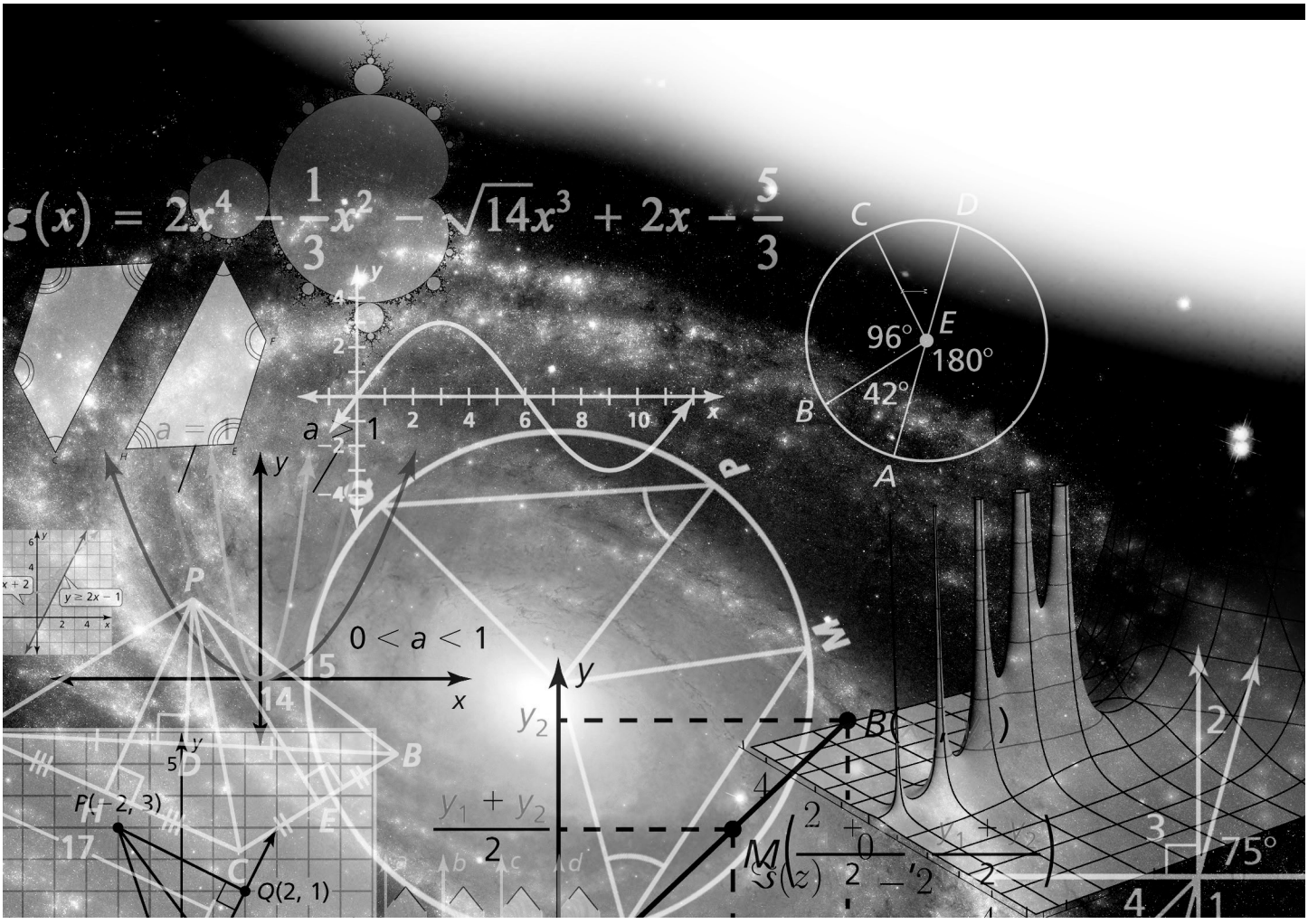
CHAPTER 7

Polynomial Equations and Factoring



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Chapter 7 Maintaining Mathematical Proficiency

Simplify the expression.

1. $5x - 6 + 3x$

2. $3t + 7 - 3t - 4$

3. $8s - 4 + 4s - 6 - 5s$

4. $9m + 3 + m - 3 + 5m$

5. $-4 - 3p - 7 - 3p - 4$

6. $12(z - 1) + 4$

7. $-6(x + 2) - 4$

8. $3(h + 4) - 3(h - 4)$

9. $7(z + 4) - 3(z + 2) - 2(z - 3)$

Find the greatest common factor.

