# Solve Problems Using Systems of Equations

Name: _____

## Prerequisite: Use Substitution to Solve Systems of Equations

**Study the example problem showing how to use substitution to solve a system of equations. Then solve problems 1–7.**

### Example

Use substitution to solve this system of equations.

$y + 3x = -4$
$y = x + 4$

The second equation tells you that $y = x + 4$, so you can substitute $x + 4$ for $y$ in the first equation and solve for $x$.

$$\begin{aligned} \mathbf{y} + 3x &= -4 \\ \mathbf{(x + 4)} + 3x &= -4 \\ 4x + 4 &= -4 \\ 4x &= -8 \\ x &= -2 \end{aligned}$$

Now you can find the value of $y$. You can substitute $-2$ for $x$ into either equation and solve for $y$. Try using the second equation.

$$\begin{aligned} y &= \mathbf{x} + 4 \\ y &= \mathbf{-2} + 4 \\ y &= 2 \end{aligned}$$

The solution is $(-2, 2)$.

**1** Explain why you substitute $x + 4$ for $y$ in the first equation of the system in the example.

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**2** Once you know the value of one variable in a system of equations, how can you find the value of the second variable?

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**3** Look at the system of equations at the right. Which variable would you find the value of first? Explain your reasoning and solve for that variable.

$4y + x = 12$
$x = 2y$

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_____

**Solve.**

**4** Use substitution to solve the system of equations.

$2y - x = -9$
$y = 2x - 3$

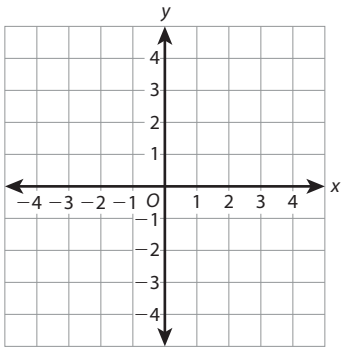
***Show your work.***

*Solution:* _____

**Use the system of equations at the right for problems 5–6.**

$y = 2x - 4$
$y = -x + 2$

**5** Graph the system of equations. What ordered pair appears to be the solution?

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**6** Solve the system of equations algebraically to check your solution to problem 5.

***Show your work.***

*Solution:* _____

**7** Tom's work to solve a system of equations is shown. Do you agree with Tom's statement about the solution? Explain. Describe the graph of the system of equations.

| System | Using Substitution |
|---|---|
| $y = -2x + 1$ | $2x + (-2x + 1) = 3$ |
| $2x + y = 3$ | $1 = 3$ |

The system has no solution.

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Name: _____

## Solve Real-World Problems

**Study the example problem showing how to use a system of equations to solve a real-world problem. Then solve problems 1–7.**

### Example

Oceanview Hotel charges $100 per day plus a one-time fee of $40. Beachside Hotel charges $110 per day. After how many days will the costs at the two hotels be equal?

Start by writing a system of equations to model the problem. Let $c$ be the cost and $d$ be the number of days.

Total cost for Oceanview: $c = 100d + 40$
Total cost for Beachside: $c = 110d$

Use substitution to solve the system. The second equation tells you that $c = 110d$, so you can substitute $110d$ for $c$.

$$c = 100d + 40$$
$$110d = 100d + 40 \qquad \text{Substitute } 110d \text{ for } c.$$
$$10d = 40$$
$$d = 4$$

The costs at the hotels will be the same after 4 days.

**1** Explain what the equation $110d = 100d + 40$ represents in the context of the example problem.

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**2** Suppose Oceanview Hotel changes their fee to $45 and Beachside Hotel changes their daily rate to $115. Write new equations for the total costs for the two resorts.

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_____

**3** Solve the system of equations formed by the equations you wrote in problem 2. After how many days would the total costs at the two resorts be the same?

_____

**Solve.**

**4** Roberto got $30 for his birthday. He decides to save that amount and add $5 to his savings each week. Jack starts saving the same day as Roberto and puts $8 in his savings each week. After how many weeks will the boys have the same amount in savings?

***Show your work.***

*Solution:* _____

**Use this situation for problems 5–6.**

Julia earns $6 an hour babysitting and earns $5 an hour walking dogs. She earned $43 after working a total of 8 hours at her two jobs.

