

LESSON

Practice C**6-3****Dividing Polynomials****Divide by using long division.**

1. $(2x^3 + 14x^2 - 4x - 48) \div (2x + 4)$

2. $(x^3 + 12x^2 - 4) \div (x - 3)$

3. $(12x^4 + 23x^3 - 9x^2 + 15x + 4) \div (3x - 1)$

4. $(-2x^3 + 11x^2 - 8x - 7) \div (2x + 1)$

Divide by using synthetic division.

5. $(9x^2 - 3x + 11) \div (x - 6)$

6. $(3x^4 - 2x^2 + 1) \div (x + 2)$

7. $(6x^5 - 3x^2 + x - 2) \div (x - 1)$

8. $(-x^4 - 7x^3 + 6x^2 - 1) \div (x - 3)$

Use synthetic substitution to evaluate the polynomial for the given value.

9. $P(x) = 4x^3 - 12x - 2$ for $x = 5$

10. $P(x) = -3x^4 + 5x^3 - x + 7$ for $x = -2$

Solve.

11. The total weight of the cargo entering a seaport each year can be modeled by the function $C(t) = 0.2t^3 + 1000t^2 + 10t + 50,000$, where t is the number of years since the port was opened. The average weight of cargo delivered by each ship is modeled by the function $A(t) = 0.1t + 500$. Write an expression describing the number of ships entering the port each year.

LESSON **Practice A**
6-3 **Dividing Polynomials**

Divide by using long division.

1. $x - 3 \overline{)x^2 + 2x + 6}$

$$\begin{array}{r} x + 5 + \frac{21}{x-3} \\ \underline{x + 3x + 9} \\ 2x + 6 \\ \underline{2x + 6} \\ 0 \end{array}$$

2. $x + 2 \overline{)3x^2 + 3x - 12}$

$$\begin{array}{r} 3x - 3 - \frac{6}{x+2} \\ \underline{3x + 6x + 12} \\ -9x - 12 \\ \underline{-9x - 18} \\ 6 \end{array}$$

3. $2x + 1 \overline{)4x^3 + 6x^2 + 3x}$

$$\begin{array}{r} 2x^2 + 2x + \frac{x}{2x+1} \\ \underline{4x^3 + 4x^2 + 2x} \\ 2x^2 + 4x + 3x \\ \underline{2x^2 + 4x + 2} \\ x \\ \underline{x} \\ 0 \end{array}$$

4. $5x^2 \overline{)10x^4 - 20x^3 + 25x^2}$

$$\begin{array}{r} 2x^2 - 4x + 5 \\ \underline{10x^4 - 20x^3 + 25x^2} \\ 0 \end{array}$$

Complete using synthetic division.

5. $(x^2 + 4x + 1) \div (x - 5)$

$$\begin{array}{r|rrr} 5 & 1 & 4 & 1 \\ & & 5 & 45 \\ \hline & A & B & C \end{array}$$

a. $A = \underline{1}$ b. $B = \underline{9}$ c. $C = \underline{46}$

d. What is the remainder? $\underline{46}$

e. Write the quotient. $\underline{x + 9 + \frac{46}{x-5}}$

Divide by using synthetic division.

6. $(x^2 - 8x + 6) \div (x + 2)$

$$\begin{array}{r} x - 10 + \frac{26}{x+2} \\ \underline{x + 2x + 4} \\ -3x + 2 \\ \underline{-3x - 6} \\ 8 \end{array}$$

7. $(x^2 + 4x - 2) \div (x - 3)$

$$\begin{array}{r} x + 7 + \frac{19}{x-3} \\ \underline{x - 3x - 9} \\ 4x - 11 \\ \underline{4x - 12} \\ 1 \end{array}$$

Use synthetic substitution to evaluate the polynomial for the given value.

8. $P(x) = x^2 - 4x + 5$ for $x = 4$

$\underline{P(4) = 5}$

9. $P(x) = 2x^2 + 7x - 1$ for $x = -3$

$\underline{P(-3) = -4}$

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LESSON **Practice B**
6-3 **Dividing Polynomials**

Divide by using long division.

