Expressions, Values, and Errors

For each expression, if it produces an error when evaluated, write what kind of error occurs:

- For division by zero errors, write "division by 0".

- For errors where the operator is given a value of the wrong type, write "wrong type".

Otherwise, write what the expression evaluates to.

Expression	Value, or Error?
`8 - 5.3`	
`2 / 0`	
`"Three" * 2`	
`(3 + 5) * 3`	
`1.5 * "6"`	
`(2 / (3 - (2 + 1)))`	

Identifiers and Expressions

Imagine the program below has been written in your definitions window:

```
x = (3 * 2) - 2
y = x * 1.5
```

For each expression, if it produces an error when evaluated,
write what kind of error occurs:

- For division by zero errors, write "division by 0".
- For errors where a variable hasn't been defined, write "unbound id"

Otherwise, write what the expression evaluates to.

Expression	Value, or Error?
y	
x - 3	
(y - 1) * z	
(x + y) / 2	
X + Y	

Contracts and Functions

Complete the table below, so that each function has a contract, and an example. You should use Pyret to experiment with different applications of each function, and determine the output of functions that are missing a contract.

Function Name	Contract	Example
num-max		num-max(-1, 3)
string-length		string-length("pyret")
string-repeat	# string-repeat : String Number -> String	

Animals

Animal	Number-of-legs
"Human"	2
"Ant"	6
"Spider"	8
"Bear"	4
"Snake"	0

How many rows does this table have?   _____

How many columns does this table have?   _____

What are the names of the columns?   _____

For the row with value "Human" in the **Animal** column, what is the value in the **Number-of-legs** column?

_____

_____

Circle the header row of this table

Presidents and Nutrition

Answer the following questions about the `presidents` and `nutrition` tables, using your unit-2 Pyret program:

How many columns does the `presidents` table have?   _____

What are the names of the columns?   _____

How many rows does the `presidents` table have?   _____

Is the data in the `party` column quantitative or categorical?   _____

Is the data in the `home-state` column categorical?   _____

If so, how many categories are there?   _____

What is the home state of Millard Fillmore?   _____

Who was the first president from the Federalist party?   _____

How many columns does the `nutrition` table have?   _____

How many rows does the `nutrition` table have?   _____

Is the data in the `calories` column quantitative? If so, why?   _____

How many grams of cholesterol does the Hamburger have?   _____

Which food has the largest serving size?   _____

Mean, Median, Mode Practice

Using pencil & paper, calculate the 3 numbers that measure the center of each list. If a list contains more than one mode, write the number with the smallest value.

These lists are bound to variables `a`, `b`, `c`, `d`, `e` in the Unit 3 template file, so you can check your answers with Pyret.

List	Mean	Median	Mode
a = [list: 1, 1, 4]			
b = [list: 3, 4, 5]			
c = [list: 3, 3, 4, 6]			
d = [list: -1, 0.5, 2, 0.5, 2, 6]			
e = [list: 2, 11, 7, 4]			

Measuring Center in Pyret

1. What is the mode of the `calories-list`? _____

2. What is the mean amount of `sodium` for menu items? _____

3. What is the median GDP for all the countries in `countries`?

   _____

4. What is the median of `life-expectancy-list`? _____

Imagine the following code is in your definitions window:

```
mystery-list = [list: 1, 2, 3, 4, 5, 6, 7, 8, 9]
```

What is the median of this `mystery-list`? _____

Now imagine these lists (which contain the same elements as mystery-list) are in your definitions window:

```
some-mystery = [list: 1, 4, 7]
more-mystery = [list: 2, 3, 8]
rest-mystery = [list: 5, 6, 9]
```

What is the median of `some-mystery`? _____

What is the median of `more-mystery`? _____

What is the median of `rest-mystery`? _____

What is the median of a list containing these 3 medians? _____

Is this different from the median of `mystery-list`? _____

Answering Questions With Charts

Which menu item has the most sodium?   _____

Which menu item has the least sodium?   _____

Do french fries have more sodium than hamburgers?   _____

Which country has the largest GDP?   _____

What percent of the total world GDP is from China?   _____

Frequency Bar Chart

First	Last	Eye-Color
"John"	"Doe"	"Green"
"Jane"	"Smith"	"Brown"
"Javon"	"Jackson"	"Brown"
"Angela"	"Enriquez"	"Hazel"
"Jack"	"Thompson"	"Blue"
"Dominique"	"Rodriguez"	"Hazel"
"Sammy"	"Carter"	"Blue"
"Andrea"	"Garcia"	"Brown"

How many students have Brown eyes?

_____

How many students have Green eyes?

_____

How many students have Hazel eyes?

_____

How many students have Blue eyes?

