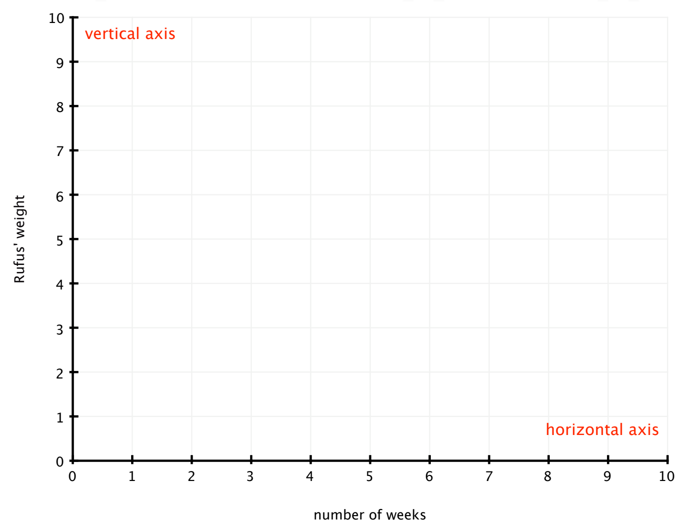
Solving Inequalities
A Closer Look at the Video

After watching the *Solving Inequalities* video, make sense of the mathematics by reading through the problem situation and solution. Use the comments and questions in bold to help you solve inequalities.

When the problem involves determining when something is greater than or less than something else, you will be solving an inequality. One of the ways to solve an inequality is to draw a graph of the problem in order to better understand it, and then represent the situation using symbols. Solve the inequality that you created to determine the answer. You may use this inequality and your graph to check your answer.

Problem 1: Rufus is a dog that weighs 5 pounds but the vet says that ideally he should weigh over 9 pounds. If he gains 1/2 pound per week, when will he be over 9 pounds?

Represent the problem using a graph.



The vertical axis represents the dog's weight in pounds, and the horizontal axis represents the number of weeks since the dog went to the vet.

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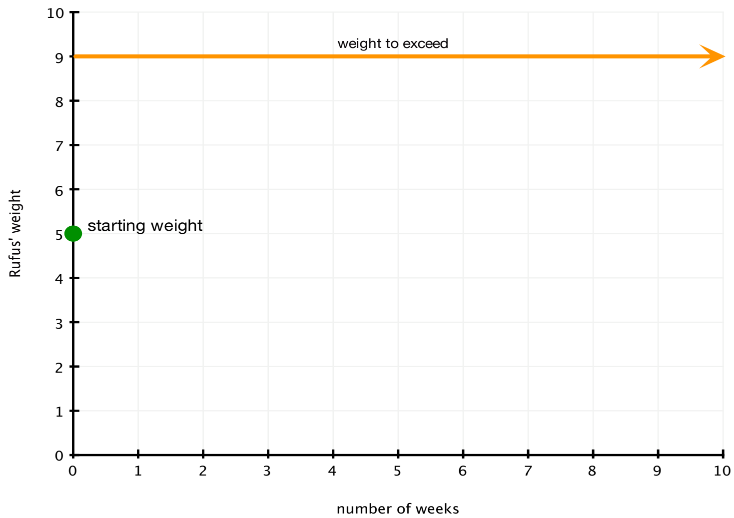
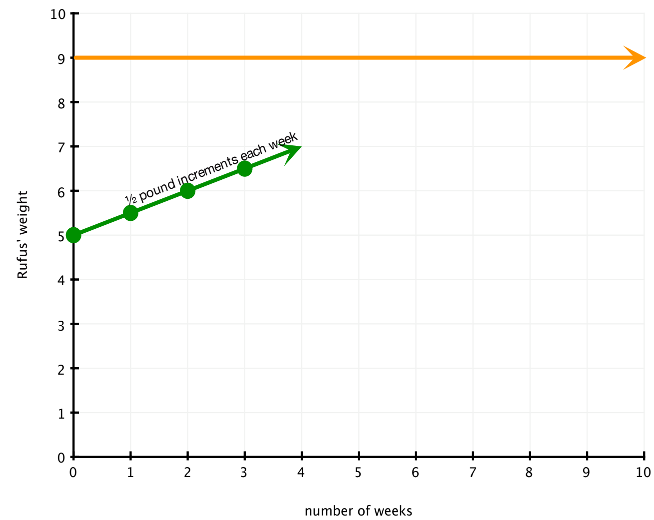
Draw a line at 9 pounds since this is the weight that Rufus should exceed. Plot Rufus' starting weight of 5 pounds.



