Unit 1 Statistics Review   Name
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1. If a z-score is zero, what must be true? Explain your reasoning.

2. Human pregnancies are normally distributed and last a mean average of 266 days and a standard deviation of 16 days.

   a) Draw a picture of the normal curve with the pregnancy lengths for 1, 2 and 3 standard deviations above and below the mean.

   b) What percent of pregnancies last between 218 days and 266 days?

   c) Find the range of pregnancy lengths that the middle 68% of people fall between.

   d) A travelling salesman came home from a long business trip and was amazed to hear that his wife was pregnant and expecting a baby. This was especially amazing since it had been 314 days since he had last seen his wife. His wife claims that the baby is just very late in coming. What is the probability that a pregnancy would last 314 days or more? What does this tell you about the wife's claim?

3. In a recent year, the ACT scores for high school students with a 3.50 to 4.00 grade point average were normally distributed, with a mean of 24.1 and a standard deviation of 4.3. A student with a 3.50 to 4.00 grade point average who took the ACT during this time is randomly selected.
   a) Find the probability that the student's ACT score is less than 20.

   b) Find the probability that the student's ACT score is between 22 and 27.

   c) If 500 students took the ACT, about how many would you expect to find that scored more than 29?

4. The life span of a battery is normally distributed, with a mean of 2000 hours and a standard deviation of 30 hours. What percent of batteries have a life span that is more than 2065 hours? Would it be unusual for a battery to have a life span that is more

than 2065 hours? Explain your reasoning.

5. A set of mathematics exam scores has a mean of 70 and a standard deviation of 8. A set of English exam scores has a mean of 74 and a standard deviation of 16. For which exam would a score of 78 have a higher standing?

6. A normal distribution has a mean of 120 and a standard deviation of 20. For this distribution, what score corresponds to the 90th percentile?

7. Bias exists in each of the following survey questions. Explain the source of the bias, then write a version of the question that would be considered unbiased:

   a) Many people have said that there is a need for stricter laws on the possession of dangerous weapons. Do you agree?

   b) Should we reduce violent crime by getting guns off the streets, or should we just lock people up longer?

   c) Because of the Columbine tragedy and other shootings, many people feel that violent crime is worse today than it was 20 years ago. Do you agree?

8. Identify the type of bias in each of the following scenarios.

   a) Students are asked by their teacher whether they had ever cheated on a test.

   b) A fast-food franchiser uses a cluster survey to find out about employer-employee relations.

   c) A survey asks the question: "Are you in favor of holding the Olympics in Toronto, even though your taxes may increase?"

   d) A radio station asks listeners to call in to voice their opinions on whether a Canadian figure skater should have won a gold medal.

9. Modern Managed Hospitals (MMH) is a national for-profit chain of hospitals. Management wants to survey patients discharged this past year to obtain patient satisfaction profiles. They wish to use a sample of such patients. Some sampling techniques are described below. Categorize each technique as simple random sampling, stratified sampling, systematic sampling, cluster sampling, or convenience sampling.

a) Obtain a list of patients discharged from all MMH facilities. Divide the patients according to the length of hospital stay (3 days or less, 3 – 7 days, 8 – 14 days, more than 14 days). Draw simple random samples from each group.

b) Obtain a list of patients discharged from all MMH facilities. Number these patients, and then use a random-number table to obtain the sample.

c) Randomly select a few MMH facilities from each of five geographic regions, and then take all patients on the discharge list of the selected hospitals.

d) At the beginning of the year, instruct all MMH facilities to survey every 500th patient discharged.

e) Instruct each MMH facility to survey 10 discharged patients this week and send in the results.

10. Determine whether the following is an observational study or an experiment:

a) Fifty people with clinical depression were divided into two groups. Over a 6 month period, one group was given a traditional treatment for depression while the other group was given a new drug. The people were evaluated at the end of the period to determine whether their depression had improved.

b) One hundred people who regularly work out at a gym and one hundred people who do not workout tested for their cholesterol levels to determine whether exercise helps lower cholesterol.

c) In 2002, the journal Science reported that a study of women in Finland indicated that having sons shortened the lifespans of mothers by about 34 weeks

per son, but daughters helped to lengthen the mothers' lives. The data came from church records from the period 1640 to 1870.

11. A public interest group is interested in people's opinions about gun control. Random samples of voting age citizens are drawn in each of 3 states: Texas, Montana and New York. Each person is asked "Do you favor tougher gun control legislation?"

   a) In Texas, 1000 people are sampled; 402 answer YES. Give an estimate and margin of error for the percentage of all Texans who favor gun control legislation.

   b) Does the margin of error depend on the size of the state population from which the sample is gathered?

12. For each sample, find (1) the sample proportion, (2) the margin of error, and (3) the interval likely to contain the true population proportion.

   a) In a random sample of 408 grocery shoppers, 258 prefer one large trip per week to several smaller ones.

   b) 27 out of 60 mothers prefer generic brands when available.

13. A poll reports that 56% of the voters prefer Candidate B with a margin of error of ±3%. Estimate the number of voters in the poll.