

Lesson 12: Solving Problems

Selecting a Method, Solving General Problems

Use **two variables** to solve these application problems by any of the three methods.

1. Read over the problem and think about what are the two unknowns.
2. Read over the problem again and identify the two “relationships” for equations. In developing the equations to solve an application, typically there will be a ‘simple’ equation using two variables and a more ‘complex’ equation using the two variables.
3. Create two equations with no more than two variables being used in either equation. The problem may include more information that you need. Be sure to only use two variables in the equations.
4. Solve the two equations by either substitution or elimination.
5. Determine if your answer makes sense. Test it. State the result in a ‘labeled’ sentence. EX: Kay walked 5 hours and Dan ran 3 hours.

Problems involving general quantities

- A. The sum of two numbers is -16 and their difference is 8. Find the numbers.

Unknowns:	$x = 1^{\text{st}}$ number	Equations:	$x + y = -16$
	$y = 2^{\text{nd}}$ number		$x - y = 8$

- B. Jackie won 4 fewer blue ribbons than Terry. Together they won 28 ribbons. Find the number each won.

Unknowns:	J = ribbons won by Jackie	Equations:	J = T - 4
	T = ribbons won by Terry		J + T = 28

Solving Geometry Problems

- A. The length of a rectangular swimming pool is twice the width. If the perimeter is 120 feet, find the length and the width.

Unknowns: $l = \text{length}$
 $w = \text{width}$

Equations: $l = 2w$
 $120 = l + l + w + w$

- B. If the perimeter of a rectangle is 278 meters and the length is 1 meter longer than twice the width, find the length and the width.

Unknowns: $l = \text{length}$
 $w = \text{width}$

Equations:

- C. Find the measures of two supplementary angles if angle x is one-third the measure of angle y .

Unknowns: $x = \text{measure of angle } x$
 $y = \text{measure of angle } y$

Equations: $x + y = 180$
 $x = 1/3 y$

Solving Cost Problems

- A. One night the manager of the Sea Breeze Motel rented 5 singles and 12 doubles for a total of \$390. The next night he rented 9 singles and 10 doubles for a total of \$412. Find the rental charge for each type of room.

Unknowns: S = single price
D = double price

Equations: $5S + 12D = 390$
 $9S + 10D = 412$

- B. At Gwen's garage sale, all books were one price, and all magazines were another price. Harriet bought four books and three magazines for \$1.45, and June bought two books and five magazines for \$1.25. Find the price of a book and of a magazine.

Unknowns: B = book price
M = magazine price

Equations:

- C. Tickets for a concert were sold to adults for \$3 and to students for \$2. If the total receipts were \$824 and twice as many adult tickets as student tickets were sold, find how many of each were sold.

[Be careful with this one. Is the equation representing "twice as many adults as students" written $2A = S$ or $A = 2S$?]

Unknowns: S = number of student tickets
A = number of adult tickets

Equations: $3A + 2S = 824$
 $A = 2S$

Solving Mixture and Interest Problems

- A. Ziggy's Famous Yogurt blends regular yogurt that is 3% fat with its no-fat yogurt to obtain low-fat yogurt that is 1% FAT. Find how many pounds of regular yogurt and how many pounds of no-fat yogurt should be mixed to obtain 60 pounds of low-fat yogurt.

Unknowns:	T = pounds of 3%	Equations:	T + N = 60
	N = pounds of no fat 0%		.03T + .0N = .01(60)

- B. Find how many milliliters of 4% acid solution and how many milliliters of a 10% acid solution must be mixed to obtain 54 ml of a 6% solution.

Unknowns:	F = milliliters of 4% acid	Equations:	F + T = 54
	T = milliliters of 10% acid		.04F + .10T = .06 (54)

- C. Cashews sell for \$1.20 per bag and Brazil nuts sell for \$1.50 per bag. Find how many pounds of cashews should be mixed with 20 pounds of Brazil nuts to get a mixture that sells for \$1.30 per bag.

Unknowns: C = pounds of Cashews Equations:
 M = pounds of total Mix

- D. Kay invested \$3000 and received a total of \$230 in interest. If she invested part of the money at 10% and the remainder at 5%, find how much she invested at each rate.

Unknowns: T = dollars at 10% Equations: T + F = 3000
 F = dollars at 5% .10T + .05F = 230

Solving Distance=Rate*Time Problems

- A. A small plane can fly 400 miles in the same amount of time a jet can fly 1000 miles. If the jet's speed is 300 mph more than the speed of the small plane, find the speeds of both planes. [$d = r * t$ or $t = d/r$]

Unknowns: $P =$ speed of plane Equations: $J = P + 300$
 $J =$ speed of jet $400/P = 1000/J$ (since times are equal)

- B. Two canoeists make a 30-mile trip in 7 hours. If they paddle at a rate of 4.5 miles per hour part of the time and 4 miles per hour for the remaining time, find how many hours they traveled at each rate.

Unknowns: $F =$ time paddled first Equations: $F + S = 7$ (total time)
 $S =$ time paddled second $4.5F + 4S = 30$ (total distance)

- C. Spike averaged 45 mph driving from Rochester to Syracuse and 49 mph driving from Syracuse to Albany. If he drove a total of 237 miles in 5 hours, find how far is it from Syracuse to Albany.

Unknowns: $R =$ time from Rochester to Syracuse Equations: $R + S = 5$ (total time)
 $S =$ time from Syracuse to Albany $45R + 49S = 237$ (dist)

Solve for S , then use the time to calculate the distance - the question in this problem.