10. 24, 32

11. 30, 55

12. 48, 84

13. 28, 72

14. 42, 60

15. 35, 99

16. Explain how to find the greatest common factor of 42, 70, and 84.

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7.1 Adding and Subtracting Polynomials

For use with Exploration 7.1

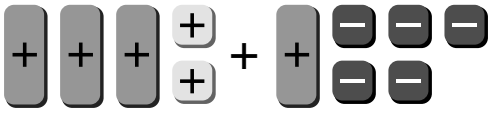
Essential Question How can you add and subtract polynomials?

1 EXPLORATION: Adding Polynomials

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

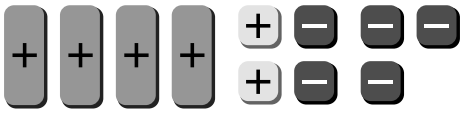
Work with a partner. Write the expression modeled by the algebra tiles in each step.

Step 1



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

Step 2



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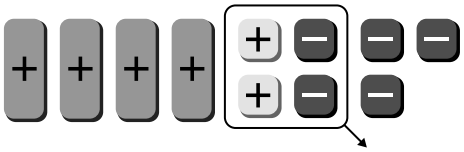
Step 3



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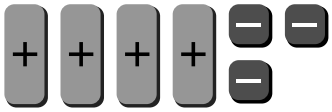
Step 4



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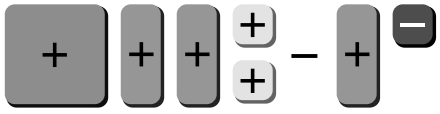
2 EXPLORATION: Subtracting Polynomials

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

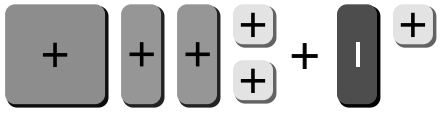
Work with a partner. Write the expression modeled by the algebra tiles in each step.

Step 1



$(x^2 + 2x + 2) - (x - 1)$

Step 2



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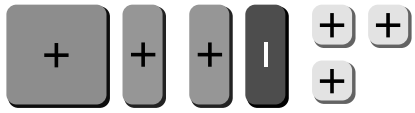
Step 3



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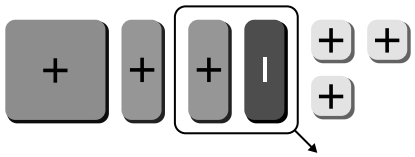
7.1 Adding and Subtracting Polynomials (continued)

2 EXPLORATION: Subtracting Polynomials (continued)

Step 4



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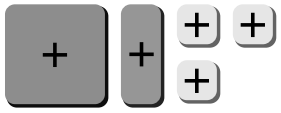
Step 5



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Communicate Your Answer

3. How can you add and subtract polynomials?

4. Use your methods in Question 3 to find each sum or difference.

a. $(x^2 + 2x - 1) + (2x^2 - 2x + 1)$

b. $(4x + 3) + (x - 2)$

c. $(x^2 + 2) - (3x^2 + 2x + 5)$

d. $(2x - 3x) - (x^2 - 2x + 4)$

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7.1 Practice

For use after Lesson 7.1

Notes:

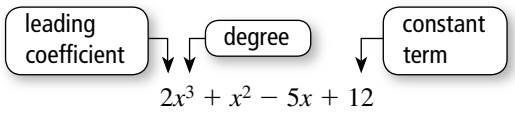
Core Concepts

Polynomials

A **polynomial** is a monomial or a sum of monomials. Each monomial is called a *term* of the polynomial. A polynomial with two terms is a **binomial**. A polynomial with three terms is a **trinomial**.

Binomial	Trinomial
$5x + 2$	$x^2 + 5x + 2$

The **degree of a polynomial** is the greatest degree of its terms. A polynomial in one variable is in **standard form** when the exponents of the terms decrease from left to right. When you write a polynomial in standard form, the coefficient of the first term is the **leading coefficient**.



Notes:

Worked-Out Examples

Example #1

Write the polynomial in standard form. Identify the degree and leading coefficient of the polynomial. Then classify the polynomial by the number of terms.

$8d - 2 - 4d^3$

You can write the polynomial $8d - 2 - 4d^3$ in standard form as $-4d^3 + 8d - 2$.

