Test 2 Review – Math 105   Name: _____
Thonney

Show your work as much as possible for partial credit. You may use a calculator. 100 points total.

1. Here is a list of questions I asked my students in a class survey. What type of data will the question generate? Write either C for categorical or Q for Quantitative.

   _Q_ How many hours do you normally work per week?
   _C_ What city or town do you live in?
   _Q_ What is your height in inches?
   _C_ What is your major?

2. I asked statistics students the question "What is your relationship status" for several terms. Here is a summary of their responses.
   If you round on the relative frequency you will get the blue answers. If you don't round the answers you will get the red answers.

Relationship Status	Frequency	Relative Frequency	Degrees in a Pie Chart
Engaged	2	0.01 unrounded: 0.0121	4° 4.39°
In a Relationship	73	0.45 If you don't round this is 0.44512	162° If you dont' round this is 160.2°
It's complicated	15	0.09 unrounded: 0.09146	32° unrounded: 32.9°
Married	16	0.10	36°
Single	58	0.35	126°
	164 total	1.00	360°

a. In the table above, write relative frequency as a decimal rounded to the nearest hundredth (2 decimal places).

b. In the final column fill in the degrees that category should have in a pie chart.

c. Draw a pie chart to represent this data. Label each section with its relationship status and a percentage.

Relationship Status

Engaged
1.2%

Single
35.4%

In a Relationship
44.5%

Married
9.8%

It's complicated
9.1%
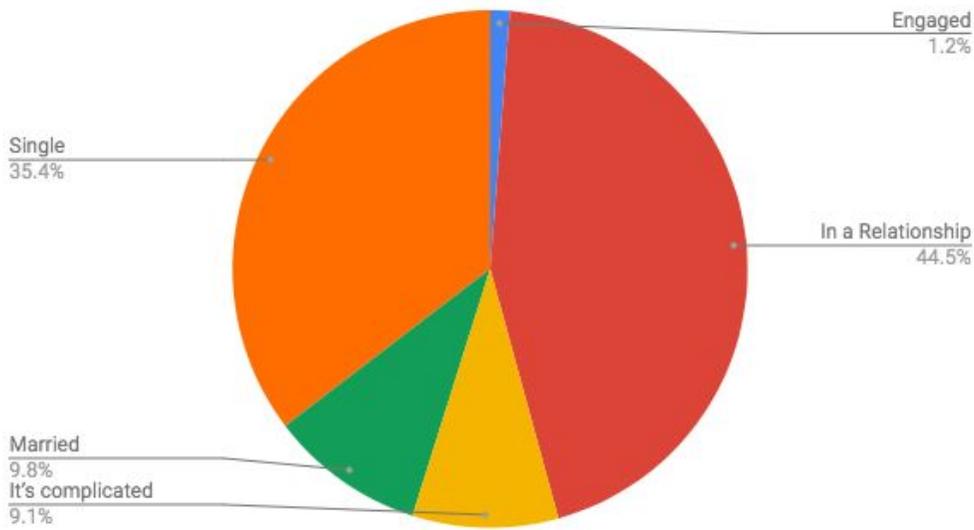
Note: Google Sheets gives me one decimal place of accuracy for the percent labels, but I am fine with (and prefer) to just round to the nearest percent when labeling percentages. I couldn't find a way to adjust the chart editor to make it round to the nearest whole number on those labels.

