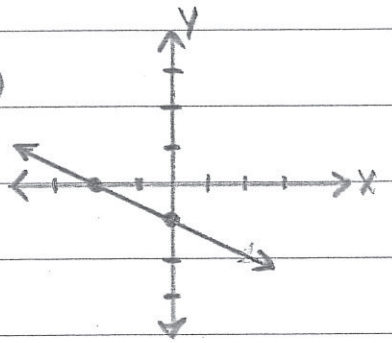
Linear Equations

Slope-Intercept Form: $y = mx + b$ (m: Slope, b: y-Intercept)

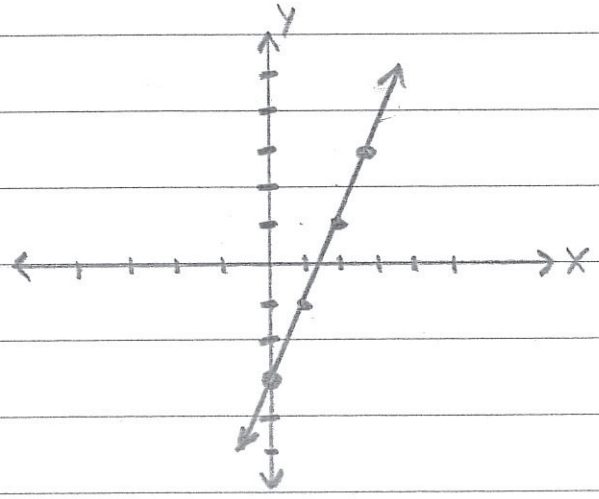
① 

$y = mx + b$

$y = -\frac{1}{2}x - 1$

Write a linear equation in Slope-Intercept form.

② Graph the line using the equation $y = 2x - 3$.

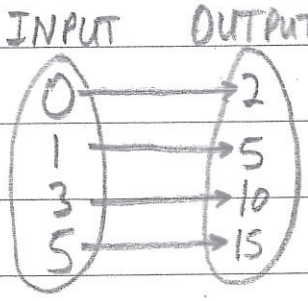


Relations and Functions

Relation: Any set of ordered pairs.

Example → (0,2), (1,5), (3,10), (5,15)

Function: A relation when each input is assigned exactly one output.



Example: Cross Country Ages and Times

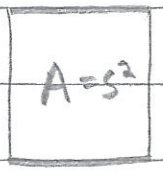
Age	Time
9	15:21
12	13:08
14	10:54
13	14:13
12	13:15
10	12:08
12	11:02

Is this a function?

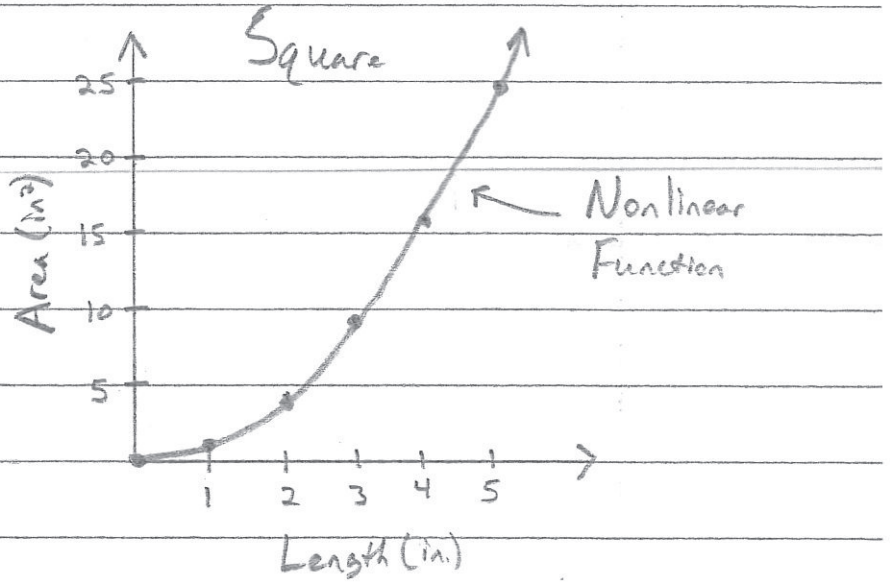
No, this relation is not a function because the input of 12 has 3 different outputs.

Representations of Functions

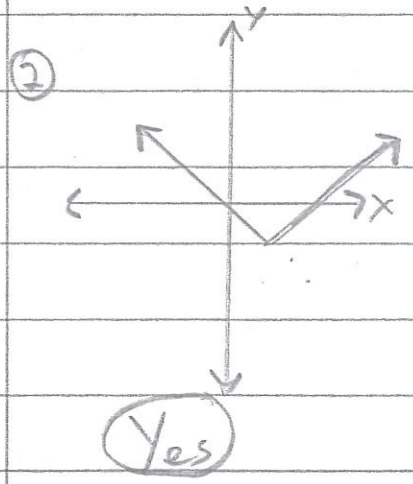
① Create a table and graph relating the length of a side of a square to the area.

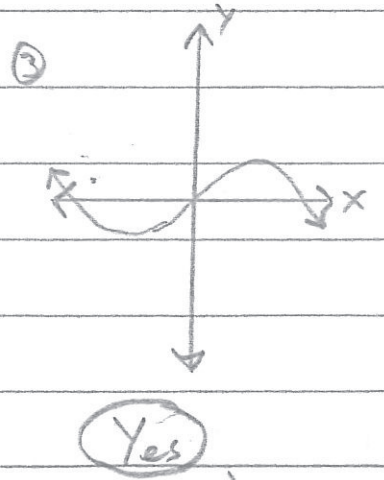


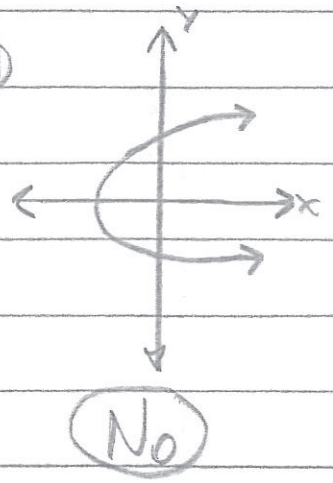
Length (in)	Area (in^2)
0	0
1	1
2	4
3	9
4	16
5	25



Determine whether each graph represents a function.





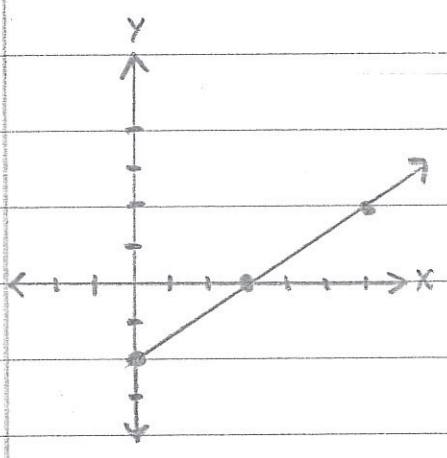


(Use the vertical line test)

Comparing Linear Functions

Which function has the greatest rate of change?
Which function has the greatest initial value?

Function A



Rate of Change = Slope = $\frac{\text{Rise}}{\text{Run}} = \frac{2}{3}$

Initial Value = y-Intercept = -2

Function B

x	y
2	2
6	0
10	-2
12	-3

Rate of Change $= \frac{y_2 - y_1}{x_2 - x_1} = \frac{2-0}{2-6} = \frac{2}{-4} = -\frac{1}{2}$

$y = -\frac{1}{2}x + b$

$2 = -\frac{1}{2}(2) + b$

$2 = -1 + b$

$+1 \quad +1$

$3 = b$

Initial Value = y-Int. = $b = 3$

Function C

$y = 2x - 5$

Rate of Change $= m = 2$

Initial Value $= b = -5$

Function C has the greatest rate of change. Function B has the greatest initial value.

Writing Functions

A band will be paid a flat fee for playing a concert. Additionally, the band will receive a fixed amount for every ticket sold. If 40 tickets are sold, the band will be paid $200. If 70 tickets are sold, the band will be paid $260. Construct a linear function in the form $y = mx + b$.

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

$$= \frac{260 - 200}{70 - 40}$$

$$= \frac{60}{30}$$

$$= 2$$

↑ Rate of Change

$y = mx + b$ (40, 200) (70, 260)

$y = 2x + b$

$200 = 2(40) + b$

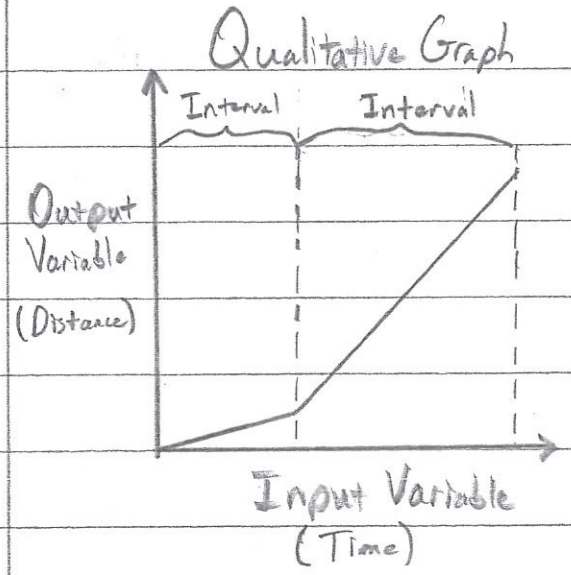
$200 = 80 + b$

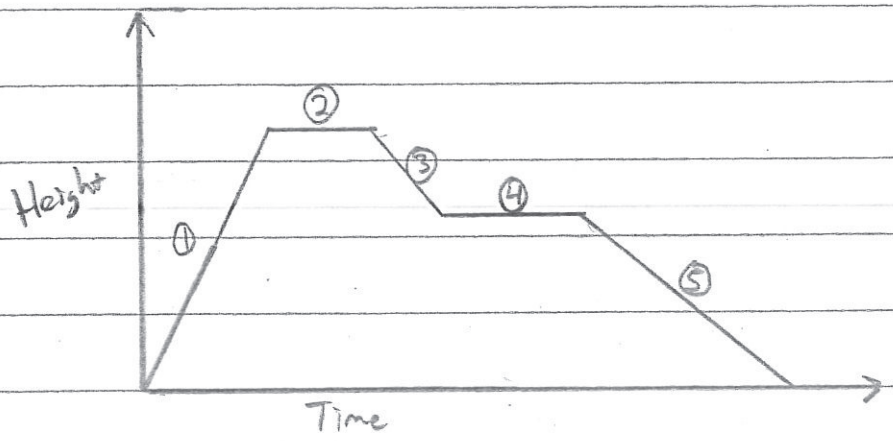
$-80 \quad -80$

$120 = b$

$y = 2x + 120$

Intervals of Increase and Decrease





① The function is increasing.

② The function is constant.

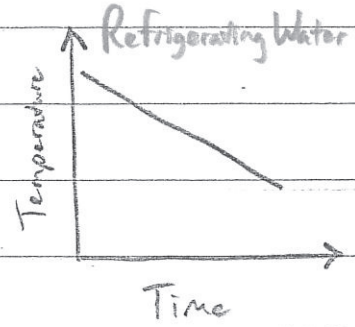
③ The function is decreasing.

④ The function is constant.

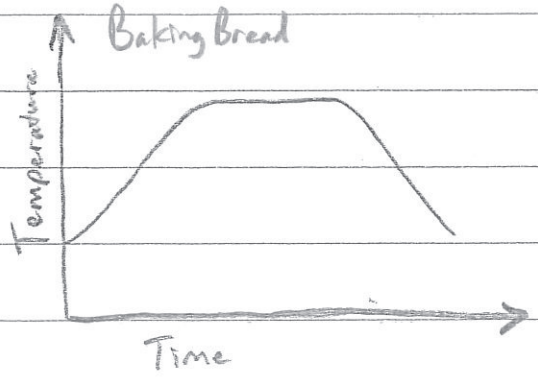
⑤ The function is decreasing.

Sketching Functions

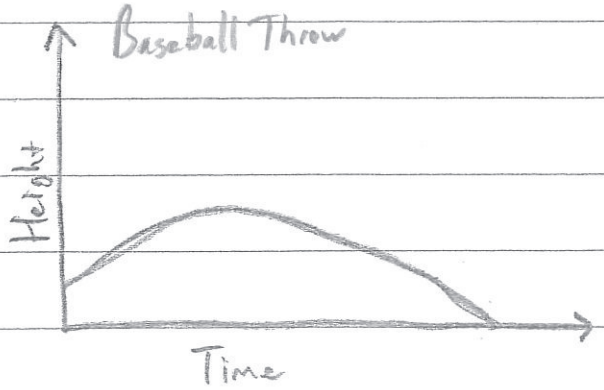
① The temperature of the water decreases over the first few hours in the refrigerator.



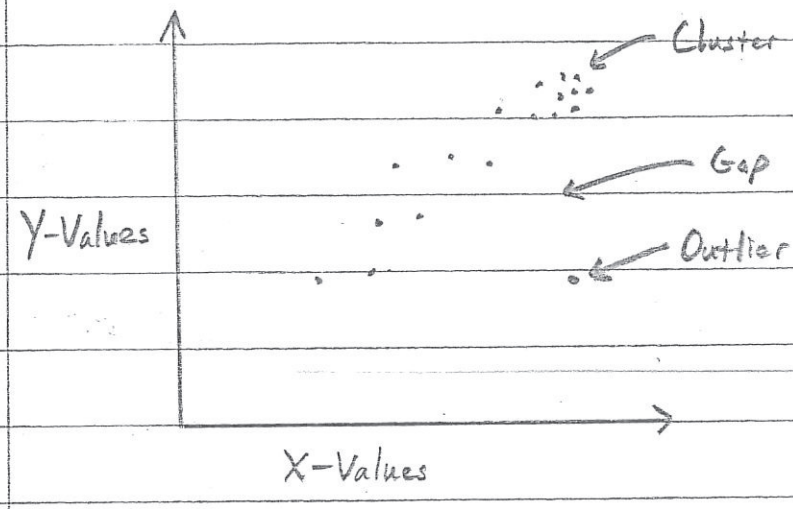
② The temperature changed as Shelly preheated the oven, cooked the bread, and turned off the oven.

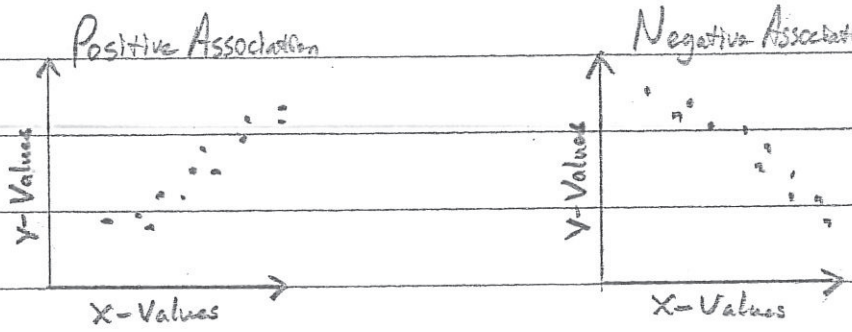


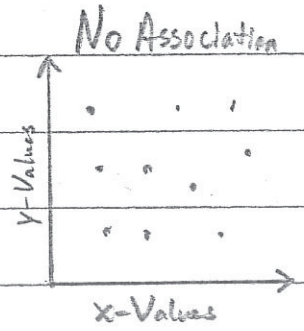
③ Jason throws a baseball from left field towards home plate.



