Grab a Calculator

p.139 #1, 2, 5-10, 17 Due Today

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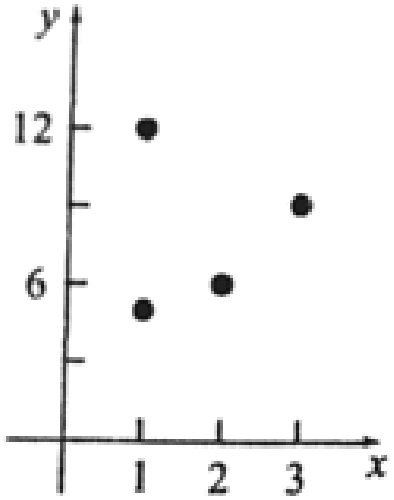
1.



No, the relation is not a function because an input, i, corresponds to two different outputs, 5 and 12.

2. Let $(x_1, y_1) = (1, 4)$ and $(x_2, y_2) = (3, 8)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8-4}{3-1} = \frac{4}{2} = 2$$

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

$$y - 4 = 2(x - 1)$$

$$y - 4 = 2x - 2$$

$$y = 2x + 2$$

5. Linear relation, $m > 0$

6. Nonlinear relation

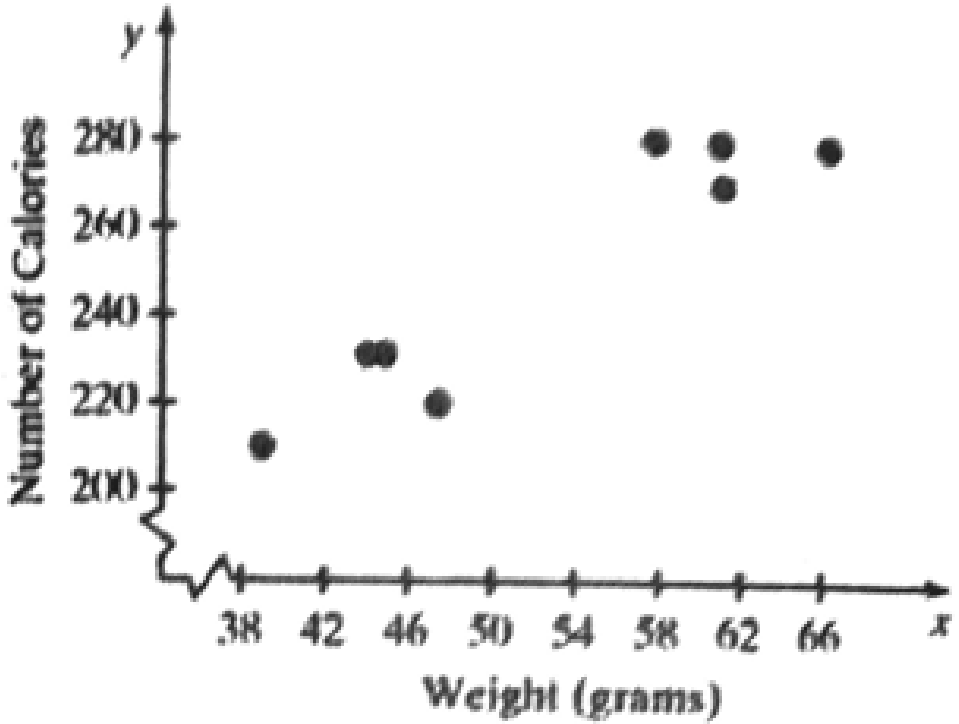
7. Linear relation, $m < 0$

8. Linear relation, $m > 0$

9. Nonlinear relation

10. Nonlinear relation

17. a.



b. Linear.

c. Answers will vary. We will use the points (39.52, 210) and (66.45, 280).

