

Day 18

2.4 Linear Models

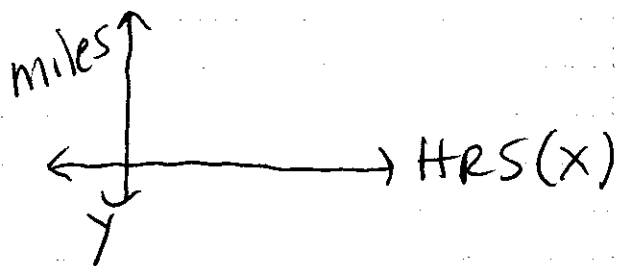
Key words:

slope: rate, rate of change, "per"

mi/hr descending (negative)
 ↑ increasing (positive)
per

y-intercept: initial amount, base pay, flat fee, starting point

If time is involved, it is always the "x"-value. (secs, min, hrs, days, yrs)



If a problem has 4 values, then they probably represent two ordered pairs, and you will have to find the slope ($m = \frac{y_2 - y_1}{x_2 - x_1}$) and then put the eq. in point-slope ($y - y_1 = m(x - x_1)$)

and solve for y. (final answer will be in $y = mx + b$ form)

p. 78 Quick #1

Suppose a balloon begins descending at a rate of 20ft/min. from an elevation of 1350ft.

b

↑
 $m = -20$

$y = -20x + 1350$

Find the x-int. to graph.

(height) $h = -20t + 1350$
ft ↑
time in min.

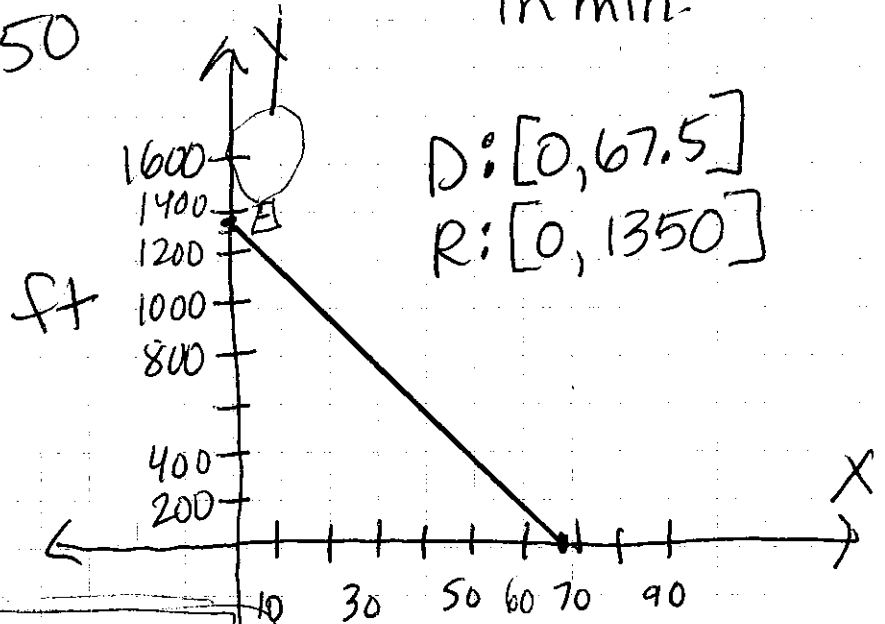
$$0 = -20t + 1350$$

$$+20t \quad +20t$$

$$\frac{20t}{20} = \frac{1350}{20}$$

$$t = 67.5$$

x-int: (67.5, 0)
y-int: (0, 1350)

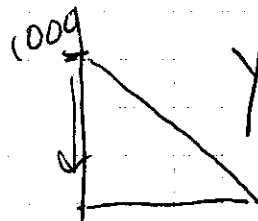


D: [0, 67.5]
R: [0, 1350]

It took 67.5 minutes to land.

minutes

p. 81 (2) equation



$y = -50x + 1000$

(3) equation

$y = 8x + 60$
↑
8 in/yr

$\frac{5\text{-ft}}{\times 12}$
60 in

⑤ An empty 5-gal water jug weighs 0.75 lb. With 3c of water inside, the jug weighs 2.25 lb. Predict the weight of the jug with 5c of water inside.

