Expand by using the distributive property:

25. *(29)* $p^0x^{-1}(x - 2x^0)$

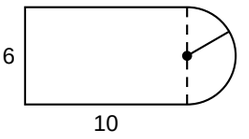
26. *(29)* $y^0x^{-4}(x^4 - 5y^4x^4)$

Evaluate:

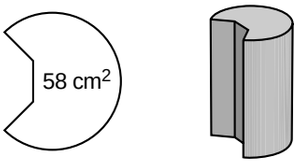
27. *(19)* $-a^2 - 3a(a - b)$ if $a = -2$ and $b = -1$

28. *(29)* $-c(ac - a^0)$ if $a = -3$ and $c = 4$

29. *(3)* Find the perimeter of this figure. Corners that look square are square. Dimensions are in feet.



30. *(20)* A base of the right solid has an area of 58 cm^2. The height of the right solid is 15 cm. Find the volume of the right solid.



LESSON 32 Word Problems

To solve word problems, we look for statements in the problems that describe equal quantities. Then we use algebraic phrases and equals signs to write equations that make the same statements of equality. We will begin by solving problems that contain only one statement of equality. These problems require that we write only one equation. Later, we will encounter problems that contain more than one statement of equality. These problems will require more than one equation for their solution.

We will avoid the use of the letters *x* and *y* in writing these equations. We will try to use variables whose meaning is easy to remember. The problems in this lesson discuss some unknown number. We will use the letter *N* to represent the unknown number.

example 32.1 The sum of twice a number and 13 is 75. Find the number.

solution We will use *N* to represent the unknown number. **The word *is* means "equal to." Thus, the sum of twice a number and 13 equals 75.**

$$2N + 13 = 75 \qquad \text{equation}$$

We can solve this equation by adding –13 to both sides and then dividing both sides by 2.

$$\begin{array}{rrl} 2N + 13 = & 75 & \text{equation} \\ \quad - 13 \quad\; & -13 & \text{added } -13 \text{ to both sides} \\ \hline 2N \quad\; = & 62 & \end{array}$$

$$N = \mathbf{31} \qquad \text{divided both sides by 2}$$

Solutions to word problems should always be checked to see if they really do solve the problem.

$$2(31) + 13 = 75 \;\rightarrow\; 62 + 13 = 75 \;\rightarrow\; 75 = 75 \qquad \text{Check}$$

example 32.2 Find a number such that 13 less than twice the number is 137.

solution We will use N to represent the unknown number. Then twice the unknown number is $2N$ and 13 less than that is $2N - 13$.

$$\begin{array}{rrl} 2N - 13 &= 137 & \text{equation} \\ +\ 13 & +13 & \text{added 13 to both sides} \\ \hline 2N & = 150 & \end{array}$$

$$N = \mathbf{75} \qquad \text{divided both sides by 2}$$

$$2(75) - 13 = 137 \rightarrow 150 - 13 = 137 \rightarrow 137 = 137 \qquad \text{Check}$$

example 32.3 Find a number such that if 5 times the number is decreased by 14, the result is twice the opposite of the number.

solution If we use N for the number, then $2(-N)$ will represent twice the opposite of the number.

$$5N - 14 = 2(-N) \qquad \text{equation}$$

$$\begin{array}{rrl} 5N - 14 &= -2N & \text{multiplied} \\ 2N + 14 & 2N + 14 & \text{added } 2N + 14 \text{ to both sides} \\ \hline 7N & = 14 & \end{array}$$

$$N = \mathbf{2} \qquad \text{divided both sides by 7}$$

$$5(2) - 14 = 2(-2) \rightarrow 10 - 14 = -4 \rightarrow -4 = -4 \qquad \text{Check}$$

example 32.4 Find a number which decreased by 18 equals 5 times its opposite.

solution Again we use N for the number and $-N$ for its opposite.

$$N - 18 = 5(-N) \qquad \text{equation}$$

$$\begin{array}{rrl} N - 18 &= -5N & \text{multiplied} \\ 5N + 18 & 5N + 18 & \text{added } 5N + 18 \text{ to both sides} \\ \hline 6N & = 18 & \end{array}$$

$$N = \mathbf{3} \qquad \text{divided both sides by 6}$$

$$3 - 18 = 5(-3) \rightarrow 3 - 18 = -15 \rightarrow -15 = -15 \qquad \text{Check}$$

example 32.5 We get the same result if we multiply a number by 3 *or* if we multiply the number by 5 and then add 2. Find the number.

solution The statement of the problem leads to the following equation.

$$\begin{array}{rrl} 3N &= 5N + 2 & \text{equation} \\ -5N & -5N & \text{added } -5N \text{ to both sides} \\ \hline -2N & = 2 & \end{array}$$

$$N = \mathbf{-1} \qquad \text{divided both sides by } -2$$

$$3(-1) = 5(-1) + 2 \rightarrow -3 = -5 + 2 \rightarrow -3 = -3 \qquad \text{Check}$$

practice

a. Four times a number decreased by 8 equals 92. Find the number. Check your answer.

b. If the product of 4 and a number is decreased by 12, the result is twice the opposite of the number. Find the number. Check your answer.

problem set 32

1. *(15)* (a) What do we call the total area of all exposed surfaces of a geometric solid?

