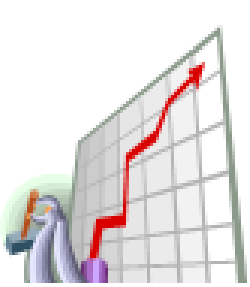
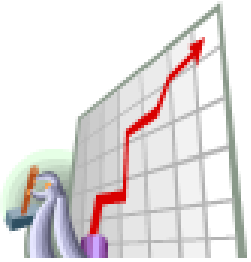
Name: _____ Date: _____ Period: _____

Graphing Skill #1: Parts of a graph



I-TALK



I = Information: Type of information matches the graph. The correct type of graph is being used (bar vs. line graph, etc..).

T= Title: The graph contains a title that describes what the graph is about. An experimental question works well for a title.

A= Axis: The X, Y-axis are scaled correctly and spaced evenly. The graph takes up as much of the paper as possible.

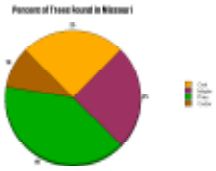
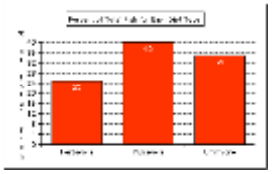
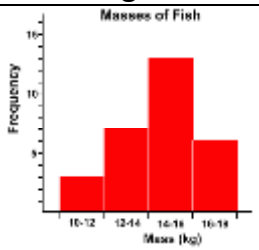
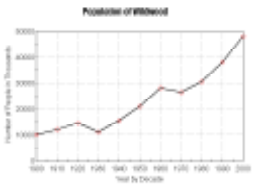
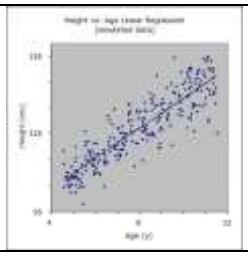
L= Labels: Each axis is label with units

K= Key: If more than one data set is in the graph, the key describes which line is which.

Name: _____ Date: _____ Period: _____

Graphing Skill #2: What Type of Graph is it?

There are several types of graphs that scientists often use to display data. They include:

Pie Graphs	Bar Graphs	Histograms	Line Graphs	Scatter Plots
				
• Dependent variable is NOT continuous • Usually presents data as a "part of a whole" or as percentages	• Dependent variable is NOT continuous • There is no order to the categories on the X-axis • Bars typically don't touch • Y-axis is usually a percentage or a frequency (count)	• A specific type of bar graph • Dependent variable must have a natural order that can be grouped into defined "chunks" • Bars must always touch • Y-axis is usually a percentage or a frequency (count)	• Dependent variable IS continuous • Points are plotted using x- and y-components • The points are connected because the observations are NOT independent (the next value depends on the previous value)	• Dependent variable IS continuous • Points are plotted using x- and y-components • The points are NOT connected because the observations are independent (the next value does NOT depend on the previous value) • Uses a best-fit line or curve to show relationship

Based on these definitions, and the descriptions of the experiments below, please put an "X" in the box for the type of graph that would be *most* appropriate (some descriptions may have several graph types that would be appropriate; you only need to select one).

#	Description	Pie	Bar	Histo.	Line	Scatter
Ex	A graph showing the number of 5th graders who prefer Coke or Pepsi		X			
1	A graph showing how a newborn baby's weight changes over time					
2	A graph showing the percentage of the class earning As, Bs, and Cs.					
3	A graph showing the distribution of trees of different size groups (e.g. 0-10cm, 10-20cm, etc…) in a forest					
4	A graph showing the relationship between height and arm length					
5	A graph showing the percentage of an allowance spent on different categories (e.g. food, movies, etc)					
6	A graph showing the amount of rainfall, by month over a 12 month period					
7	A graph showing the number of ice cream cones purchased as a function of the day's temperature					
8	A graph showing the number of pushups done each day during a 2-week training program					

