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Lesson 7.4 Expanding and Factoring Algebraic Expressions

Expand each expression.

1. $3(4w + 5)$

= _____

2. $5(6 - 3y)$

= _____

3. $7(2a - 7)$

= _____

4. $9(3p + 5)$

= _____

5. $10(3 - 4d)$

= _____

6. $8(5r + 3)$

= _____

Factor each expression.

7. $7y + 21$

= _____

8. $12 - 4k$

= _____

9. $18 - 12h$

= _____

10. $20w + 15$

= _____

11. $14 - 8x$

= _____

12. $24p - 15$

= _____

State whether each pair of expressions are equivalent.

13. $8(3 - 5m)$ and $24 - 5m$

_____

14. $9(2k + 3)$ and $18k + 27$

_____

15. $5(3 + 5b)$ and $25b + 15$

_____

16. $3(7z - 4)$ and $12 - 21z$

_____

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Expand each expression. Then simplify the expression.

17. $3(3x + 7) + 4(5x - 2)$

= _____

18. $9(5k + 2) + 4(7 - 10k)$

= _____

19. $7(5 + 4w) + 6(8w - 3)$

= _____

20. $4(6 + 5g) + 7(3 - g)$

= _____

Simplify each expression. Then factor the expression.

21. $12p - 8 + 6p + 14$

= _____

22. $20 + 15x - 6 - 9x$

= _____

23. $9h + 30 + 12h - 2$

= _____

24. $20k + 7 - 2k + 8$

= _____

Solve.

25. Expand and simplify the expression
$3(y - 3) + 2(5 + 3y) + 24(2y - 5) + 6(5 - y)$.

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26. Are the two expressions equivalent?
$2w + 3w + 2(w + 5) - 6w + 2(9w + 3) + (38 - 4w)$ and $3(5w + 18)$

27. A train is moving at an average speed of $(5x - 8)$ miles per hour.

a) Write an expression for the distance traveled by the train in 3 hours.

b) How far does the train travel in 3 hours if $x = 15$?

28. A pound of turkey costs $(3w + 8)$ dollars and a pound of cheese costs $(4w - 3)$ dollars. Mrs. Young bought 2 pounds of turkey and 3 pounds of cheese.

a) Write an expression for the amount Mrs. Young paid for the two items.

b) How much did Mrs. Young pay if $w = 4$?

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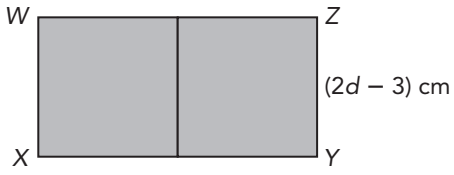
29. The average height of 4 children is $(15h - 3)$ centimeters. Two more children with heights of $(10h + 46)$ centimeters and $(14h - 16)$ centimeters join the group. Find the average height of the 6 children if $h = 9$.

30. The figure below shows two identical squares joined together to form rectangle *WXYZ*.



a) Write an expression for the perimeter of rectangle *WXYZ*.

b) Write an expression for the sum of the perimeters of the two identical squares.

c) Find the difference between your answers in **a)** and **b)** if $d = 8$.

Chapter 7

Lesson 7.1

1. $k + 8$ **2.** $10 - y$

3. $7g$ **4.** $\frac{h}{8}$ or $\frac{1}{8}h$

5. $5w - 6$ **6.** $7z + 10$

7. $4h - 10$ **8.** $\frac{s}{9} + 5$ or $5 + \frac{s}{9}$

9. $\frac{6y}{7}$

10. $4 \times 4 - \frac{h}{3}$ or $16 - \frac{h}{3}$

11. **a)** $(p - 10)$ stickers
b) $3p$ stickers
c) $(p + 6)$ stickers
d) $\frac{2p}{5}$ stickers

12. $(6g + 10)$ seashells

13. $(2b - 6)$ dollars

14. $\frac{50}{x + 2}$ loaves of bread

15. 3 units $\rightarrow 12y$
1 unit $\rightarrow 12y \div 3 = 4y$
5 units $\rightarrow 5 \times 4y = 20y$
$20y$ silver guppies