$$m = \frac{280-210}{66.45-39.52} = \frac{70}{26.93} \approx 2.5993316$$

$$y - 210 = 2.5993316(x - 39.52)$$

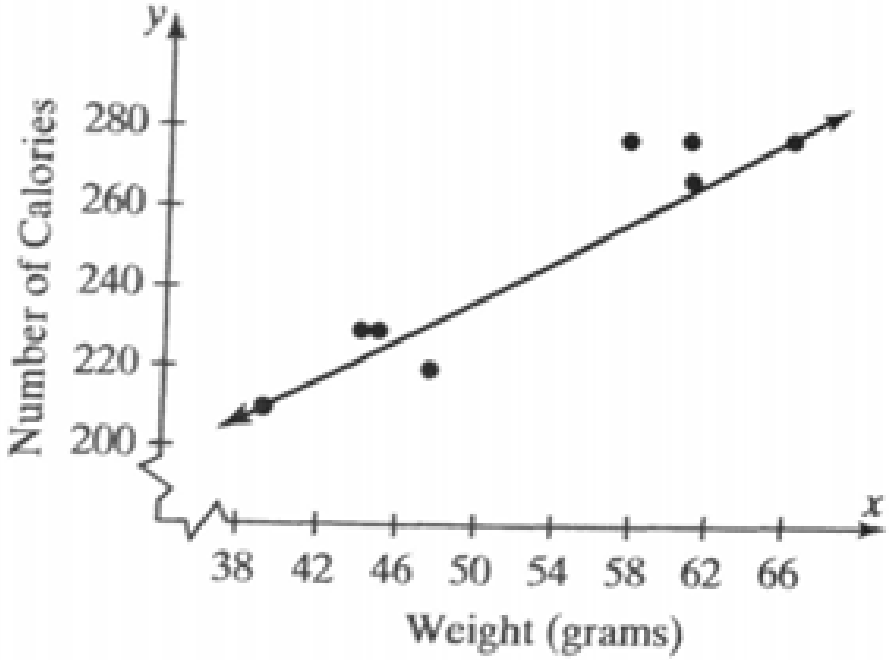
$$y - 210 = 2.5993316x - 102.7255848$$

$$y = 2.599x + 107.274$$

17)

(c) Answers will vary. Using the points $(39.52, 210)$ and $(66.45, 280)$, $y = 2.599x + 107.288$.

(d)



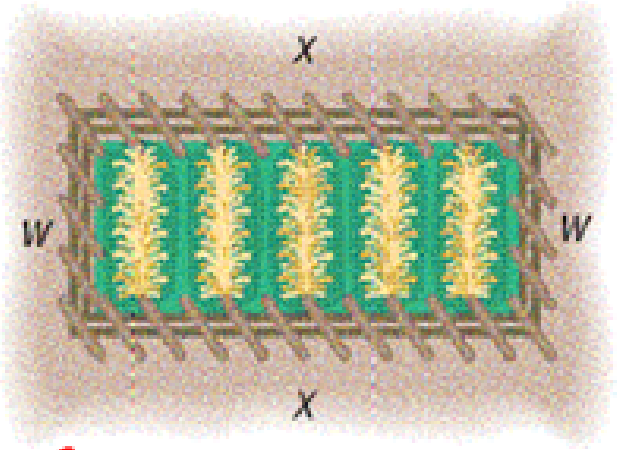
(e) 269 calories

(f) If the weight of a candy bar is increased by 1 gram, the number of calories will increase by 2.599.

EXAMPLE

Maximizing the Area Enclosed by a Fence

A farmer has 800 yards of fence to enclose a rectangular field. What are the dimensions of the rectangle that encloses the most area?



$2x + 2w = 800$

$-2x \qquad -2x$

$\frac{2w}{2} = \frac{800 - 2x}{2}$

$w = 400 - x$

$A = xw$

$A = x(400 - x)$

$A = 400x - x^2$

$-x^2 + 400x$

$\frac{b}{2a} = \frac{400}{2(1)} = 200$

$x = 200$

$$A(x) = -x^2 + 400x$$

$$A(200) = -(200)^2 + 400(200)$$

$$\boxed{A = 40{,}000 \text{ sq yds}}$$

EXAMPLE

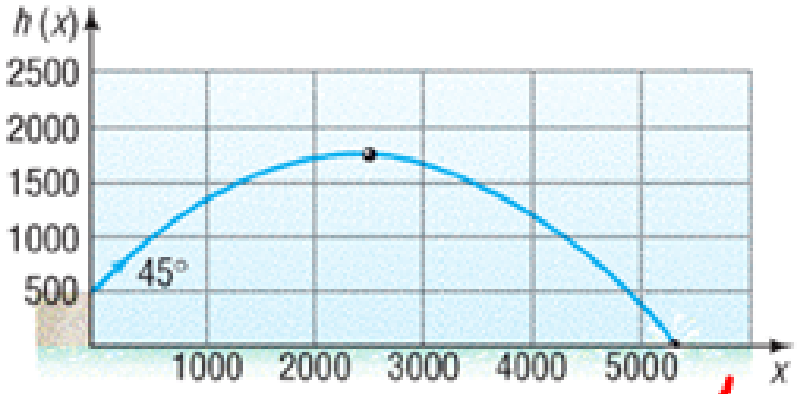
Analyzing the Motion of a Projectile

A projectile is fired from a cliff 500 feet above the water at an inclination of 45° to the horizontal, with a muzzle velocity of 400 feet per second. In physics, it is established that the height h of the projectile above the water is given by