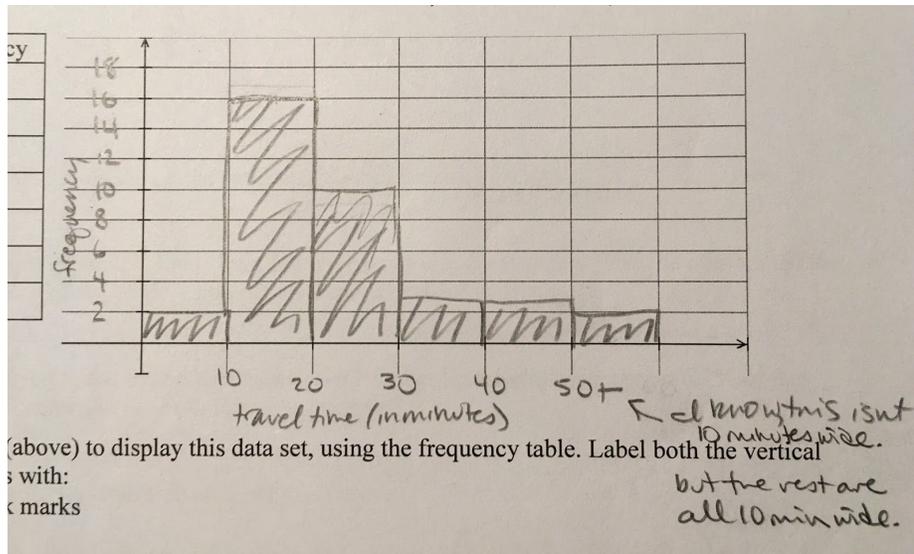3. The data below shows responses to the question "How long did it take you to get to school today (in minutes)?"

5	5	10	10	12	12	12	12	15	15
15	15	15	15	15	17	17	17	20	20
20	20	20	20	22	25	25	26	30	30
30	40	40	40	55	90				

a. How many students were surveyed? **36 students**

b. What is the mean of the travel times? **807/36 = 22.4 minutes**

c. What is the median of the travel times? **36 is an even number of data values, so there are two middle values. The median is the average of the 18th and 19th values. The 18th value is 17, and the 19th value of this data set is 20. The median is (17+20)/2 = 18.5 minutes.**

d. What is the mode of the travel times? **The mode is 15 minutes, which occurs 7 times.**

e. Which data value was an outlier? **90 minutes**

f. Was the mean, the median, or the mode more affected by the outlier?

The mean got bigger because of the outlier. The outlier has no effect on the median or the mode.

g. What is the range of the travel times? **Max - min = 90 - 5 = 85 minutes**

h. Complete the frequency table for this data set, using the class intervals below that start at 0 and are 10 minutes wide. (A person answering "10 minutes" would be counted in the second row, not the first row.)

Time in Minutes	Frequency
0-10	2
10-20	16
20-30	10
30-40	3
40-50	3
50+	2
Total	36

I know this isnt 10 minutes wide. but the rest are all 10 min wide.

(above) to display this data set, using the frequency table. Label both the vertical

i. Make a histogram (above) to display this data set, using the frequency table. Label both the vertical and the horizontal axis with:
- equally spaced tick marks
- numbers
- a word or phrase.

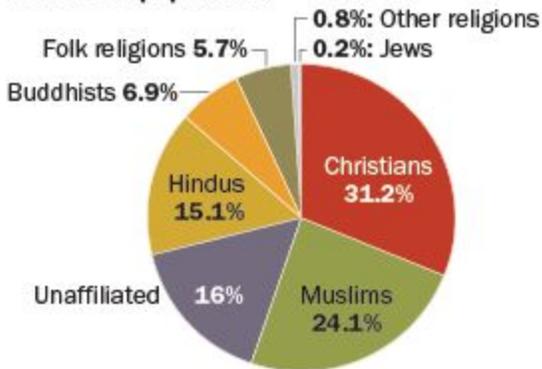Then draw the bars for each class interval.

4. You want to draw a graph summarizing the heights (in inches) of a class of students. What type of graph or chart would be best to use: a bar graph, a pie chart, or a histogram? Explain why.