_____

Above the "Blue" label on this bar chart, add a bar with height that corresponds to the number of students with Blue eyes.
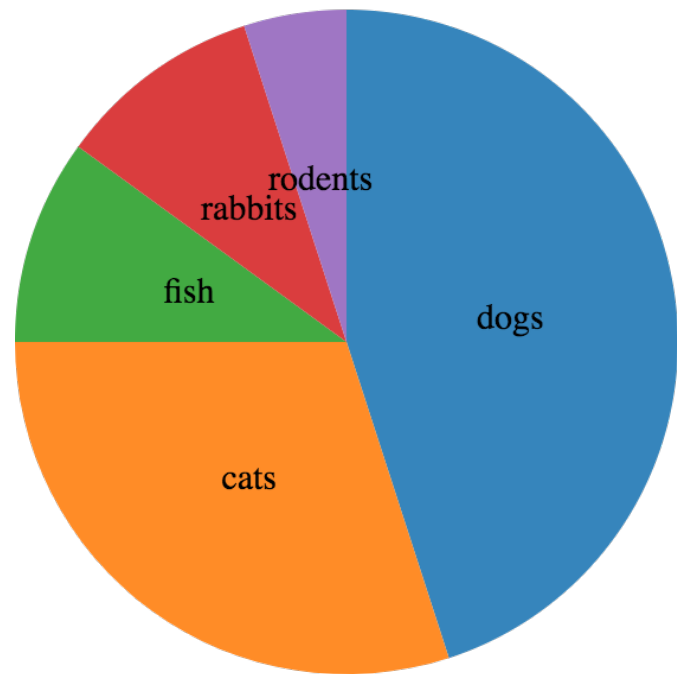
Frequency of Eye Color
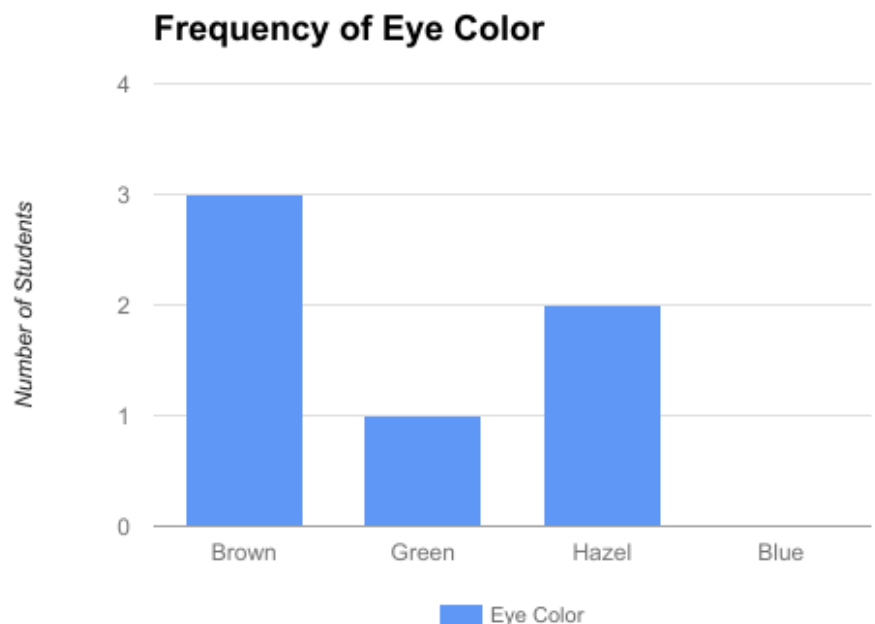
Chart Practice

Is this a pie chart, or a bar chart?

_____

Which pet is the most popular?

_____

Which pet is the least popular?

_____

Which are more popular, fish or rodents?

_____

Pet Ownership

rodents

rabbits

fish

dogs

cats

Favorite Movie Genre

Number of Fans

5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0

comedy action romance drama sci-fi

Movie genre
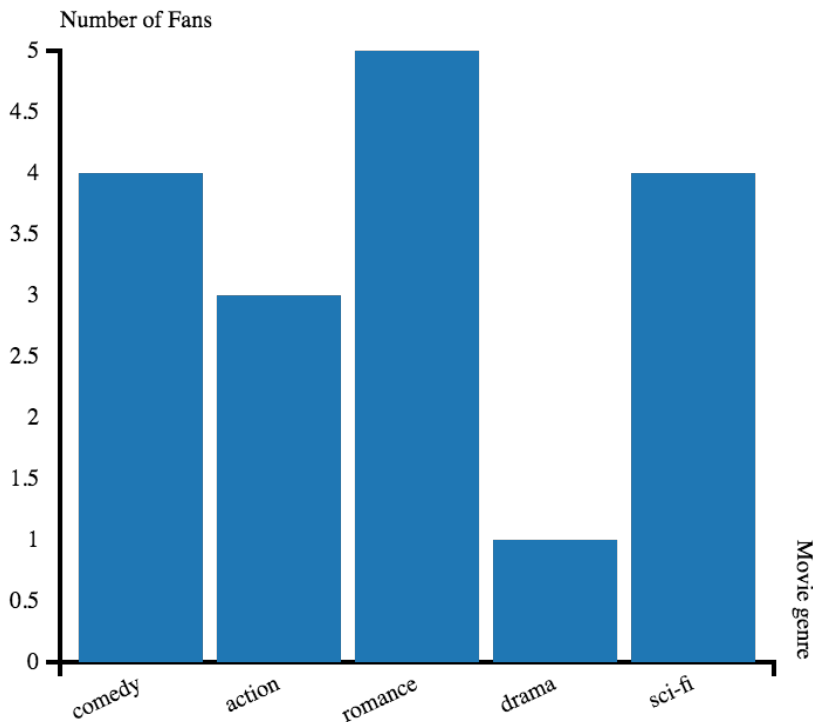
Is this a bar chart or a pie chart?

_____

What genre is most popular?

_____

What are the labels of this chart?

_____

What are the values of this chart?

_____

Is this a frequency bar chart?

