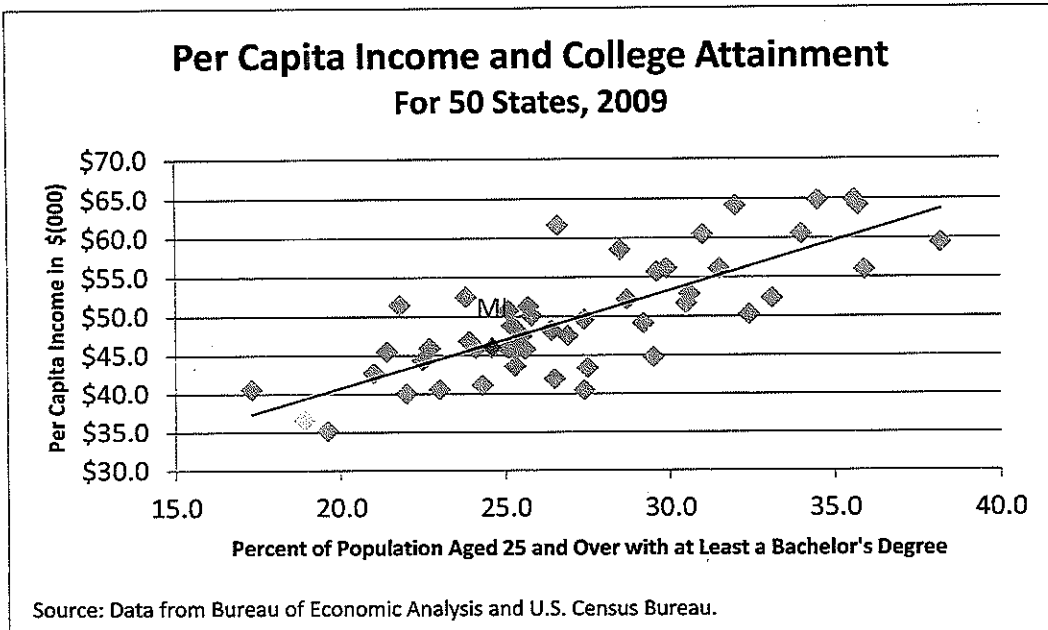


1. The table below shows the relationship between education and income by state in 2009.



a. Oregon had a coordinate point (29.7, 52). What does this tell you about the state?

~~Oregon~~ has about 30% of adults in Oregon have a Bachelor's or higher. The average income is 52K.

b. Describe the trend in the data. Be specific and detailed. Use the variables as defined in your description..

As the percent of population with a Bachelor's degree increases, so does the per capita income.

c. Researchers often describe data trends by calculating a line of best fit (the trend line shown) and using the equation for this line to make predictions. Given that the coordinate points (21, 41) and (35, 59) are on the trend line, find the equation of the line of best fit in the form $y = mx + b$.

$$\frac{59 - 41}{35 - 21} = \frac{18}{14} = \frac{9}{7} \rightarrow y = \frac{9}{7}x + b$$

$$41 = \frac{9}{7}(21) + b \rightarrow 41 = 27 + b \rightarrow 14 = b$$

$$y = \frac{9}{7}x + 14$$

d. Looking specifically at the slope of the trend line (and remembering that slope = $\frac{\Delta y}{\Delta x}$), what does the slope tell you about the relationship between education and income? Be specific and detailed.

If the population percent increases by 1, the per capita income increases by $\frac{9}{7} \approx 1.29$.

e. In mathematics, it is common to assume that x is an independent variable and y is a dependent variable. In the graph above, that would mean that a state's per capita income depends on the percent of a state's population with at least a Bachelor's degree. In other words, increasing the percent educated in a state would cause average income to increase. Comment on this assumption.

This assumes that income depends on education. People who have more education might make more money.

f. Some would argue that the inverse of this relationship is true. Namely, that higher average income would cause an increase in the state's education level. What effect would this have on the equation in part (c)? Rewrite the equation in part (c) so that the independent variable (x) and dependent variable (y) are switched.

$$y = \frac{9}{7}x + 14$$

$$y - 14 = \frac{9}{7}x$$


$$\frac{7}{9}(y - 14) = x$$

This would imply that education depends on income. Maybe richer people can afford college, while poorer people cannot.