A histogram, because the horizontal axis would be a number line, and we can divide people's heights into classes. A bar graph would have categories (like cats, dogs, horses, no pets) on the horizontal axis.
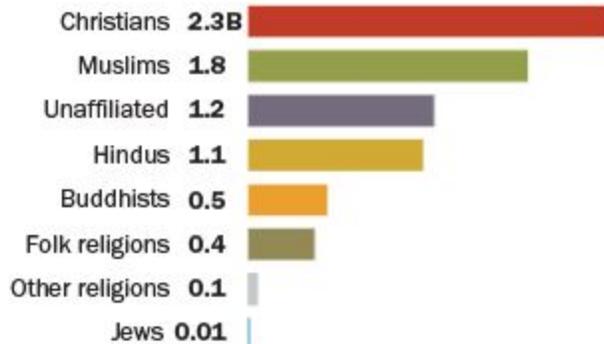
5. The pie chart below shows the distribution of religions in the world[1]. Use it to answer the questions that follow.

Christians are the largest religious group in 2015

% of world population

- 0.8%: Other religions
- 0.2%: Jews

Folk religions 5.7%
Buddhists 6.9%
Hindus 15.1%
Christians 31.2%
Unaffiliated 16%
Muslims 24.1%

Number of people in 2015, in billions

Christians	2.3B
Muslims	1.8
Unaffiliated	1.2
Hindus	1.1
Buddhists	0.5
Folk religions	0.4
Other religions	0.1
Jews	0.01

Source: Pew Research Center demographic projections. See Methodology for details.
"The Changing Global Religious Landscape"

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a. What is the total world population based on the bar graph?
If we add up the values beside the bar graph, we get a total of 7.41 billion people.

b. When I check the percentages presented, I get close, but not exactly the same values. Use the numbers in the bar graph to calculate the percent of the world's population that is classified as Buddhist.

$\frac{x}{100} = \frac{0.5 \, billion}{7.41 \, billion}$ x = 6.7 % The pie chart says Buddhists are 6.9% of the world's population.

The discrepancy is likely to due rounding values presented in the bar graph. I wouldn't worry too much about the difference.

c. Use the world's population you found in part a, as well as the fact that Folk Religion makes up 5.7% of the world. How many people are counted in the Folk Religion category?

$\frac{5.7}{100} = \frac{x \, billion}{7.41 \, billion}$ x = 0.422 billion, which is 0.422*(1,000,000,000) = 422,000,000 or 422

million people. Another way is to take 0.057*7,410,000,000 = 422,370,000
d. Is the bar graph presented a Pareto chart? Explain why or why not.
Yes, it is, because the bars are arranged from highest to lowest.

6. Two data sets are presented below. These represent the ages of statistics students in two classes.

Fall 2018

18	18	18	18	18	18	19	20	20	20	21	21	22	23	24	25	25	26	28	30	31	33

Fall 2019

16	17	17	17	18	19	19	19	19	19	19	19	20	20	20	20	20	20	20	20	21	22	22	23	26	26	26	27	27	30	31	32	38	42

a. Write two observations based on this data. Write two complete sentences.
There were more students in Fall 2019 (or at least more students took the survey).
There was a greater range of ages in Fall 2019 than in 2018.
The mean age in Fall 2018 was 496/22 = 22.5 years old.
The mean age in Fall 2019 was 799/35 = 22.8 years old (quite similar to Fall 2018).

b. The standard deviation of the second class is 6.03 years. Do you expect the standard deviation of the first class to be higher or lower?
It should be lower, because there is greater range & variability in ages in (second class) Fall 2019.

c. Use the table below to find the standard deviation of the first class. Assume that the data is from a population, not a sample.

	deviation	deviation squared	
Age	age - 22.5	<<answer ^2	
18	-4.5	20.25	
18	-4.5	20.25	
18	-4.5	20.25	
18	-4.5	20.25	
18	-4.5	20.25	
18	-4.5	20.25	
19	-3.5	12.25	
20	-2.5	6.25	
20	-2.5	6.25	
20	-2.5	6.25	
21	-1.5	2.25	
21	-1.5	2.25	
22	-0.5	0.25	
23	0.5	0.25	
24	1.5	2.25	
25	2.5	6.25	
25	2.5	6.25	
26	3.5	12.25	
28	5.5	30.25	
30	7.5	56.25	
31	8.5	72.25	

|			
33	10.5	110.25	
		453.5	sum of squared deviations
This is also the variance.>>		20.61363636	sum of squared deviations divided by n = 22
This is the standard deviation.>>		4.540224264	square root of previous value

Link to spreadsheet version of this.