_____

More Chart Practice

Are apples more popular than grapes?
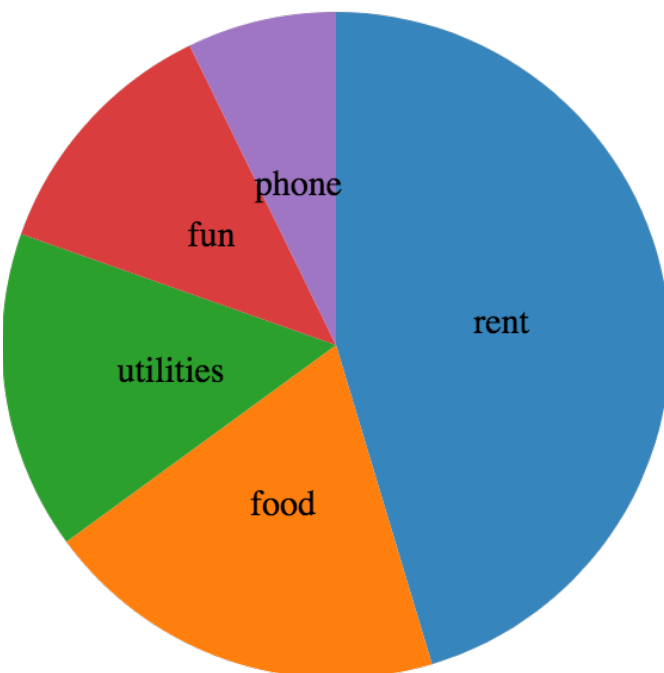
_____

How many categories of fruit are there?

_____

How many pears were sold?

_____

What fruit is least popular?

_____

Fruit Sales

How Many Sold

Fruit

apples bananas grapes oranges pears

Monthly Budget

phone
fun
rent
utilities
food
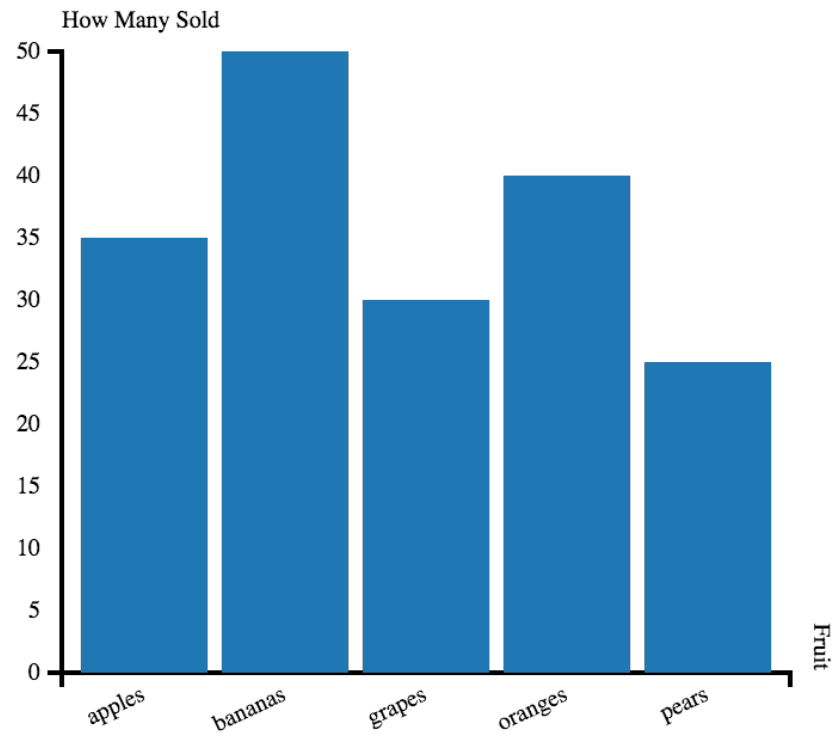
Which expense needs the least amount of money?

_____

Which expense takes up almost half of the budget?

_____

If this person has a monthly budget of $2000, and spends 15% of it on food, how many dollars are spent on food?

_____

Introducing Histograms

| First	Last	Height
"John"	"Doe"	52.0
"Jane"	"Smith"	49.1
"Javon"	"Jackson"	57.7
"Angela"	"Enriquez"	52.5
"Jack"	"Thompson"	53.0
"Dominique"	"Rodriguez"	51.1
"Sammy"	"Carter"	56.2
"Andrea"	"Garcia"	50.8

How many students are between 48 and 50 inches tall?

_____

How many students are between 50 and 52 inches tall?

_____

How many students are between 52 and 54 inches tall?

_____

How many students are between 54 and 56 inches tall?

_____

How many students are between 56 and 58 inches tall?

_____

Add a bar to this histogram between the 50 and 52 markers, with a height that corresponds to how many students are between 50 and 52 inches tall.