x_1 y_1
 $(0, 0.75)$
 x_2 y_2
 $(3, 2.25)$

x
 cups
 water
 y
 weight

$$m = \frac{2.25 - 0.75}{3 - 0} = \frac{1.5}{3}$$

$$m = 0.5$$

$$y - 0.75 = 0.5(x - 0)$$

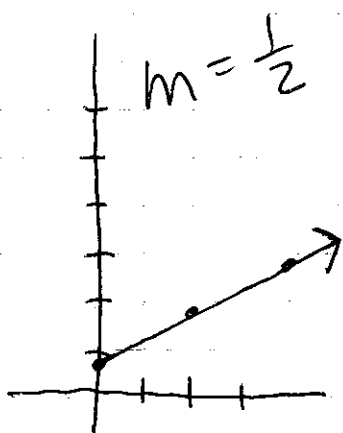
$$y - 0.75 = 0.5x$$

$$+ 0.75 \quad + 0.75$$

linear model: $y = 0.5x + 0.75$

prediction: $y = 0.5(5) + 0.75$

$$y = 3.25 \text{ lb}$$



⑩ WTEOTL

x-intercept: -2, y-int: -6

$(-2, 0)$
 $x_1 \quad y_1$

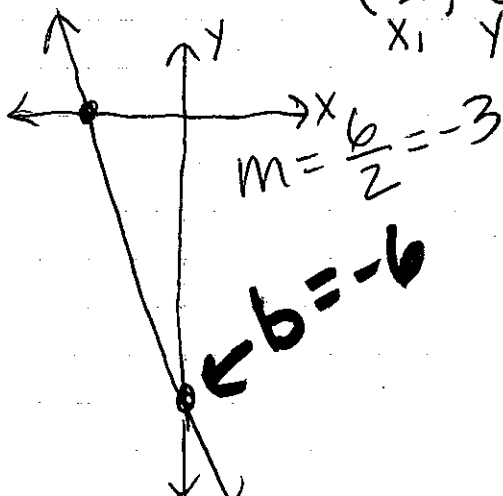
$(0, -6)$
 $x_2 \quad y_2$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\frac{-6 - 0}{0 - (-2)} = \frac{-6}{2} = -3$$

$$y = -3x - 6$$

linear model



$$\textcircled{18} \quad \begin{matrix} (3.5, -2.3) & \text{x-int: } (5.1, 0) \\ x_2 & y_2 & & x_1 & y_1 \end{matrix}$$

$$m = \frac{-2.3 - 0}{3.5 - 5.1} = \frac{-2.3}{-1.6} = 1.4375$$

$$y - y_1 = m(x - x_1)$$

$$y - 0 = 1.4375(x - 5.1)$$

$$y = 1.4375x - 7.33125$$

Alg.2 Practice 2-4

Using Linear Models

Write an equation for each line.

1. y-intercept of -2.1, x-intercept of 3.5 like #16

2. through (1.2, 5.1), x-intercept of 3.7 like #18

For each situation, find a linear model and use it to make a prediction. (like #5)

3. The cost of producing 4 units is \$204.80. The cost of producing 8 units is \$209.60. How much does it cost to produce 12 units? equation prediction
 (,) (,)

4. There were ^y174 words typed in ^x3 minutes. There were 348 words typed in 6 minutes. How many words will be typed in 8 minutes? _____
 (6, 348) (3, 174) $m =$ $y - y_1 = m(x - x_1)$

5. After 5 months the number of subscribers to a newspaper was 5730. After 7 months the number of subscribers to the newspaper was 6022. How many subscribers to the newspaper will there be after 10 months? _____
 (,) (,)

Graph each set of data. Decide whether a linear model is reasonable. If so, draw a trend line and write its equation.

6. {(1, 2.1), (3, 3.1), (5, 4.0), (7, 5.2), (9, 5.9)} _____

7. {(2, 3.5), (4, 4.9), (6, 6.3), (8, 4.6), (10, 2.9)} _____

8. {(-2, -3.9), (-1, -1.8), (0, 0.1), (1, 1.9), (2, 3.8)} _____

9. {(0.3, 0), (0.8, 3), (1.1, 5), (2.0, 6), (2.5, 6)} _____

10. The table shows the percentage of the population not covered by health insurance in selected states for the years 1990 and 1999.

State	Idaho	Illinois	Michigan	Montana	New York
1990	15.1	10.9	9.4	14.0	12.1
1999	19.1	14.1	11.2	18.6	16.4

Source: *The World Almanac and Book of Facts, 2001*

- a. Draw a scatter plot showing the relationship between the percentage not covered by health insurance in 1990 and the percentage not covered in 1999. Use the 1990 percentage as the independent variable(x).
- b. Use your scatter plot to develop a model relating the 1990 percentage to the 1999 percentage.
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- c. In Wyoming, 12.5% of the population were not covered by health insurance in 1990. Use your model to estimate the percentage who were not covered in 1999.
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- d. The actual percentage for Wyoming in 1999 was 16.1. Is your model reasonable?
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p. 81 (#1)