


12-2



Personal Math Trainer 

12.1 Creating Systems of Linear Equations - Class &
Homework



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Notes

1 Use the cost table for the two services to create a linear system of equations. Then solve the system to determine when the cost of the two services will be equal.

Two garden supply companies deliver pea stone according to the following table.

Pea Stone x (in cubic yards)	Yard Depot $f(x)$	Lawn & Garden $g(x)$
1	\$64	\$44
2	\$94	\$78
3	\$124	\$112

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$y - y_1 = m(x - x_1)$$

given $m, (x_1, y_1)$

Equation-1: Use the points (1, 64) and (2, 94):

Yard Depot:

$$m = \frac{94 - 64}{2 - 1} = 30$$

$$y - 64 = 30(x - 1)$$

$$y - \cancel{64} = 30x - 30$$

$$\begin{array}{r} y - \cancel{64} = 30x - 30 \\ + \cancel{64} \qquad + 64 \\ \hline y = 30x + 34 \end{array}$$

Equation-2: Use the points (1, 44) and (2, 78):

Lawn & Garden:

$$m = \frac{78 - 44}{2 - 1} = 34$$

$$y - 44 = 34(x - 1)$$

$$y - \cancel{44} = 34x - 34$$

$$\begin{array}{r} y - \cancel{44} = 34x - 34 \\ + \cancel{44} \qquad + 44 \\ \hline y = 34x + 10 \end{array}$$

The system of equations is:

$$\begin{cases} f(x) = 30x + 34 \\ g(x) = 34x + 10 \end{cases}$$

Solve the system when $f(x) = g(x)$.

$$\begin{array}{r} 30x + \cancel{34} = 34x + 10 \\ -34x - \cancel{34} \quad -34x - 34 \\ \hline -4x = -24 \\ x = 6 \end{array}$$

Solve for $f(x)$ when $x = 6$.

$$f(x) = 30x + 34$$

$$f(6) = 30(6) + 34$$

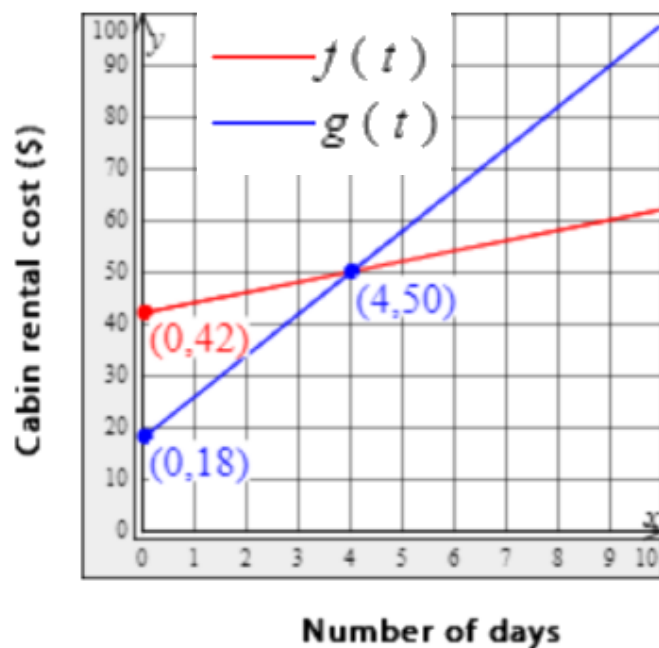
$$f(6) = 180 + 34$$

$$f(6) = 214$$

Both Yard Depot and Lawn & Garden charge \$214 to deliver 6 cubic yards of pea stone.

2 Part 1 out of 2

Use the graph to make a linear model of each function. Describe the meaning of the terms in the models. Then create the linear system and state what the solution represents.



The y intercept b of $f(t)$ is .

The slope m of $f(t)$ is $\frac{50 - 42}{4 - 0} = 2$.

$$f(t) = \text{2}t + \text{42}$$

The y intercept b of $g(t)$ is .

The slope m of $g(t)$ is $\frac{50 - 18}{4 - 0} = 8$.

$$g(t) = \text{8}t + \text{18}$$

Part 2

The represents the initial costs of the cabin rental.

The represents the rental cost per day.

The point of intersection (,) represents the cost of for days that both cabins cost.

3 Use the given cost table for the same product from two different companies to create a linear system. Then solve the system to determine when the cost of the product will be the same and what the price will be.

Two online retailers sell organic vanilla extract by the ounce using the following pricing chart.

