

Unit 7: Solving Systems of Linear Equations Algebraically**7.1 Solving Systems of Linear Equations by Substitution****Substitution Method:**

Ex. Solve $4x + 5y = 26$
 $3x = y - 9$

- Isolate a single variable in one of the two equations (If possible choose a variable with a coefficient of 1)
- Substitute the expression into the other equation and solve one of the variables
- Substitute the first variable solution into either original equation and solve for the remaining variable
- Verify your solution by substituting into both original equations

Ex. Solve $2x + y = 13$
 $x - 0.4y = -16$

Ex. Solve $\frac{2}{3}x + \frac{3y}{5} = -2$
 $\frac{x}{6} - \frac{y}{2} = -7$

Ex. At a dance recital, there were 220 people. Tickets cost \$9 for an adult and \$6 for a child. The dance collected \$1614 in ticket sales. How many adults and how many children attended the recital?

7.2 Solving Systems of Linear Equations by Elimination

Elimination Method:

Ex. Solve
$$\begin{aligned} 6x &= 24 - 5y \\ 3y + 4x &= 12 \end{aligned}$$

- Rearrange the equations so that like variables appear in the same position in both equations. The most common form is $ax + by = c$.
- Determine which variable to eliminate. If necessary, multiply one or both equations by a constant to eliminate the variable by addition or subtraction.
- Solve for the remaining variable.
- Solve for the second variable by substituting the value for the first variable into one of the original equations.
- Verify your answer by substituting each value into both original equations.

Ex. Solve
$$\begin{aligned} 3a - 5b &= -9 \\ 4a + 5b &= 23 \end{aligned}$$

Ex. Solve
$$\begin{aligned} y &= 4x + 11 \\ x - y &= 1 \end{aligned}$$

Ex. Connor downloaded two orders of games and songs. The first order consisted of five games and four songs for \$26. The second order consisted of three games and two songs for \$15. All games cost the same amount and all songs cost the same amount. Write a system of linear equations. Then, determine the cost of one song and the cost of one game.

Ex. The perimeter of a rectangular garden is 17 m. Triple the length is 2.46 m longer than five times the width. Sketch and label a diagram. Create a system of linear equations to determine the dimensions of the rectangle. Solve the system using elimination.

Why Are There Rules in Croquet?

Solve each problem below using a system of two equations in two variables. Find the solution in the answer column and notice the three letters next to it. Write these letters in the three boxes at the bottom of the page that contain the number of that exercise.



- ① The sum of two numbers is 90. Their difference is 18. Find the numbers.
- ② The second of two numbers is 4 more than the first. The sum of the numbers is 56. Find the numbers.
- ③ The number of girls at Sky High School is 60 greater than the number of boys. If there are 1250 students all together, how many girls are there?
- ④ The second of two numbers is 5 more than twice the first. The sum of the numbers is 44. Find the numbers.
- ⑤ The sum of two numbers is 75. The second number is 3 less than twice the first. Find the numbers.
- ⑥ The larger of two numbers is 8 more than four times the smaller. If the larger is increased by four times the smaller, the result is 40. Find the numbers.
- ⑦ The number of calories in a piece of pie is 20 less than three times the number of calories in a scoop of ice cream. The pie and ice cream together have 500 calories. How many calories are in each?
- ⑧ The sum of two numbers is 4 less than twice the larger. If the larger is decreased by three times the smaller, the result is -20 . Find the numbers.

660	THE
655	WEC
38, 52	BEC
16, 12	DER
24, 4	LAW
36, 54	SOT
635	ITW
16, 28	ROQ
13, 31	ANH
24, 32	HER
370, 130	NOR
26, 30	HAT
36, 39	ITB
350, 150	YER
26, 49	AVE

1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	6	6	6	7	7	7	8	8	8
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What Kind of Monkey Can Fly?

Solve each problem below using a system of two equations in two variables. Find the solution in the answer column and notice the letter next to it. Write this letter in each box that contains the number of that exercise.

① Three times the larger of two numbers is equal to four times the smaller. The sum of the numbers is 21. Find the numbers.

② The difference between two numbers is 16. Five times the smaller is the same as 8 less than twice the larger. Find the numbers.

③ The larger of two numbers is 1 more than twice the smaller. The sum of the numbers is 20 less than three times the larger. Find the numbers.

④ Two records and three tapes cost \$31. Three records and two tapes cost \$29. Find the cost of each record and each tape.

⑤ The sum of two numbers is the same as four times the smaller number. If twice the larger is decreased by the smaller, the result is 30. Find the numbers.

⑥ A group of students go out for lunch. If two have hamburgers and five have hot dogs, the bill will be \$8.00. If five have hamburgers and two have hot dogs, the bill will be \$9.50. What is the price of a hamburger?

⑦ The price of a sweater is \$5 less than twice the price of a shirt. If four sweaters and three shirts cost \$200, find the price of each shirt and each sweater.

⑧ A shipment of TV sets, some weighing 30 kg each and the others weighing 50 kg each, has a total weight of 880 kg. If there are 20 TV sets all together, how many weigh 50 kg?

(S)	22, 6
(K)	16, 9
(R)	18, 6
(M)	11, 10
(B)	\$20, \$35
(I)	12, 9
(P)	\$1.35
(N)	13, 6
(O)	14
(T)	\$1.50
(L)	\$8, \$5
(A)	24, 8
(D)	\$23, \$41
(H)	\$5, \$7
(E)	17

2	4	8	6	2	1	5	7	2	7	8	8	3
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FACTS: A "one-L" Lama is a Tibetan monk.

A "two-L" Llama is a beast of burden.

QUESTION: What is a "three-L" LLLama?

Solve each problem using a system of two equations in two variables. Find each answer below and cross out the letter above it. When you finish, the answer to the title question will remain.

- 1 Larry is 8 years older than his sister. In 3 years, he will be twice as old as she is now. How old are they now?
- 2 Barry is 8 years older than his sister. In 3 years, he will be twice as old as she will be then. How old is each now?
- 3 Jennifer is 6 years older than Sue. In 4 years, she will be twice as old as Sue was 5 years ago. Find their ages now.
- 4 Adam is 5 years younger than Eve. In 1 year, Eve will be three times as old as Adam was 4 years ago. Find their ages now.
- 5 Jack is twice as old as Jill. In 2 years, Jack will be 4 times as old as Jill was 9 years ago. How old are they now?
- 6 Four years ago, Katie was twice as old as Anne was then. In 6 years, Anne will be the same age that Katie is now. How old is each now?
- 7 Five years ago, Tom was one third as old as his father was then. In 5 years, Tom will be half as old as his father will be then. Find their ages now.



S	A	B	A	E	I	T	G	F	A	T	I	R	M	E
26, 20	30, 24	37, 17	9, 14	19, 11	17, 9	16, 10	18, 12	20, 40	15, 35	13, 5	16, 8	18, 42	38, 19	10, 15