Chapter 11 Review

Objective [11.1a] Evaluate an algebraic expression by substitution.

Brief Procedure	Example	Practice Exercise
Substitute for the variable(s) and carry out the resulting calculation.	Evaluate $m - n$ for $m = 29$ and $n = 12$. Substitute 29 for m and 12 for n and carry out the subtraction. $m - n = 29 - 12 = 17$	1. Evaluate $\frac{x}{y}$ for $x = 72$ and $y = -9$. A. $-\frac{1}{8}$ B. -8 C. 63 D. 81

Objective [11.1b] Use the distributive laws to multiply expressions like 8 and $x - y$.

Brief Procedure	Example	Practice Exercise
For any numbers a, b, and c, $a(b + c) = ab + ac$ and $a(b - c) = ab - ac$.	Multiply: $5(2x - 3y + z)$. $5(2x - 3y + z)$ $= 5 \cdot 2x - 5 \cdot 3y + 5 \cdot z$ $= 10x - 15y + 5z$	2. Multiply: $3(x + 4y - 2z)$. A. $3x + 4y - 2z$ B. $3x + 12y + 6z$ C. $3x + 12y - 6z$ D. $3x - 12y - 6z$

Objective [11.1c] Use the distributive laws to factor expressions like $4x - 12$.

Brief Procedure	Example	Practice Exercise
Find the largest factor that is common to all the terms of the expression and factor it out.	Factor: $8a + 4b - 12c$. $8a + 4b - 12c$ $= 4 \cdot 2a + 4 \cdot b - 4 \cdot 3c$ $= 4(2a + b - 3c)$	3. Factor: $36m - 27n + 9p$. A. $3(12m - 9n + 3p)$ B. $36(m - 27n + 9p)$ C. $9(4m - 3n)$ D. $9(4m - 3n + p)$

Objective [11.1d] Collect like terms.

Brief Procedure	Example	Practice Exercise
Identify the terms with exactly the same variable, use the distributive laws to factor out the variable, and then simplify.	Collect like terms: $3x - 5y + 8x + y$. $3x - 5y + 8x + y$ $= 3x + 8x - 5y + y$ $= 3x + 8x - 5y + 1 \cdot y$ $= (3 + 8)x + (-5 + 1)y$ $= 11x - 4y$	4. Collect like terms: $6a - 4b - a + 2b$. A. $5a - 2b$ B. $2a + b$ C. $6a - 2b$ D. $5a + 6b$

Objective [11.2a] Solve equations using the addition principle.

Brief Procedure	Example	Practice Exercise
For any real numbers a, b, and c, $a = b$ is equivalent to $a + c = b + c$. Add the same number on both sides of the equation to get the variable alone. Since $a + (-c) = b + (-c)$ is equivalent to $a - c = b - c$, we can also subtract the same number on both sides of the equation.	Solve: $x + 4 = 9$. We subtract 4 on both sides of the equation to get x alone. $x + 4 = 9$ $x + 4 - 4 = 9 - 4$ $x + 0 = 5$ $x = 5$ The solution is 5.	5. Solve: $y - 3 = -1$. A. -4 B. -2 C. 2 D. 4

Objective [11.3a] Solve equations using the multiplication principle.

Brief Procedure	Example	Practice Exercise
For any real numbers a, b, and c, $c \neq 0$, $a = b$ is equivalent to $a \cdot c = b \cdot c$. Multiply by the same number on both sides of the equation to get the variable alone. For $c \neq 0$, $a \cdot \frac{1}{c} = b \cdot \frac{1}{c}$ is equivalent to $\frac{a}{c} = \frac{b}{c}$, so we can also divide by the same number on both sides of the equation.	Solve: $54 = -9y$. We divide by -9 on both sides of the equation to get y alone. $54 = -9y$ $\frac{54}{-9} = \frac{-9y}{-9}$ $-6 = 1 \cdot y$ $-6 = y$ The solution is -6.	6. Solve: $6x = -42$. A. 7 B. -7 C. -36 D. -48

Objective [11.4a] Solve equations using both the addition and the multiplication principles.