Vanilla Extract (oz)	Chef Mate $c(n)$	Grocery Gourmet $g(n)$
2	\$15.50	\$17.00
3	\$20.75	\$22.00
4	\$26.00	\$27.00
5	\$31.25	\$32.00

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$y - y_1 = m(x - x_1)$$

given $m, (x_1, y_1)$

Equation-1: Use the points (2, 15.50) and (3, 20.75):

$$m = \frac{20.75 - 15.50}{3 - 2} = \frac{5.25}{1}$$

$$y - 15.50 = 5.25(x - 2)$$

$$y - 15.50 = 5.25x - 10.50$$

$$c(n) = 5.25x + 5$$

Equation-2: Use the points (2, 17) and (3, 22):

$$m = \frac{22 - 17}{3 - 2} = \frac{5}{1}$$

$$y - 17 = 5(x - 2)$$

$$y - 17 = 5x - 10$$

$$g(n) = 5x + 7$$

Solve the system when $c(n) = g(n)$.

$$5.25n + 5 = 5n + 7$$

$$0.25n = 2$$

$$n = 8$$

Solve for $c(n)$ when $n = 8$.

$$c(n) = 5.25n + 5$$

$$c(8) = 5.25(8) + 5$$

$$c(8) = 42 + 5$$

$$c(8) = 47$$

Both Chef Mate and Grocery Gourmet charge \$ **47** for **8** ounces of vanilla extract.

4 Use the given cost table for the same product from two different companies to create a linear system. Then solve the system to determine when the cost of the product will be the same and what the price will be.

Let $f(x)$ represent the cost for dry cleaning at Company 1 and let $g(x)$ represent the cost of dry cleaning at Company 2, where x is the number of garments dry cleaned.

Number of Garments	Company 1	Company 2
5	\$62.75	\$38.75
10	\$85.50	\$67.50
15	\$108.25	\$96.25

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$y - y_1 = m(x - x_1)$$

given $m, (x_1, y_1)$

Equation-1: Use the points (5, 62.75) and (10, 85.50):

$$m = \frac{85.50 - 62.75}{10 - 5} = \frac{22.75}{5} = 4.55$$

$$y - 62.75 = 4.55(x - 5)$$

$$y - 62.75 = 4.55x - 22.75$$

$$c(n) = 4.55x + 40$$

Equation-2: Use the points (5, 38.75) and (10, 67.50):

$$m = \frac{67.50 - 38.75}{10 - 5} = \frac{28.75}{5} = 5.75$$

$$y - 38.75 = 5.75(x - 5)$$

$$y - 38.75 = 5.75x - 28.75$$

$$c(n) = 5.25x + 10$$

Solve the system when $f(x) = g(x)$.

$$4.55x + 40 = 5.75x + 10$$

$$30 = 1.2x$$

$$x = 25$$

Solve for $f(x)$ when $x = 25$.

$$f(x) = 4.55x + 40$$

$$f(25) = 4.55(25) + 40$$

$$f(25) = 113.75 + 40$$

$$f(25) = 153.75$$

Both Company 1 and Company 2 charge \$153.75 for cleaning 25 garments.

5 Determine when the cost of the two services will be the same amount, and what the price will be.

One cable television provider has a \$60 setup fee and charges \$80 per month, and another cable provider has a \$100 equipment fee and charges \$70 per month.

Equation-1:

Let $f(t)$ represent the cost for the first cable company.

$$f(t) = 60 + 80t$$

Equation-2:

Let $g(t)$ represent the cost of the second cable company, where t is the number of

$$g(t) = 100 + 70t$$

$$y = mx + b$$

↑ ↑
slope intercept

Solve the system when $f(t) = g(t)$.

$$60 + 80t = 100 + 70t$$

$$10t = 40$$

$$t = 4$$

Solve for $f(t)$ when $t = 4$.

$$f(t) = 60 + 80t$$

$$f(4) = 60 + 80(4)$$

$$f(4) = 60 + 320$$

$$f(4) = 380$$

A subscriber would have paid either company \$ for months of service.

6 Determine when the cost of the two services will be the same amount, and what the price will be.

The Strauss family is deciding between two lawn-care services. Green Lawn charges a \$33 startup fee plus \$29 per month. Yard Guard charges a \$23 startup fee plus \$34 per month.