(b) How do you find the lateral surface area of any right solid?

2. *(5)* (a) The set {1, 2, 3, …} represents what set of numbers?

(b) The set {0, 1, 2, 3, …} represents what set of numbers?

(c) The set {…, –3, –2, –1, 0, 1, 2, 3, …} represents what set of numbers?

3. *(4)* Use two unit multipliers to convert 1828 centimeters to feet.

4. *(10)* Use two unit multipliers to convert 57 square feet to square yards.

5. *(3)* The circumference of a circle is 14π centimeters. Find the diameter of the circle.

6. *(32)* The sum of twice a number and 17 is 55. Find the number.

7. *(32)* Find a number such that 16 less than twice the number is 84.

8. *(30)* What decimal part of 25 is 1.25?

Simplify:

9. *(29)* $(-5)^{-2}$

10. *(29)* $\dfrac{1}{(-4)^{-3}}$

11. *(29)* -5^0

12. *(28)* $2\frac{1}{9}$ of what number is 76?

13. *(28)* If $g(x) = -5x - 4$, find $g(-5)$.

Solve:

14. *(25)* $2\frac{1}{2}x - 5 = 15$

15. *(25)* $2\frac{1}{4}k + \frac{1}{4} = \frac{1}{8}$

16. *(27)* $0.025x + 0.03 = 1.03$

17. *(31)* $3p - 4 - 6 = -2(p - 5)$

18. *(31)* $-(x - 3) - 2(x - 4) = 7$

19. *(23)* (a) What value of x satisfies the equation $2x - 1 = 7$?

(b) What value of x satisfies the equation $3x + 5 = -7$?

(c) Are the solutions of both equations the same?

(d) Given your answer to part (c), are the two equations equivalent?

20. *(21)* Simplify by adding like terms: $k^2p^{-4}y - 5k^2yp^{-4} + 2yk^2p^{-4} - 5k^2yp^{-4}$

Expand by using the distributive property:

21. *(29)* $2x^{-2}y^0\left(x^2y^0 - 4x^{-6}y^4\right)$

22. *(29)* $\left(x^2 - 4x^5y^{-5}\right)3p^0x^{-2}$

Evaluate:

23. *(29)* $-a^3\left(a^0 - b\right)$ if $a = -2$ and $b = 4$

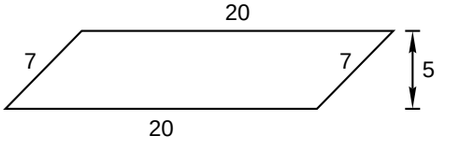
24. *(29)* $x\left(x^0 - y\right)(y - 2x)$ if $x = -3$ and $y = 5$

Simplify:

25. *(19)* $-3^2 + (-3)^3 - 3^0 - |-3 - 3|$

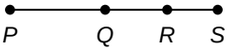
26. *(13)* $\dfrac{-3[5(-2 - 1) - (6 - 3)]}{2(-3 - 4)}$

27. *(8)* Find the area of this parallelogram. Dimensions are in meters.

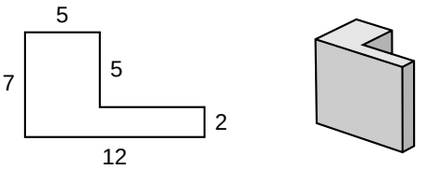


28. *(9)* Simplify: $\dfrac{0.09338}{-0.046}$

29. *(1)* *PS* is $14\frac{2}{5}$ kilometers. *QR* is $4\frac{3}{10}$ kilometers. *RS* is $3\frac{1}{2}$ kilometers. Find *PQ*.



30. *(15)* A base of the right prism 10 inches high is shown. Find the surface area of the right prism. All angles are right angles. Dimensions are in inches. (Remember that the lateral surface area of a right prism is equal to the perimeter of a base times the height.)



LESSON 33 Products of Prime Factors • Statements About Unequal Quantities

33.A products of prime factors

The number 6 can be composed by multiplying the two counting numbers 3 and 2.

$$3 \cdot 2 = 6$$

Because 6 can be composed by multiplying two counting numbers that are both greater than 1, we say that 6 is a **composite number.** The number 35 is also a composite number because it can be composed as the product of the counting numbers 5 and 7.

$$5 \cdot 7 = 35$$

The number 1 must be one of the factors if we wish to compose 17 by multiplying.

$$17 \cdot 1 = 17$$

The number 1 must also be a factor if we wish to compose either 3 or 11 or 23.

$$1 \cdot 3 = 3 \qquad 1 \cdot 11 = 11 \qquad 1 \cdot 23 = 23$$

Since these numbers can be composed only if 1 is one of the factors, we do not call these numbers composite numbers. We call them **prime numbers.**

A prime number is a counting number greater than 1 whose only counting number factors are 1 and the number itself.

The number 12 can be written as a product of integral factors in four different ways.

(a) $12 \cdot 1$ (b) $4 \cdot 3$ (c) $2 \cdot 6$ (d) $2 \cdot 2 \cdot 3$