


12-9

Adding and Subtracting Polynomials

- 1 To add polynomials
- 2 To subtract polynomials

New Vocabulary • coefficient

Check Skills You'll Need

 For help, go to Lesson 12-8.

Simplify each polynomial. Clear Annotations to reveal answers.

1. $-p + 2p + 3p$

2. $x^2 + 5x - 2x^2$

3. $2y^2 + 3y + (-5y)$

4. $-x + x + 6x^2 - 1$

5. $7z - 8z^2 + z + 3z^2$

6. $-2 - 10m + 3m + 4$

A **coefficient** is a number that is multiplied by a variable.

Name the coefficients in each polynomial.

12-9

Adding and Subtracting Polynomials

Add $(3x^2 - 5x - 1)$ and $(x^2 - 6x + 3)$



Group similar shapes. Eliminate 'zero-pairs.'



$$4x^2 + 11x + 2$$



12-9

Adding and Subtracting Polynomials

Add $(3x^2 + 5x + 1)$ and $(x^2 + 6x + 3)$

Group similar terms. Add coefficients.*

$$\underbrace{3x^2 + x^2} + \underbrace{-5x + -6x} + \underbrace{-1 + 3}$$

$$4x^2 + -11x + 2$$

* A **coefficient** is a number that is multiplied by a variable.

EXERCISES

For more practice, see *Extra Practice*.

Add using properties.


$$\begin{aligned} 9. (3p^2 + 2p + 1) + (5p^2 + 4p) \\ (3p^2 + 5p^2) + (2p + 4p) + 1 \\ 8p^2 + 2p + 1 \end{aligned}$$

$$\begin{aligned} 10. (7t^2 + t + 3) + (-6t^2 + 3) \\ (7t^2 + -6t^2) + t + \cancel{(3 + 3)} \\ t^2 + t \end{aligned}$$


$$\begin{aligned} 11. (k^2 + 3k) + (3k^2 + 2k) \\ (k^2 + 3k^2) + (3k + 2k) \\ 4k^2 + 5k \end{aligned}$$

$$\begin{aligned} 12. (2b^2 + b + 3) + (2b^2 + b + 3) \\ (2b^2 + 2b^2) + (b + b) + (3 + 3) \\ 4b^2 + 2b + 6 \end{aligned}$$

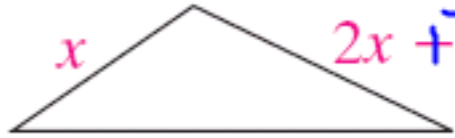
Write the perimeter of each figure as a polynomial. Simplify.

13. 

$$\begin{aligned} x + x + 3 + x + x + 3 \\ 4x + 6 \end{aligned}$$

14. 

$$\begin{aligned} 2x + 5 \\ 4x + 8 \\ 2x + 5 \\ + 4x + 8 \\ \hline 12x + 26 \end{aligned}$$

15. 

$$\begin{aligned} & x \\ & 3x + 3 \\ + & 2x + 2 \\ \hline & 6x + 5 \end{aligned}$$

Use the distributive property to
simplify

$$-(3x + 2)$$

$$-3x + 2$$

To subtract a polynomial, add the opposite of each term in the second polynomial.

Simplify $2a - 3 - (a + 2)$

$$2a +^{-}3 +^{-}(a + 2)$$

$$2a +^{-}3 +^{-}a +^{-}2$$

$$(2a +^{-}a) + (^{-}3 + ^{-}2)$$

$$a + ^{-}5$$

subtract $(2x^2 + x - 3)$ from $(x^2 - 3x + 1)$

$$(x^2 + \overset{-}{3}x + 1) + (\overset{-}{2}x^2 + \overset{-}{x} + 3)$$

KEEP CHANGE FLIP (3 PARTS!)

$$x^2 + \overset{-}{3}x + 1 + \overset{-}{2}x^2 + \overset{-}{x} + 3$$

$$(x^2 + \overset{-}{2}x^2) + (\overset{-}{3}x + \overset{-}{x}) + (1 + 3)$$

$$\overset{-}{x}^2 + \overset{-}{4}x + 4$$

Simplify $(16x - 11) - 3(2x + 4)$

$$16x +^{-}11 +^{-}6x +^{-}12$$

$$(16x +^{-}6x) + (^{-}11 +^{-}12)$$

$$10x +^{-}23$$

EXERCISES

 For more practice, see *Extra Practice*.

Subtract.

18. $(2x^2 + 5x + 7) - (3x^2 + 7x)$

$$2x^2 + 5x + 7 - 3x^2 - 7x$$
$$-x^2 - 2x + 7$$

19. $(2e^2 + 5e + 7) - (e^2 + 3e + 1)$

$$2e^2 + 5e + 7 - e^2 + 3e + 1$$
$$e^2 + 8e + 8$$

20. $(g^2 + 7) - (3g^2 + 2g + 1)$

$$g^2 + 7 - 3g^2 - 2g - 1$$
$$-2g^2 - 2g + 6$$

21. $(3r^2 + 4r + 1) - (2r^2 + r + 4)$

$$3r^2 + 4r + 1 - 2r^2 - r + 4$$
$$r^2 + 5r + 3$$

EXERCISES

For more practice, see *Extra Practice*.

27. a. What polynomial is the opposite of $4x^2 + 2x - 6$?

$$\frac{-4x^2 + -2x + -6}{\bigcirc + \bigcirc + \bigcirc}$$

b. What is the sum of $4x^2 + 2x - 6$ and its opposite?

30. **Error Analysis** A student rewrote $(6x^2 + 4x - 2) - (3x^2 - x)$ as $6x^2 + 4x - 2 - 3x^2 - x$. What error did the student make?

This should be positive. Check it out.