

Solving Applications Using Systems

Intermediate Algebra

NAME _____

EXAMPLE:

Seven times a number is 50 more than three times a second number, while 12 times the first number is 61 less than 7 times the second number. Find the two numbers. (Follow steps A, B, C, D.)

A. Represent the unknowns with variables:

Let x = the first number
Let y = the second number

B. Write a system

$$\begin{cases} 7x = 3y + 50 \\ 12x = 7y - 61 \end{cases}$$

C. Solve the system.

Multiply both sides of Equation 1 by .
Multiply both sides of Equation 2 by -3.

$$\begin{cases} 7x - 3y = 50 \\ 12x - 7y = -61 \end{cases}$$

$$\begin{cases} 49x - 21y = 350 \\ -36x + 21y = 183 \end{cases}$$

Add, term by term $13x = 533$

Divide by 13 $x = 41$

Find y by substitution in Equation 1

$$7(41) - 3y = 50$$

$$287 - 3y = 50$$

$$-3y = -237$$

$$y = 79$$

D. The first number is 41 and the second number is 79. (Always answer a word problem with a complete English sentence.)

E. To check, check in the wording of the problem.

Is 7(41) fifty more than 3(79)?

$$287 \stackrel{?}{=} 50 + 237$$

Yes, $287 = 287$

Is 12 (41) sixty-one less than 7(79)?

$$12(41) \stackrel{?}{=} 7(79) - 61$$

Yes, $492 = 492$

Problems:

1. Four times a number is 9 less than 3 times a second number, while 3 times the first number is 1 less than twice the second number. Find the two numbers.

Answer _____

2. A man rowed 9 miles up a river in 3 hours and rowed back in $1\frac{1}{2}$ hours. Find the rate of the current and the man's rate of rowing in still water.

Answer _____

3. A purse contains \$1.55 in nickels and quarters. If the quarters were nickels and the nickels were quarters, the value of the coins would be \$4.15. How many nickels and how many quarters are in the purse?

Answer _____

4. A rectangular garden is 18 feet longer than it is wide. The perimeter of the garden is 156 feet. Find the dimensions of the garden.

Answer _____

5. If 7 pounds of oranges and 4 pounds of apples cost \$8.75 and 9 pounds of apples cost \$8.82, what is the price per pound of the oranges and of the apples?

Answer _____

6. Flying with the wind, a plane took 2 hours and 20 minutes to go 630 miles. Flying against the wind on the return trip, the plane took 3 hours. Find the speed of the wind and the speed of the plane in still air.

Answer _____

7. Three times a number is 2 more than twice a second number, while 5 times the first number is 22 more than 3 times the second number. Find the two numbers.

Answer _____

WORD PROBLEMS

1. One number is 27 more than another. If their sum is 141, what are the numbers?
2. The sum of two numbers is 243 and one number is twice the other. Find the numbers.
3. One number is 14 more than the other. Twice the smaller is 5 less than the larger. Find the numbers.
4. The sum of two consecutive integers is 71. Find the numbers.
5. If twice a certain integer is added to 3 times the next consecutive integer, the sum is 253. Find the numbers.
6. The length of a rectangle is 4 more than twice the width. The perimeter is 80. Find the length and width.
7. The perimeter of a triangle is 43. The length of the second side is 5 more than the first, and the third is 3 more than the second. Find the length of each side.
8. The perimeter of a rectangle is 56. If the length is three more than twice the width, find the dimensions. (Distance may not come out even.)
9. The length of a rectangle is three less than 5 times the width. The perimeter is 10 times the width. Find the dimensions and the perimeter.
10. In a triangle the sum of the angles is 180° . The second angle of a particular triangle is 75° more than the first, and the third is 60° more than the first. Find the angles.
11. In triangle ABC, angle A is 20° more than twice angle B. Angle C is 10° more than three times angle A. Find the measure of the angles.
12. A number of quarters, three times as many dimes, and 15 pennies are worth \$1.80. How many of each coin are there?
13. A number of quarters, four times as many pennies as quarters and 6 more dimes than pennies are worth \$3.36. How many of each are there?
14. A box contains \$8 in nickels, dimes, and quarters. There are three times as many nickels as quarters, and the number of dimes is 4 less than the number of nickels. How many of each coin are there?
15. A certain number of dimes, four times as many pennies, and 5 nickels are worth \$1.23. Find the total number of coins.

