Chapter 6 Solve Polynomial Equations

6.1 Simplifying Polynomial Expressions

KEY CONCEPTS

- When multiplying monomials, multiply the coefficients, and then use the exponent laws for each variable.
- Use the distributive property to expand, or multiply, polynomial expressions.

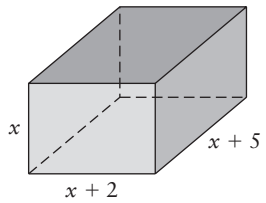
$a(b + c) = ab + ac$

For example: $(x + 2)(3x + 4) = x(3x) + x(4) + 2(3x) + 2(4)$
$= 3x^2 + 4x + 6x + 8$
$= 3x^2 + 10x + 8$

- After expanding polynomial expressions, it may be necessary to simplify by collecting like terms.

Example

A container is in the shape of a rectangular prism. The width is 2 more than the height. The length is 5 more than the height. Determine an expression for the surface area of the container.



Solution

The surface area of a rectangular prism is the sum of the areas of the faces.

SA = (back and front faces) + (two side faces) + (top and bottom faces)
$= 2[x(x + 2)] + 2[x(x + 5)] + 2[(x + 2)(x + 5)]$
$= 2[x^2 + 2x] + 2[x^2 + 5x] + 2[x^2 + 7x + 10]$
$= 2x^2 + 4x + 2x^2 + 10x + 2x^2 + 14x + 20$
$= 6x^2 + 28x + 20$

A

1. Simplify.

a) $-5(2d)(-3e)$

b) $(ab)(ab)$

c) $(3gh)(4g^2h^3)$

d) $(6bc^3)(-6b^3c)$

e) $(0.5c^4e^5)(0.3c^2e^3)$

f) $3b(-2ab)(4a)$

2. The length of a rectangle is $7x^2y^3$ and the width of the rectangle is $4xy^2$. Determine an expression for the area of the rectangle.

3. Expand.

a) $xy(4xy^2 + 5x^2y^3)$

b) $2m^2n^3(m^2n - 3mn^2)$

c) $-gh^4(g + h)$

d) $-3ab(5a^3b^4 + 6ab^5)$

e) $4ce(3c^2e - 5ce^3)$

4. Expand.

a) $2x(5x^2 - 3x + 1)$

b) $-3x^2(2x^2 + 5x - 3)$

c) $ax(bx - cy + d)$

5. Describe the steps you would use to expand $(2x + 3)(5x + 4)$.

6. Expand and simplify.

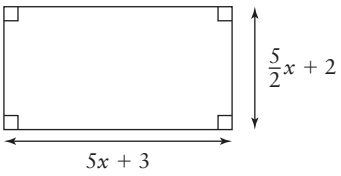
a) $3(x - 5)(x + 6)$

b) $-2(x - 7)(x - 9)$

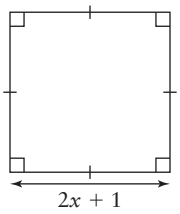
c) $-(y + 2)(y - 8)$

d) $2(k + 3)(k + 7)$

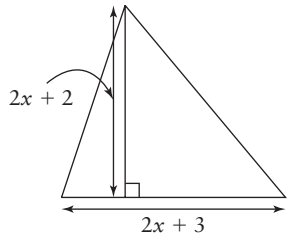
7. Determine a simplified expression for the area of the rectangle shown.



8. Determine a simplified expression for the area of the square shown.

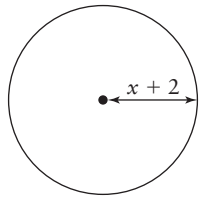


9. Determine a simplified expression for the area of the triangle shown.



B

10. Determine a simplified expression for the area of a circle with radius $x + 2$.



☆**11. a)** Expand and simplify the expression $\pi(R + r)(R - r)$. Explain why the expression can be used to model the area of the top of a glazed doughnut.

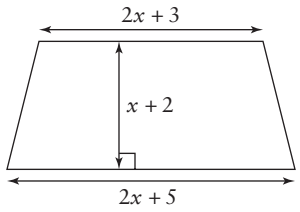
b) Draw a diagram of the doughnut and identify R and r.

12. The dimensions of the lid of a rectangular box are $x + 7y$ and $x - 3y$.

a) Determine an expression, in simplified form, to represent the area of the lid of the rectangular box.

b) If the height of the box is $x + 2y$, determine an expression, in simplified form, to represent the volume of the rectangular box.

13. Determine the area of the trapezoid shown.



☆**14.** The dimensions of a rectangular platform are 3 ft by 2 ft. If the length and width are both increased by the same amount, a new rectangular platform will be built that has an area that is double the area of the original platform.

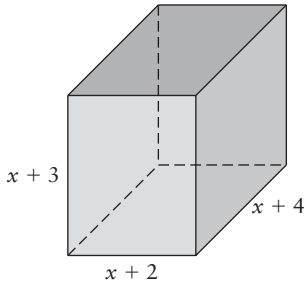
a) Write an expression to represent the length of the new rectangular platform.

b) Write an expression to represent the width of the new rectangular platform.

c) Use an algebraic solution to determine the dimensions of the new rectangular platform.

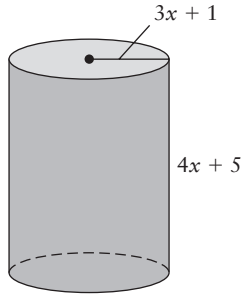
d) Is there another method that you can use to solve this problem? Explain. Would your method work if the original dimensions of the rectangular platform were 4 ft by 5 ft? Explain.

15. a) Explain how you would calculate the surface area of the rectangular wooden box shown. Then, determine an expression, in simplified form, to represent the surface area of the wooden box.



b) Explain how you would calculate the volume of the wooden box shown. Then, determine an expression, in simplified form, to represent the volume of the wooden box.

16. The diagram shows a plastic cylindrical container.



a) Explain how you would calculate the surface area of the plastic cylindrical container shown. Then, determine an expression, in simplified form, to represent the surface area of the plastic cylindrical container.

b) Explain how you would calculate the volume of the plastic cylindrical container shown. Then, determine an expression, in simplified form, to represent the volume of the plastic cylindrical container.

C

17. The area of a rectangular deck is $x^2 + 5xy - 24y^2$. The length of the rectangular deck is $x + 8y$. Determine an expression for the width of the rectangular deck.

18. A spherical tennis ball has a radius of $2x + 3$.

a) Determine a simplified expression for the surface area of the tennis ball.

b) Determine a simplified expression for the volume of the tennis ball.