PRINCIPLES - LESSON 6B
SCATTER PLOTS

Many real-life situations are described in terms of pairs of numbers. A scatter plot is a graph made up of ordered pairs that represent gathered data.

Scatter plots show how two sets of data vary relative to each other.

For example, let's say we want to see how the average heights of kids aged 1-8 compare to their ages. We can create a scatter plot to examine this relationship.

HEIGHT VS AGE SCATTER PLOT

Height and age data was gathered on 14 students.

The results are given in the table below.

Height (Inches)	27	43	38	50	45	49	31	35	40	45	33	24	52	47
Age (Years)	1	5	4	8	6	7	2	3	4	5	2	1	8	6

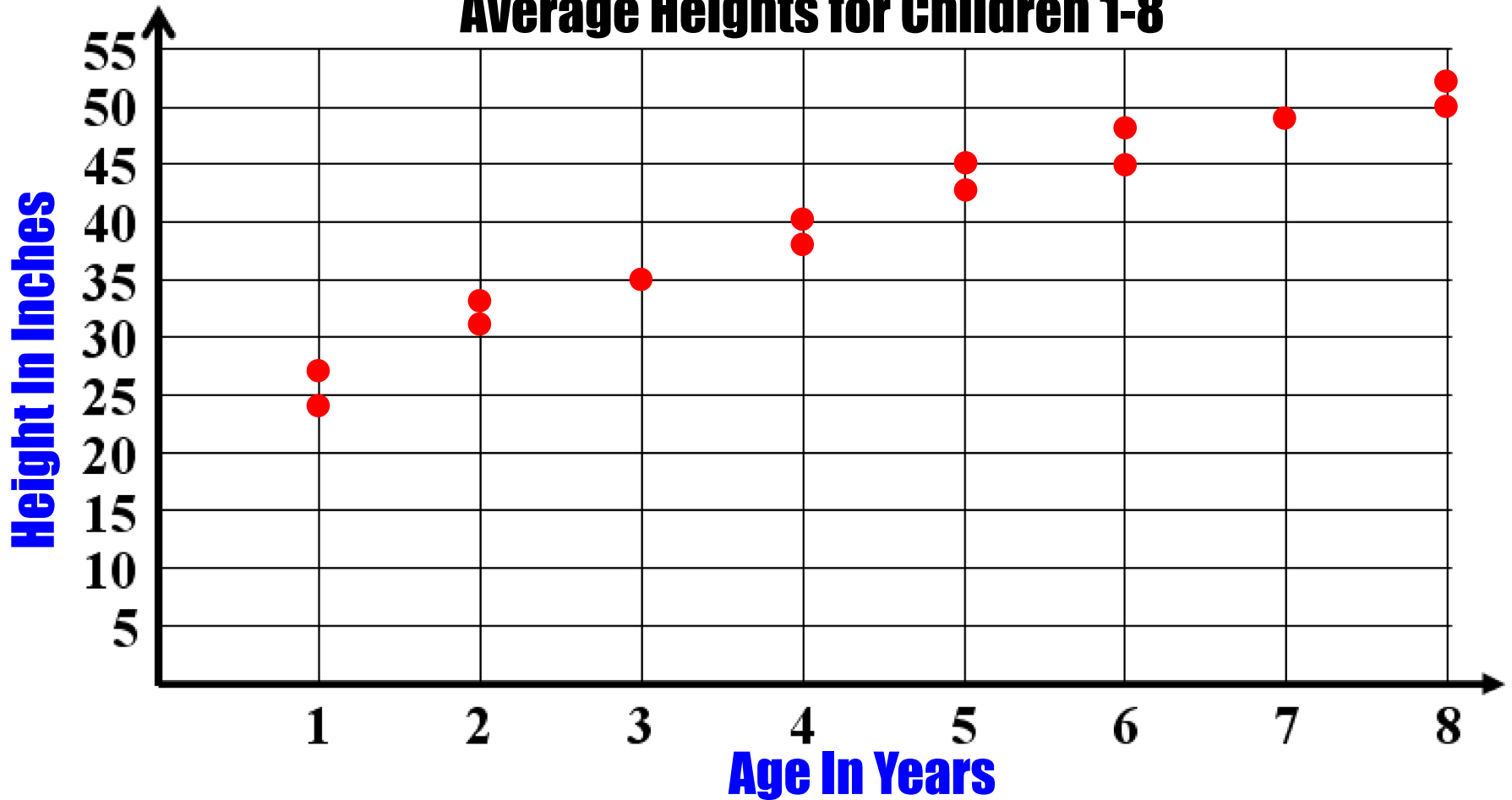Notice the data consists only of positive numbers.

In which quadrant will ALL of our ordered pairs lie?

All of these ordered pairs will lie in Quadrant I. (both x and y are positive)

Height (Inches)	27	43	38	50	45	49	31	35	40	45	33	24	52	47
Age (Years)	1	5	4	8	6	7	2	3	4	5	2	1	8	6

Average Heights for Children 1-8
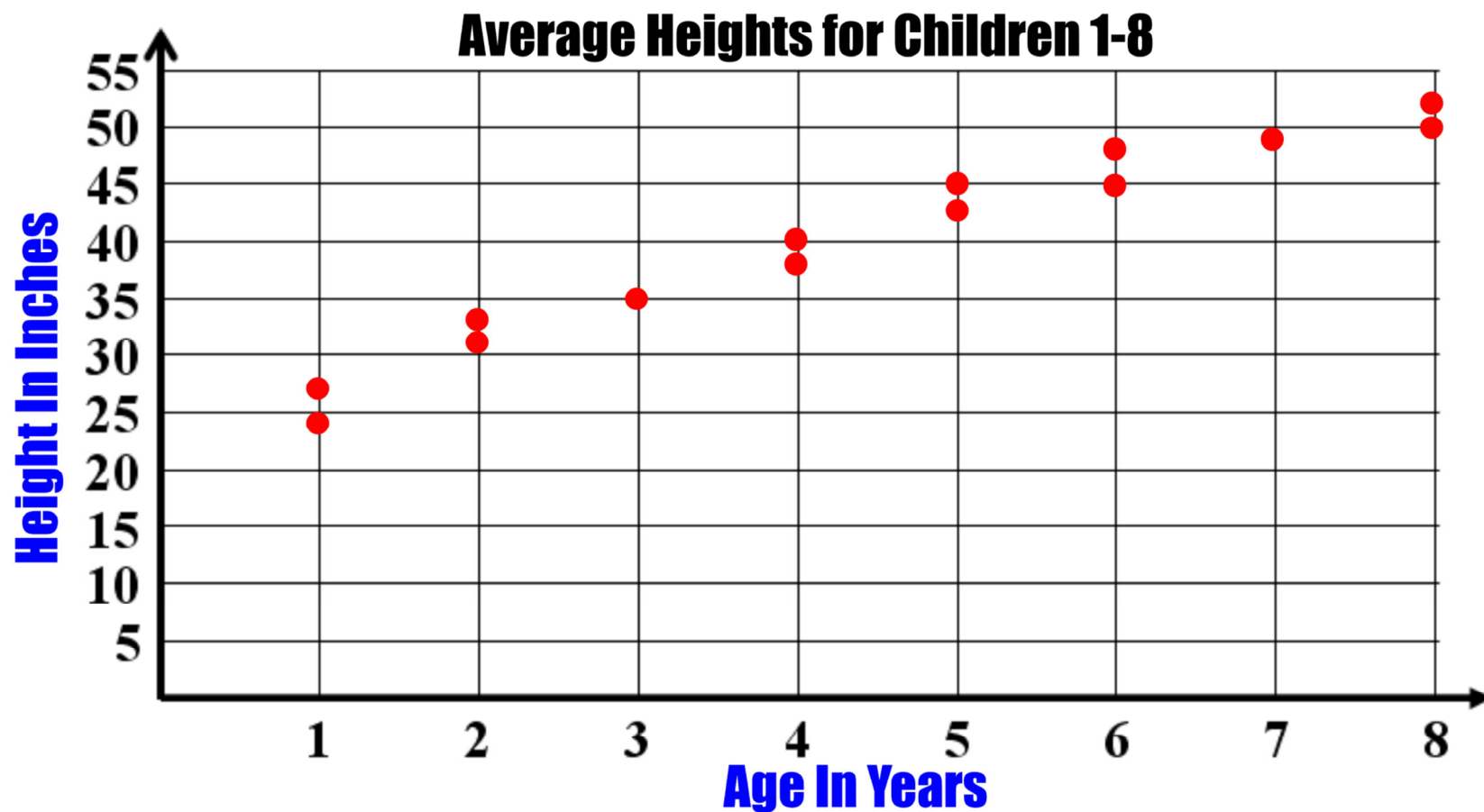
Average Heights for Children 1-8

The scatter plot clearly shows that as age increases, height increases.