Frequency of Heights in Classroom
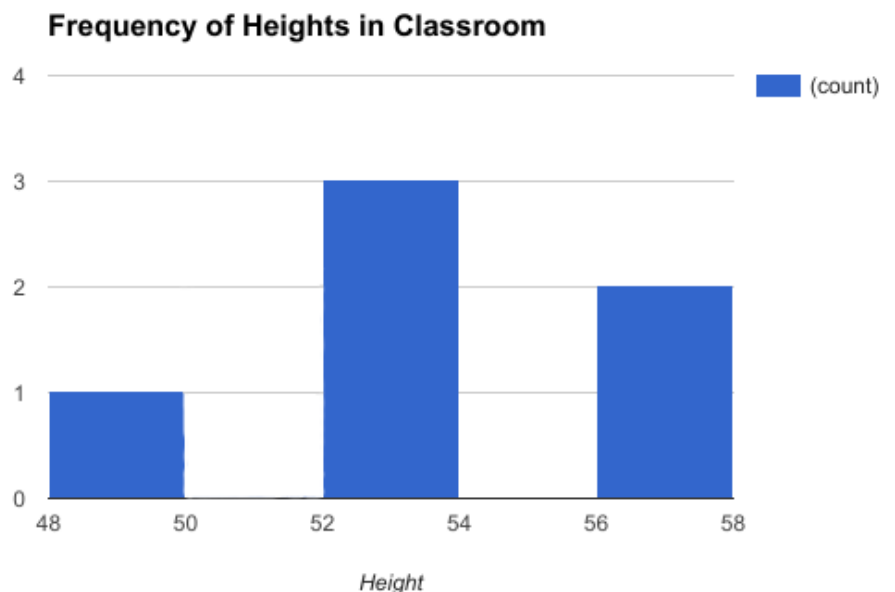
Histogram Practice

How many people were born between 1996 and 1997?

_____

What year on record had the highest number of people born?

_____

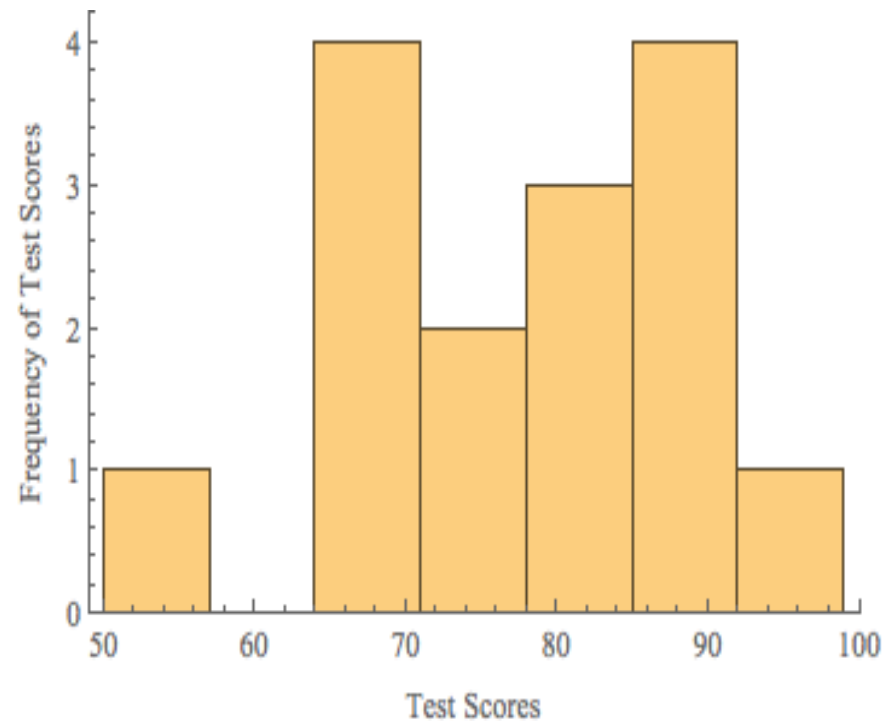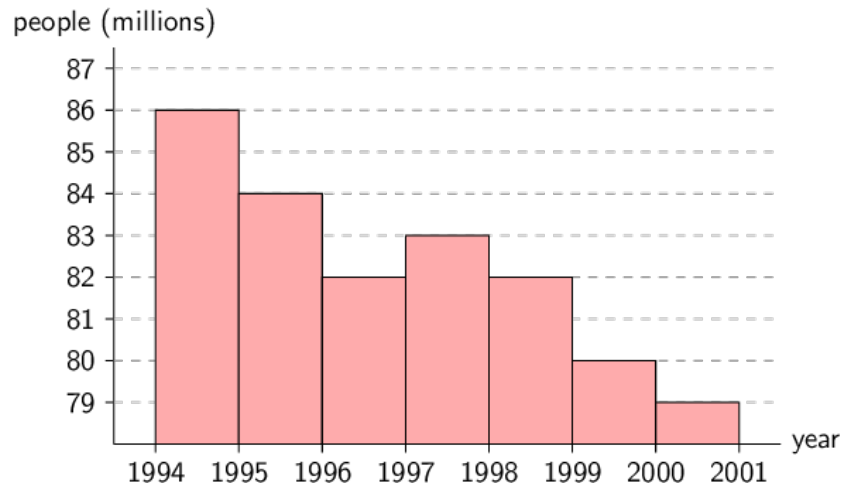How many bins does this histogram have?

_____

Were more people born in 1994 or 1995?

_____

How many bins does this histogram have?

_____

What is (are) the bins with the highest frequency of scores?

_____

How many students scored between 85 and 92?

_____

Creating a Scatter Plot

For each row in the following table, add a dot to the scatter plot. The first 3 rows have been completed for you. Use the values from the left column along the horizontal axis, and values from the right column along the vertical axis.

0	3
1	5
2.5	1
2	2
6	0
4	3
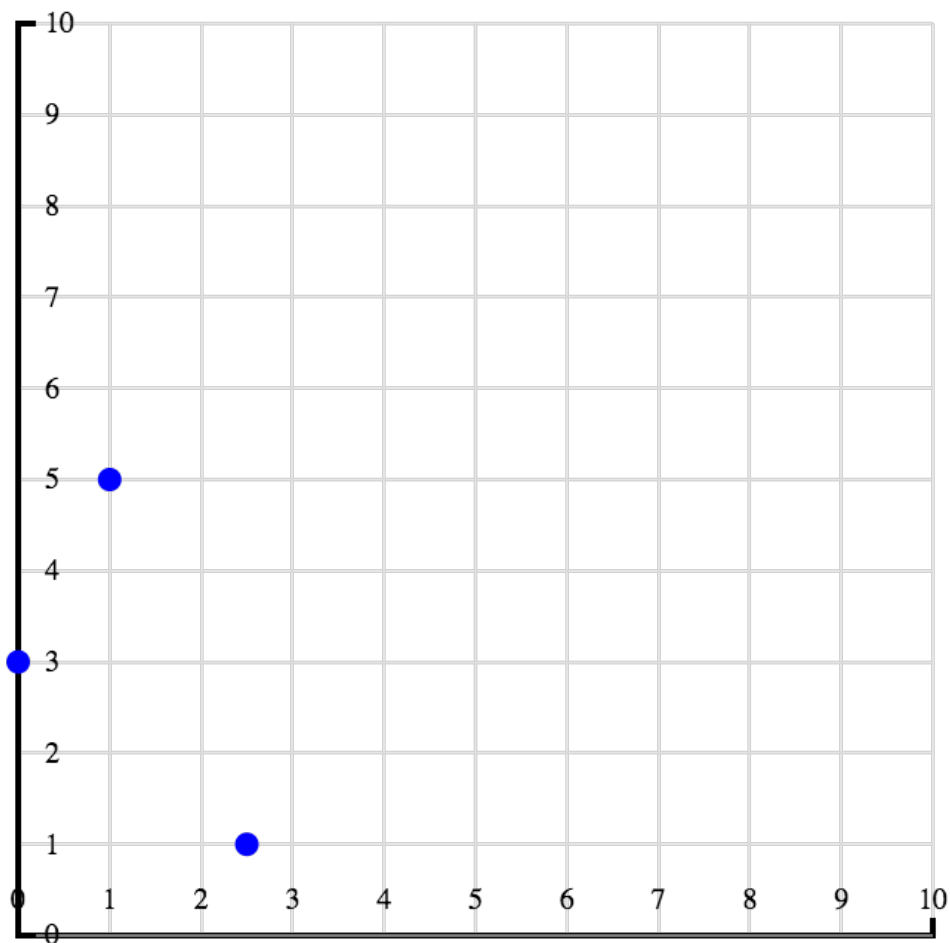
Grading Predictor Functions

