

3.2 Assess Your Understanding

'Are You Prepared?' Answers are given at the end of these exercises. If you get a wrong answer, read the pages listed in red.

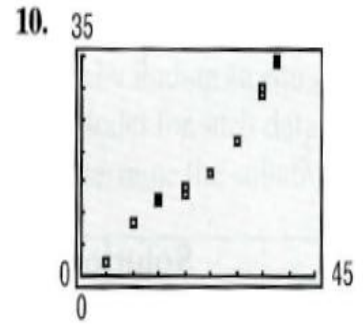
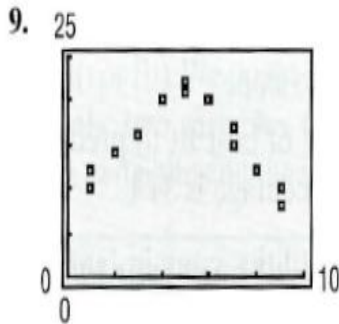
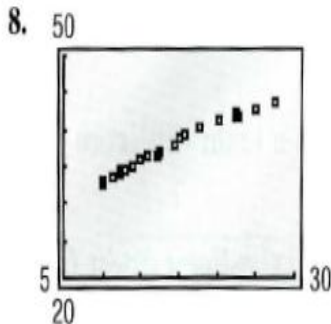
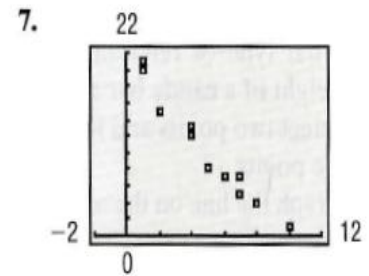
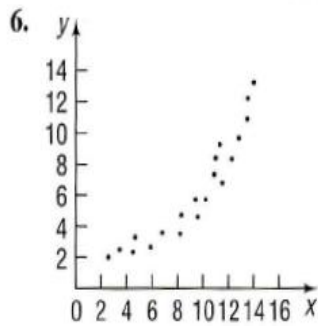
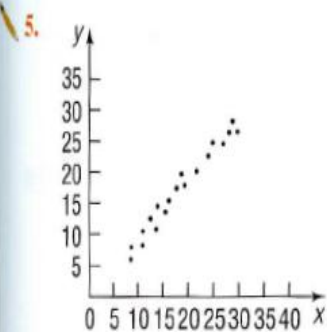
- Plot the points $(1, 5), (2, 6), (3, 9), (1, 12)$ in the Cartesian plane. Is the relation $\{(1, 5), (2, 6), (3, 9), (1, 12)\}$ a function? Why? (pp. 2 and 58–61)
- Find an equation of the line containing the points $(1, 4)$ and $(3, 8)$. (p. 34)

Concepts and Vocabulary

- A _____ is used to help us to see the type of relation, if any, that may exist between two variables.
- If the independent variable in a line of best fit $y = -0.008x + 14$ is credit score, and the dependent variable is the interest rate on a used car loan, then the slope is interpreted as "if credit score increases by 1 point, the interest rate will _____ (increase/decrease) by _____ percent, on average.

Skill Building

In Problems 5–10, examine the scatter diagram and determine whether the type of relation is linear or nonlinear.



In Problems 11–16,

- Draw a scatter diagram.
- Select two points from the scatter diagram and find the equation of the line containing the points selected.
- Graph the line found in part (b) on the scatter diagram.
- Use a graphing utility to find the line of best fit.
- Use a graphing utility to draw the scatter diagram and graph the line of best fit on it.

11.

x	3	4	5	6	7	8	9
y	4	6	7	10	12	14	16

12.

x	3	5	7	9	11	13
y	0	2	3	6	9	11

13.

x	-2	-1	0	1	2
y	-4	0	1	4	5

14.

x	-2	-1	0	1	2
y	7	6	3	2	0

15.

x	-20	-17	-15	-14	-10
y	100	120	118	130	140

16.

x	-30	-27	-25	-20	-14
y	10	12	13	13	18

Applications and Extensions

- 17. Candy** The following data represent the weight (in grams) of various candy bars and the corresponding number of calories.



Candy Bar	Weight, x	Calories, y
Hershey's Milk Chocolate®	44.28	230
Nestle's Crunch®	44.84	230
Butterfinger®	61.30	270
Baby Ruth®	66.45	280
Almond Joy®	47.33	220
Twix® (with Caramel)	58.00	280
Snickers®	61.12	280
Heath®	39.52	210

Source: Megan Pocius, Student at Joliet Junior College

- Draw a scatter diagram of the data treating weight as the independent variable.
- What type of relation appears to exist between the weight of a candy bar and the number of calories?
- Select two points and find a linear model that contains the points.
- Graph the line on the scatter diagram drawn in part (a).

- Use the linear model to predict the number of calories in a candy bar that weighs 62.3 grams.
- Interpret the slope of the line found in part (c).

- 18. Raisins** The following data represent the weight (in grams) of a box of raisins and the number of raisins in the box.




Weight (in grams), w	Number of Raisins, N
42.3	87
42.7	91
42.8	93
42.4	87
42.6	89
42.4	90
42.3	82
42.5	86
42.7	86
42.5	86

Source: Jennifer Maxwell, Student at Joliet Junior College

- Draw a scatter diagram of the data treating weight as the independent variable.