7. A person said to you "Larger groups will always have larger standard deviations." Do you agree or disagree? Explain your reasoning with an example or a counter-example.

I disagree. If a very large group all were close the same age, then the group would have a very small standard deviation.

8. Two age distribution histograms are shown below. These are from a Pew Research Center animation that had graphs like this for every 5 years between 1950 and 2060[2]. The bars represent ages in 5 year increments (for example 0-4 yrs, 5-9 years, 10-14 years, etc).
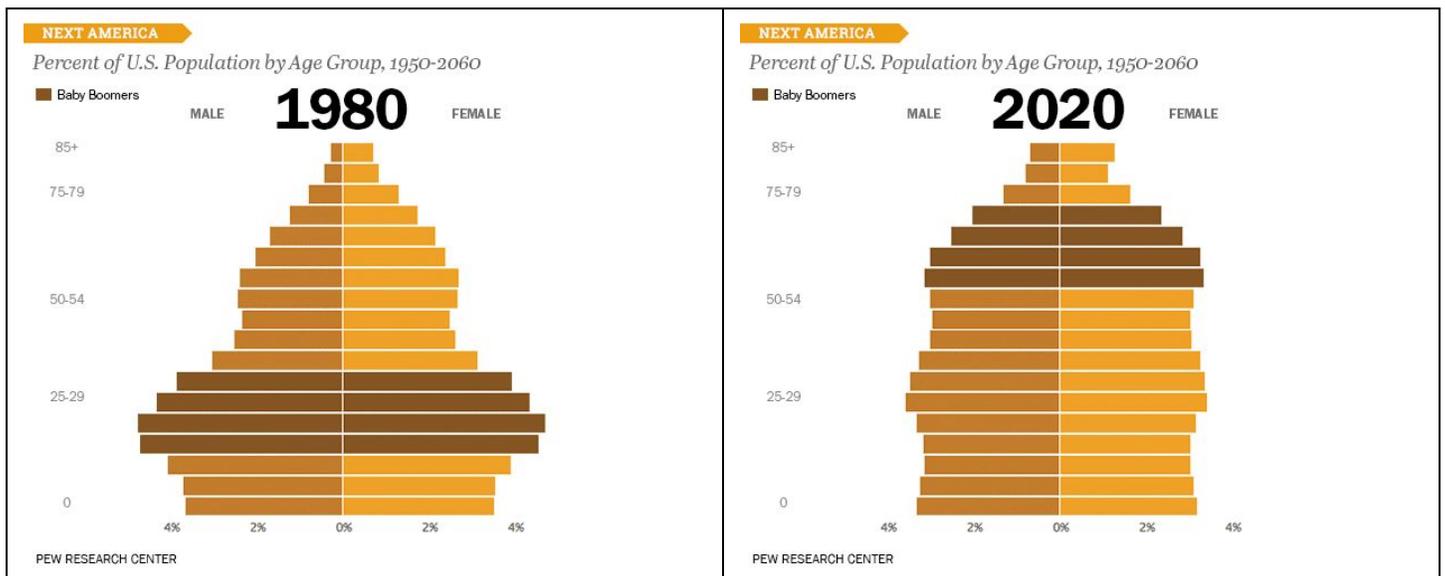
Choose True or False for each statement comparing the U.S. Age distribution in 1980 to 2020.

T F   a. In 1980, the highest percentage of people are in the age group 20-25.

T **F** b. In 2020 the percent of the population aged 85+ is smaller than it was in 1980.

T F   c. In 1980 the country as a whole was younger.

T F   d. In 2020 people are living longer.

T **F** e. In 1980 the country was more uniformly distributed by age.