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Math 30011 Spring 2009

Basic Probability & Statistics

Exam 1 – SOLUTIONS – Sections (Chapter 1, Chapter 2, Chapter 3, Chapter 10) – February 25, 2009

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1. Which branch of statistics would employ probability to predict how many miles one would be able to drive a 2000 Toyota Camry during its lifetime?

(a). unfortunate statistics
(b). descriptive statistics
(c). inferential statistics
(d). differential statistics

Ans: (c)

2. Which of the following correctly describes the relationship between a sample and a population?

(a). A sample is a group of populations that are subject to observation.
(b). A population is a group of samples that may or may not be included in a study.
(c). A sample is a group of subjects selected from a population to be studied.
(d). A population and a sample are not related.

Ans: (c)

3. What level of measurement classifies data into mutually exclusive (nonoverlapping), exhausting categories in which no order or ranking can be imposed on the data?

(a). nominal
(b). ordinal
(c). interval
(d). ratio

Ans: (a)

4. What level of measurement possesses all the characteristics of interval measurement, and there exists a true zero?

(a). nominal
(b). ordinal
(c). interval
(d). ratio

Ans: (d)

5. What would be the boundaries on the average age for high school graduates if they were reported to be 18 years old?

(a). 17.5-18.5 years old

(b). 17.5-19.5 years old

(c). 17.6-18.6 years old

(d). 17.5-19 years old

Ans: (a)

6. What type of sampling is being employed if the country is divided into economic classes and a sample is chosen from each class to be surveyed?

(a). random sampling

(b). systematic sampling

(c). stratified sampling

(d). cluster sampling

Ans: (c)

7. Statistics is the science of conducting studies to

(a). solve a system of equations.

(b). hypothesize, experiment, and form conclusions.

(c). collect, organize, summarize, analyze, and draw conclusions from data.

(d). monitor, study, and report on a subject.

Ans: (c)

8. **Fill in the blank.** The ordinal level of measurement classifies data into categories that can be ranked; however, precise differences between the ranks do not exist.

9. An automobile dealer wants to construct a pie graph to represent types of cars sold in July. He sold 72 cars; 16 of which were convertibles. The convertibles will represent how many degrees in the circle?

(a). 60°

(b). 80°

(c). 100°

(d). 50°

Ans: (b)

10. An advertiser states that its brand of energy pills gets into the user's blood stream faster than a competitor's and shows the following two graphs to prove its claim. Why is the comparison misleading?

There are no labels or scales on the vertical axes. Hence, the apparent faster speed in the first graph is not necessarily appreciable, as the graph "suggests"; in fact, the speeds might be very close.

11. A local fund raiser wants to graphically display the contributions they have received over the past five years. Construct a time series graph for the following data.

Year	Contributions
1996	\$550
1997	\$700
1998	\$800
1999	\$1050
2000	\$1200

Please refer to the other page.

12. Using the following frequency distribution, construct a frequency polygon.

Temperature	Frequency
28.5-31.5	1
31.5-34.5	3
34.5-37.5	6
37.5-40.5	10
40.5-43.5	8
43.5-46.5	7

Please refer to the other page.

13. The following information shows the colors of cars preferred by customers. Draw a pareto chart and clearly mark your axis.

Colors	Number
Red	50
Black	60
White	30
Green	20
Blue	40

Please refer to the other page.

14. (This question requires a lot of time) Corn is an important animal food. Normal corn lacks certain amino acids, which are building blocks for protein. Scientists have developed new corn varieties that have more of these amino acids. To test a new corn as an animal food, a group of 20 one-day-old male chicks were fed a ration containing the new corn. A control group of 20 chicks were fed with a ration that was identical except that it contained normal corn. Listed below are the weight gains after 21 days.

Normal corn:	380	321	366	356
	283	349	402	462
	356	410	329	399
	350	384	316	272
	345	455	360	431

New corn:	361	447	401	375
	434	403	393	426
	406	318	467	407
	427	420	477	392
	430	339	410	326

(a) Use your calculator to find the 5-point summary of data and record your answers below.

NORMAL CORN	NEW CORN
min = 272	min = 318
$Q_1 = 337$	$Q_1 = 383.5$
$M = 358$	$M = 406.5$
$Q_3 = 400.5$	$Q_3 = 428.5$
max = 462	max = 477

(b) Based on the previous part draw the box plots. **Comment briefly** on what you observe.

It appears from the two box plots (sketch them by hand) that the new corn is a better feed for the chicks since the weight gain on average is more pronounced. The normal corn is right skewed and the new corn is slightly left skewed.

15. The exam scores for the students in a statistics class are:

88	82	89	70	85
63	100	86	67	39
90	96	76	34	81
64	75	84	89	96

Construct a frequency table using **six** classes.

Please refer to the other page.

16. Given the following data set, find the percentile that corresponds to 23.

$$\begin{aligned} & & 10, 44, 15, 23, 14, 18, 72, 56 \\ \text{arrange data:} & & 10, 14, 15, 18, 23, 44, 56, 72 \\ \text{Percentile} &= & \frac{(\#\text{ of scores below } x) + 0.5}{\text{total } \#\text{ of scores}} \times 100\% \\ &= & \frac{4.5}{8} \times 100\% = 56.25 = 56\text{th}. \end{aligned}$$

Ans: 56th

17. Find the mean, mode, and median value for the following data set.

$$12, 15, 18, 18, 15, 22, 15, 30, 12$$

Ans: mean = 17.4, mode = 15, median = 15

18. A study is done to see whether there is a relationship between a mother's age and the number of children she has. The data is shown below. If there is a significant relationship, **predict the number of children of a mother whose age is 34**. Be clear with your answer. The correlation coefficient and the regression line (**you must use the formula done in class**) need to be considered. Answer all the items below.

Mother's age x	18	22	29	20	27	32	33	36
Number of children y	2	1	3	1	2	4	3	5

correlation coefficient: $r = 0.872523$
mean age: $\overline{x} = 27.125$
SD of age: $s_x = 6.556077$
mean # of children: $\overline{y} = 2.625$
SD of # of children: $s_y = 1.407886$
slope of regression line: $b = r\frac{s_y}{s_x} = (0.872523)(1.407886/6.556077) = 0.187\,37$
intercept of regression line: $a = \overline{y} - b\overline{x} = 2.625 - (0.18737)(27.125) = -2.\,457\,4$
regression line: $y' = -2.4574 + 0.1874x$
When $x = 34 \Longrightarrow y' = -2.4574 + 0.1874(34) = 3.9142 \simeq 4$ children.

19. Joe DiMaggio played center field for the Yankees for 13 years. He was succeeded by Mickey Mantle, who played for 18 years.

The number of home runs hit by DiMaggio are:

$$29, 46, 32, 30, 31, 30, 21, 25, 20, 39, 14, 32, 12$$

The number of home runs hit by Mantle are:

$$13, 23, 21, 27, 37, 52, 34, 42, 31, 40, 54, 30, 15, 35, 19, 23, 22, 18$$

Construct a back to back stem-and-leaf plot for the above data and **comment briefly** on what you observe.

DiMaggio	Stem	Mantle
	1	
	2	
	3	
	4	
	5	

Please refer to the other page.

20. Heights of men have a mean of 69.0 inches and a standard deviation of 2.8 inches. Use Chebyshev's Theorem to answer the following.

(a) What percentage of values falls between 63.4 inches and 74.6 inches?

(b) Find the two values where at least 88.9% of the men's heights falls between?

Ans: (a). 75% (b). 60.6 and 77.4 inches