

Math 1530-017 Exam 2
March 26, 2009

Name _____
Student Number E _____

There are five possible responses to each of the following multiple choice questions. There is only one “BEST” answer. Be sure to read all possible choices before selecting your answer. You may mark on this examination. You should use a calculator, but it is not required. However, a calculator manual cannot be used. Each problem is worth 7 points (for a total of 266 points).

1. Two-way tables provide suitable displays for showing counts obtained by classifying a collection of individuals according to measurements (or responses) taken on two variables. Commonly, both variables are of which major variable type?
(a) Quantitative (b) Dependent (c) Categorical (d) Continuous (e) Lurking

Use the following information in the next two questions. The National Survey of Adolescent Health interviewed several thousand teens (grades 7 to 12). One question asked was “What do you think are the chances you will be married in the next ten years?” Here is a two-way table of the responses by gender:

	Female	Male
Almost no chance	119	103
Some chance, but probably not	150	171
A 50-50 chance	447	512
A good chance	735	710
Almost certain	1174	756

2. What percent of those who thought they were almost certain to be married were female?
(a) about 40% (b) about 45% (c) about 50% (d) about 61%
(e) about 1174
3. Your percent from the previous exercise is part of
(a) the marginal distribution of chance of marriage.
(b) the marginal distribution of gender.
(c) the conditional distribution of chance of marriage given gender.
(d) the conditional distribution of gender given chance of marriage.
(e) the conditional distribution of chance of marriage given gender.
4. A bar graph showing the conditional distribution of chance of marriage given that the respondent was female would have:
(a) 2 bars.
(b) 4 bars.
(c) 5 bars.
(d) 10 bars.
(e) We need to know which value of the categorical variable ‘chance of marriage’ in order to answer.

Use the following information in the next two questions. Consider the 190 Three Stooges films. One categorical variable is “the role of third stooge” (Curly/ Shemp/Joe) and the other is “number of slaps in the film” (which we break into intervals as $[0, 5]$, $[6, 10]$, \dots). The data can be put in a two-way table as follows.

	Curly	Shemp	Joe	TOTAL
0 to 5 slaps	20	9	5	34
6 to 10 slaps	29	25	5	59
11 to 15 slaps	20	16	2	38
16 to 20 slaps	16	5	3	24
21 to 25 slaps	3	7	1	11
26 to 30 slaps	4	7	0	11
31 to 35 slaps	1	2	0	3
36 to 40 slaps	2	0	0	2
more than 40 slaps	2	6	0	8
TOTAL	97	77	16	190

- What is/are the marginal variable(s)?
 - ‘0 to 5 slaps’ and ‘Curly.’
 - ‘The role of third stooge’ and ‘number of slaps in the film.’
 - ‘Curly,’ ‘Shemp,’ and ‘Joe.’
 - ‘0 to 5 slaps,’ ‘6 to 10 slaps,’ \dots , and ‘more than 40 slaps.’
 - none of the above.
- If you were asked to create a conditional distribution for the Curly category, then you would create:
 - a bar graph using the data 34, 59, 38, 24, 11, 11, 3, 2, 8.
 - a histogram using the data 34, 59, 38, 24, 11, 11, 3, 2, 8.
 - a bar graph using the data 97, 77, 16, 190.
 - a histogram using the data 97, 77, 16, 190.
 - a bar graph using the data 20, 29, 20, 16, 3, 4, 1, 2, 2.

Use the following information in the next two questions. Here is a two-way table that summarizes data collected from eight high schools on smoking among students and among their parents.

	Neither Parent Smokes	One Parent Smokes	Both Parents Smoke
Student Doesn’t Smoke	1168	1823	1380
Student Smokes	188	416	400

- How many students do these data describe?
 - 1780
 - 5375
 - 4371
 - 1004
 - 2239
- Approximately what percent of smoking students have two smoking parents?
 - 50%
 - 68%
 - 35%
 - 40%
 - 23%

9. On October 23, 2008 AOL conducted an online poll of their subscribers to see who voters preferred in the presidential race. Approximately 281,000 responses were recorded. Of these, 56% picked McCain and 42% picked Obama. Identify the type of sampling used in this example.
- (a) Simple random sampling.
 - (b) Systematic sampling.
 - (c) Voluntary response sampling.
 - (d) Stratified random sampling.
 - (e) census.
10. A sample of size n , chosen in such a way that every set of n individuals in the population has an equal chance to be in the sample, is called what?
- (a) A multistage random sample
 - (b) A stratified random sample
 - (c) A cluster sample
 - (d) A simple random sample
 - (e) A voluntary response sample
11. If the design of a study or survey is such that it systematically favors certain outcomes, it is said to be what?
- (a) Truly random
 - (b) Biased
 - (c) A comparative study
 - (d) Lurking
 - (e) Simpson's paradox
12. A stratified random sample is a sample in which
- (a) at each stage, a simple random sample is selected from the sample selected in the previous stage.
 - (b) all similarly sized sets of members of the population have the same chance of being selected.
 - (c) every member of the population has the same chance of being selected.
 - (d) selection of the sample depends first on random mechanism and then on systematic elements.
 - (e) the population is first divided into groups of similar individuals, and then a separate simple random sample is selected from each group and combined to form the full sample.
13. You want to choose a Simple Random Sample (SRS) of size 10 from the 77 *Three Stooges* films which have Shemp in the role of the third stooge. How would you label this population in order to use the table of random digits (Table B)?
- (a) 10, 20, 30, ..., 77.
 - (b) 10, 20, 30, ... 70.
 - (c) 1, 2, 3, ..., 77.
 - (d) 01, 02, 03, ..., 77.
 - (e) The films should be labeled using their titles.

14. A Stoogeologist wonders if Moe hit Curly more than he hit Shemp. He does not have time to watch all of the 97 Moe-Larry-Curly films and the 77 Moe-Larry-Shemp films. He decides to watch 10 Moe-Larry-Curly films and 10 Moe-Larry-Shemp films and to count the number of times Moe hits either Curly or Shemp per film. He goes to his DVD collection and chooses to watch the first 10 episodes he can find from each population. This is an example of a:
- (a) multistage random sample.
 - (b) stratified random sample.
 - (c) cluster sample.
 - (d) simple random sample.
 - (e) convenience sample.
15. The Nurses' Health Study has interviewed a sample of more than 100,000 female registered nurses every two years since 1976. This study finds that "light-to-moderate drinkers had a significantly lower risk of death" than either nondrinkers or heavy drinkers. How strong is the evidence that moderate drinking lowers the risk of death?
- (a) Quite strong because it comes from an experiment.
 - (b) Quite strong because it comes from a large random sample.
 - (c) Quite strong because it minimizes response bias.
 - (d) Weak, because drinking habits are confounded with many other variables.
 - (e) Weak, because this is an example of Simpson's Paradox.
16. A sample of households in a community is selected at random from the telephone directory. In this community, 4% of households have no telephone and another 35% have unlisted telephone numbers. The sample will certainly suffer from
- (a) undercoverage.
 - (b) nonresponse.
 - (c) false responses.
 - (d) a stratified sample.
 - (e) bias.
17. A study of cell phones and the risk of brain cancer looked at a group of 469 people who have brain cancer. The investigators matched each cancer patient with a person of the same sex, age, and race who did not have brain cancer, then asked about use of cell phones. This is
- (a) an observational study.
 - (b) an uncontrolled experiment.
 - (c) a randomized comparative experiment.
 - (d) a sample experiment.
 - (e) a convenience sample.
18. What occurs in a double-blind experiment?
- (a) Subjects know neither what they are to do nor when they are to do it.
 - (b) Experimental units (usually animals) are not allowed to see the other units or the researchers.
 - (c) Both eyes are blindfolded so as to deprive subjects of visual input.
 - (d) Neither the subjects nor the evaluators know which treatment the subjects are receiving.
 - (e) Subjects are watched through a one-way window so that they are not aware of being observed.
19. When the effects of two variables in an experiment cannot be separated, and hence we cannot say which one is responsible for the observed responses, we say the variables are what?
- (a) Dependent
 - (b) Blocked
 - (c) Factors
 - (d) Significant
 - (e) Confounded

20. What is one good reason for using random allocation to assign experimental units to treatments in an experiment?
- (a) To produce the blocks in a block design.
 - (b) To “match” pairs of experimental units on as many variables as possible.
 - (c) To eliminate lack of realism.
 - (d) To produce experimental groups that are similar.
 - (e) To produce Simpson’s paradox.

Use the following information in the next two questions. The Physicians Health Study followed 22,000 male physicians for a period of several years. About 11,000 took an aspirin every second day while the rest took a placebo. The subjects had been randomly placed in one of the two groups. At the completion of the study, it was noted whether a subject had experienced a heart attack during the period of the study. It was found that the aspirin group had significantly fewer heart attacks than the placebo group.

21. The factor in the experiment is
- (a) the severity of the heart attack.
 - (b) use of a placebo.
 - (c) the length of the study.
 - (d) the 22,000 subjects.
 - (e) medication used (aspirin or placebo).
22. The response variable in this experiment is
- (a) whether a heart attack occurred.
 - (b) the placebo effect.
 - (c) whether the symptoms lessened.
 - (d) aspirin or placebo.
 - (e) the length of the study.
23. The Community Intervention Trial for Smoking Cessation asked whether a community-wide advertising campaign would reduce smoking. The researchers located 11 pairs of communities, each pair similar in location, size, economic status, and so on. One community in each pair participated in the advertising campaign and the other did not. This is
- (a) an observational study.
 - (b) an example of lack of realism.
 - (c) a matched pairs experiment.
 - (d) a completely randomized experiment.
 - (e) does not have control groups.

Use the following information in the next two questions. A survey is given to a population of 100 Stooze fans which asks them which is their favorite “third stooze,” Curly (*C*), Shemp (*S*), Joe (*J*), or Curly Joe (*CJ*). 60 of them choose Curly, 25 of them choose Shemp, 10 of them choose Joe, and 5 of them choose Curly Joe.

24. Based on this survey, what is the probability that a member of this population chooses Curly or Shemp as their favorite Stooze?
- (a) 0.45
 - (b) 0.85
 - (c) 0.60
 - (d) 0.25
 - (e) 100
25. Based on this survey, what is the probability that a member of this population does not choose Curly as their favorite Stooze?
- (a) 0.05
 - (b) 0.10
 - (c) 0.15
 - (d) 0.25
 - (e) 0.40

Use the following information in the next two questions. Here is the probability model for the blood type of a randomly chosen person in the United States.

Blood Type	O	A	B	AB
Probability	0.45	0.40	0.11	?

26. The probability that a randomly chosen American has type AB blood must be
(a) any number between 0 and 1. **(b)** 0.04 **(c)** 0.29 **(d)** 0.40 **(e)** 0.51
27. Maria has type B blood. She can safely receive blood transfusions from people with blood types either O or B. What is the probability that a randomly chosen American can donate blood to Maria?
(a) 0.04 **(b)** 0.11 **(c)** 0.44 **(d)** 0.56 **(e)** 0.96
28. You read in a book on poker that the probability of being dealt three of a kind in a five-card poker hand is $1/50$. This means that
(a) if you deal thousands of poker hands, the fraction of them that contain three of a kind will be very close to $1/50$.
(b) if you deal 50 poker hands, exactly 1 of them will contain three of a kind.
(c) it is impossible that you can be dealt 50 poker hands in a row, each one containing three of a kind.
(d) if you deal 10,000 poker hands, exactly 200 of them will contain three of a kind.
(e) none of the above.
29. The National Weather Service has the following model for the random variable $X =$ the number of hurricanes that hit North Carolina in a year:

Number of hurricanes X	0	1	2	3	4	5
Probability	0.30	0.35	0.20	0.10	0.04	?

What is the probability that there will be more than three hurricanes in a year?

- (a)** 0.04 **(b)** 0.05 **(c)** 0.10 **(d)** 0.95 **(e)** 0.15
30. Suppose the number of slaps per film in the Three Stooges films to be normally distributed with a mean of $\mu = 12.95$ and standard deviation $\sigma = 4.50$ (that is, the distribution is $N(12.95, 4.50)$). Denote the count of slaps per film by the letter F . Then F is a random variable and its probability distribution is $N(12.95, 4.50)$. What is the probability that a film chosen at random has more than 14 slaps per film? That is, what is $P(F) \geq 14$?
(a) 0.4090 **(b)** 0.5910 **(c)** 0.9236 **(d)** 0.3594 **(e)** 0.9406

Use the following information in the next two questions. If we break the 190 Three Stooges films into two categories, one for the director and one for the role of the third stooge, we get the following:

3rd Stooge\Director	Del Lord	Jules White	Ed Bernds	Other	Total
Curly	38	33	5	21	97
Shemp	1	55	20	1	77
Joe	0	16	0	0	16
Total	39	104	25	22	190

Denote events as: C represents the event of Curly as the third Stooge, S represents Shemp as the third stooge, J represents Joe as the third stooge, L represents the event Del Lord is the director, W represents Jules White is the director, B represents Ed Bernds is the director, and O represents a director other than Lord, White, or Bernds. Suppose the experiment of choosing a Three Stooges film at random is performed.

31. What is $P(C \text{ and } B)$?
 (a) 25/190 (b) 5/25 (c) 97/190 (d) 5/190 (e) 122/190
32. What is $P(C | B)$?
 (a) 25/190 (b) 5/25 (c) 97/190 (d) 5/190 (e) 122/190
33. The data concerning Three Stooges films used in the last two problems yields $P(W | S) = 55/77$ and $P(S) = 77/190$. