

Classified ads in the *Ithaca Journal* offered several used Toyota Corollas for sale. Listed below are the ages of the car and their advertised prices.

- 1) What are the two variables in the chart? Which would you call the **explanatory variable** and which would you call the **response variable**?

X: Age of the car  
Y: Price Advertised

- 2) Given your response above, fill in the blanks in the following sentence:

The behavior of Age of the car explains the behavior of Price Advertised

- 3) Soon, but not yet, we will make a scatterplot of this data. The horizontal axis will be labeled with the explanatory variable and the vertical axis will be labeled with the response variable. Think about this and fill in the following prediction below:

As Age of the car increases, Price Advertised  
will decrease, in general.

Age (yr)	Price Advertised (\$)
1	13,990
1	13,495
3	12,999
4	9500
4	10,495
5	8995
5	9495
6	6999
7	6950
7	7850
8	6999
8	5995
10	4950
10	4495
13	2850

Now Graph the scatterplot:

What is the Domain of the explanatory variable?

The possible ages of the cars

Write the Domain as a set:

$$0 < X \leq 13$$

What is the range of the Response variable?

The resulting prices advertised

Write the Range as a set:

$$2850 \leq Y \leq 13990$$

Think carefully about how to make a scale for both horizontal and vertical axis. Be sure to label your axes.