This is called a positive correlation between these two variables.

CORRELATION

When there exists a relationship between two variables, we say that the variables are correlated.

When both variables increase or decrease together, we say that the variables show a positive correlation.

Height and age of children show such a correlation.

When one variable increases as the other decreases, we say that the variables show a negative correlation.

We will now look at two variables that are negatively correlated.

BRUSHING VS CAVITIES SCATTER PLOT

Data was collected on 15 people regarding the number of seconds they spend brushing their teeth and the number of cavities they had.

The data is listed in the table below.

Seconds Spent Brushing Teeth	117	53	25	0	67	45	98	82	102	31	95	12	108	40	75
Number of Cavities	1	5	6	8	4	5	2	3	0	6	1	7	0	5	3

Again, all the data lies in Quadrant 1.

Seconds Spent Brushing Teeth	117	53	25	0	67	45	98	82	102	31	95	12	108	40	75
Number of Cavities	1	5	6	8	4	5	2	3	0	6	1	7	0	5	3

Cavities and Time Brushing Teeth

Number of Cavities

Seconds Spent Brushing Teeth

Cavities and Time Brushing Teeth

Number of Cavities (y-axis)

Seconds Spent Brushing Teeth (x-axis)
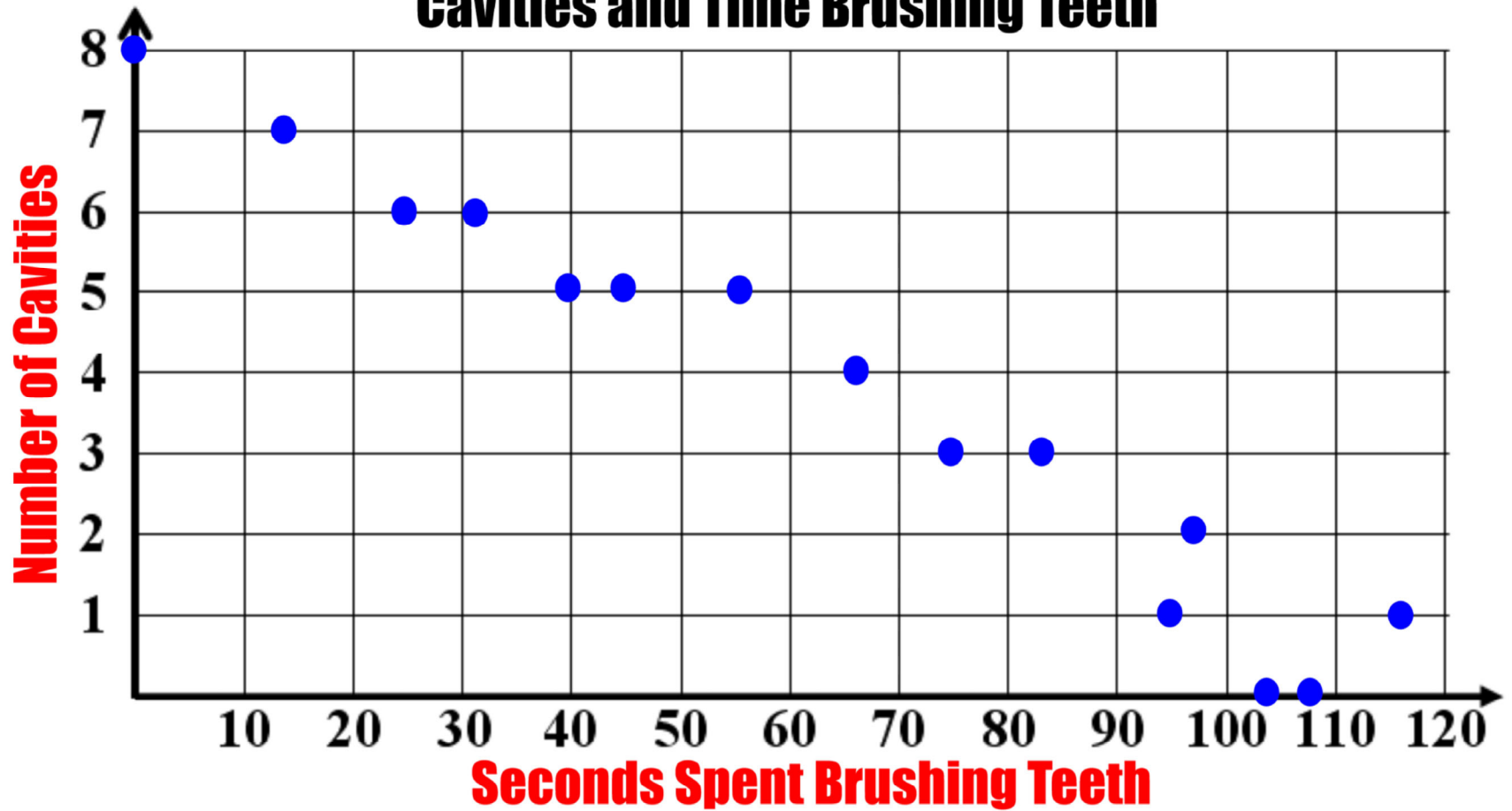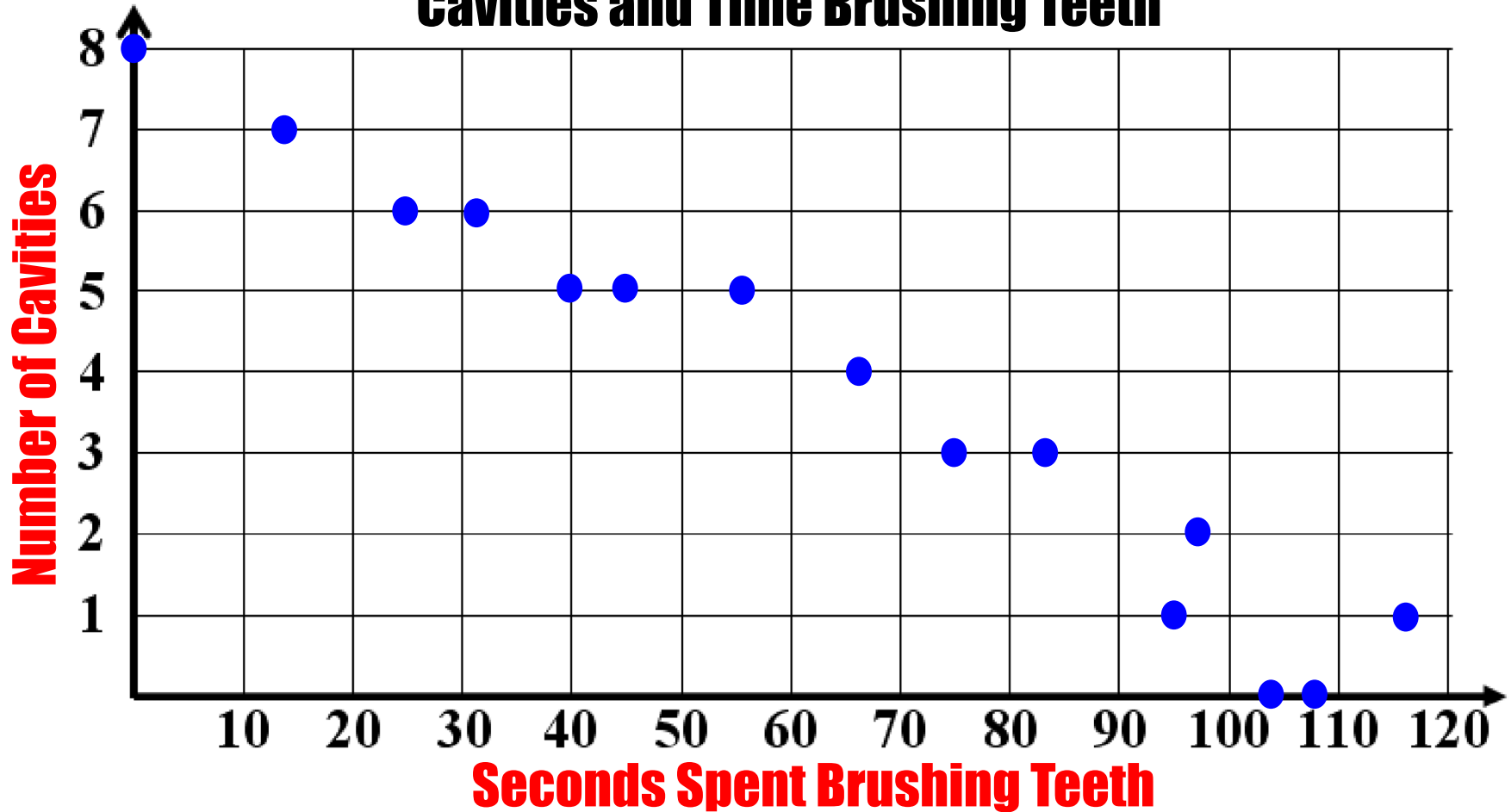
The scatter plot clearly shows that as time spent brushing teeth **increases**, cavities **decrease**.

This is called a **negative correlation** between these two variables.

ARE ALL VARIABLES CORRELATED?

Do you think that it is true that there is always a relationship between any two variables? *No!*

Let's look at the results of a study completed that compared student scores on Mr. Leach's Civics test to their heights.

Scores on Mr. Leach's Test	92	37	75	83	98	100	56	71	95	81	78	65	60	88	100
Height In Inches	49	53	55	65	68	50	56	67	57	48	60	70	65	71	70

Why am I always yelling?

I don't think you can help it.

Scores on Mr. Leach's Test	92	88	75	83	98	100	56	71	95	81	78	65	60	88	100
Height In Inches	49	53	55	65	68	50	56	67	57	48	60	70	65	71	70

Height and Scores on Mr. Leach's Test

This is a break.
We are using it because we are
skipping from y=0 to y=45.
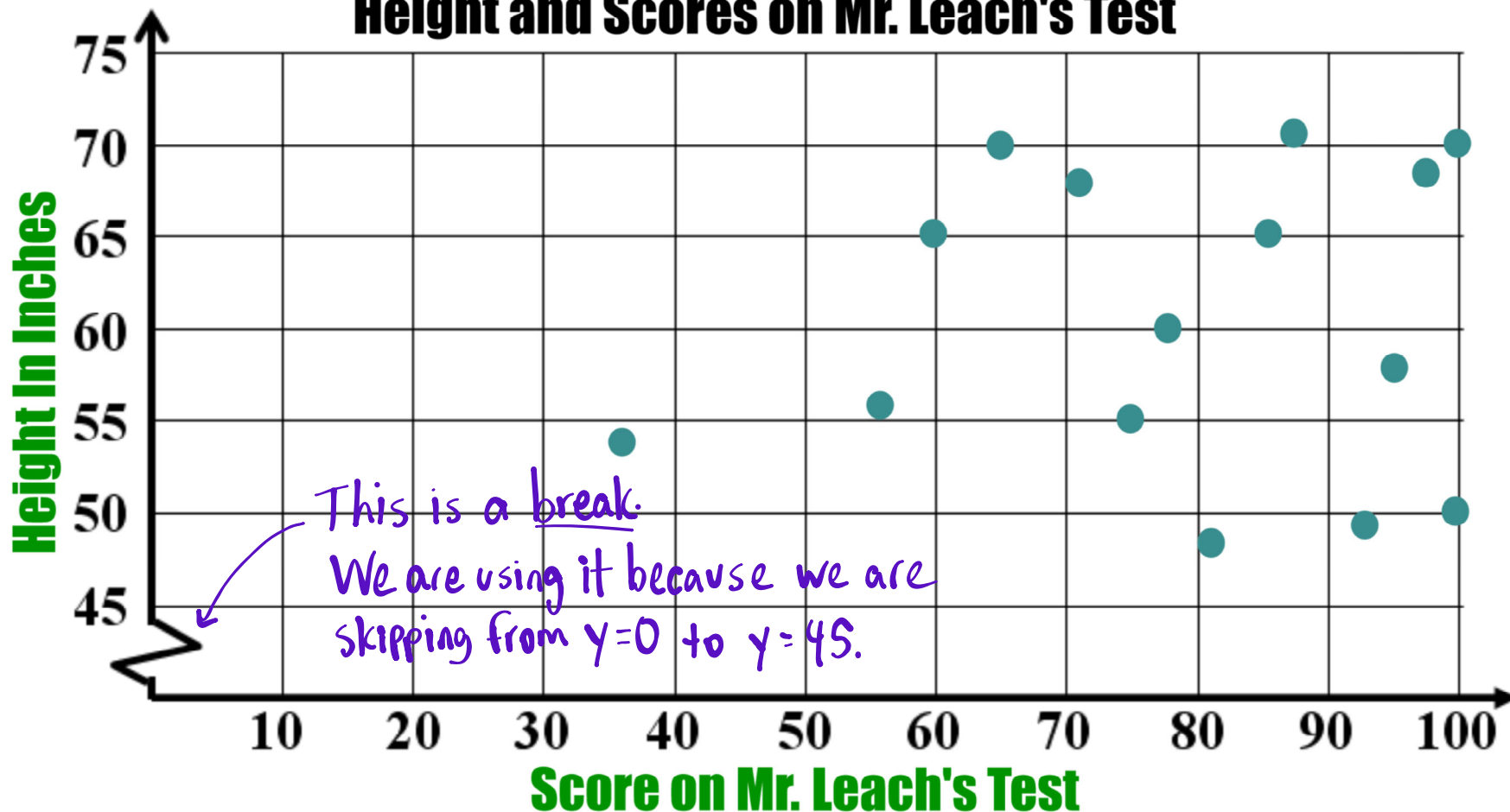
Height and Scores on Mr. Leach's Test
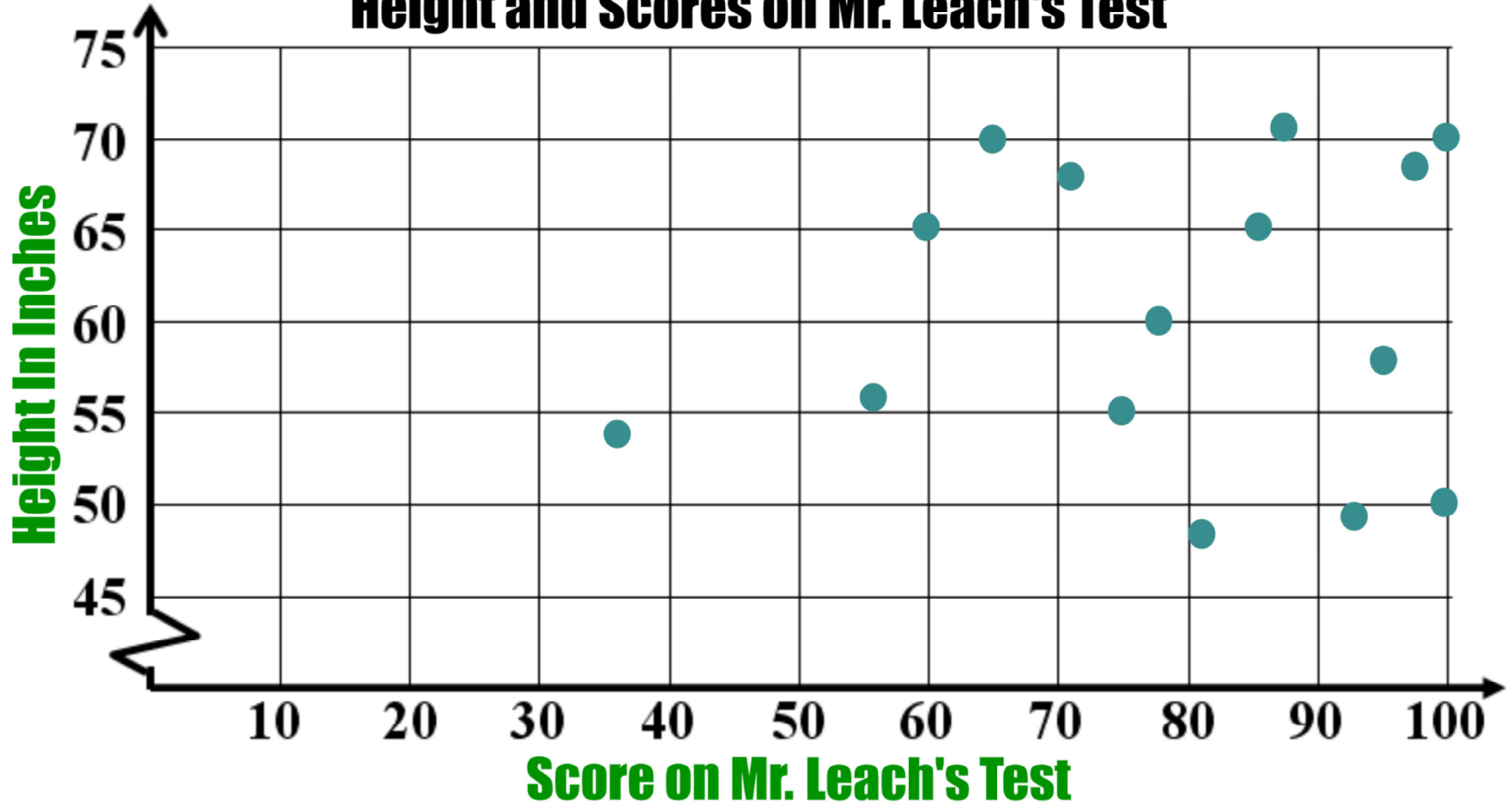
The scatter plot clearly shows that height has no effect on the scores of a student taking Mr. Leach's test.

