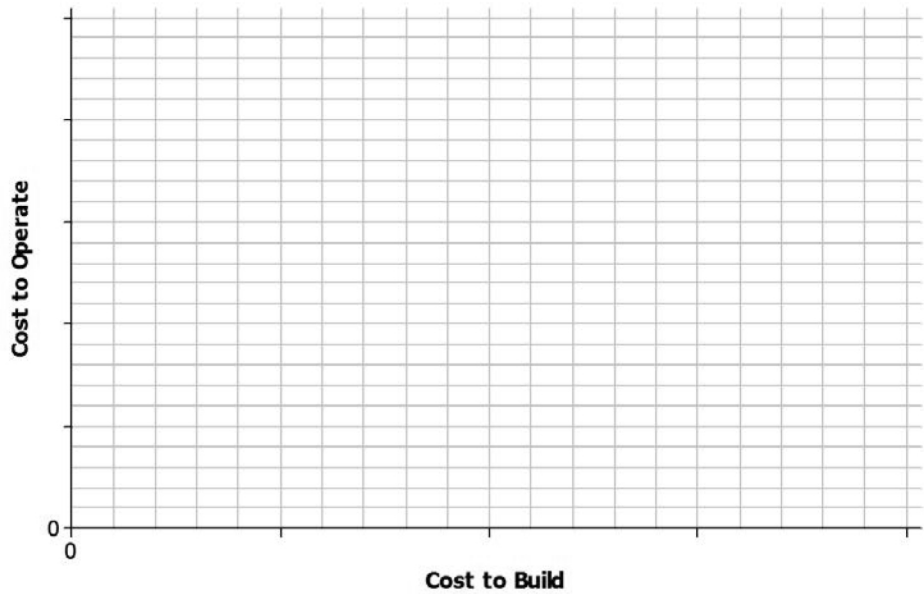


# Scatter Plots

Energy is measured in kilowatt hours. The table below shows the cost of building a facility to produce energy and the ongoing cost of operating the facility for five different types of energy.

Type of Energy	Cost to Operate (cents per kilowatt hour)	Cost to Build (dollars per kilowatt hour)
Hydroelectric	0.4	2,200
Wind	1.0	1,900
Nuclear	2.0	3,500
Coal	2.2	2,500
Natural Gas	4.8	1,000

1. Construct a scatter plot of the cost to build the facility ( $x$ ) and the cost to operate the facility ( $y$ ). Use the grid below, and be sure to add an appropriate scale to the axes.
2. Do you think that there is a statistical relationship between building cost and operating cost? If so, describe the nature of the relationship.



3. Based on the scatter plot, can you conclude that decreased building cost is the cause of increased operating cost? Explain.

1. The table below shows the price and overall quality rating for 15 different brands of bike helmets.

Data Source: [www.consumerreports.org](http://www.consumerreports.org)

Helmet	Price (dollars)	Quality Rating
A	35	65
B	20	61
C	30	60
D	40	55
E	50	54
F	23	47
G	30	47
H	18	43
I	40	42
J	28	41
K	20	40
L	25	32
M	30	63
N	30	63
O	40	53

Construct a scatter plot of price ( $x$ ) and quality rating ( $y$ ). Use the grid below.