Name: _____ Date: _____ Period: _____

Graphing Skill #3: Labeling Axes

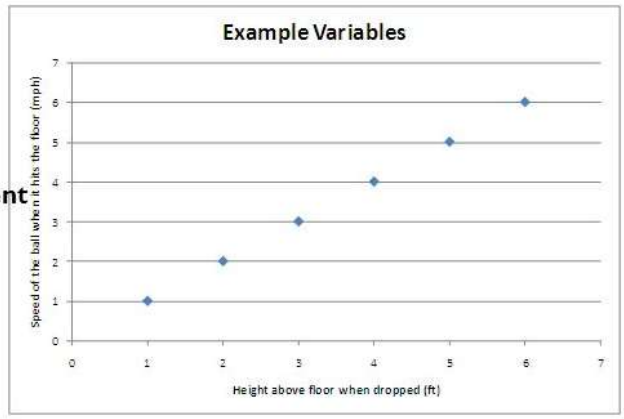
DRY MIX

Dependent variable

Responding

Y-Axis

Dependent Variable



Manipulated

Independent variable

X-Axis

Independent Variable

When labeling your axes, keep 3 things in mind:

- ❒ The independent (manipulated) variable is written along the horizontal axis (X axis)
- ❒ Dependent (responding) variable is written along the vertical axis (Y axis)
- ❒ Units on any variables should be included in parentheses ( ) following the axis title

Practice Problems

For each experiment described below, write the independent and dependent variable on the appropriate axis. Be sure to include units when appropriate.

SAMPLE: A farmer wants to know if there is a relationship between the amount of fertilizer (in kilograms) she uses and how tall her corn grows (in centimeters).

Corn Height (cm)

Amount of Fertilizer (kg)

Name: _____ Date: _____ Period: _____

Graph 1: A ball is dropped from several distances above the floor (in meters) and the height it bounces is then measured (in centimeters).	**Graph 2:** A candle was burned under glass jars of different volumes (in mL) to see if the volume of the jar affects the length of time (in seconds) the candle burns.
Graph 3: A fisherman used fishing lines of several different gauges (test pounds) and recorded the number of fish caught on each gauge.	**Graph 4:** Geologists wanted to know if there was a relationship between the density (in g/cm^3) of a rock and how many meters down it was collected from.
Graph 5: How does the depth of a river (in meters) impact its speed (measured in meters per second)?	**Graph 6:** Sea otters were counted over a several years to see if their numbers were decreasing over time.
Graph 7: Does the length of time an ice cube is in water (in seconds) affect the temperature of the water (in degrees Celsius)?	**Graph 8:** Does the amount of nitrogen in the soil (measured in kilograms) affect corn production (measured in kilograms)?

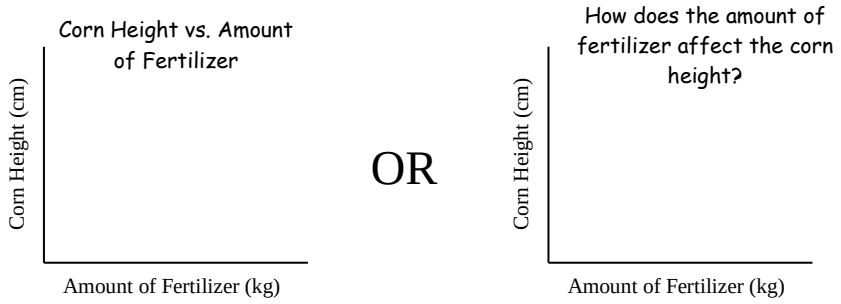
Name: _____ Date: _____ Period: _____

Graphing Skill #4: Creating Titles

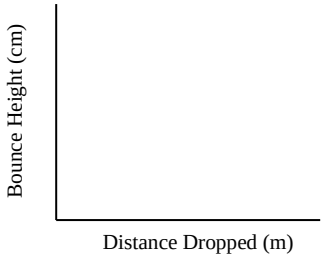
When writing a title for you graph, please remember:

- ❒ Must communicate the dependent and independent variables
- ❒ Can be presented in the form "Y versus X"
- ❒ Some graphs need more explanation than others. Make sure your reader would be able to understand what your data represent

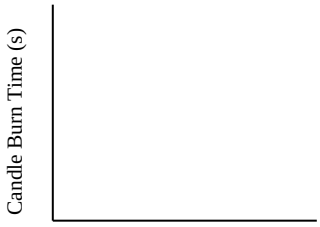
SAMPLE: A farmer wants to know if there is a relationship between the amount of fertilizer (in kilograms) she uses and how tall her corn grows (in centimeters).