There is no correlation between these two variables.

CORRELATION ≠ CAUSATION

When we say that two variables are correlated, this does NOT mean that one of the variables CAUSES the other.

All that the scatter plot can tell us is that there is a relationship between the two variables. It cannot tell us that one of them causes the other.
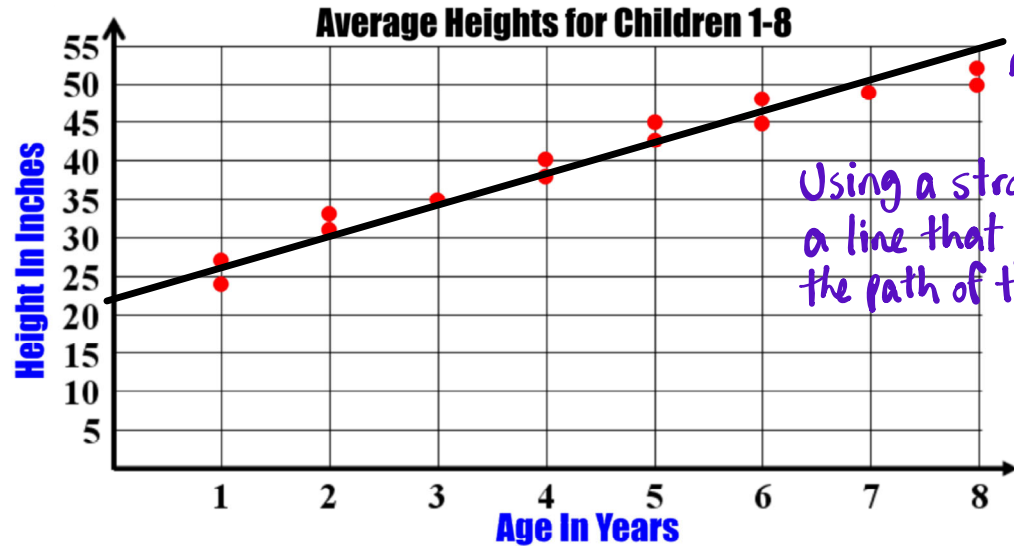
PREDICTING THE FUTURE USING SCATTER PLOTS

