The percent of the population voting in presidential elections has been estimated to be

$$p = 65.4042 - 0.3552x$$

where x is the number of years after 1950. During what year does this model predict that the percent voting in a presidential election will be 49%?

There are two strategies that will quickly find the year. Ideally you should use both strategies and show that they give answers that make sense and that are consistent.

Algebraic Strategy

To utilize an algebraic approach, let's make sure we understand exactly what this relationship describes.

$$p = 65.4042 - 0.3552x$$

Percent p

Years after 1950

For instance, if we set x = 0 (the year 1950), we get

$$p = 65.4042 - 0.3552(0) = 65.4042\%$$

This means that in 1950, the percentage of the population voting was 65.4042 percent.

This question gives a percentage, p = 49, and asks us to find the corresponding year. Substituting p = 49 into the relationship gives

$$49 = 65.4042 - 0.3552x$$

Isolating the x by subtracting 65.4042 from both sides and dividing by -0.3552, yields

$$-16.4042 = -0.3552x$$

$$\frac{-16.4042}{-0.3552} = x$$

$$x \approx 46.2$$

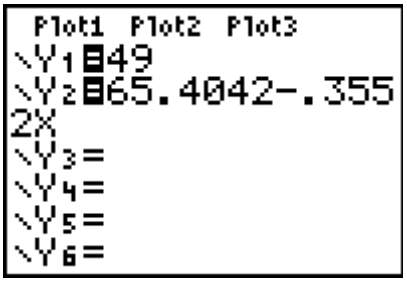
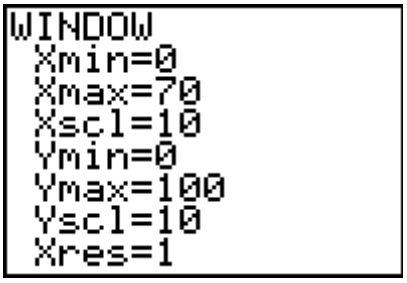
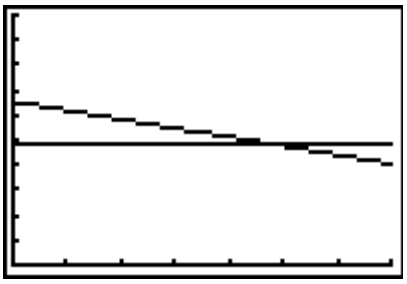
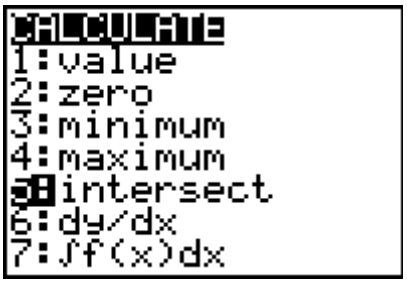
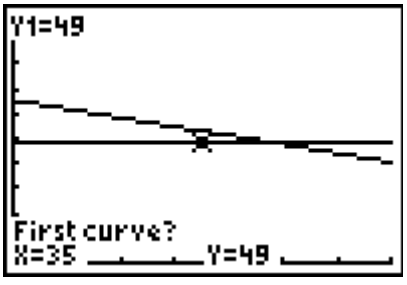
This solution indicates that about 46.2 years after 1950 or in 1996, the percent voting was 49%.

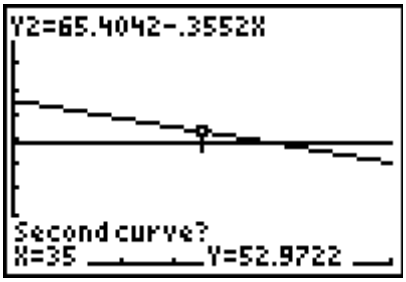
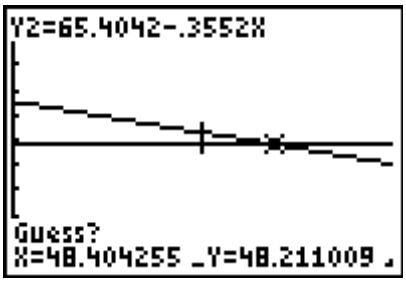
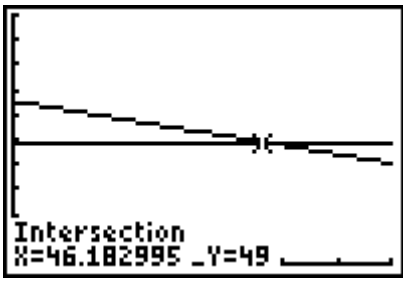
Graphical Strategy

A graphical strategy for this problem consists of applying the method of intersection to find the solution of the equation

$$49 = 65.4042 - 0.3552x$$

To carry out the method of intersection, follow the steps below:

1. To apply the method of intersection, you need to enter each side of the equation into the equation editor. Press [Y=] to access the equation editor. 2. Type each equation into the equation editor as shown to the right.	
3. Press [WINDOW]. 4. Since the independent variable represents years after 1950, Xmin = 0 and Xmax = 70 seems like a reasonable interval since it spans the time period from 1950 to 2020. Since the dependent variable represents percentage, Ymin = 0 and Ymax = 100 is appropriate.	
5. Press [GRAPH] to check to see if the point of intersection is visible. Since it is visible, we'll use the calculator to approximate the point of intersection.	
6. Press [2nd][TRACE] to access the CALCULATE menu. 7. Press 5 or highlight 5 : intersect and press [ENTER].	
8. Since you could potentially have many functions on the viewing screen, we need to select the pair that we want to intersect. The calculator will prompt you to select the curves by pressing [ENTER]. At the prompt "First curve?" press [ENTER].	

9. Press [ENTER] to select the second curve.	
10. Since two graphs could intersect at several points, move the cursor using [◄] and [►] to a location near the point of intersection you are interested in.	
11. Press [ENTER]. The coordinates of the point of intersection is placed on the screen and the cursor is moved to the point on the graph.	

The point of intersection is at $x \approx 46.2$ so the solution to the equation

$$49 = 65.4042 - 0.3552x$$

is $x \approx 46.2$.

Notice that this solution matches the solution we found algebraically. The fact that these answers match is convincing evidence that the solutions are correct.