Plot the ½ pound increments for the weight gained each week.



Use algebraic symbols to solve the problem.

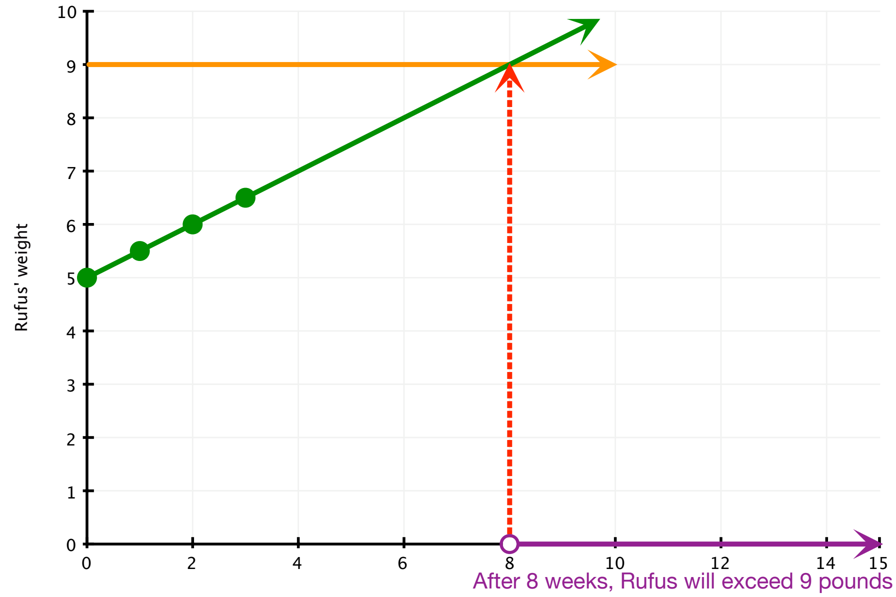
The situation can be represented with symbols using an inequality. Rufus' starting weight is 5 pounds. Add ½ pound for every week (½w).

When will his weight exceed 9 pounds? His weight will exceed 9 pounds when $5+\frac{1}{2}w > 9$.

$5+\frac{1}{2}w > 9$	original inequality
$5+\frac{1}{2}w > 9$ $-5 \qquad -5$	subtract 5 from both sides of the inequality
$2(\frac{1}{2}w) > 4(2)$	multiply each side of the inequality by two
$w > 8$	w is greater than 8

It will take more than 8 weeks for Rufus' weight to exceed 9 pounds.

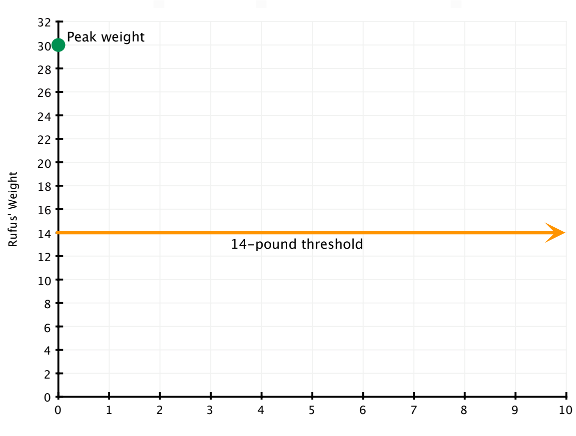
Here is what the answer looks like on the graph:



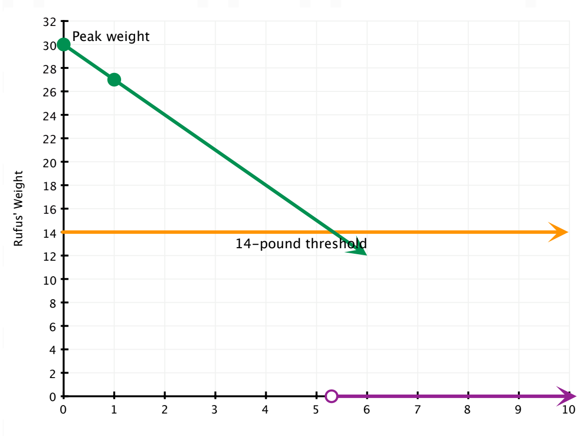
Problem 2: Rufus continued to grow. Before long he weighed 30 pounds! The vet said that he needed to weigh under 14 pounds. If he loses 3 pounds per month, when will his weight be less than 14 pounds?