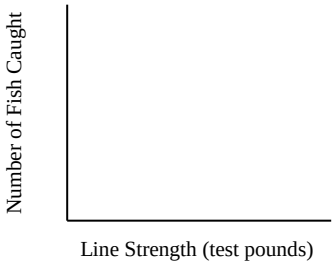
Graph 1: A ball is dropped from several distances above the floor (in meters) and the height it bounces is then measured (in centimeters).



Graph 2: A candle was burned under glass jars of different volumes (in mL) to see if the volume of the jar affects the length of time (in seconds) the candle burns.



Graph 3: A fisherman used fishing lines of several different gauges (test pounds) and recorded the number of fish caught on each gauge.



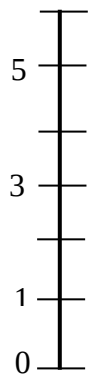
Graph 4: Geologists wanted to know if there was a relationship between the density of a rock and how many meters down it was collected from.

Name: _____ Date: _____ Period: _____

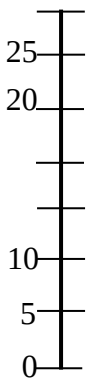
Graphing Skill #5: Scaling Axes

What does my scale look like? Each of the scales for the *dependent* variables has a few missing values on it. Please fill in any missing values.

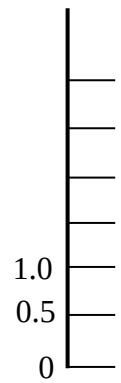
A)



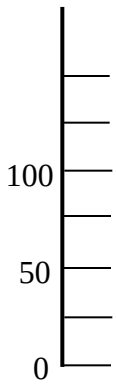
B)



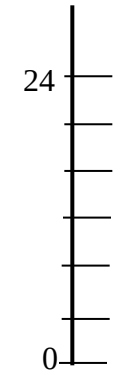
C)



D)

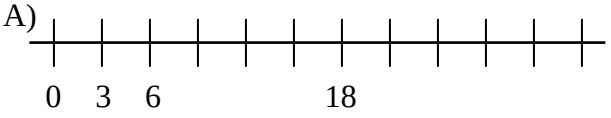


E)

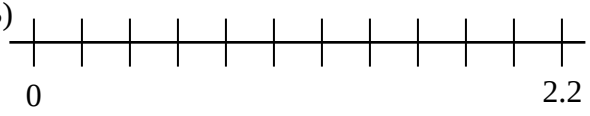


Each of the scales for the *independent* variables has a few missing values on it. Please fill in any missing values.

A)



B)



There are a few important steps involved in correctly scaling an axis:

- STEP 1: Find the **range** for the variable
  - Range = **Largest Value** - **Smallest Value**
- STEP 2: Divide the **range** by the number of **intervals** you want (not too many or too few). We don't want all of the data smooshed in only part of the graph; spread it out.
  - After dividing, we may need to **round *up*** to get a number that is easy to count by. (It is easier to count by 2s instead of 1.9s)
- STEP 3: Use the rounded number to mark off intervals along the axis.
  - The interval must be the **same** amount each time.

STEP 1: What is the range of my data? Find the range of the data for each column below.

EX.

Mass (g)
5
11
14
19
26
30
40

Largest #: 40

Smallest #: 5

Range: 35-5 = 35

A)

Students
100
99
88
70
72
64
55

Largest #: _____

Smallest #: _____

Range: _____

B)

Distance (cm)
3
5
6
7
9
10
12

Largest #: _____

Smallest #: _____

Range: _____

C)

Time (s)
0.22
0.51
0.78
1.01
1.23
1.60
1.74

Largest #: _____

Smallest #: _____

Range: _____

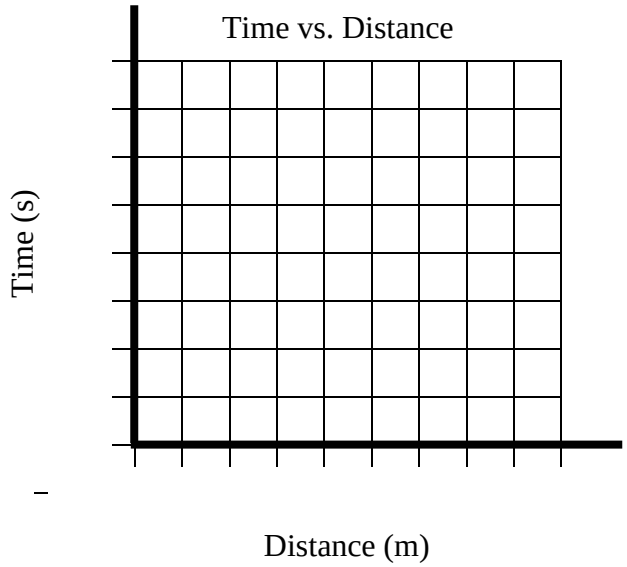
Name: _____ Date: _____ Period: _____

What number do I count by? Assume that our graph has 10 intervals (places to put numbers). If needed, round up to get to a good counting number.

