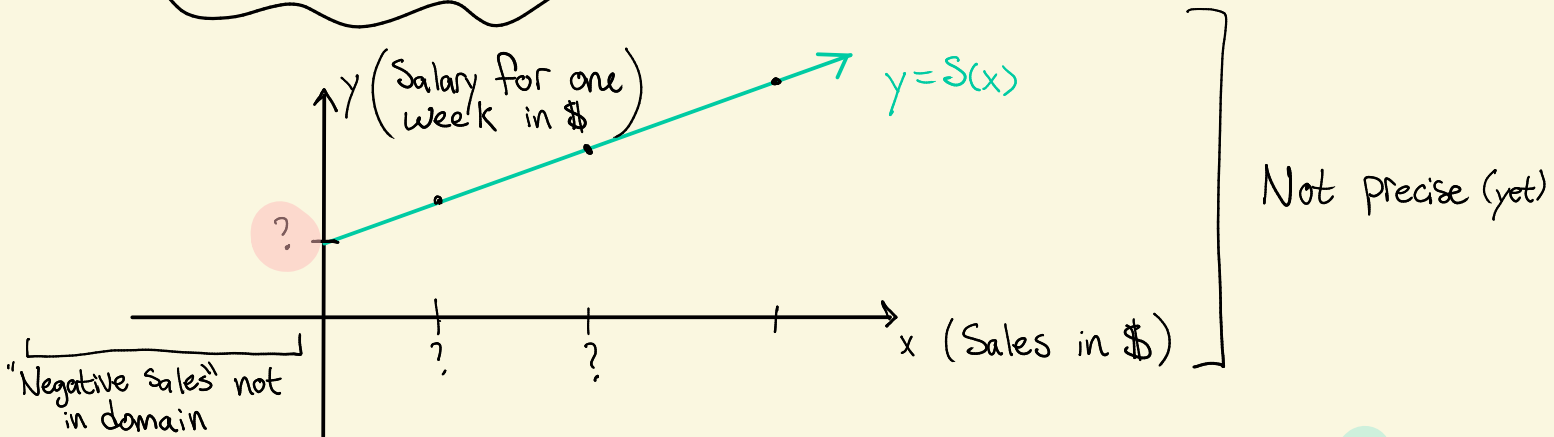


# Section 1.5

1. (2 points) A sales person makes a base salary of \$400 per week plus 12% commission on sales.

(a) Write a linear function to model the sales person's weekly salary  $S(x)$  for  $x$  dollars in sales.

What's the Picture?



Since the model is linear, we'll want an equation of the form  $S(x) = mx + b$ , where we need to find  $m$  and  $b$  (slope and intercept)

• If they make  $x = \$0$ , they get \$400 base and 12% of \$0 commission, so  $400 + 0 = \$400$ . So the  $y$ -intercept is at  $(0, b) = (0, 400)$ .

• Useful trick:  $m = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$ , so let's choose points where

$x_2 - x_1 = 1$  to save some work!

We have one point already:  $(x_1, y_1) = (0, 400)$ .

Let's find  $?$  for  $(x_2, y_2) = (1, ?)$

If they sell \$1, they get \$400 base salary plus 12% of \$1 in commission, i.e. 12 cents, i.e.  $\frac{12}{100}$  dollars. So their total pay is

$?$  =  $\$400 + (12/100)$ . Thus  $(x_2, y_2) = (1, 400 + \frac{12}{100})$ .

Then  $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{(400 + \frac{12}{100}) - (400)}{1 - 0} = \frac{(12/100)}{1} = \frac{12}{100}$ .

So our model is

$$S(x) = mx + b = \left(\frac{12}{100}\right)x + 400.$$

(b) Evaluate  $S(800)$  and interpret the meaning in the context of this problem.

$$\begin{aligned} S(800) &= \left(\frac{12}{100}\right)(800) + 400 \\ &= (12) \cdot 8 + 400 \\ &= 96 + 400 \\ &= 496. \end{aligned}$$

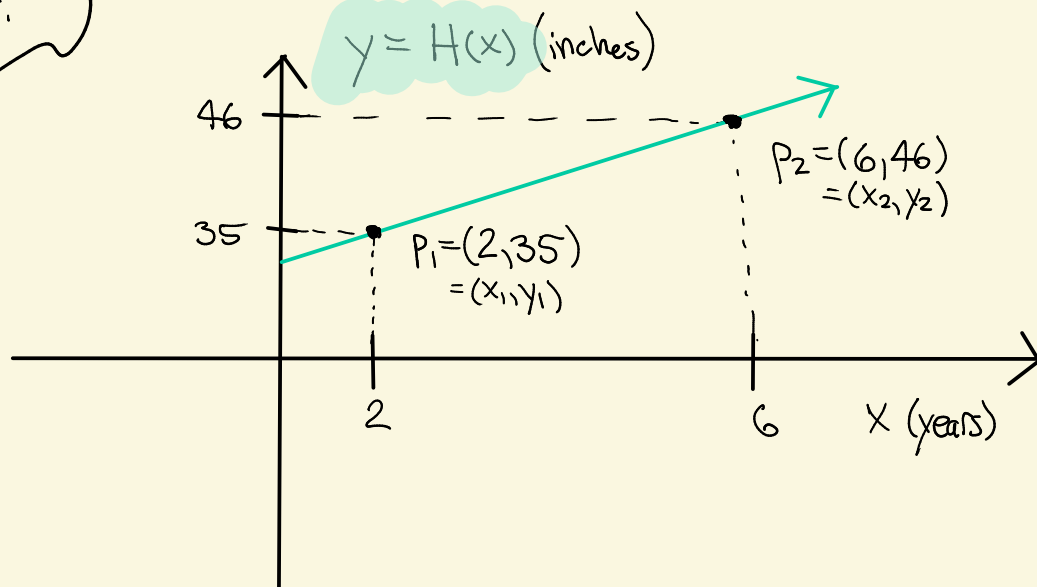
Interpretation:

If they make \$800 in sales in one particular week, then their paycheck for that week will be \$496, i.e. they will make an additional \$96 in commission.

2. (2 points) A pediatrician records the age  $x$  (in years) and average height  $y$  (in inches) for girls between the ages of 2 and 10.

(a) Use the points (2, 35) and (6, 46) to write a linear model for these data.

What's the picture?



We want an equation of the form  $H(x) = mx + b$

$$\textcircled{m}: m = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{46 - 35}{6 - 2} = \frac{11}{4}.$$

$\textcircled{b}$ : Hard to find directly, but we have points and a slope

→ Use point-slope formula!

$$y - y_1 = m(x - x_1) \Rightarrow y - 35 = \frac{11}{4}(x - 2)$$

$$\Rightarrow y = \frac{11}{4}(x - 2) + 35$$

$$= \left(\frac{11}{4}\right)x - \frac{22}{4} + 35$$

$$= \left(\frac{11}{4}\right)x + \frac{59}{2}.$$

(b) Interpret the meaning of the slope in this context.

Interpretations for  $m = \frac{11}{4}$ :

- Every 4 years, they grow 11 inches.
- Every 1 year, they grow  $\left(\frac{11}{4}\right)$  inches.