Look at his weight loss program in a graph.

Graph Rufus' weight and the line representing the 14-pound threshold.



Plot his weight loss of 3 pounds per month.

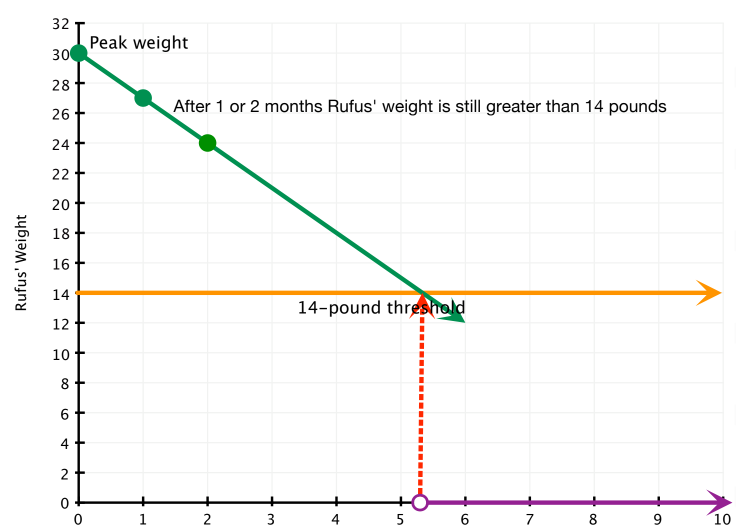


When does his weight fall below 14 pounds?

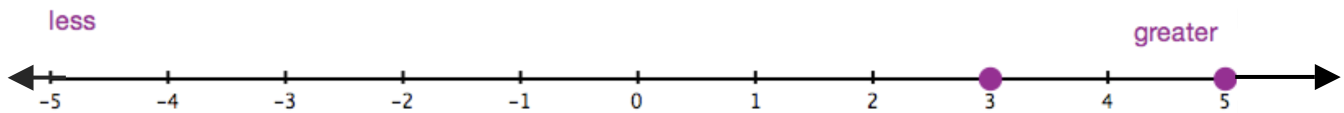
The graph shows that Rufus will weigh less than 14 pounds sometime after 5 months. To answer the question more precisely, **represent the situation with symbols using an inequality.** Find when his current weight of 30 pounds minus 3m (where 3 is the number of pounds he will lose per month and m is the number of months) will be less than 14 pounds.

$30-3m < 14$	original inequality
$30-3m < 14$ $-30 \qquad -30$	subtract 30 from both sides of the inequality
$\frac{-3m}{-3} < \frac{-16}{-3}$	divide each side of the inequality by -3
$m < 5\frac{1}{3}$	

This does not make sense! The graph shows us that after one or two months he is still over 14 pounds and it is after $5\frac{1}{3}$ months that Rufus weighs less than 14 pounds. It would make sense for the inequality to be $m > 5\frac{1}{3}$.

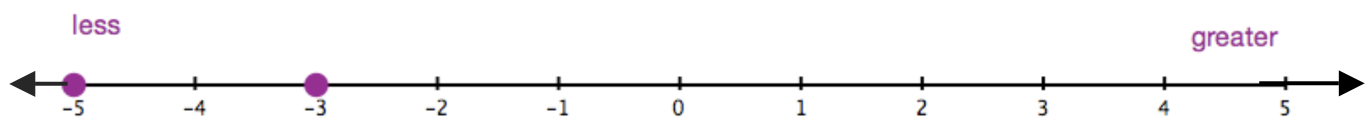


Let's look at a different example to see what happens when you multiply both sides of an inequality by a negative value.



You can see from this number line that 3 is less than 5. Now, multiply both sides of this inequality by -1.

3	<	5
-1(3)		-1(5)
-3		-5



You can see from the second number line that -3 > -5. The inequality symbol is reversed. This, of course, is only one example, but you could do this with any numbers. So, when you multiply or divide an inequality by a negative number, you have to reverse the inequality symbol.

Let's go back to the problem with Rufus. When dividing both sides by a –3, the relation between the resulting values switches as does the inequality symbol.

$30-3m < 14$	original inequality
$30-3m < 14$ $-30 \qquad -30$	subtract 30 from both sides of the inequality
$\frac{-3m}{-3} > \frac{-16}{-3}$	divide each side of the inequality by -3; reverse ("flip") the symbol
$m > 5\frac{1}{3}$	m is greater than $5\frac{1}{3}$