Example A)	B)	C)	D)
Range = ___35___ # of intervals =__10_ $\frac{\text{Range}}{\text{Intervals}} = \frac{35}{10} = 3.5$ Round to Count = 4	Range = _____ # of intervals = _____	Range = _____ # of intervals = _____	Range = _____ # of intervals = _____

Putting it all together: Please create appropriate scaling for each axis.

Distance (m)	Time (s)
10.3	1.5
20.2	2.9
29.8	4.3
40.4	5.8
49.1	7.0
60.9	8.7
70.2	10.0
80.1	11.4
90.6	12.9



Name: _____ Date: _____ Period: _____

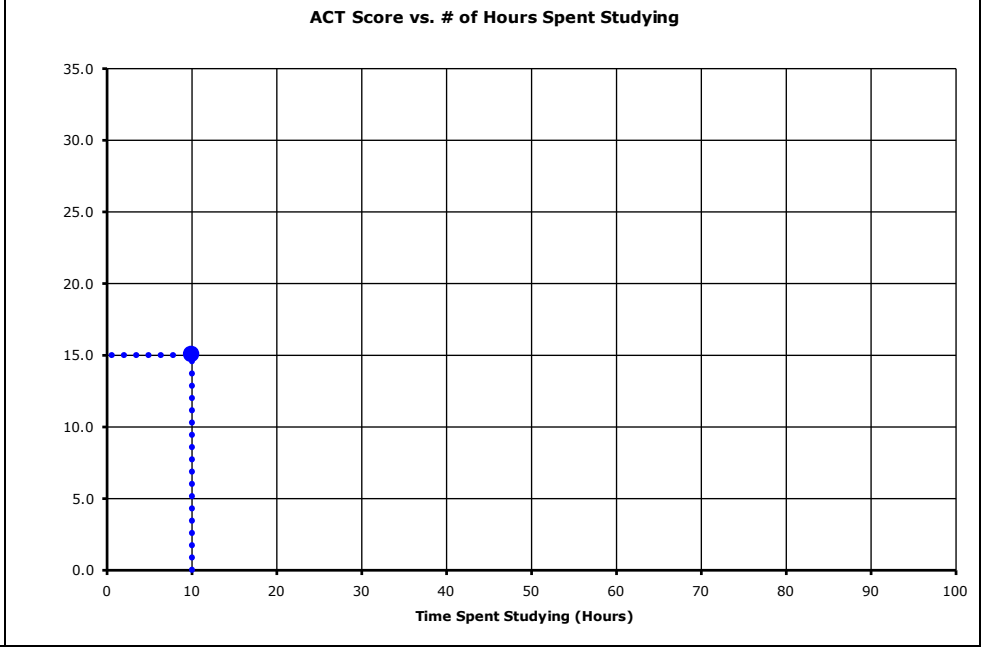
Graphing Skill #6: Plotting Points

Plotting points can be easy if you follow these simple steps…

- ❒ STEP 1: Select the first pair of values from the data table (X and Y).
- ❒ STEP 2: Draw a light dashed line up from the number on the X axis and over from the number on Y axis. (if this helps)
  - ○ Once you get good at plotting points, you won't need to draw these lines anymore
- ❒ STEP 3: Where these dotted lines cross, put a dark point. Repeat for the next pair of points.