$$h(x) = \frac{-32x^2}{(400)^2} + x + 500$$

$\frac{-32}{400} = \frac{-1}{500}$ $x^2 = \frac{-1}{5000}x^2 + x + 500$

where x is the horizontal distance of the projectile from the base of the cliff.



(a) Find the maximum height of the projectile.

$\frac{-b}{2a} = \frac{-1}{2\left(\frac{-1}{5000}\right)} = 2500$

$h(2500) = \frac{-1}{5000}(2500)^2 + 2500 + 500$

$= 1750$ ft

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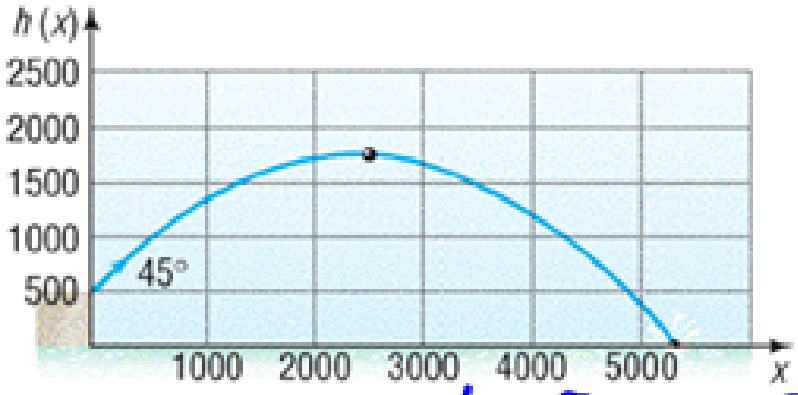

(b) How far from the base of the cliff will the projectile strike the water? x= distance traveled, h = height

$$h(x) = \frac{-1}{5000}x^2 + x + 500$$

$$0 = \frac{-1}{5000}x^2 + x + 500$$

$$x = \frac{-1 \pm \sqrt{1^2 - 4\left(\frac{-1}{5000}\right)(500)}}{2\left(\frac{-1}{5000}\right)}$$

$$= 5458 \text{ ft}$$

OBJECTIVE 2

✓ 2 Build Quadratic Models from Data

$y = ax^2 + bx + c, a > 0$

$y = ax^2 + bx + c, a < 0$

EXAMPLE

Fitting a Quadratic Function to Data

A farmer collected the data given in Table 9, which shows crop yields Y for various amounts x of fertilizer used.

(a) Use a graphing utility to draw a scatter diagram of the data. Comment on the type of relation that may exist between the two variables.

Quadratic.

(b) Use a graphing utility to find the quadratic function of best fit that models the relation between amount of fertilizer and crop yield.

Plot	Fertilizer, x (Pounds/100 ft^2)	Yield (Bushels)
1	0	4
2	0	6
3	5	10
4	5	7
5	10	12
6	10	10
7	15	15
8	15	17
9	20	18
10	20	21
11	25	20
12	25	21
13	30	21
14	30	22
15	35	21
16	35	20
17	40	19
18	40	19

EXAMPLE

Fitting a Quadratic Function to Data

(c) Use the function found in part (b) to determine the optimal amount of fertilizer to apply.

(d) Use the function found in part (b) to predict crop yield when the optimal amount of fertilizer is applied.

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1	0	4
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4	5	7
5	10	12
6	10	10
7	15	15
8	15	17
9	20	18
10	20	21
11	25	20
12	25	21
13	30	21
14	30	22
15	35	21
16	35	20
17	40	19
18	40	19

Turn your diagnostics on.....

Correlation Coefficient

when $-1<r<1$, the strength of a linear relationship can be noticed.

when the absolute value of r is closer to 1, the stronger the linear relationship is.

$r>.84$ $r<-1.23$

$r<1$ $r> .34$