Brief Procedure	Example	Practice Exercise
First use the addition principle to isolate the term that contains the variable. Then use the multiplication principle to get the variable by itself.	Solve: $2x - 5 = 3$. $2x - 5 = 3$ $2x - 5 + 5 = 3 + 5$ $2x = 8$ $\frac{2x}{2} = \frac{8}{2}$ $x = 4$ The solution is 4.	7. Solve: $3y + 1 = -8$. A. $-\frac{7}{3}$ B. $-\frac{8}{3}$ C. -3 D. -11

Objective [11.4b] Solve equations in which like terms may need to be collected.

Brief Procedure	Example	Practice Exercise
If there are like terms on one side of the equation, collect them before using the addition or multiplication principle. If there are like terms on opposite sides of the equation, use the addition principle to get all terms with a variable on one side and all numbers on the other.	Solve: $2y - 1 = -3y - 8 + 2$. $2y - 1 = -3y - 8 + 2$ $2y - 1 = -3y - 6$ $2y - 1 + 1 = -3y - 6 + 1$ $2y = -3y - 5$ $2y + 3y = -3y - 5 + 3y$ $5y = -5$ $\frac{5y}{5} = \frac{-5}{5}$ $y = -1$ The solution is -1.	8. Solve: $3x - 5 - x = 6x + 7$. A. -3 B. -1 C. $\frac{1}{4}$ D. $\frac{3}{2}$

Objective [11.4c] Solve equations by first removing parentheses and collecting like terms.

Brief Procedure	Example	Practice Exercise
If an equation contains parentheses, first use the distributive laws to remove them. Then collect like terms, if necessary, and use the addition and multiplication principles to complete the solution of the equation.	Solve: $8b - 2(3b + 1) = 10$. $8b - 2(3b + 1) = 10$ $8b - 6b - 2 = 10$ $2b - 2 = 10$ $2b - 2 + 2 = 10 + 2$ $2b = 12$ $\frac{2b}{2} = \frac{12}{2}$ $b = 6$ The solution is 6.	9. Solve: $3(n - 4) = 2(n + 1)$. A. -5 B. -2 C. 5 D. 14

Objective [11.5a] Translate phrases to algebraic expressions.

Brief Procedure	Example	Practice Exercise
Learn which words translate to certain operation symbols. (See page 579 in the text.) Choose a variable or variables to correspond to the number or numbers involved. It can be helpful to try some numerical examples before writing the algebraic expression.	Translate to an algebraic expression: Four less than some number. Let $n =$ the number. Now if the number were 7, then the translation would be $7 - 4$. Similarly, if the number were 52, then the translation would be $52 - 4$. Thus, we see from these numerical examples, that if the number were n, the translation would be $n - 4$.	10. Translate to an algebraic expression: Three times some number. A. $n + 3$ B. $n - 3$ C. $3 - n$ D. $3n$

Objective [11.5b] Solve applied problems by translating to equations.		
Brief Procedure	Example	Practice Exercise
Use the five-step problem solving process.	A 12-ft pipe is cut into three pieces. The second piece is three times as long as the first. The third piece is twice as long as the first. How long is each piece? 1. *Familiarize.* Let $x =$ the length of the first piece of pipe. Then $3x =$ the length of the second piece and $2x =$ the length of the third piece. 2. *Translate.* We use the fact that the sum of the lengths is 12 feet. $\underbrace{\text{Length of first piece}}_{\downarrow\; x}\ \text{plus}\ (\downarrow +)\ \underbrace{\text{length of second piece}}_{\downarrow\; 3x}\ \text{plus}\ (\downarrow +)$ $\underbrace{\text{Length of third piece}}_{\downarrow\; 2x}\ \text{is}\ (\downarrow =)\ \underbrace{\text{total length}}_{\downarrow\; 12}$ 3. *Solve.* We solve the equation. $x + 3x + 2x = 12$ $6x = 12$ $\frac{6x}{6} = \frac{12}{6}$ $x = 2$ If $x = 2$, then $3x = 3 \cdot 2$, or 6, and $2x = 2 \cdot 2$, or 4. 4. *Check.* The second piece, 6 ft is three times as long as the first, 2 ft, and the third piece, 4 ft, is twice as long as the first. Also, the lengths total 2 ft + 6 ft + 4 ft, or 12 ft. The answer checks. 5. *State.* The first piece of pipe is 2 ft long, the second piece is 6 ft, and the third piece is 4 ft.	11. The perimeter of a rectangular rug is 40 ft. The width is 4 ft less than the length. Find the dimensions of the rug. A. The width is 8 ft. B. The width is 10 ft. C. The width is 12 ft. D. The width is 16 ft.