16. A certain number of pennies, four times as many dimes as pennies, and a number of quarters which is 16 less than twice the number of dimes, are worth \$24.92. How many of each are there?
17. A sum of money consists of nickels, dimes, and quarters amounting to \$1.90. If there were half as many quarters as nickels, and three more nickels than dimes, how many of each are there?
18. An equilateral triangle and a rectangle are formed from a piece of wire 178 in long. The width of the rectangle is 7 inches shorter than the side of the triangle, and the length of the rectangle is 12 in longer than the width of the rectangle. What are the lengths of the sides of the triangle, and the sides of the rectangle?
19. If the first of three consecutive even integers is divided by 4, the second by 6, and the third by 8, the sum of the quotients is 29. Find the numbers.
20. If 52 coins, some dimes, and the rest quarters are worth \$10, how many of each are there?
21. The value of 28 coins, consisting of nickels and dimes, is \$1.95. How many of each kind are there?
22. The supplement of an angle is 4 times the angle. Find the angle and its supplement.
23. The complement of an angle is 20° more than the angle. Find the angle and its complement.
24. What angle has a supplement 18° more than three times its complement?
25. A garden 45 m square is in the center of a rectangular park 150 m longer than it is wide. The perimeter of the park is 10 m less than 4 times that of the garden. Find the dimensions of the park.
26. Two boys leave town at 6 am driving in opposite directions. If one boy travels at an average speed of 54 miles per hour, and the other travels at an average speed of 60 mph, at what time will they be 513 miles apart?
27. Two motorists start toward each other at 4:30 pm from towns which are 225 miles apart. If their respective average speeds are 30 mph and 45 mph, at what time will they meet?
28. Two cars start toward each other from points 200 miles apart. If one car travels 2 mph faster than the other, and if it takes 4 hours for the cars to meet, what is the average speed of each car?
29. Two cars starting at the same point and traveling in opposite directions were 240 miles apart at the end of 4 hours. If one car travelled 6 mph faster than the other, find the rate of each.

30. Two cars start together and travel in the same direction one going three times as fast as the other. At the end of two hours they are 100 miles apart. How fast is each travelling?
31. A plane travels 450 miles in the same time that a train travels 60 miles. If the plane goes 416 mph faster than the train find each rate.
32. A man rode a bicycle for 10 miles and then hiked for 4 miles at a rate which was 3 mph less than his riding rate. If the time for each part of the trip was the same, find each rate.
33. A scientist earns \$30 per hour and his assistant earns \$20 per hour. For their work at which the assistant worked 12 hours less than the scientist, they received a total of \$1450. How much did each earn?
34. When each side of a square is decreased by 6 inches, the area is decreased by 84 square inches. Find the length of the side of the original square.
35. A woman has \$6.48 in pennies, nickels, and dimes. There are 102 coins in all and twice as many dimes as pennies. How many of each are there?
36. The sum of the squares of 3 consecutive even integers is three times the square of the third integer minus 76. Find the integers.

Word Problems

Answers

- | | |
|---|--|
| 1. 57, 84 | 19. 52, 54, 56 |
| 2. 81, 162 | 20. 32Q, 20D |
| 3. 9, 23 | 21. 17N, 11D |
| 4. 35, 36 | 22. Angle = 36° , supp. = 144° |
| 5. 50, 51 | 23. Angle = 35° , comp. = 55° |
| 6. 28, 12 | 24. 54° |
| 7. 10, 15, 18 | 25. W = 100 m, l = 250 m |
| 8. $8\frac{1}{3}$, $19\frac{2}{3}$ | 26. 10:30 am |
| 9. 3, 12, 30 | 27. 7:30 pm |
| 10. 15° , 90° , 75° | 28. 24, 26 mph |
| 11. 40° , 10° , 130° | 29. 27, 33 mph |
| 12. 3Q, 9D | 30. 25, 75 mph |
| 13. 4Q, 22D, 16P | 31. T = 64 mph, P = 480 mph |
| 14. 12Q, 32D, 36 N | 32. 5, 2 mph |
| 15. 7D, 28P, 40 Total | 33. S: 33.8 hrs, \$1014; A: 21.8 hrs, \$436 |
| 16. 80Q, 48D, 12P | 34. 10 in. |
| 17. 4Q, 5D, 8N | 35. 23P, 46D, 33N |
| 18. w = 19", l = 31:, triangle = 26" | 36. 4, 6, 8 |

APPLICATIONS

Intermediate Algebra

NAME _____

1. An overnight mail service charges \$3.60 for the first six ounces and \$.45 for each additional ounce or fraction of an ounce. Find the number of ounces in a package that costs \$7.65 to deliver.

Answer _____

2. A collection of 56 coins has a value of \$4.00. The collection contains only nickels and dimes. Find the number of dimes in the collection.

Answer _____

3. Find three consecutive odd integers such that three times the middle integer is seven more than the sum of the first and third integers.

Answer _____

4. A shopkeeper wishes to combine coffee costing \$5.50 per pound with coffee costing \$3.00 per pound. How many pounds of each should be used to make 40 lb of a blend costing \$4.00 per pound?

Answer _____

5. A ferry leaves a harbor and travels to a resort island at an average speed of 18 mph. ON the return trip, the ferry travels at an average speed of 12 mph due to fog. The total trip is 6 hours. How far is the island from the harbor?

Answer _____

6. Two investments earn an annual income of \$765. One investment earns an annual simple interest rate of 8.5%, while the other investment earns an annual simple interest rate of 10.2%. The total amount invested is \$8,000. How much is invested in each account?

Answer _____

7. How many pounds of 12% aluminum allow must be mixed with 400 lb of a 30% aluminum alloy to make a 20% aluminum alloy?

Answer _____