

- (b) By eye draw a straight line that fits these data well and find its equation.
- (c) Use a calculator or computer to find the equation of the regression line for these data. What is the correlation coefficient, r , to 4 decimal places? To 3 decimal places? What does this tell you?
- (d) What does the slope of the regression line mean in terms of Henry Aaron's home-run record?
- (e) From your answer to part (d), how many home-runs do you estimate Henry Aaron hit in each of the years 1974, 1975, 1976, and 1977? If you were told that Henry Aaron retired at the end of the 1976 season, would this affect your answers?

Table 1.38 Henry Aaron's cumulative home-run record, H , from 1954 to 1973, with t in years since 1953

t	1	2	3	4	5	6	7	8	9	10
H	13	40	66	110	140	179	219	253	298	342
t	11	12	13	14	15	16	17	18	19	20
H	366	398	442	481	510	554	592	639	673	713

8. Table 1.39 shows men's and women's world records for swimming distances from 50 meters to 1500 meters.¹⁷

- (a) What values would you add to Table 1.39 to represent the time taken by both men and women to swim 0 meters?
- (b) Plot men's time against distance, with time t in seconds on the vertical axis and distance d in meters

on the horizontal axis. It is claimed that a straight line models this behavior well. What is the equation for that line? What does its slope represent? On the same graph, plot women's time against distance and find the equation of the straight line that models this behavior well. Is this line steeper or flatter than the men's line? What does that mean in terms of swimming? What are the values of the vertical intercepts? Do these values have a practical interpretation?

- (c) On another graph plot the women's times against the men's times, with women's times, w , on the vertical axis and men's times, m , on the horizontal axis. It should look linear. How could you have predicted this linearity from the equations you found in part (b)? What is the slope of this line and how can it be interpreted? A newspaper reporter claims that the women's records are about 8% slower than the men's. Do the facts support this statement? What is the value of the vertical intercept? Does this value have a practical interpretation?

Table 1.39 Men's and women's world swimming records

Distance (m)	50	100	200	400	800	1500
Men (sec)	21.64	47.84	104.06	220.17	459.16	874.56
Women (sec)	24.13	53.77	116.78	243.85	496.22	952.10

CHAPTER SUMMARY

• Functions

Definition: a rule which takes certain numbers as inputs and assigns to each input exactly one output number.

Function notation, $y = f(x)$.

Use of vertical line test.

• Average rate of change

Average rate of change of $Q = f(t)$ on $[a, b]$ is

$$\frac{\Delta Q}{\Delta t} = \frac{f(b) - f(a)}{b - a}.$$

Increasing, decreasing functions; identifying from average rate of change.

• Linear Functions

Value of y changes at constant rate.

• Formulas for Linear Functions

Slope-intercept form: $y = b + mx$.

Point-slope form: $y - y_0 = m(x - x_0)$.

Standard form: $Ax + By + C = 0$.

• Properties of Linear Functions

Interpretation of slope, vertical and horizontal intercepts.

Intersection of lines: Solution of equations.

Parallel lines: $m_1 = m_2$.

Perpendicular lines: $m_1 = -\frac{1}{m_2}$.

• Fitting Lines to Data

Linear regression: correlation. Interpolation, extrapolation; dangers of extrapolation.

¹⁷Data from "The World Almanac and Book of Facts: 2002," World Almanac Education Group, Inc., New York, 2002.