The greatest degree is 3, so the degree of the polynomial 3.

The leading coefficient is -4.

The polynomial has 3 terms, so it is a trinomial.

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7.1 Practice (continued)

Example #2

Find the difference.

$(4m^2 - m + 2) - (-3m^2 + 10m + 4)$

$= 4m^2 - m + 2 + 3m^2 - 10m - 4$

$= (4m^2 + 3m^2) + (-m - 10m) + (2 - 4)$

$= 7m^2 - 11m - 2$

Alternate solution:

$$\begin{array}{r} 4m^2 - m + 2 \\ -(-3m^2 + 10m + 4) \end{array} \Rightarrow \begin{array}{r} 4m^2 - m + 2 \\ 3m^2 - 10m - 4 \\ \hline 7m^2 - 11m - 2 \end{array}$$

Practice A

In Exercises 1–8, find the degree of the monomial.

1. $-6s$

2. w

3. 8

4. $-2abc$

5. $7x^2y$

6. $4r^2s^3t$

7. $10mn^3$

8. $\frac{2}{3}$

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7.1 Practice (continued)

In Exercises 9–12, write the polynomial in standard form. Identify the degree and leading coefficient of the polynomial. Then classify the polynomial by the number of terms.

9. $x + 3x^2 + 5$

10. $\sqrt{5}\,y$

11. $3x^5 + 6x^8$

12. $f^2 - 2f + f^4$

In Exercises 13–16, find the sum.

13. $(-4x + 9) + (6x - 14)$

14. $(-3a - 2) + (7a + 5)$

15. $(x^2 + 3x + 5) + (-x^2 + 6x - 4)$

16. $(t^2 + 3t^3 - 3) + (2t^2 + 7t - 2t^3)$

In Exercises 17–20, find the difference.

17. $(g - 4) - (3g - 6)$

18. $(-5h - 2) - (7h + 6)$

19. $(-x^2 - 5) - (-3x^2 - x - 8)$

20. $(k^2 + 6k^3 - 4) - (5k^3 + 7k - 3k^2)$

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Practice B

In Exercises 1–3, find the degree of the monomial.

1. $-3.25n^8$ **2.** $\frac{1}{5}x^4yz^2$ **3.** uv^3w^9

In Exercises 4–6, write the polynomial in standard form. Identify the degree and leading coefficient of the polynomial. Then classify the polynomial by the number of terms.

4. $3t - 8t^2 + 10t^5$ **5.** $\frac{2}{9}n^2 - \pi n + 3n^4$ **6.** $\sqrt{14}p^5$

7. The monthly profit for a small company is represented by $250x^5 - 42x^2 + 112x$, where x is the number of beds sold. Classify the polynomial by the number of terms. What is its degree?

In Exercises 8–11, find the sum.

8. $(-2t^2 - 7t + 5) + (-8t^2 + 4t - 3)$ **9.** $(8y^2 - 2y + 4) + (5y^2 - 7y)$

10. $(3k - 5k^3 + 9) + (8k^3 - 4k + 8)$ **11.** $(3q^2 - 7q - 6) + (2q^2 - 5q^3 + 8q)$

In Exercises 12–15, find the difference.

12. $(t^3 - 5t^2 - 7) - (t - 11)$ **13.** $(-w - 13) - (-3w^3 + w^2 + 6w)$

14. $(x^4 - x^2 + 9) - (13 - 6x^2 + 8x)$ **15.** $(3g - 5g^3 + 6g^2) - (12g^3 + 9g - 10)$

16. The number of economy-size cars rented in w weeks is represented by $152 + 3w$. The number of full-size cars rented in w weeks is represented by $99 + 2w$. Write a polynomial that represents how many more economy cars are rented in w weeks than full-size cars.

In Exercises 17 and 18, find the sum or difference.

17. $(g^2 - 9h^2) + (g^2 - 15gh + 8h^2)$ **18.** $(-m^2 - 5mn) - (m^2 + 3mn - 9n^2)$

19. The polynomial $-16t^2 + v_0t + s_0$ represents the height (in feet) of an object, where v_0 is the initial vertical velocity (in feet per second), s_0 is the initial height of the object (in feet), and t is the time (in seconds). Write a polynomial that represents the height of an object that has initial velocity 25 feet per second and initial height 4 feet. Then find the height of the object after 1 second.