2. Arlo is starting a hedgehog farm and needs to determine how to price his beloved animals. He hires a marketing company and they provide the following data (x = price of a hedgehog in \$, y = number of hedgehogs sold):

x	0	10	20	30	40
y	10	40	50	40	10

$y = a(x-20)^2 + 50$
 $40 = a(10-20)^2 + 50$
 $-10 = a(-10)^2$
 $-10 = a(100)$
 $-\frac{1}{10} = a$



- a. Write the equation for Arlo's data in the form $p(x) = a(x-h)^2 + k$.

$$p(x) = -\frac{1}{10}(x-20)^2 + 50$$

- b. Use the equation to determine the price that Arlo should charge to sell 5 hedgehogs.

$$5 = -\frac{1}{10}(x-20)^2 + 50 \rightarrow -45 = -\frac{1}{10}(x-20)^2 \rightarrow 450 = (x-20)^2$$

- c. Use the equation to determine the price that Arlo should charge to sell 25 hedgehogs.

$$25 = -\frac{1}{10}(x-20)^2 + 50 \rightarrow -25 = -\frac{1}{10}(x-20)^2 \rightarrow 250 = (x-20)^2$$

- d. Rather than solving the same equation several times, the inverse of a function is found by switching the independent (x) and dependent (y) variables and then solving the equation for y . For example,

$$y = 3\sqrt{x+1} - 5 \Rightarrow x = 3\sqrt{y+1} - 5 \quad (\text{add 5 to both sides})$$

$$y = -\frac{1}{10}(x-20)^2 + 50$$

$$x = -\frac{1}{10}(y-20)^2 + 50$$

$$x - 50 = -\frac{1}{10}(y-20)^2$$

$$-10(x-50) = (y-20)^2$$

$$\sqrt{-10(x-50)} = y-20$$

$$\sqrt{-10(x-50)} + 20 = y$$

Use the process above to find the inverse of Arlo's function in part (a). Show your work in your math notebook.

$$x+5 = 3\sqrt{y+1} \quad (\text{divide both sides by 3})$$

$$\frac{x+5}{3} = \sqrt{y+1} \quad (\text{square both sides})$$

$$\left(\frac{x+5}{3}\right)^2 = y+1 \quad (\text{subtract 1 from both sides})$$

$$\left(\frac{x+5}{3}\right)^2 - 1 = y$$

$x-20 = \pm 15.811$
 $x = 20 + 15.811 = 35.811$
 or
 $x = 20 - 15.811 = 4.189$

- e. Hence, if Arlo wants to sell 35 hedgehogs, use the inverse to find the price should he charge.

$$\sqrt{-10(35-50)} + 20 = \sqrt{-10(-15)} + 20 = \sqrt{150} + 20 = 12.25 + 20 = 32.25$$

3. Use the method described above to find the inverse of each function below. Show your work in your math notebook.

a. $L(x) = 2x - 5$

$$x = 2y - 5$$

$$x+5 = 2y$$

$$a) \quad y = \frac{x+5}{2}$$

b. $s(x) = \sqrt[3]{x+2} - 7$

$$x = \sqrt[3]{y+2} - 7$$

$$x+7 = \sqrt[3]{y+2}$$

$$b) \quad (x+7)^3 = y+2$$

$$(x+7)^3 - 2 = y$$

c. $q(x) = (3x-1)^3 + 8$

$$x = (3y-1)^3 + 8$$

$$(x-8) = (3y-1)^3$$

$$c) \quad \sqrt[3]{x-8} = 3y-1$$

$$\frac{\sqrt[3]{x-8} + 1}{3} = y$$

d. $t(x) = \frac{-2}{x+1} - 5$

$$d) \quad x = \frac{-2}{y+1} - 5$$

$$(y+1)x + 5 = \frac{-2}{y+1}$$

$$(y+1)(x+5) = -2$$

$$y+1 = \frac{-2}{x+5}$$

$$y = \frac{-2}{x+5} - 1$$