Equation-1:

Let $G(t)$ represent the cost for Green Lawn

$$G(t) = 33 + 29t$$

Equation-2:

Let $Y(t)$ represent the cost of Yard Guard, where t is the number of months.

$$Y(t) = 23 + 34t$$

$$y = mx + b$$

slope
intercept

Solve the system when $G(t) = Y(t)$.

$$33 + 29t = 23 + 34t$$

$$10 = 5t$$

$$t = 2$$

Solve for $G(t)$ when $t = 2$.

$$G(t) = 33 + 29t$$

$$G(2) = 33 + 29(2)$$

$$G(2) = 33 + 58$$

$$G(2) = 91$$

After months, a customer would have paid either company \$.

7 Set up and solve a system of equations to solve the problem.

A jar contains n nickels and d dimes. There are 18 coins in the jar, and the total value of the coins is \$1.20. How many nickels and how many dimes are in the jar?

Equation-1:

"There are 18 coins in the jar..."

$$n + d = 18$$

Solve for d :

$$d = 18 - n$$

Equation-2:

"...the total value of the coins is \$1.20."

$$0.05n + 0.1d = 1.20$$

Substitute that statement in for d in the second equation.

$$0.05n + 0.1d = 1.20$$

$$0.05n + 0.1(18 - n) = 1.20$$

$$0.05n + 1.8 - 0.1n = 1.20$$

$$1.8 - 0.05n = 1.20$$

$$-0.05n = -0.6$$

$$n = 12$$

Substitute 12 in for n to solve for d .

$$d = 18 - n$$

$$d = 18 - 12$$

$$d = 6$$

The jar contains nickels

and dimes.

8 Set up and solve a system of equations to solve the problem.

A local boys club sold 196 bags of mulch and made a total of \$759. It sold two types of mulch: hardwood for \$4.25 a bag and pine bark for \$3.75 a bag. How many bags of each kind of mulch did it sell?

Equation-1:

$$p + h = 196$$

Solve for p :

$$p = 196 - h$$

Equation-2:

$$3.75p + 4.25h = 759$$

Substitute that statement in for p in the second equation.

$$\begin{aligned} 3.75p + 4.25h &= 759 \\ 3.75(196 - h) + 4.25h &= 759 \\ 735 - 3.75h + 4.25h &= 759 \\ 0.5h &= 24 \\ h &= 48 \end{aligned}$$

Substitute the value of h into the first equation to find p .

$$\begin{aligned} p &= 196 - h \\ p &= 196 - (48) \\ p &= 148 \end{aligned}$$

The boys club sold

48 bags of hardwood mulch
and 148 bags of pine bark mulch.



Set up and solve a system of equations to solve the problem.

The school band sells carnations on Valentine's Day for \$3 each. It buys the carnations from a florist for \$0.50 each, plus a \$19 delivery charge. When will the cost of the carnations be equal to the revenue from selling them? How many carnations does it need to sell to reach this point?

Equation-1:

$$f(n) = 0.5n + 19$$

Equation-2:

$$g(n) = 3n$$

Solve the system when $f(n) = g(n)$.

$$0.5n + 19 = 3n$$

$$19 = 2.5n$$

$$n = 7.6$$

The cost of the carnations will be equal to the revenue when it has sold carnations. It will reach this point after it sells carnations.

10 Nathan buys coffee and hot chocolate for his co-workers. Each cup of coffee costs \$1.50 and each cup of hot chocolate costs \$1.00. If he pays a total of \$10.50 for 8 cups, how many of each does he buy?

Create a table to organize the information.

	Coffee	Hot Chocolate	Total
Number of cups	c	h	8
Cost	$\$1.50c$	$\$1.00h$	$\$10.50$

Use the information to write a system of equations.

Total amount spent on c cups of coffee and h cups of hot chocolate.

$$1.50c + 1.00h = 10.50$$

Total number of cups bought.

$$c + h = 8$$

Multiply the second equation by -1.50 to get opposite coefficients for c .

$$-1.50(c + h = 8)$$

$$-1.50c - 1.50h = -12.00$$

Add the new equation to the first equation.

$$1.50c + 1.00h = 10.50$$

$$+(-1.50c - 1.50h = -12.00)$$

$$\hline -0.50h = -1.50$$

Solve for h .

$$-0.50h = -1.50$$

$$h = 3$$

Substitute the value found for h back into one of the original equations and solve for c .

$$c + h = 8$$

$$c + 3 = 8$$

$$c = 5$$

Nathan buys cups of coffee and cups of hot chocolate.

The only way
to learn
mathematics
is to do
mathematics.

PAUL HALMOS