16. $(\frac{4p}{3} - 5)$ years old

17. $(y^2 + 2y)$ square centimeters

Lesson 7.2

1. $6 \cdot 5 + 7 = 37$

2. $9 \cdot 3 - 10 = 17$

3. $14 \cdot 7 - 98 + 3 \cdot 7 = 21$

4. $6 \cdot 8 + 25 - 5 \cdot 8 \div 4 = 63$

5. $50 - \frac{7 \cdot 6}{3} + 4 \cdot 6 = 60$

6. $10 \cdot 10 - \frac{3 \cdot 10 - 2}{4} + 5 = 98$

7. $3(5 \cdot 4 - 1) - 4(3 \cdot 4 - 7) = 37$

8. $3(5 \cdot 4 - 6) + 4(20 - 3 \cdot 4) = 74$

9. $5(10 \cdot 9 + 3) - 7 \cdot 9 = 402$

10. $4(5 \cdot 9 - 3) - 2(6 \cdot 9 - 7) = 74$

11. $\frac{6 \cdot 4 + 4}{7} + \frac{5 \cdot 4 - 6}{2} - \frac{3 \cdot 4}{4} = 8$

12. $\frac{3(6 - 2)}{4} + \frac{4(2 \cdot 6 - 3)}{5} = 10\frac{1}{5}$

13. $8e + 20 - 60 = 8 \cdot 7 + 20 - 60$
$= 16$

14. $(2 \cdot 4 + 1)(3 \cdot 4 - 6) = 54$

15. $5(3w + 2) - 3(w^2 - 5w + 4)$
$= 5(3 \cdot 6 + 2) - 3(6 \cdot 6 - 5 \cdot 6 + 4)$
$= 5 \cdot 20 - 3 \cdot 10 = 70$

16. $2(3 \cdot 9 + 8) + 5(40 - 4 \cdot 9) = 90$

17. $\frac{3}{4}(12 + 4) + \frac{5}{6}(12 - 6)$
$= 12 + 5 = 17$

18. $(5x + 1) \div (2x - 5)$
$= (5 \cdot 7 + 1) \div (2 \cdot 7 - 5) = 4$

19. $\frac{5 + 3}{5 - 1} + \frac{4 \cdot 5 - 5}{2 \cdot 5 + 5} - \frac{6 \cdot 5 - 25}{5} = 2$

Lesson 7.3

1. $2x + 7$, coefficient 2

2. $k - 3$, coefficient 1

3. $10g$ **4.** $3u$

5. $11m$ **6.** $16x$

7. equivalent **8.** not equivalent

9. not equivalent **10.** equivalent

11. $4 + 3d$ **12.** $8 + 10k$

13. $6m + 5$ **14.** $9 + n$

15. u **16.** $12 + 5k$

17. $5x + 7$ **18.** $7r + 4$

19. $5x + 5x + 3x + 3x + 3x = 19x$
$19x$ dollars

20. $3z + 3z + 3z + 3z + 3z + 4z - 7$
$= 19z - 7$
$(19z - 7)$ hours

21. $30w$ centimeters

22. Shanti: $5p$
Jon: $10p$
Ching: $10p - 16$
Total $= 25p - 16$
$(25p - 16)$ croissants

23. $20x - 3x - 5 - 6x = 11x - 5$
$(11x - 5)$ dollars

24. $4y + 3y + 9 + 5y + 7 = 12y + 16$
$(12y + 16)$ miles

25. **a)** $4\left(\frac{5s - 2}{4}\right) = 5s - 2$
$(5s - 2)$ yards
b) $2(s + 9) + 2(3s - 5)$
$= 2s + 18 + 6s - 10$
$= 8s + 8$
$(8s + 8)$ yards
c) $(5s - 2) + (8s + 8)$
$= 13s + 6$
$13 \cdot 5 + 6 = 71$
71 yards
d) $(8s + 8) - (5s - 2) = 3s + 10$
$3 \cdot 7 + 10 = 31$
31 yards

