

Family Support Materials

Linear Equations, Inequalities, and Systems

In this unit, your student will analyze constraints on different quantities. For example, the amount you spend on a bicycle may be limited by how much you have saved. To qualify for a sports team, you may need to practice at least a certain number of hours, or lift at least a certain number of pounds.

Here are some ways to write constraints using mathematical notation:

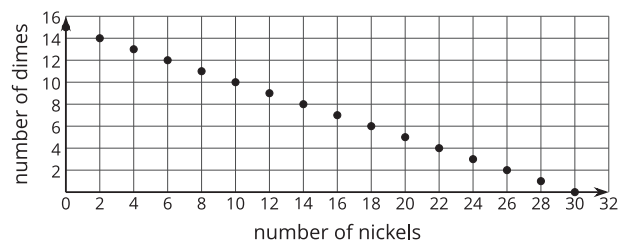
$w < 20$. An apartment building only allows dogs that weigh less than 20 pounds.

$m + g + b = 4$. A casserole recipe calls for four cups of vegetables. You have mushrooms, green beans, and broccoli.

$12.5c + 15a \geq 1,000$. In order for a concert to be performed, the artists need to be sure of \$1,000 in ticket sales. Tickets for children under 18 are \$12.50, and tickets for adults are \$15.

$5n + 10d = 150$. You need \$1.50 in coins for a parking meter. You have a bunch of nickels and dimes in your pocket.

For this last situation, we can see that using more dimes to make \$1.50 means that we can use fewer nickels, and vice-versa. A graph allows us to see this relationship even more clearly.



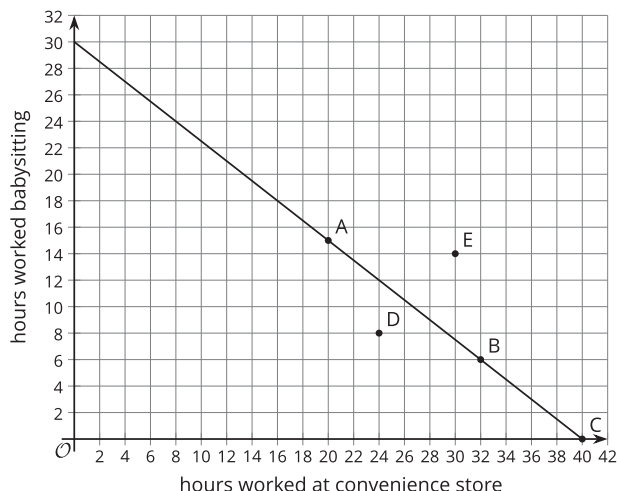
Each point on the graph represents a combination of nickels and dimes that totals \$1.50. For example, if you use 8 nickels, you will need 11 dimes.

Here is a task for you to try with your student:

Priya is saving money to go on an overnight school trip. The cost of the trip is \$360. She has a job at a convenience store, which pays \$9 per hour, and sometimes babysits for a family in her neighborhood, which pays \$12 per hour.

The equation $9x + 12y = 360$ represents all the combinations of hours Priya could work at each job and earn a total of \$360. Here is a graph showing those combinations:

1. What are the coordinates of point *A*?
2. What does it tell us about the number of hours Priya worked at each job?
3. Answer the same questions about points *B* and *C*.
4. Point *D* is not on the line. How should we interpret point *D*?
5. Point *E* is not on the line. How should we interpret point *E*?



Solution:

1. (20, 15)
2. Priya works 20 hours at the convenience store and 15 hours babysitting.
3. Point *B*: (32, 6). Priya works 32 hours at the convenience store and 6 hours babysitting. Point *C*: (40, 0). Priya works 40 hours at the convenience store and does not babysit at all.
4. Priya does not make enough money. She works 24 hours at the convenience store and 8 hours babysitting. She makes only \$312, since $24 \cdot 9 + 8 \cdot 12 = 312$.
5. Priya makes more than enough money: \$438. She works 30 hours at the convenience store and 14 hours babysitting. $30 \cdot 9 + 14 \cdot 12 = 438$.