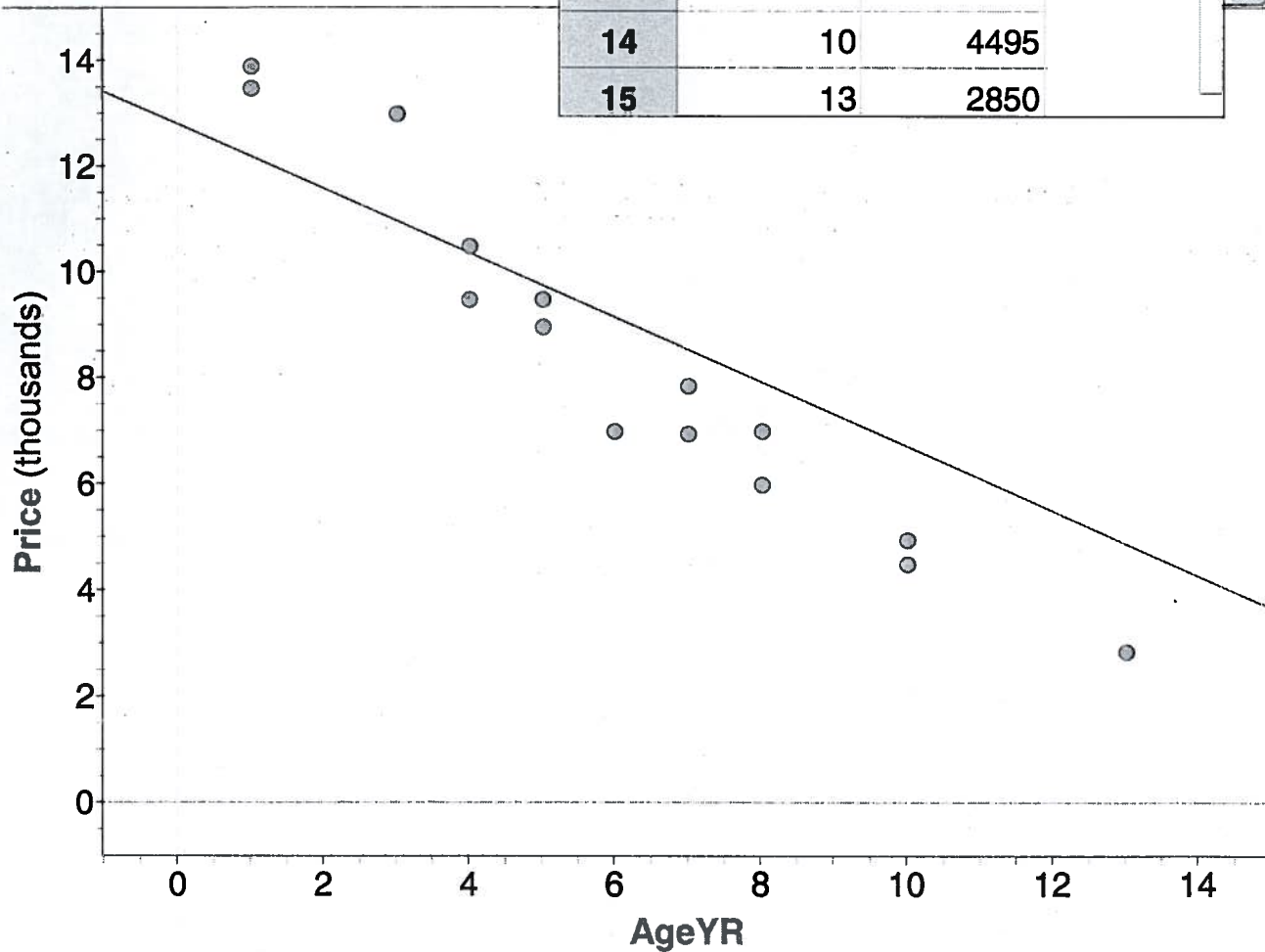


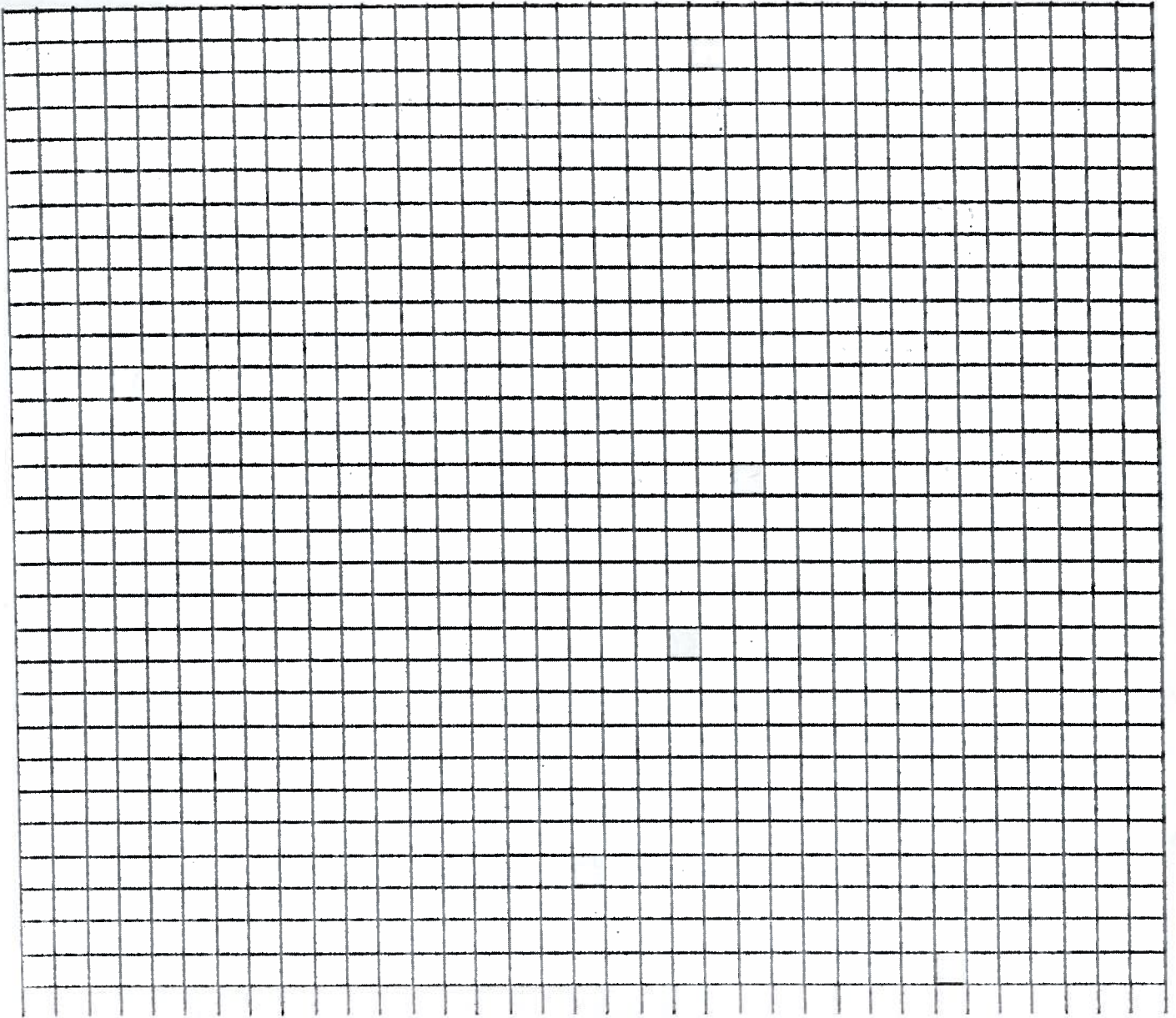
## Used Cars

Used Cars

	AgeYR	Price	<new>
2	1	13495	
3	3	12999	
4	4	9500	
5	4	10495	
6	5	8995	
7	5	9495	
8	6	6999	
9	7	6950	
10	7	7850	
11	8	6999	
12	8	5995	
13	10	4950	
14	10	4495	
15	13	2850	

Used Cars





- 4) Use your calculator to find the Least Squares Regression line.

$$\hat{y} = 14262.208 - 956.1536 X$$

- 5) Why is this line called the "Least Squares" line?