Below are 3 data sets, each of which has two scatter plots shown. Each pair of scatter plots has two different predictors shown. For each data set, circle the plot with the predictor function that fits better, and give it a grade between 0 and 1. 1 means it fits perfectly, 0.5 if the fit is just ok, and 0 if it doesn't fit at all.
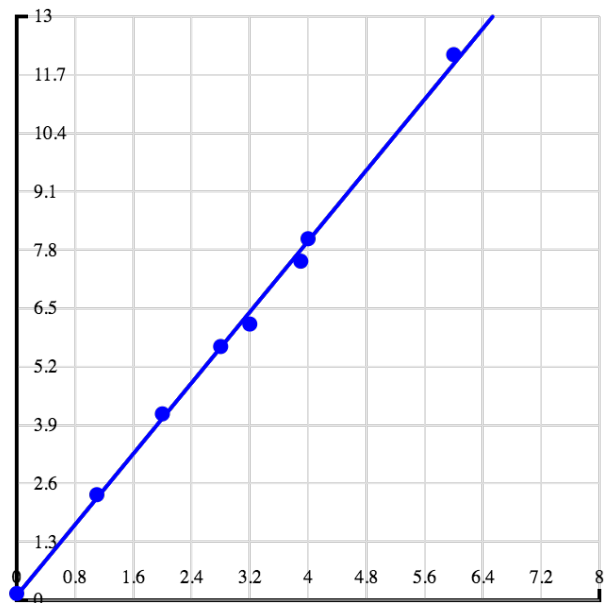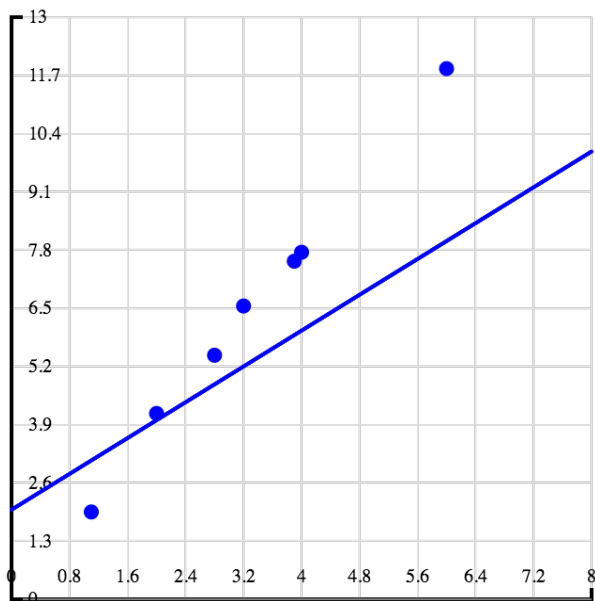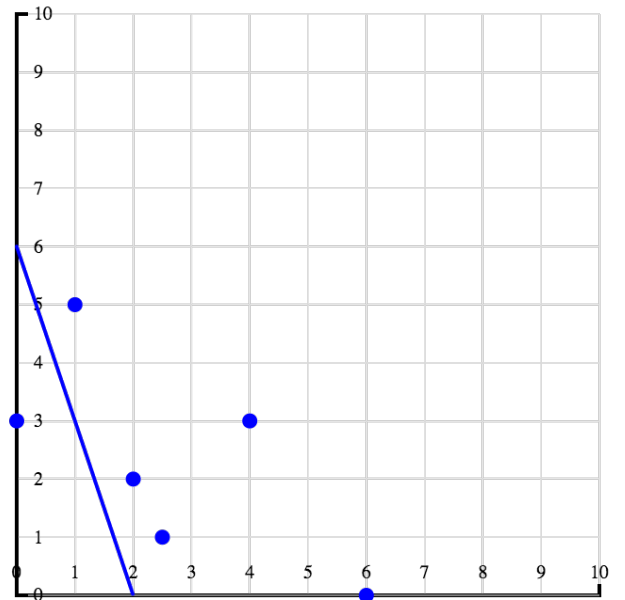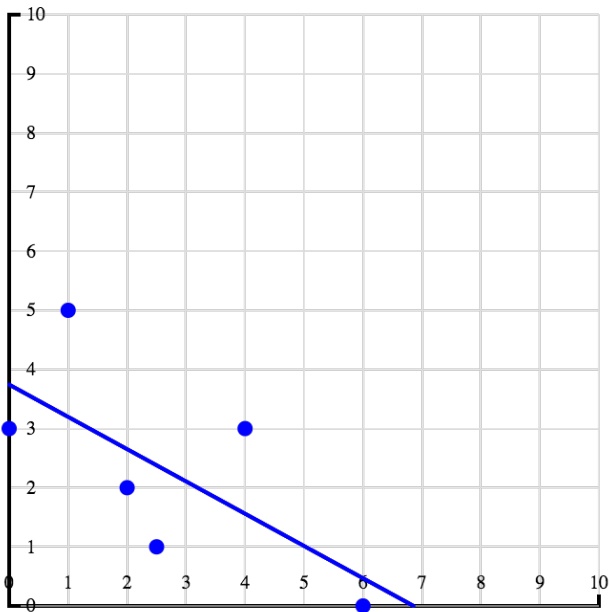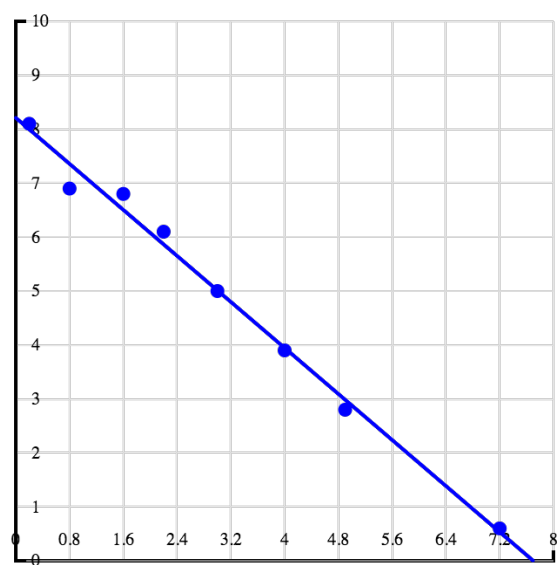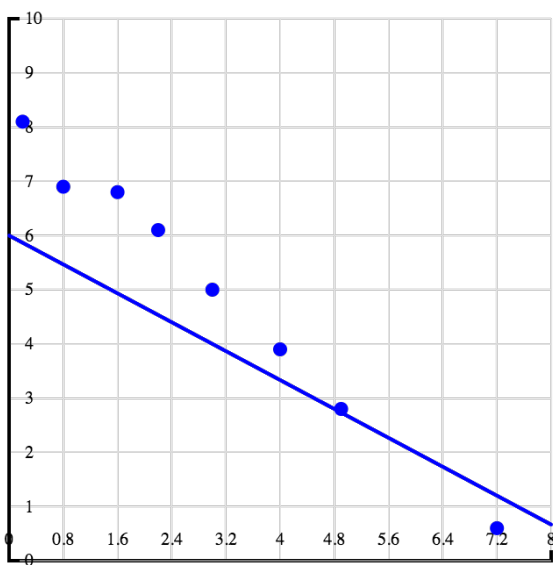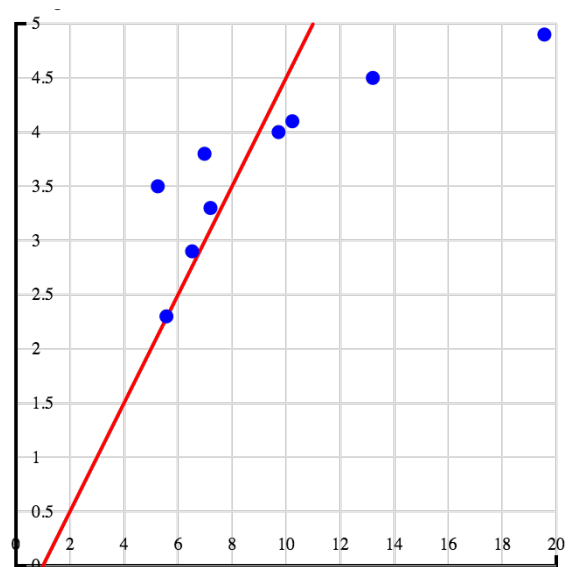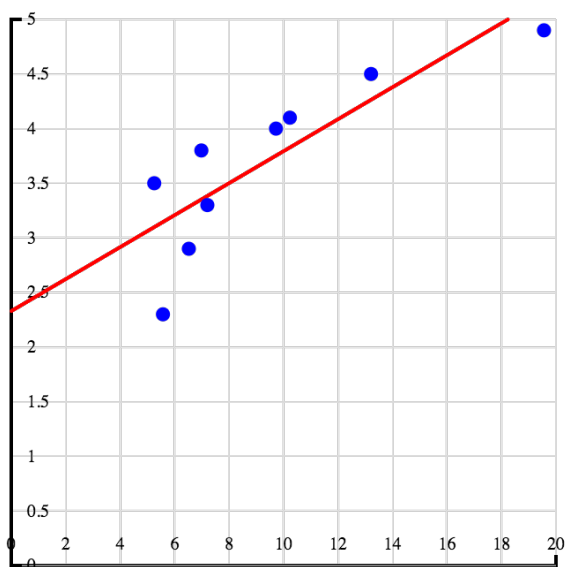
Select Practice