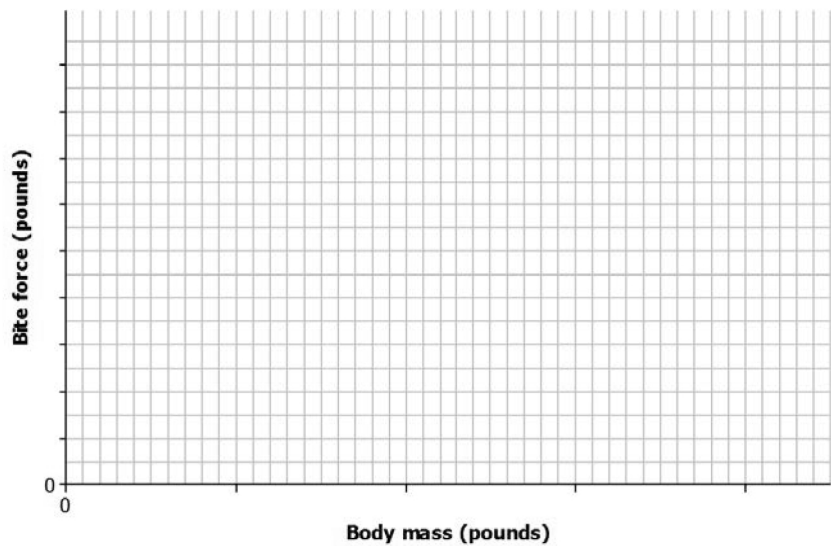


2. Do you think that there is a statistical relationship between price and quality rating? If so, describe the nature of the relationship.
3. Scientists are interested in finding out how different species adapt to finding food sources. One group studied crocodilian species to find out how their bite force was related to body mass and diet. The table below displays the information they collected on body mass (in pounds) and bite force (in pounds).

Species	Body Mass (pounds)	Bite Force (pounds)
Dwarf crocodile	35	450
Crocodile F	40	260
Alligator A	30	250
Caiman A	28	230
Caiman B	37	240
Caiman C	45	255
Croc A	110	550
Nile crocodile	275	650
Croc B	130	500
Croc C	135	600
Croc D	135	750
Caiman D	125	550
Indian Gharial croc	225	400
Crocodile G	220	1,000
American croc	270	900
Croc D	285	750
Croc E	425	1,650
American Alligator	300	1,150
Alligator B	325	1,200
Alligator C	365	1,450

Data Source: PLoS One Greg Erickson biomechanics, Florida State University

Construct a scatter plot of body mass ( $x$ ) and bite force ( $y$ ). Use the grid below, and be sure to add an appropriate scale to the axes.

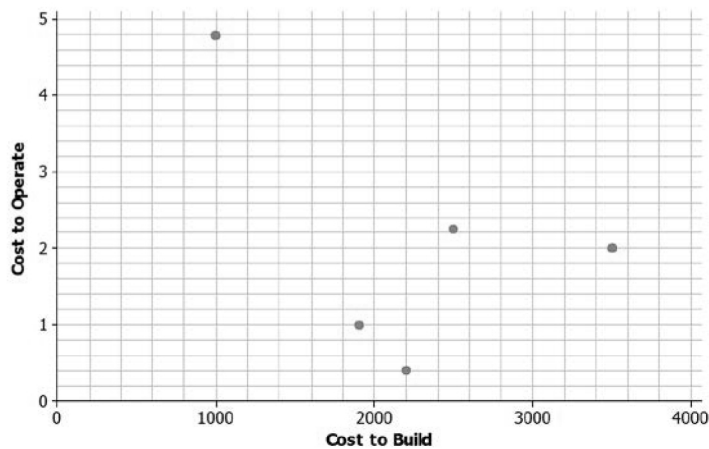


- 4. Do you think that there is a statistical relationship between body mass and bite force? If so, describe the nature of the relationship.
- 5. Based on the scatter plot, can you conclude that increased body mass causes increased bite force? Explain.

Energy is measured in kilowatt hours. The table below shows the cost of building a facility to produce energy and the ongoing cost of operating the facility for five different types of energy.

Type of Energy	Cost to Operate (cents per kilowatt hour)	Cost to Build (dollars per kilowatt hour)
Hydroelectric	0.4	2,200
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Coal	2.2	2,500
Natural Gas	4.8	1,000

- Construct a scatter plot of the cost to build the facility ( $x$ ) and the cost to operate the facility ( $y$ ). Use the grid below, and be sure to add an appropriate scale to the axes.



- Do you think that there is a statistical relationship between building cost and operating cost? If so, describe the nature of the relationship.

*Answers may vary. Sample response: Yes, because it looks like there is a downward pattern in the scatter plot. It appears that the types of energy that have facilities that are more expensive to build are less expensive to operate.*

- Based on the scatter plot, can you conclude that decreased building cost is the cause of increased operating cost? Explain.