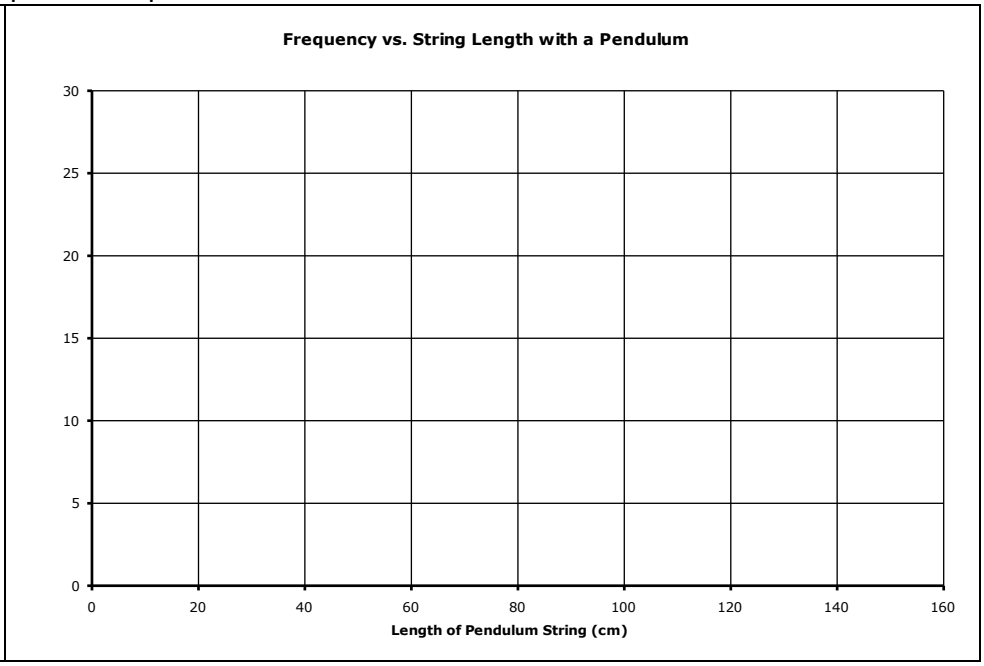
Practice: Please plot these points. The first pair has been plotted for you as an example.

Time Spent Studying (hours)	Score (pts)
10	15.0
20	17.0
30	19.0
40	21.0
50	23.0
60	25.0
70	27.0
80	29.0
90	31.0



More Practice: Please plot these points.

String Length (cm)	Frequency (Hz)
10	25
20	23
30	22
40	21.5
50	20.5
60	20
70	19.5
80	19
90	16
100	15
110	14.5
120	13
130	12.5
140	12
150	11

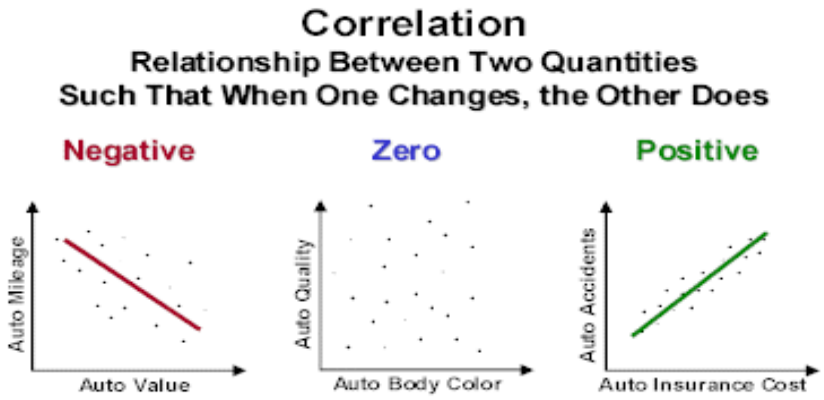


Name: _____ Date: _____ Period: _____

Graphing Skill #7: Graphing Correlations

First, draw a best fit line:

- ❒ Do you notice a pattern or trend in the data?
- ❒ If so, draw a straight line or curve that represents that trend.
- ❒ All points should lie on or very near the line



Positive Correlation

General trend in the plotted points is from **bottom left to top right.**

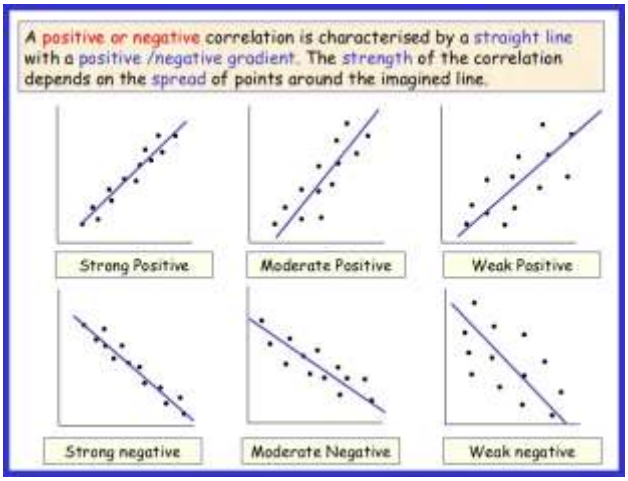
Negative Correlation

General trend in the plotted points is from **top left to bottom right.**

No Correlation

No general trend in plotted points, or a non-*linear* trend.

