

Age (years)	5	7	9
Height (inches)	42	47.5	53

(a) What is the average rate of growth between 5 and 7 years? Between 7 and 9 years?

- Between 5 and 7 years: Avg. rate of growth = $\frac{47.5-42}{7-5} = 2.75$ inches/yr
- Between 7 and 9 years: Avg. rate of growth = $\frac{53-47.5}{9-7} = 2.75$ inches/yr

(b) Assuming that the average height h is a linear function of age t , write a formula for h in terms of t .

By assuming that h is a linear function of t , we are assuming that h increases by 2.75 in/yr. Here are two ways to write an equation for h in terms of t :

- Using the slope-intercept form $h = mt + b$
Rate of change = $m = 2.75$ in/yr. $\Rightarrow h = 2.75t + b$

To solve for b , we can plug in values from our table since these values should satisfy the equation.

$$\text{Using } t = 5 \text{ and } h = 42: 42 = 2.75(5) + b \Rightarrow b = 28.25$$

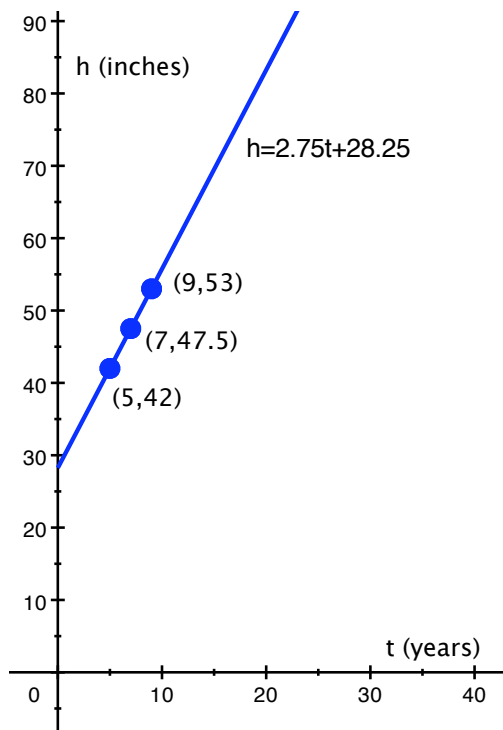
(Note: You can use the other values in the table to find b as well.)

$$\text{So, } h = 2.75t + 28.25.$$

- Using the point-slope form $h - h_1 = m(t - t_1)$ for a point (t_1, h_1) on the line
Rate of Change = $m = 2.75$ in/year
Points on the line: $(5, 42)$, $(7, 47.5)$, and $(9, 53)$

You can use any point on the line for values to put into the equation. Using the first point, we have that $h - 42 = 2.75(t - 5)$. (Note that this simplifies to $h = 2.75t + 28.25$)

(c) Graph the average height as a function of t .



- (d) According to your formula, what is the average height of a 25 year old?

To find the average height of a 25 year old according to the model, we can plug $t=25$ into the formula.

$$h = 2.75(25) + 28.25 = 97 \text{ inches (That's over 8 feet!)}$$

- (e) Do you think the formula from part (b) reasonably models height?

The main problem with the formula is that it assumes that, on average, women keep growing throughout their lives, which we know is not true. So, in the long term, this formula does not reasonably model height.