Below is a table bound to the variable name `animals`

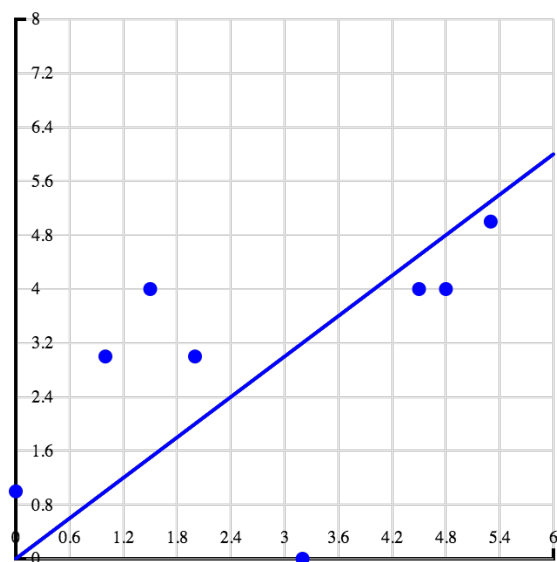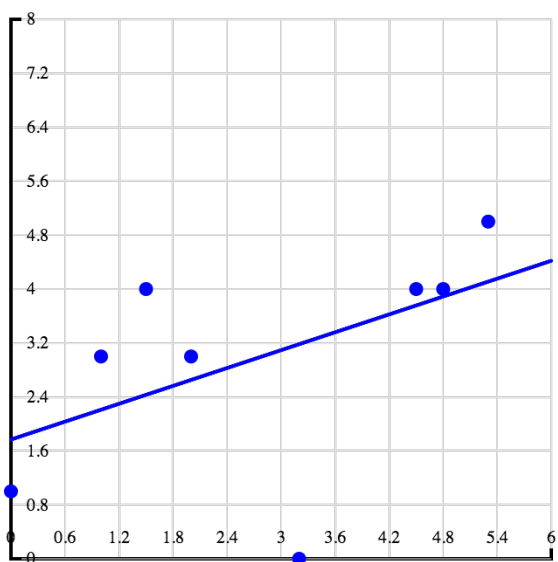| name	legs	eyes	lifespan
"Human"	2	2	71
"Garden Ant"	6	2	8
"Spider"	8	8	2.5
"Bear"	4	2	10

Write the code to select only the `name, eyes` columns from `animals`

Write the code to select only the `name, legs` columns from `animals`

Write the code to select only the `eyes, lifespan` columns from `animals`

Draw the table this code produces: `select lifespan, name from animals end`

What code produces the following table?

eyes
2
2
8
2

Challenge: Draw the table produced by this code:

```
mystery = select name, legs from animals end

select legs from mystery end
```

Order Practice

Below is a table bound to the variable name `animals`

name	legs	lifespan
"Human"	2	71
"Garden Ant"	6	8
"Spider"	8	2.5
"Bear"	4	10

Draw the `animals` table ordered by the `legs` column in `descending` order:

name	legs	lifespan

Draw the `animals` table ordered by the `lifespan` column in `ascending` order:

name	legs	lifespan

Questions About Rows

Circle or highlight all of the rows with animals that have 4 legs or less.

name	legs	eyes	class
"Human"	2	2	"Mammal"
"Garden Ant"	6	2	"Invertebrate"
"Spider"	8	8	"Invertebrate"
"Bear"	4	2	"Mammal"

Which animal(s) with 4 legs or less have exactly 2 eyes?

_____

Circle or highlight all of the rows with animals that are mammals.

name	legs	eyes	class
"Human"	2	2	"Mammal"
"Garden Ant"	6	2	"Invertebrate"
"Spider"	8	8	"Invertebrate"
"Bear"	4	2	"Mammal"

What animal(s) that are mammals have exactly 4 legs?

_____

Booleans and Comparison

The following code is in your definitions window:

```
legs = 2

eyes = 2

class = "Mammal"
```

What do each of these boolean expressions evaluate to? You may only use the Interactions window to check your answers after you have permission from the teacher.

