3-6 Systems of Linear Equations in two variables
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Algebra 2 Standard: 2.0 Students solve systems of linear equations and inequalities (in two or three variables) by substitution, with graphs, or with matrices.

Ex 1) In one day, a music store sold 10 guitars for a total of $4800. Electric guitars sold for $450 each and acoustic guitars sold for $550 each.
These were the only types of guitars sold that day.
How many of each type of guitar were sold?

Let x = number of electric guitars sold.

Let y = number of acoustic guitars sold.

Equation 1: represents number of guitars sold.
Equation 2: represents amount of sales in dollars.

$$x + y = 10$$
$$450x + 550y = 4800$$

Solve this system of equations using either the substitution or linear combination methods.

(I)

$450(x+y=10) \rightarrow 450x + 450y = 4500$

$- \quad 450x + 550y = 4800$

$-100y = -300$

$-100 \qquad -100$

$y = 3$

(II)

$x + y = 10$

$x + 3 = 10$

$x = 7$

There were 7 electric guitars and 3 acoustic guitars sold that day.

Ex 2) A one day pass for an amusement park costs $6 more for adults than for children. When 3 tickets were purchased for children and 7 tickets were purchased for adults the total cost for the tickets was $852. Find the cost of each adult ticket.

Let x = cost for children's ticket

Let y = cost for adult ticket

Equation 1: represents comparison of ticket costs.

Equation 1: represents total cost of the tickets.

$y = x + 6$

$3x + 7y = 852$

(I) $3x + 7(x+6) = 852$

$3x + 7x + 42 = 852$

$10x + 42 = 852$

$-42 \quad -42$

$10x = 810$

$x = 81$ cost for children's tickets

(II) $y = 81 + 6$

$= 87$

Cost for adult tickets: $87

Ex 3) Joe's Moped charges a rental fee of $35 plus $5 per hour or any fraction thereof. Sam's Moped charges a rental fee of $20 plus $7.50 per hour or any fraction thereof. When is it more cost effective to rent from Joe's Moped?

(Hint: when is the cost the same?)

Let x = cost per hour

Let y = total cost for each rental service.

Equation 1 Joe's: $y = 5x + 35$

Equation 2 Sam's: $y = 7.5x + 20$

(I)

$5x + 35 = 7.5x + 20$

$-7.5x \qquad -7.5x$

$-2.5x + 35 = 20$

$-35 \qquad -35$

$\frac{-2.5x}{-2.5} = \frac{-15}{-2.5}$

$x = 6$ x = cost per hour

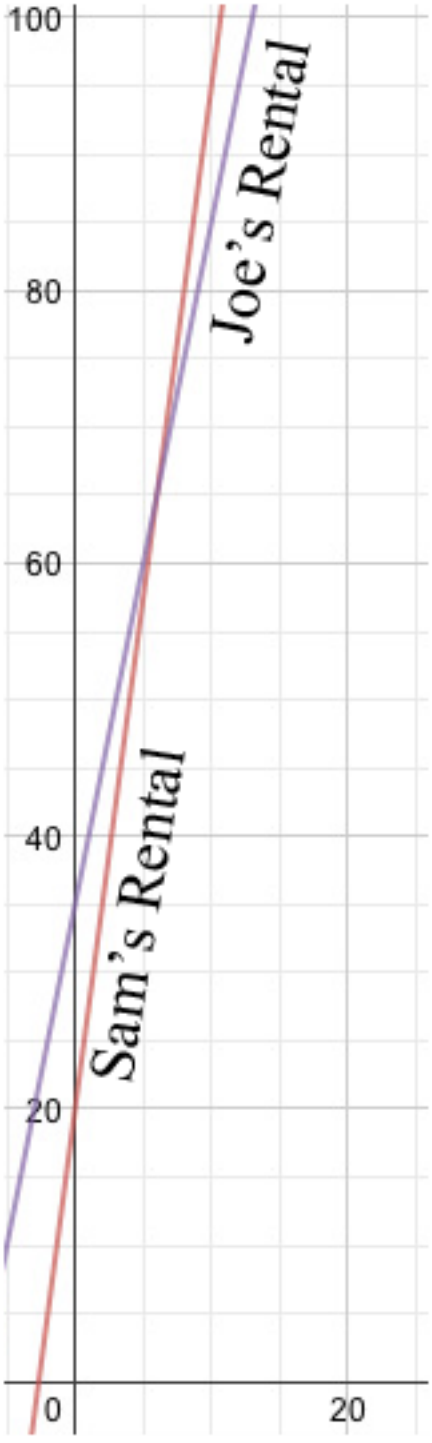
(II) $y = 5(6) + 35$

$y = 30 + 35$

$y = 65$ y = total cost for each rental service.

At 6 hours, both rentals cost $65.

A graph can be helpful to visualize the cost for each rental service. A table of data can help too.



	Sam's	Joe's
x	y=7.5x+20	y=5x+35
1	27.5	40
2	35	45
3	42.5	50
4	50	55
5	57.5	60
6	65	65
7	72.5	70
8	80	75
9	87.5	80
10	95	85

Sam's rental is less expensive for 5 hours or less, while Joe's rental is less expensive when renting a Moped for more than 6 hours.