_\_\_\_ + \_\_\_\_$ — Simplify.

$= \_\_\_\_$ — Factor.

20. $2v + 11 + 3 + 5v$

21. $9(6a + 7) - 6 - 3a$

22. $6(3 + 2s) + 4(s + 8)$

Lesson 7.3

1. $p + p + p + p + p + p = \underline{6} \cdot p$
$= \underline{6p}$
In the term $\underline{6p}$, the coefficient of p is $\underline{6}$.

2. $n + n + n + 13 + 8 = \underline{3} \cdot n + 13 + 8$
$= \underline{3n} + 21$
In the term $\underline{3n}$, the coefficient of n is $\underline{3}$.

3. $d + d + d + d + d + 5 - 2$
$= \underline{5} \cdot d + 3$
In the term $\underline{5d}$, the coefficient of d is $\underline{5}$.

4. $4m$, $4m$, 4

5. $5r$, $5r$, 5

6. Figure label: d, d;
$\underline{d} + \underline{d} + \underline{d} = \underline{3} \cdot \underline{d}$
$= \underline{3d}$
The perimeter of the triangle is $\underline{3d}$ inches.

7. Figure label: m, 2;
$\underline{m} + \underline{2} + \underline{m} + \underline{2} = \underline{2} \cdot \underline{m} + \underline{4}$
$= \underline{2m + 4}$
The perimeter of the rectangle is $\underline{(2m + 4)}$ feet.

8. Figure label: h, h, h, h, h, h, h;
8h centimeters

9. $7g$

10. $11p$

11. $16m$

12. $20y$

13. $43d$

14. Equivalent

15. Not equivalent

16. Not equivalent

17. Equivalent

18. $3x$

19. $16n$

20. 0

21. $29z$

22. $14b$

23. Not equivalent

24. Equivalent

25. Equivalent

26. Not equivalent

27. $12c - 3c - 3c = \underline{9c} - 3c$
$= \underline{6c}$

28. $5j + 2j + 9j = \underline{7j} + 9j$
$= \underline{16j}$

29. $10k$

30. $5y$

31. $5t + 4 + 2t = \underline{5t + 2t} + \underline{4}$
$= \underline{7t + 4}$

32. $6m - 10 - 2m - m$
$= \underline{6m - 2m - m} - \underline{10}$
$= \underline{3m - 10}$

33. $12r - 12$

34. $9j + 3$

35. $\underline{2y + 2} + \underline{2y + 2} + \underline{5y} + \underline{5y}$
$= \underline{2y + 2y + 5y + 5y} + \underline{2 + 2}$
$= \underline{(14y + 4)}$
The perimeter of the triangle is $\underline{(14y + 4)}$ centimeters.

36. $(5d + 36)$ inches

Lesson 7.4

1. Figure label $\underline{4} \cdot \underline{g}$, $\underline{4} \cdot \underline{4}$;
$4(g + 4) = 4 \cdot (g + 4)$
$= \underline{4 \cdot g} + \underline{4 \cdot 4}$
$= \underline{4g + 16}$

2. $2h + 14$

3. $9k - 36$

4. $42s + 54$

5. $27c - 18$

6. Not equivalent

7. Equivalent

8. Equivalent

9. Not equivalent

10. The factors of $3d$ are:
$1 \cdot 3d$
$3 \cdot \underline{1d}$
The factors of 9 are:
$1 \cdot 9$
$3 \cdot \underline{3}$
$9 \cdot \underline{1}$
The common factor of $3d$ and 9 is $\underline{3}$.
$3d = \underline{3} \cdot \underline{d}$
$9 = \underline{3} \cdot \underline{3}$
$3d + 9 = \underline{3} \cdot \underline{d} + \underline{3} \cdot \underline{3}$
$= \underline{3(d + 3)}$

11. $8(3g + 1)$

12. $7(3b - 1)$

13. $5(9h + 1)$

14. $6(9z - 1)$

15. Equivalent

16. Not equivalent

17. Not equivalent

18. Not equivalent

19. $6p + 2 + 4p + 13p$
$= \underline{6p} + \underline{4p} + \underline{2} + \underline{13}$
$= \underline{10p} + \underline{15}$
$= \underline{5(2p + 3)}$

20. $7(v + 2)$

21. $3(17a + 19)$

22. $2(8s + 25)$

Lesson 7.5

1. a) $2k + 8$

b) $\underline{6k} + \underline{8} + \underline{2k} + \underline{8}$
$= \underline{6k + 2k} + \underline{8 + 8}$
$= \underline{8k + 16}$
The perimeter of the rectangle is $\underline{(8k + 16)}$ inches.

c) When $k = 3$
$8k + 16 = 8 \cdot 3 + 16$
$= 24 + 16$
$= 40$
The perimeter of the rectangle is $\underline{40}$ inches.

2. a) $(9n + 10)$ years

b) $(15n + 10)$ years

c) $(6n - 9)$ years

d) $(21n + 1)$ years

e) 85 years