This test consists of 5 problems on 7 pages. You must show your work to receive full credit. Be sure to clearly indicate your answers. Cross out or erase any work that you do not want to be graded. You may use a scientific or graphing calculator. You are allowed one note card.

Name: Solutions

Question	Points	Score
1	16	
2	12	
3	20	
4	28	
5	24	
Total:	100	

1. Below is a description of a statistical study. Answer the following questions about this study.

> In a Harris Interactive survey of 1,006 randomly selected adults, 96% say that they wash their hands when in a public restroom.

(a) [4 points] Is the statistical study an observational study or an experiment? Explain why.

Observational study because no treatment is being imposed on the

(b) [2 points] Identify the population of interest.

The population is all adults

(c) [2 points] Identify the sample.

The sample is the 1,006 adults who participated in the survey

(d) [2 points] What is the population parameter?

The population parameter is the percent of all adults that wash their hands

(e) [2 points] What is the sample statistic?

The sample statistic is the 96% of the adults in the sample that wash their hands

(f) [4 points] Are there any biases present in this study? If so, give an example of why the study is biased. If it isn't, explain why.

Possible answers:

Yes: The participants are likely to lie about washing their hands to avoid judgement

No: The survey is a simple random sample and is therefore representative

2. Below is a description of a statistical study. Answer the following questions about this study.

> In testing the effectiveness of a blood pressure medication, researchers randomly selected 40 men and 40 women. The men were given the medication while the women were given a placebo. Neither the participants nor the researchers who interacted with them knew who received the medication and who received the placebo.

(a) [4 points] Is the statistical study an observational study or an experiment? Explain why.

It is an experiment because a treatment (the blood pressure medication) is being given to some of the participants in an attempt to change their blood pressure.

(b) [4 points] Is the statistical study single-blind, double-blind, or neither? Explain why.

The experiment is double-blind because neither the participants nor the researchers who interacted with them knew who received each treatment

(c) [4 points] The data indicates that the blood pressure of the participants who received the medication decreased significantly more than those who received the placebo. Can the experimenters conclude that the medication is effective? Explain why or why not.

The experimenters cannot make any conclusions because gender is a lurking variable. It is unclear if the decrease in blood pressure is due to the drug or the fact that all participants who received the drug were male.

3. Below are the grades of 10 students on a test.

76 89 63 100 94 77 81 94 89 94

(a) [8 points] What is the mean test grade?

$$\bar{X} = \frac{76+89+63+100+94+77+81+94+89+94}{}$$

$$= \frac{857}{10}$$

$$= 85.7$$

(b) [8 points] What is the median test grade?

63 76 77 81 $\boxed{89\ 89}$ 94 94 94 100

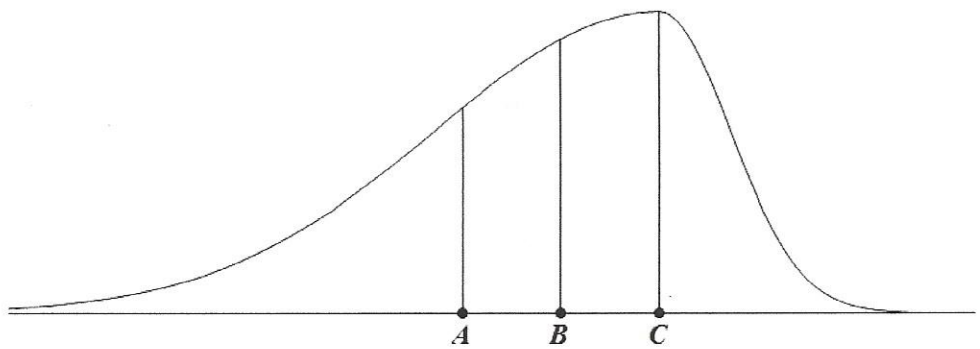
Since there is an even number of data values,

$$\text{median} = \frac{89+89}{2} = 89$$

(c) [4 points] What is the mode test grade?

mode = 94 because this score occured the most often (three times)

4. Below is the distribution of a data set.



(a) [4 points] Is the distribution symmetric, left-skewed, or right-skewed? Justify your answer.

Left-skewed because the data values are more spread out on the left side of the distribution

(b) [8 points] Does the point ***A*** represent the mean, median, or mode of the distribution? Justify your answer.

A represents the mean because the mean is influenced more by outliers than the median. It is the center of mass of the distribution.

(c) [8 points] Does the point ***B*** represent the mean, median, or mode of the distribution? Justify your answer.

B represents the median because the median is influenced less by outliers than the median. It is the point that divides the area under the curve into two equal parts.

(d) [8 points] Does the point ***C*** represent the mean, median, or mode of the distribution? Justify your answer.

C represents the mode because the mode is the data value that appears with the greatest frequency. It is the value corresponding to the highest point on the curve

5. The winners of the Academy Award for Best Actor since 2011 are listed below along with their age when they won.

Actor	Age
Colin Firth	50
Jean Dujardin	39
Daniel Day-Lewis	55
Matthew McConaughey	44

(a) [4 points] Is the variable Actor a quantitative variable or a qualitative variable? Justify your answer.

The variable Actor is qualitative because it cannot be counted or measured with numbers

(b) [4 points] Is the variable Age a quantitative variable or a qualitative variable? Justify your answer.

The variable Age is quantitative because it can be measured with numbers

(c) [4 points] What is the mean age of the past four Best Actor winners?

$$\bar{X} = \frac{50+39+55+44}{4}$$

$$= \frac{188}{4}$$

$$= 47$$

(d) [8 points] What is the standard deviation of the ages of the past four Best Actor winners?

deviations from mean	$(\text{deviations from mean})^2$
$50 - 47 = 3$	9
$39 - 47 = -8$	64
$55 - 47 = 8$	64
$44 - 47 = -3$	+ 9
	146

$$\text{standard deviation} = \sqrt{\frac{\text{sum of } (\text{deviations from mean})^2}{\#\text{ data values} - 1}}$$

$$= \sqrt{\frac{146}{3}}$$

$$= 6.98$$

(e) [4 points] Michael Keaton, who is 63 years old, is nominated for Best Actor at the 87th Academy Awards, which will be awarded in 2015. ***Without performing any calculations***, will the standard deviation of the ages of the winners of the Academy Award for Best Actor since 2011 increase or decrease? Justify your answer.

The standard deviation will increase. The standard deviation is a measure of the average deviation from the mean. Since 63 is farther from the mean than the other data values, this average deviation will increase.