Lesson 7.4

1. $12w + 15$ **2.** $30 - 15y$

3. $14a - 49$ **4.** $27p + 45$

5. $30 - 40d$ **6.** $40r + 24$

7. $7(y + 3)$ **8.** $4(3 - k)$

9. $6(3 - 2h)$ **10.** $5(4w + 3)$

11. $2(7 - 4x)$ **12.** $3(8p - 5)$

13. not equivalent **14.** equivalent

15. equivalent **16.** not equivalent

17. $29x + 13$ **18.** $5k + 46$

19. $76w + 17$ **20.** $45 + 13g$

21. $6(3p + 1)$ or $6(1 + 3p)$
22. $2(7 + 3x)$ or $2(3x + 7)$
23. $7(3h + 4)$
24. $3(6k + 5)$
25. $3y - 9 + 10 + 6y + 48y - 120 + 30 - 6y$
$= 51y - 89$
26. Both expressions are equal to $15w + 54$.
Yes, the two expressions are equivalent.
27. a) $3(5x - 8)$ miles
b) $3(5 \cdot 15 - 8) = 201$
The train travels 201 miles.
28. a) Total amount $= 2(3w + 8) + 3(4w - 3)$
$= (18w + 7)$ dollars
b) $18 \cdot 4 + 7 = 79$
Mrs. Young paid \$79.
29. $4(15h - 3) = 60h - 12$
$(60h - 12) + (10h + 46) + (14h - 16)$
$= 84h + 18$
$(84h + 18) \div 6 = 14h + 3$
$14 \cdot 9 + 3 = 129$
129 centimeters
30. a) $6(2d - 3) = (12d - 18)$ centimeters
b) $8(2d - 3) = (16d - 24)$ centimeters
c) Difference: $2(2d - 3)$
$2(2 \cdot 8 - 3) = 26$ centimeters

Lesson 7.5

1. a) $(b + 3)$ miles
b) $(2b - 4)$ miles
c) The doctor's office is closer.
It is 2 miles closer.
2. a) 1 hour $\rightarrow 6m \div 2 = 3m$
5 hours $\rightarrow 5 \times 3m = 15m$
Casey can knit $15m$ doll dresses in 5 hours.
b) $15 \cdot 7 = 105$
Casey can knit 105 doll dresses in 5 hours.
3. a) Number of girls: $(16x + 30) + (5x - 12)$
$= (21x + 18)$
Total $= (16x + 30) + (21x + 18)$
$= (37x + 48)$
There are $(37x + 48)$ children at the tournament.
b) Number of girls: $(21x + 18)$
$21 \cdot 5 + 18 = 123$ girls
4. a) Afternoon: $\frac{3}{4} \cdot 16p = 12p$
Evening: $12p + 20$
Total $= 16p + 12p + (12p + 20)$
$= 40p + 20$
Adam sold $(40p + 20)$ newspapers altogether.
b) $40 \cdot 3 + 20 = 140$ newspapers
5. $(3k + 4) + 2(3k + 4) + 4(5 + 6k)$
$= 33k + 32$
They collect $(33k + 32)$ dimes altogether.
6. a) $(12h + 2)$ yards
b) The cost is $28(12h + 2)$ dollars.
c) $28(12 \cdot 5 + 2) = 1{,}736$
The cost is \$1,736.
7. a) $(3g + 1) + 2(3g + 1) + 2 + 2$
$= 9g + 7$
The sum of their ages is $(9g + 7)$ years.
b) $2(3g + 1) + (3g + 1)$
$= 9g + 3$
Shanti will be $(9g + 3)$ years old.
c) Moesha's age: $3g + 1 - 4$
$= 3 \cdot 5 + 1 - 4 = 12$ years
Shanti's age: $2(3g + 1) - 4$
$= 2 \cdot 16 - 4 = 28$ years

Brain @ Work

1. a) $\frac{1}{w}$ of the pool
b) $\frac{1}{w + 6}$ of the pool
c) $4\left(\frac{1}{w} + \frac{1}{w + 6}\right)$ of the pool
2. a) $\frac{1}{3y + 2}$ of the house
b) $2\left(\frac{1}{3y + 2 + 5}\right) = \frac{2}{3y + 7}$ of the house
c) $3\left(\frac{1}{3y + 2} + \frac{1}{3y + 7}\right)$ of the house

Cumulative Practice for Chapters 4 to 7+++

1. 135
2. 6
3. 2 : 5
4. 8 : 13
5. 5 : 3
6. 4 : 3
7. 76%
8. 109%
9. 65%
10. $58\frac{1}{3}\%$
11. 0.09
12. 1.5
13. $\frac{22}{25}$
14. $1\frac{1}{5}$
15. 43.2 quarts
16. 36 minutes
17. 25
18. 18
19. 49
20. 15
21. $7w + 5$
22. $9 + 5y$
23. $24q - 12$
24. $38 + 52y$
25. $4(4g + 1)$
26. $7(7 - 2h)$
27. $6p + 7$
28. 8 notebooks $\rightarrow y$ dollars
2 notebooks $\rightarrow \frac{y}{4}$ dollars
29. Nails $\rightarrow m + 20$
Bolts $\rightarrow 2m + 30$
Total $\rightarrow 3m + 50$ nails and bolts