The "squares" represent how far off the data is from the predicted value.

- 6) Very carefully draw the line that models the association between the two variables. How good a fit is the line to the data? Rate is on a scale from 1 to 10, where 1 would be a completely random pattern of points and 10 would be a perfect fit.

- 7) Where does your line hit the y-axis?

What is the x-coordinate at this point?

$$y = 14262.209$$



What does this point represent in the context of this data?

The price of a new car.

- 8) Use two points on your line to find its slope. Remember that "slope" is the ratio of the vertical change in a line to its horizontal change from point to point. A line is the only curve in which this ratio is a constant (which means it never changes.)

$$\begin{array}{l} (3, 11393.748) \\ (8, 6612.9799) \end{array} \quad \frac{\Delta y}{\Delta x} = \frac{4780.7681}{5} = 956.1536$$

What are the units of the slope?

dollars  
year

Write the slope as a unit measure.

956.15 \$/year

What does the slope mean in the context of this data?

How many \$ the price should increase, in general, for every year older the used car is.

For every increase of one year, I expect the price advertised to decrease by \$956.15 (on average)

**A RELATION** is a set of ordered pairs.

- Does the data form a relation? If so, write out the set of ordered pairs that forms this relation.

What is the Domain of the explanatory variable?

Write the Domain as a set:

What is the range of the Response variable?

Write the Range as a set:

- Does the line that you drew form a relation? If so, write out the set of ordered pairs that forms this relation.

What is the Domain of the explanatory variable?

Write the Domain as a set:

What is the range of the Response variable?

Write the Range as a set:



Now put the ordered pairs into these charts:

DATA	
Age (yr)	Price Advertised (\$)
0	na
1	13,990
1	13,495
2	na
3	12,999
4	9500
4	10,495
5	8995
5	9495
6	6999
7	6950
7	7850
8	6999
8	5995
9	na
10	4950
10	4495
11	na
12	na
13	2850

LINEAR MODEL	
x	y
0	14262.2087
1	13306.0551
1	13306.0551
2	12349.9015
3	11393.7479
4	10437.5943
4	10437.5943
5	9481.4407
5	9481.4407
6	8525.2871
7	7569.1336
7	7569.1336
8	6613.9799
8	6613.9799
9	5656.8264
10	4700.6728
10	4700.6728
11	3744.5192
12	2788.3656
13	1832.212



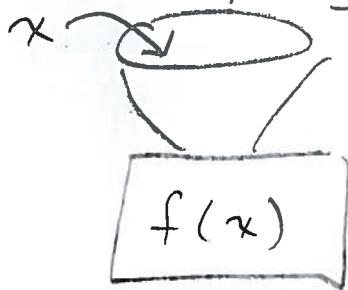
There are some very interesting differences between the data and the model that represents the data. Use this space to make some notes about those differences- we will shortly discuss the differences and you will want to be prepared.

- ⊙ Data has 2 prices for some ages; Model only has 1 price per age
- ⊙ Model increases consistently from age to age; Data increases only generally

Now we are going to define the word **FUNCTION**. This is a space for your notes.

Function: A set of ordered pairs  $(a, b)$  such that each first element,  $a$ , corresponds to exactly one second element,  $b$ . The set of allowable first elements is called the DOMAIN of the function; the set of resultant second elements is called the RANGE of the function.

Domain: What am I allowed to plug in?



$$(x, y) \in f$$

Range: What will the results be that chug out?

$x$	$y$
-	-
-	-
-	-

Here are some questions you should be able to answer about functions:

- Where is this defined in your book?
- What is the difference between a **function** and a **relation**?
- How are **function** and **relation** defined in English? Do those definitions help you to remember the mathematical definitions?
- Like all mathematical ideas, you should be able to represent both **functions** and **relations** in four ways- can you represent **functions** and **relations**
  - Verbally
  - Algebraically
  - Graphically
  - Numerically
- How does the calculator help you to work with **functions** and **relations**?