4. When translating a sentence into an equation, translate the word is as “=.” Always true

5. If a rope 19 inches long is cut into two pieces and one of the pieces has length \( x \) inches, then the length of the other piece can be expressed as \( (x - 19) \) inches. Never true

6. In addition to a number, the answer to an application problem must have a unit, such as meters, dollars, minutes, or miles per hour. Always true

4.1 Exercises

Translate a sentence into an equation and solve

1. When we translate a sentence into an equation, the word is translates into the ___2___ sign. equals

2. The sum of two numbers is twelve. If \( n \) represents one of the numbers, then the other number is represented by ___2___. \( 12 - n \)

Translate into an equation and solve.

3. The difference between a number and fifteen is seven. Find the number: \( n - 15 = 7; n = 22 \)

4. The sum of five and a number is three. Find the number. \( 5 + n = 3; n = -2 \)

5. The product of seven and a number is negative twenty-one. Find the number. \( 7n = -21; n = -3 \)

6. The quotient of a number and four is two. Find the number. \( \frac{n}{4} = 2; n = 8 \)

7. Four less than three times a number is five. Find the number. \( 3n - 4 = 5; n = 3 \)

8. The difference between five and twice a number is one. Find the number. \( 5 - 2n = 1; n = 2 \)

9. Four times the sum of twice a number and three is twelve. Find the number. \( 4(2n + 3) = 12; n = 0 \)

10. Twenty-one is three times the difference between four times a number and five. Find the number. \( 21 = 3(4n - 5); n = 3 \)

11. Twelve is six times the difference between a number and three. Find the number. \( 12 = 6(n - 3); n = 5 \)

12. The difference between six times a number and four times the number is negative fourteen. Find the number. \( 6n - 4n = -14; n = -7 \)

13. Twenty-two is two less than six times a number. Find the number. \( 22 = 6n - 2; n = 4 \)
14. Negative fifteen is three more than twice a number. Find the number.
\[-15 = 2n + 3; n = -9\]

15. Seven more than four times a number is three more than two times the number. Find the number.
\[4n + 7 = 2n + 3; n = -2\]

16. The difference between three times a number and four is five times the number. Find the number.
\[3n - 4 = 5n; n = -2\]

17. Eight less than five times a number is four more than eight times the number. Find the number.
\[5n - 8 = 8n + 4; n = -4\]

18. The sum of a number and six is four less than six times the number. Find the number.
\[n + 6 = 6n - 4; n = 2\]

19. Twice the difference between a number and twenty-five is three times the number. Find the number.
\[2(n - 25) = 3n; n = -50\]

20. Four times a number is three times the difference between thirty-five and the number. Find the number.
\[4n = 3(35 - n); n = 15\]

21. The sum of two numbers is twenty. Three times the smaller is equal to two times the larger. Find the two numbers.
\[3n = 2(20 - n); 8 \text{ and } 12\]

22. The sum of two numbers is fifteen. One less than three times the smaller is equal to the larger. Find the two numbers.
\[3n - 1 = 15 - n; 4 \text{ and } 11\]

23. The sum of two numbers is eighteen. The total of three times the smaller and twice the larger is forty-four. Find the two numbers.
\[3n + 2(18 - n) = 44; 8 \text{ and } 10\]

24. The sum of two numbers is two. The difference between eight and twice the smaller number is two less than four times the larger. Find the two numbers.
\[8 - 2n = 4(2 - n) - 2; -1 \text{ and } 3\]

25. The sum of two numbers is fourteen. One number is ten more than the other number. Write two different equations that can be used to find the numbers by first writing an equation in which \(n\) represents "the larger number" and then writing an equation in which \(n\) represents "the smaller number."

Answers may vary. For example: \(n + n + 10 = 14; n + n - 10 = 14\)

26. The sum of two numbers is seven. Twice one number is four less than the other number. Which of the following equations does not represent this situation?
   a. \(2n = 7 - n - 4\)
   b. \(2(7 - x) = x - 4\)
   c. \(2x + 4 = 7 - x\)
   d. \(2n - 4 = 7 - n\)

2 Application problems

27. The number of calories in a cup of low-fat milk is two-thirds the number of calories in a cup of whole milk. In this situation, let \(n\) represent the number of calories in a cup of \(\_\_\_\_\_\_\_\_\_\_\) milk, and let \(\frac{2}{3}n\) represent the number of calories in a cup of \(\_\_\_\_\_\_\_\_\_\_\_\) milk. whole; low-fat
28. A cup of low-fat milk has 100 calories. Use the information in Exercise 27 to write an equation that can be used to find the number of calories in a cup of whole milk: \[ ? \text{?} = \frac{2}{3} \cdot 100; \]

Write an equation and solve.

29. Depreciation As a result of depreciation, the value of a car is now $9600. This is three-fifths of its original value. Find the original value of the car. $16,000

30. Structures The length of the Royal Gorge Bridge in Colorado is 320 m. This is one-fourth the length of the Golden Gate Bridge. Find the length of the Golden Gate Bridge. 1280 m

31. Nutrition One slice of cheese pizza contains 290 calories. A medium-size orange has one-fifth that number of calories. How many calories are in a medium-size orange? 58 calories

32. History John D. Rockefeller died in 1937. At the time of his death, Rockefeller had accumulated a wealth of $1,400 million, which was equal to one-sixty-fifth of the gross national product of the United States at that time. What was the U.S. gross national product in 1937? (Source: The Wealthy 100: A Ranking of the Richest Americans, Past and Present) $91,000 million

33. Agriculture A soil supplement that weighs 18 lb contains iron, potassium, and a mulch. There is fifteen times as much mulch as iron and twice as much potassium as iron. Find the amount of mulch in the soil supplement. 15 lb

34. Commissions A real estate agent sold two homes and received commissions totaling $6000. The agent's commission on one home was one and one-half times the commission on the second home. Find the agent's commission on each home. $2400 and $3600

35. Safety Loudness, or the intensity of sound, is measured in decibels. The sound level of a television is about 70 decibels, which is considered a safe hearing level. A food blender runs at 20 decibels higher than a TV, and a jet engine's decibel reading is 40 less than twice that of a blender. At this level, exposure can cause hearing loss. Find the intensity of the sound of a jet engine. 140 decibels

36. Education A university employs a total of 600 teaching assistants and research assistants. There are three times as many teaching assistants as research assistants. Find the number of research assistants employed by the university. 150 research assistants

37. Consumerism The purchase price of a new big-screen TV, including finance charges, was $3276. A down payment of $450 was made. The remainder was paid in 24 equal monthly installments. Find the monthly payment. $117.75

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**Point of Interest**

The low-frequency pulses or whistles made by blue whales have been measured at up to 188 decibels, making them the loudest sounds produced by a living organism.