**5** Complete the system of equations below to represent the situation. Let $b$ = the number of hours that Julia babysits and $d$ = the number of hours she walks dogs.

____ + ____ = 8 ____ + ____ = 43

**6** Solve the system of equations from problem 5 to find the number of hours Julia worked at each job.

_____

**7** Consider the situation at the right. Write a question and a system of equations for the situation. Then answer your question by solving the system of equations.

Trisha and Yoshi are at the start of a trail. Trisha walks 500 feet before Yoshi starts. Trisha walks 350 feet per minute, and Yoshi walks 430 feet per minute.

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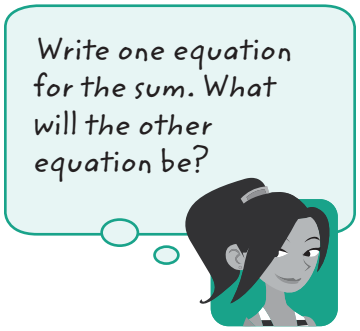
Name: _____

## Solve Problems Using Systems of Equations

**Solve the problems.**

**1** The sum of two numbers is 27. One number is 3 more than the other number. Write and solve a system of equations to find the two numbers.

***Show your work.***




*Solution:* _____

**2** Roberta has $4.00 in dimes and quarters. She has 5 more dimes than quarters. Write a system of equations that you could use to find how many dimes and quarters she has.

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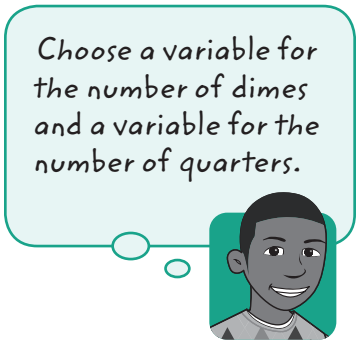


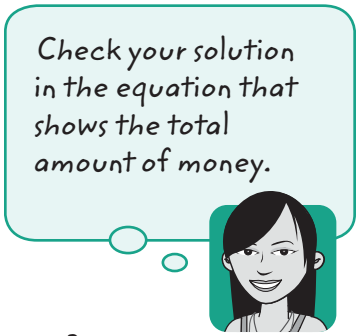

**3** Use the system of equations you wrote in problem 2 to find how many dimes and quarters Roberta has.

**A** 10 dimes and 15 quarters

**B** 10 dimes and 35 quarters

**C** 15 dimes and 10 quarters

**D** 15 dimes and 35 quarters




Dennis chose **A** as the correct answer. How did he get that answer?

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**Solve.**

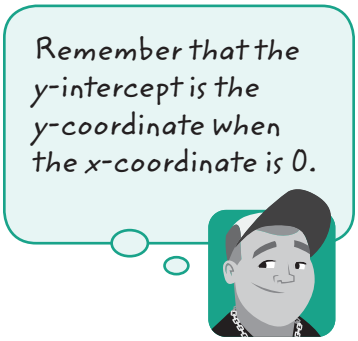
**4** Line *a* passes through the points (−3, −2) and (0, 4). Line *b* passes through the points (−2, −3) and (0, 1). Tell whether each statement is *True* or *False*.

**a.** Lines *a* and *b* intersect. ☐ True ☐ False

**b.** Lines *a* and *b* have different slopes. ☐ True ☐ False

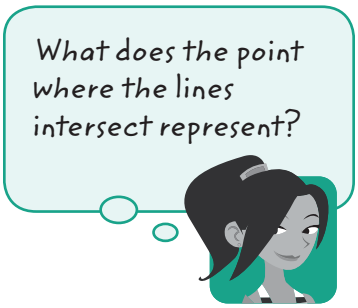
**c.** Lines *a* and *b* have different *y*-intercepts. ☐ True ☐ False

**d.** Lines *a* and *b* are parallel. ☐ True ☐ False




**5** The Parks and Recreation Department in your town offers a season pass for $150.

- With the season pass you pay $5 per session to use the town's tennis courts.
- Without the season pass you pay $15 per session to use the tennis courts.




***Part A***

Write a system of equations to represent the situation.

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***Part B***

Graph your system of equations. How many times do you need to use the tennis courts for the season pass to save you money? Explain.

*Solution:* _____

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