Once a scatter plot has been constructed and it has been determined that two variables are correlated, we can make predictions about how future data may relate to each other.
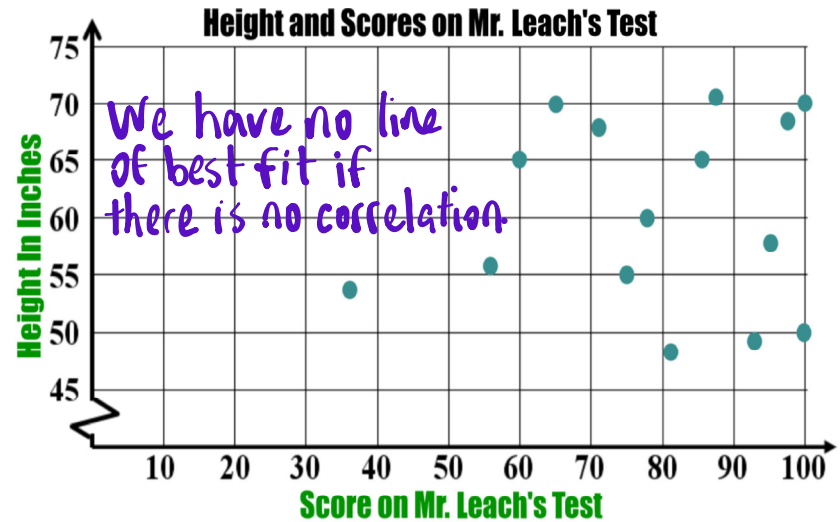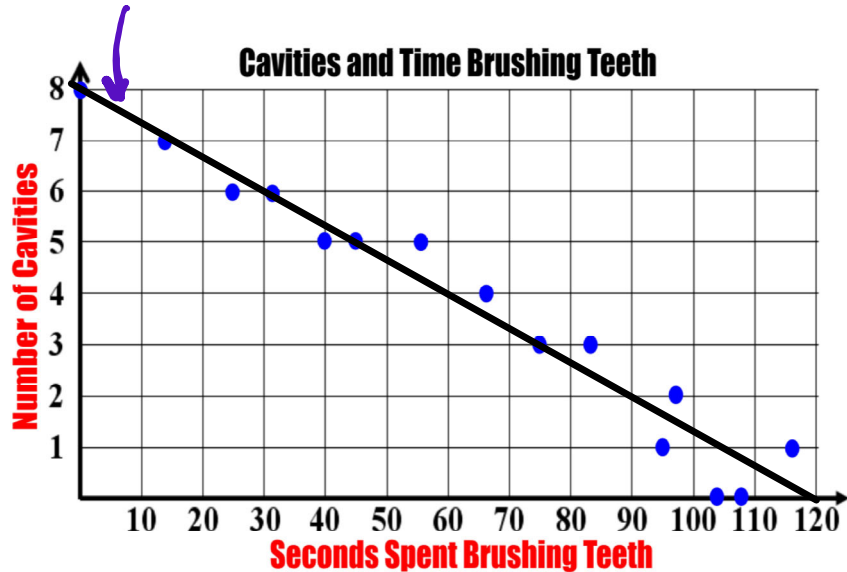
Let's look back at our three scatter plots and try to make predictions.

LINES OF BEST FIT

Average Heights for Children 1-8

← Line of best fit

Using a straight edge, create a line that best estimates the path of the data points.

Line of best fit

Cavities and Time Brushing Teeth

Height and Scores on Mr. Leach's Test

We have no line of best fit if there is no correlation

LINES OF BEST FIT

Cavities and Time Brushing Teeth

We would expect a person who brushes for one minute to have 4 cavities. Of course, this is just an educated guess based on the data we have displayed in our scatter plot.

1 minute = 60 seconds

Use the line of best fit to predict the number of cavities that a person who brushes for 1 minute can expect. Does this mean that this person will <u>definitely</u> get that number of cavities? Of course not!

SCATTER PLOTS

**When 2 variables decrease together,
it is an example of what type of correlation?**

When 2 variables increase or decrease TOGETHER, it is an example of a <u>positive correlation</u>