- (b) What type of relation appears to exist between the weight of a box of raisins and the number of raisins?
- (c) Select two points and find a linear model that contains the points.
- (d) Graph the line on the scatter diagram drawn in part (b).
- (e) Use the linear model to predict the number of raisins in a box that weighs 42.5 grams.
- (f) Interpret the slope of the line found in part (c).

19. Video Games and Grade-Point Average Professor Grant Alexander wanted to find a linear model that relates the number of hours a student plays video games each week, h , to the cumulative grade-point average, G , of the student. He obtained a random sample of 10 full-time students at his college and asked each student to disclose the number of hours spent playing video games and the student's cumulative grade-point average.




Hours of Video Games per Week, h	Grade-Point Average, G
0	3.49
0	3.05
2	3.24
3	2.82
3	3.19
5	2.78
8	2.31
8	2.54
10	2.03
12	2.51

- (a) Explain why the number of hours spent playing video games is the independent variable and cumulative grade-point average is the dependent variable.
- (b) Use a graphing utility to draw a scatter diagram.

- (c) Use a graphing utility to find the line of best fit that models the relation between number of hours of video game playing each week and grade-point average. Express the model using function notation.
- (d) Interpret the slope.
- (e) Predict the grade-point average of a student who plays video games for 8 hours each week.
- (f) How many hours of video game playing do you think a student plays whose grade-point average is 2.40?

20. Height versus Head Circumference A pediatrician wanted to find a linear model that relates a child's height, H , to head circumference, C . She randomly selects nine children from her practice, measures their height and head circumference, and obtains the data shown. Let H represent the independent variable and C the dependent variable.



Height, H (inches)	Head Circumference, C (inches)
25.25	16.4
25.75	16.9
25	16.9
27.75	17.6
26.5	17.3
27	17.5
26.75	17.3
26.75	17.5
27.5	17.5

Source: Denise Slucki, Student at Joliet Junior College

- (a) Use a graphing utility to draw a scatter diagram.
- (b) Use a graphing utility to find the line of best fit that models the relation between height and head circumference. Express the model using function notation.
- (c) Interpret the slope.
- (d) Predict the head circumference of a child that is 26 inches tall.
- (e) What is the height of a child whose head circumference is 17.4 inches?

Mixed Practice


- 21. Demand for Jeans** The marketing manager at Levi-Strauss wishes to find a function that relates the demand D for men's jeans and p , the price of the jeans. The following data were obtained based on a price history of the jeans.



Price (\$/Pair), p	Demand (Pairs of Jeans Sold per Day), D
20	60
22	57
23	56
23	53
27	52
29	49
30	44

- Does the relation defined by the set of ordered pairs (p, D) represent a function?
- Draw a scatter diagram of the data.
- Using a graphing utility, find the line of best fit that models the relation between price and quantity demanded.
- Interpret the slope.
- Express the relationship found in part (c) using function notation.
- What is the domain of the function?
- How many jeans will be demanded if the price is \$28 a pair?

- 22. Advertising and Sales Revenue** A marketing firm wishes to find a function that relates the sales S of a product and A , the amount spent on advertising the product. The data are



Advertising Expenditures, A	Sales, S
20	335
22	339
22.5	338
24	343
24	341
27	350
28.3	351

obtained from past experience. Advertising and sales are measured in thousands of dollars.

- Does the relation defined by the set of ordered pairs (A, S) represent a function?
- Draw a scatter diagram of the data.
- Using a graphing utility, find the line of best fit that models the relation between advertising expenditures and sales.
- Interpret the slope.
- Express the relationship found in part (c) using function notation.
- What is the domain of the function?
- Predict sales if advertising expenditures are \$25,000.

Explaining Concepts: Discussion and Writing

- 23. Maternal Age versus Down Syndrome** A biologist would like to know how the age of the mother affects the incidence rate of Down syndrome. The data to the right represent the age of the mother and the incidence rate of Down syndrome per 1000 pregnancies.

Draw a scatter diagram treating age of the mother as the independent variable. Would it make sense to find the line of best fit for these data? Why or why not?

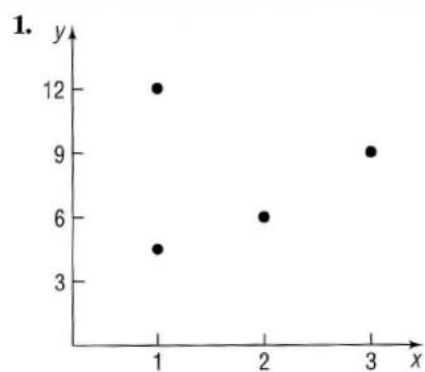
- Explain why it does not make sense to interpret the y -intercept in Problem 17.
- Refer to Problem 19. Solve $G(h) = 0$. Provide an interpretation of this result. Find $G(0)$. Provide an interpretation of this result.



Age of Mother, x	Incidence of Down Syndrome, y
33	2.4
34	3.1
35	4
36	5
37	6.7
38	8.3
39	10
40	13.3
41	16.7
42	22.2
43	28.6
44	33.3
45	50

Source: Hook, E.B., *Journal of the American Medical Association*, 249, 2034–2038, 1983.

'Are You Prepared?' Answers



No, because the input, 1, corresponds to two different outputs.

2. $y = 2x + 2$