Expression	Value
legs <= 4	
eyes == 2	
legs <> 4	
eyes <> 5 - 3	
legs == eyes	

When you finish the first table try these challenge questions:

Expression	Value
class == "Mammal"	
class == "Invertebrate"	
class <> "mammal"	

Sieve Practice

What column(s) help decide which countries to keep?   _____

What boolean expression will decide to keep a country?   _____

```
countries-sieved = sieve countries using _____:
```
                                                    Columns used in expression

_____
        Expression to ask true/false question
```
end
```

What column will the table be ordered by?   _____

Ascending or descending order?   _____

```
countries-ordered = order countries-sieved:
```

_____   _____
    Column to order by   ascending/descending
```
end
```

Which columns do we want to select?   _____

```
countries-sieved =
```

```
select _____ from countries-ordered end
```
                Columns to select

Extending Tables

Below is a table named containing the number of points scored by different NBA players in their first 3 games of a season. For each row, fill in the value of the `total-points` column, by adding the `game-1, game-2, game-3` columns together.

player	game-1	game-2	game-3	total
"Lebron James"	30	28	36	
"Steph Curry"	26	32	29	
"Kyrie Irving"	21	24	27	
"John Wall"	27	30	25	
"Isaiah Thomas"	25	22	24	

Which player has scored the most points so far?

_____

Below is a table named `stores` containing the prices of packs of socks for several different stores. Each store sells different size packs, for different prices. For each row, fill in the values of the `price-per-sock` column.

name	price	socks	price-per-sock
"Super Store"	2.50	4	
"Clothes Galore"	5.40	4	
"Bargain Mart"	4.50	6	
"Fashion Statement"	15.00	12	
"Sock Emporium"	7.00	10	

Which store has the best deal on socks?

_____

Countries Table Plan

Do I need to add a column?

_____ = **extend** _____ **using** _____:

_____ : _____

end

Do I need to get rid of any rows?

_____ = **sieve** _____ **using** _____:

_____

end

Do the rows need to be in some order?

_____ = **order** _____:

_____

end

Are any of the columns unnecessary?

_____ =

select _____ **from** _____ **end**

Nutrition Table Plan Practice

Your uncle is a bodybuilder, and wants to a healthy menu item. Healthy food is food with less than 80 grams of cholesterol. What are the top 5 healthy menu items with the highest protein per gram?

Do you need to add column(s)?

_____ = **extend** _____ **using** _____:

_____ : _____

end

Do you need to get rid of any rows?

_____ = **sieve** _____ **using** _____:

_____

end

Do the rows need to be in some order?

_____ = **order** _____:

_____

end

Are any of the columns unnecessary?

_____ =

select _____ **from** _____ **end**

Presidents Table Plan Practice

How many years was each Democratic president in office? Make a histogram to find out if more democratic presidents serve between 0 - 4 years, or 4 - 8 years.

Do you need to add column(s)?

_____ = **extend** _____ **using** _____:

_____ : _____

end

Do you need to get rid of any rows?

_____ = **sieve** _____ **using** _____:

_____

end

Do the rows need to be in some order?

_____ = **order** _____:

_____

end

Are any of the columns unnecessary?

_____ =

select _____ **from** _____ **end**

Rainfall Table Plan Practice

Given a table recording how much rain has fallen in a garden, make a scatter plot of how much rain fell in the first 99 days. Is the amount of rain per day increasing or decreasing? What's the mean rainfall of the first 99 days?

Do you need to add column(s)?

_____ = **extend** _____ **using** _____:

_____ : _____

end

Do you need to get rid of any rows?

_____ = **sieve** _____ **using** _____:

_____

end

Do the rows need to be in some order?

_____ = **order** _____:

_____

end

Are any of the columns unnecessary?

_____ =

select _____ **from** _____ **end**

Countries Table Plan Practice

Make a histogram of per-capita GDP for countries with universal health care. Do most of these countries have a per-capita GDP that is higher than the average per-capita GDP of all countries?

Do you need to add column(s)?

_____ = **extend** _____ **using** _____:

_____ : _____

end

Do you need to get rid of any rows?

_____ = **sieve** _____ **using** _____:

_____

end

Do the rows need to be in some order?

_____ = **order** _____:

_____

end

Are any of the columns unnecessary?

_____ =

select _____ **from** _____ **end**

Table Plan

Do you need to add column(s)?

_____ = **extend** _____ **using** _____:

_____ : _____

end

Do you need to get rid of any rows?

_____ = **sieve** _____ **using** _____:

_____

end

Do the rows need to be in some order?

_____ = **order** _____:

_____

end

Are any of the columns unnecessary?

_____ =

select _____ **from** _____ **end**

Table Plan

Do you need to add column(s)?

_____ = **extend** _____ **using** _____:

_____ : _____
end

Do you need to get rid of any rows?

_____ = **sieve** _____ **using** _____:

_____
end

Do the rows need to be in some order?

_____ = **order** _____:

_____
end

Are any of the columns unnecessary?

_____ =

select _____ **from** _____ **end**

Table Plan

Do you need to add column(s)?

_____ = **extend** _____ **using** _____:

_____ : _____

end

Do you need to get rid of any rows?

_____ = **sieve** _____ **using** _____:

_____

end

Do the rows need to be in some order?

_____ = **order** _____:

_____

end

Are any of the columns unnecessary?

_____ =

select _____ **from** _____ **end**