

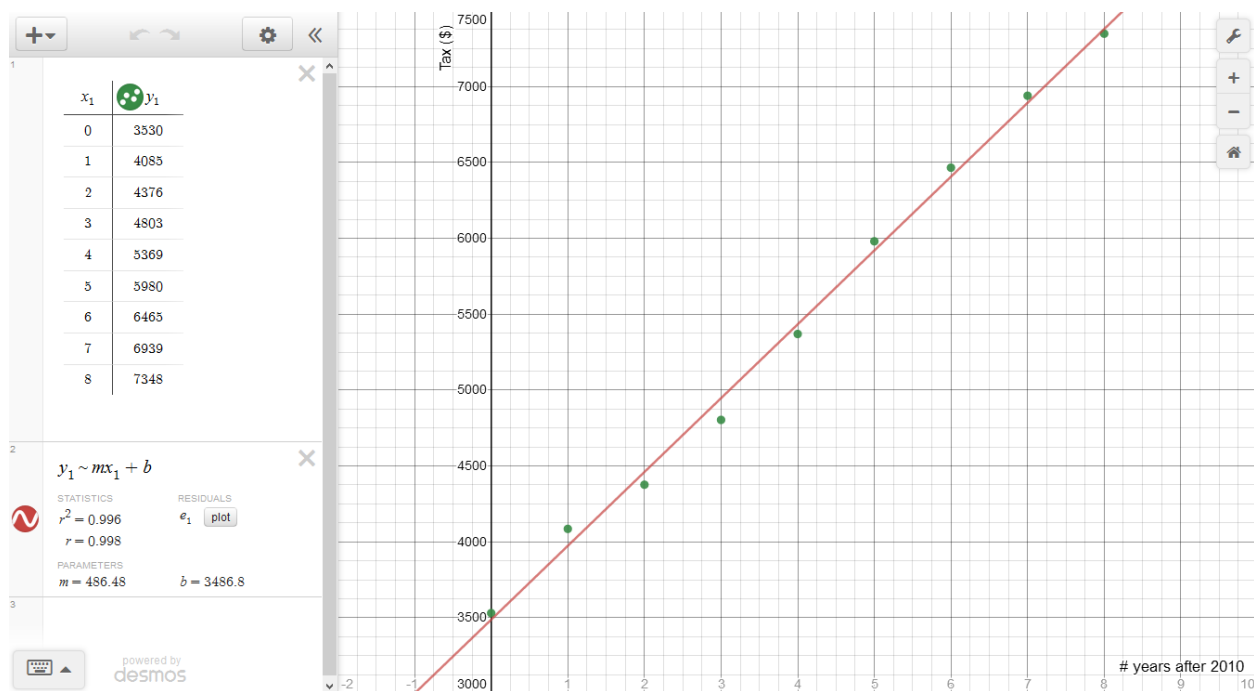
College Algebra, Section 2.2, #44
Fitting Lines to Data Points: Modeling Linear Functions

Income Tax per Capita The table shows the U.S. personal income tax per capita from 2010 and projected to 2018.¹

- a. Find the model that gives y , the federal income tax per capita (in dollars), as a function of x , the number of years after 2010. Report the model with four significant digits.

Year	Tax (\$)
2010	3530
2011	4085
2012	4376
2013	4803
2014	5369
2015	5980
2016	6465
2017	6939
2018	7348

The first step is to enter the data correctly into our graphing utility. Notice that x is the number of years AFTER 2010. This means that $x = 0$ for the year is 2010, $x = 1$ for the year 2011, and so forth. Look at the x -values below to see how I entered the data.



I used my graphing utility to find the line of best fit and give my answer with four significant digits. (If you need a refresher on significant digits, take a look in your book on page 90.)

The equation for this line is $y = 486.5x + 3487$

¹Harshbarger/Yocco, *College Algebra In Context*, 5e, p. 124, #44.

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b. What is the predicted income tax per capita in 2020 if this model still applies?

In 2020, $x = 10$. So we look for the point on the line of best fit that has an x -coordinate of 10. This point is $(10, 8352)$.



The model predicts that in 2020 the predicted income tax per capita will be \$8352.

We could also answer this question algebraically using the equation for the line of best fit and letting $x = 10$ and solving for y .

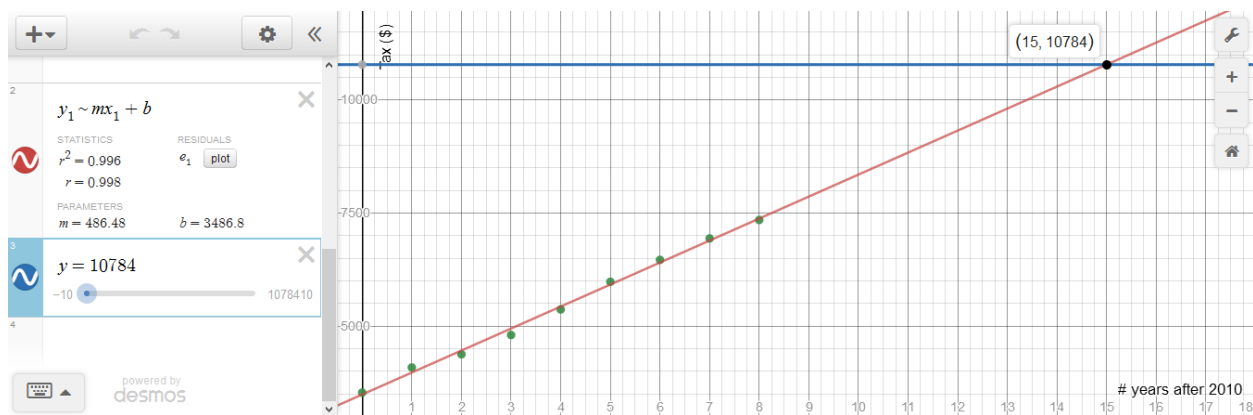
$$\begin{aligned} y &= 486.5x + 3487 \\ &= 486.5(10) + 3487 \\ &= 4865 + 3487 \\ &= 8352 \end{aligned}$$

Again, the model predicts that in 2020 the predicted income tax per capita will be \$8352.

c. When does the model predict that the income tax per capita will be \$10,784?

In this question we're asked to find an x -value when a y -value is given. And, again, we can find the answer either graphically or algebraically.

I'll start with the graphical method letting $y = 10,784$ and looking for the intersection between this horizontal line and the line of best fit that we found in part a.



The point of intersection is $(15, 10,784)$.

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The model predicts that the income tax per capita will be \$10,784 in 2025 (which is 15 years after 2010).

If you want to answer this question algebraically, let $y = 10,784$ and solve for x .

$$\begin{aligned}y &= 486.5x + 3487 \\10,784 &= 486.5x \\7,297 &= 486.5x \\15 &= x\end{aligned}$$

Again, the model predicts that the income tax per capita will be \$10,784 in 2025.