*Sample response: No. Just because there may be a statistical relationship between cost to build and cost to operate does not mean that there is a cause-and-effect relationship.*

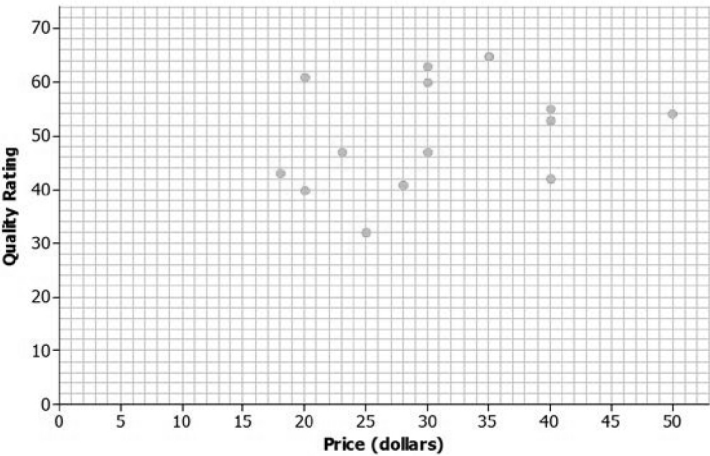
The Problem Set is intended to reinforce material from the lesson and have students think about the meaning of points in a scatter plot, clusters, positive and negative linear trends, and trends that are not linear.

1. The table below shows the price and overall quality rating for 15 different brands of bike helmets.

Data Source: [www.consumerreports.org](http://www.consumerreports.org)

Helmet	Price (dollars)	Quality Rating
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K	20	40
L	25	32
M	30	63
N	30	63
O	40	53

Construct a scatter plot of price ( $x$ ) and quality rating ( $y$ ). Use the grid below.



2. Do you think that there is a statistical relationship between price and quality rating? If so, describe the nature of the relationship.

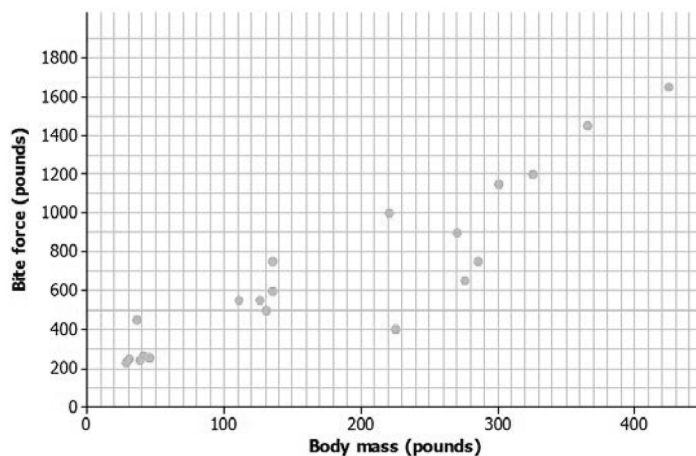
*Sample response: No. There is no pattern visible in the scatter plot. There does not appear to be a relationship between price and the quality rating for bike helmets.*

3. Scientists are interested in finding out how different species adapt to finding food sources. One group studied crocodilian species to find out how their bite force was related to body mass and diet. The table below displays the information they collected on body mass (in pounds) and bite force (in pounds).

Species	Body Mass (pounds)	Bite Force (pounds)
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American Alligator	300	1,150
Alligator B	325	1,200
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Data Source: PLoS One Greg Erickson biomechanics, Florida State University

Construct a scatter plot of body mass ( $x$ ) and bite force ( $y$ ). Use the grid below, and be sure to add an appropriate scale to the axes.



4. Do you think that there is a statistical relationship between body mass and bite force? If so, describe the nature of the relationship.

*Sample response: Yes, because it looks like there is an upward pattern in the scatter plot. It appears that alligators with larger body mass also tend to have greater bite force.*

5. Based on the scatter plot, can you conclude that increased body mass causes increased bite force? Explain.

*Sample response: No. Just because there is a statistical relationship between body mass and bite force does not mean that there is a cause-and-effect relationship.*