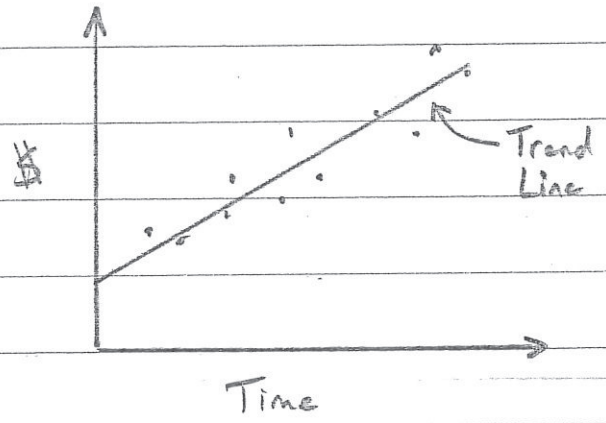
Scatter Plots



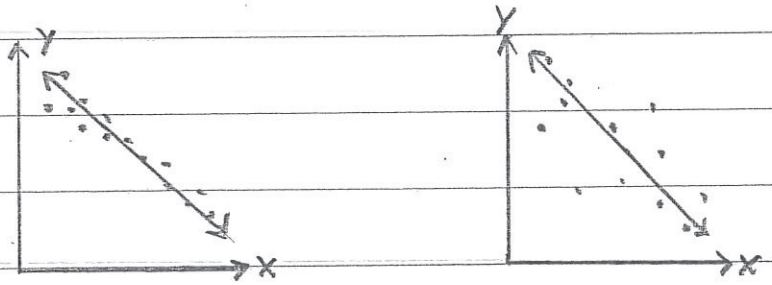




Trend Lines and Linear/Nonlinear Associations



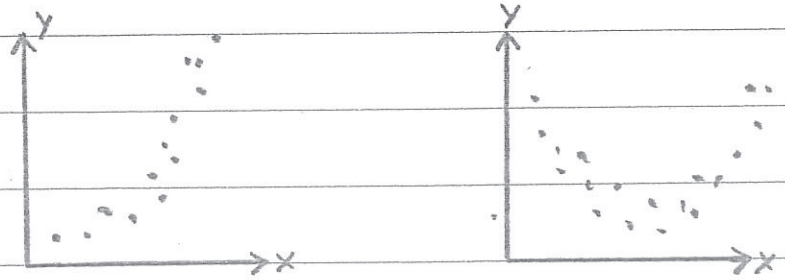
Linear Associations



Strong Negative

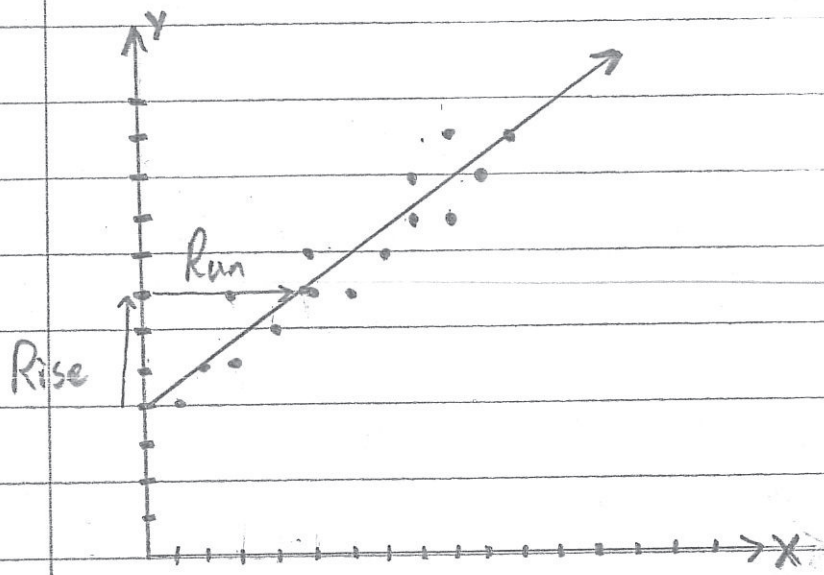
Weak Negative

Nonlinear Associations



Using Linear Models to Make Predictions

Write an equation for the trend line.



$$\text{Slope} = m = \frac{\text{Rise}}{\text{Run}} = \frac{3}{5}$$

$$y\text{-Intercept} = b = 4$$

$$\boxed{y = \frac{3}{5}x + 4}$$

Find the y-value for an x-value of 15.

$$y = \frac{3}{\cancel{5}_{1}}\left(\cancel{15}^{3}\right) + 4$$

$$y = 9 + 4$$

$$\boxed{y = 13}$$