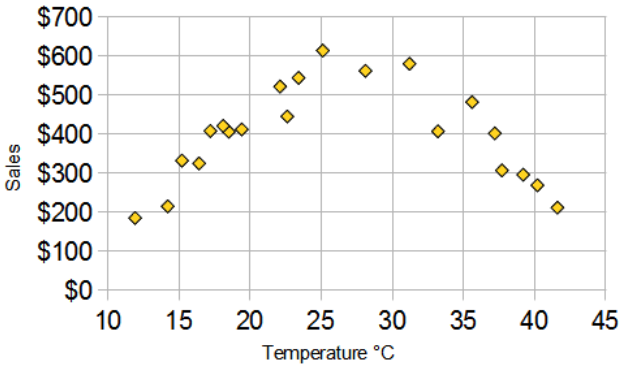
The **strength** of the linear correlation can be judged by looking at how closely the points approximate a straight line.



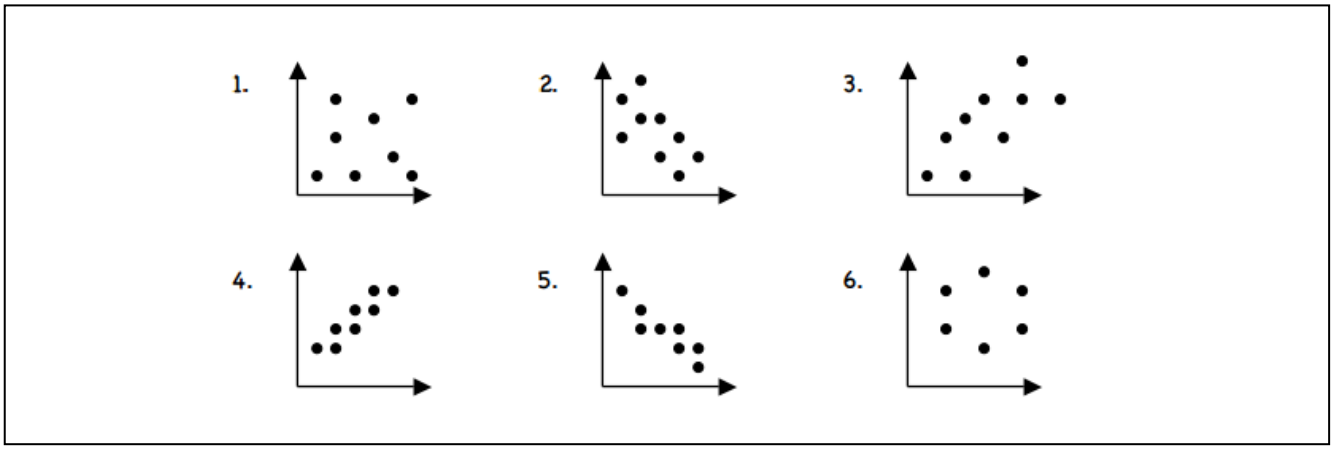
Name: _____ Date: _____ Period: _____

Warning! Correlation not good with curved lines.

The graph at the right looks like no correlation, but we can see the data follows a nice curve that reaches a peak around 25° C. But the correlation calculation is not "smart" enough to see this.



Practice Problems: Do the following have a positive, negative or no correlation?



Would you expect a positive correlation, negative correlation, or no correlation between the following two data sets?

1. The amount of free time you have and the number of classes you take
2. The sales of snow shovels and the amount of snowfall
3. The air pollution levels for a city and the number of cars registered in that city
4. Length of a baby at birth and the month in which the baby was born
5. The number of calories burned and the time spent exercising
6. A high-school sprinter's age and the time it takes to finish a 100-meter race