1. $(x^2 - x - 6) \div (x - 3)$

$$\begin{array}{r} x + 2 \\ \underline{x - 3x - 6} \\ 2x \\ \underline{2x - 6} \\ 12 \end{array}$$

2. $(2x^3 - 10x^2 + x - 5) \div (x - 5)$

$$\begin{array}{r} 2x^2 + 1 \\ \underline{2x^3 - 10x^2 + 2x - 5} \\ 12x - 5 \end{array}$$

3. $(-3x^2 + 20x - 12) \div (x - 6)$

$$\begin{array}{r} -3x + 2 \\ \underline{-3x^2 + 18x - 12} \\ 2x \\ \underline{2x - 12} \\ 0 \end{array}$$

4. $(3x^3 + 9x^2 - 14) \div (x + 3)$

$$\begin{array}{r} 3x^2 - \frac{14}{x+3} \\ \underline{3x^3 + 9x^2} \\ -14 \end{array}$$

Divide by using synthetic division.

5. $(3x^2 - 8x + 4) \div (x - 2)$

$$\begin{array}{r} 3x - 2 \\ \underline{3x^2 - 6x + 4} \\ -2x \\ \underline{-2x + 4} \\ 0 \end{array}$$

6. $(5x^2 - 4x + 12) \div (x + 3)$

$$\begin{array}{r} 5x - 19 + \frac{69}{x+3} \\ \underline{5x^2 + 15x + 57} \\ -19x + 15 \\ \underline{-19x - 57} \\ 72 \end{array}$$

7. $(9x^2 - 7x + 3) \div (x - 1)$

$$\begin{array}{r} 9x + 2 + \frac{5}{x-1} \\ \underline{9x^2 - 9x - 9} \\ 16x - 6 \\ \underline{16x - 16} \\ 10 \end{array}$$

8. $(-6x^2 + 5x - 10) \div (x + 7)$

$$\begin{array}{r} -6x + 47 - \frac{339}{x+7} \\ \underline{-6x^2 - 42x - 42} \\ 47x - 52 \\ \underline{47x + 329} \\ -381 \end{array}$$

Use synthetic substitution to evaluate the polynomial for the given value.

9. $P(x) = 4x^2 - 9x + 2$ for $x = 3$

$\underline{P(3) = 11}$

10. $P(x) = -3x^2 + 10x - 4$ for $x = -2$

$\underline{P(-2) = -36}$

Solve.

11. The total number of dollars donated each year to a small charitable organization has followed the trend $d(t) = 2t^3 + 10t^2 + 2000t + 10,000$, where d is dollars and t is the number of years since 1990. The total number of donors each year has followed the trend $p(t) = t^2 + 1000$. Write an expression describing the average number of dollars per donor.

$\underline{2t + 10}$

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LESSON **Practice C**
6-3 **Dividing Polynomials**

Divide by using long division.

1. $(2x^3 + 14x^2 - 4x - 48) \div (2x + 4)$

$$\begin{array}{r} x^2 + 5x - 12 \\ \underline{2x^3 + 10x^2 + 20x + 48} \\ 4x^2 - 24x - 52 \\ \underline{4x^2 + 20x + 48} \\ -44x - 100 \end{array}$$

2. $(x^3 + 12x^2 - 4) \div (x - 3)$

$$\begin{array}{r} x^2 + 15x + 45 + \frac{131}{x-3} \\ \underline{x^3 - 3x^2 + 9x - 9} \\ 15x^2 + 12x - 13 \\ \underline{15x^2 - 45x + 135} \\ 157x - 146 \end{array}$$

3. $(12x^4 + 23x^3 - 9x^2 + 15x + 4) \div (3x - 1)$

$$\begin{array}{r} 4x^3 + 9x^2 + 5 + \frac{9}{3x-1} \\ \underline{12x^4 - 4x^3 + 12x^2 - 12x + 12} \\ 27x^3 - 21x^2 - 7x - 8 \\ \underline{27x^3 - 9x^2 - 9x - 9} \\ 12x^2 - 14x - 20 \end{array}$$

4. $(-2x^3 + 11x^2 - 8x - 7) \div (2x + 1)$

$$\begin{array}{r} -x^2 + 6x - 7 \\ \underline{-2x^3 - 2x^2 - 2x - 7} \\ 10x^2 + 10x \\ \underline{10x^2 + 10x - 10} \\ 0 \end{array}$$

Divide by using synthetic division.

5. $(9x^2 - 3x + 11) \div (x - 6)$

$$\begin{array}{r} 9x + 51 + \frac{317}{x-6} \\ \underline{9x^2 - 54x + 306} \\ 63x + 11 \\ \underline{63x - 378} \\ 389 \end{array}$$

6. $(3x^4 - 2x^2 + 1) \div (x + 2)$

$$\begin{array}{r} 3x^3 - 6x^2 + 10x - 20 + \frac{41}{x+2} \\ \underline{3x^4 + 6x^3 + 12x^2 + 24x + 42} \\ -8x^3 - 8x^2 - 23x - 41 \\ \underline{-8x^3 - 16x^2 - 16x - 32} \\ 8x^2 - 7x - 73 \end{array}$$

7. $(6x^5 - 3x^2 + x - 2) \div (x - 1)$

$$\begin{array}{r} 6x^4 + 6x^3 + 6x^2 + 3x + 4 \\ \underline{6x^5 - 6x^4 + 6x^3 - 6x^2 + 6x - 6} \\ 12x^2 + 9x - 8 \\ \underline{12x^2 - 12x + 12} \\ 21x - 4 \end{array}$$

8. $(-x^4 - 7x^3 + 6x^2 - 1) \div (x - 3)$

$$\begin{array}{r} -x^3 - 10x^2 - 24x - 72 \\ \underline{-x^4 + 3x^3 - 9x^2 + 27x - 216} \\ 4x^3 - 16x^2 - 24x - 217 \end{array}$$

Use synthetic substitution to evaluate the polynomial for the given value.

9. $P(x) = 4x^3 - 12x - 2$ for $x = 5$

$\underline{P(5) = 438}$

10. $P(x) = -3x^4 + 5x^3 - x + 7$ for $x = -2$

$\underline{P(-2) = -79}$

Solve.

11. The total weight of the cargo entering a seaport each year can be modeled by the function $G(t) = 0.2t^3 + 1000t^2 + 10t + 50,000$, where t is the number of years since the port was opened. The average weight of cargo delivered by each ship is modeled by the function $A(t) = 0.1t + 500$. Write an expression describing the number of ships entering the port each year.

$\underline{2t^2 + 100}$

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LESSON **Review for Mastery**
6-3 **Dividing Polynomials**

In arithmetic long division, you follow these steps: divide, multiply, subtract, and bring down. Follow these same steps to use long division to divide polynomials.

Divide: $(6x^2 + x + 8) \div (2x - 1)$.

Step 1 Divide the first term of the dividend, $6x^2$, by the first term of the divisor, $2x$.

$$2x - 1 \overline{)6x^2 + x + 8} \quad \text{Divide: } 6x^2 \div 2x = 3x.$$

$$\begin{array}{r} 3x \\ \underline{6x^2 - 3x} \\ 4x + 8 \end{array} \quad \text{Multiply the complete divisor: } 3x(2x - 1) = 6x^2 - 3x. \\ \text{Subtract and bring down.}$$

Step 2 Divide the first term of the difference, $4x$, by the first term of the divisor, $2x$.

$$2x - 1 \overline{)4x + 8} \quad \text{Divide: } 4x \div 2x = 2.$$

$$\begin{array}{r} 3x + 2 \\ \underline{6x^2 - 3x} \\ 4x + 8 \end{array} \quad \text{Multiply: } 3x(2x - 1) = 6x^2 - 3x. \\ \text{Divide: } 4x \div 2x = 2. \\ \underline{4x - 2} \\ 10 \end{array} \quad \text{Multiply the complete divisor: } 2(2x - 1) = 4x - 2. \\ \text{Subtract. Use the Distributive Property.}$$

Step 3 Write the quotient including the remainder.

$$(6x^2 + x + 8) \div (2x - 1) = 3x + 2 + \frac{10}{2x - 1}$$

Remember to use the Distributive Property when you subtract.

Use long division to divide.

1. $x + 2 \overline{)4x^2 + 7x + 6}$

$$\begin{array}{r} 4x - 1 + \frac{8}{x+2} \\ \underline{x + 2 \overline{)4x^2 + 7x + 6}} \\ -4x^2 + 8x \\ \underline{-4x^2 + 8x} \\ -x + 6 \end{array}$$

2. $x + 4 \overline{)2x^2 + 9x + 9}$

$$\begin{array}{r} 2x + 1 + \frac{5}{x+4} \\ \underline{x + 4 \overline{)2x^2 + 9x + 9}} \\ -2x - 16 \\ \underline{-2x - 16} \\ 25 \end{array}$$

3. $x - 5 \overline{)3x^2 - 5x - 50}$

$$\begin{array}{r} 3x + 10 \\ \underline{x - 5 \overline{)3x^2 - 5x - 50}} \\ -3x - 15 \\ \underline{-3x - 15} \\ -35 \end{array}$$

4. $3x + 2 \overline{)6x^2 + 7x - 6}$

$$\begin{array}{r} 2x + 1 - \frac{8}{3x+2} \\ \underline{3x + 2 \overline{)6x^2 + 7x - 6}} \\ -6x - 4 \\ \underline{-6x - 4} \\ 2 \end{array}$$

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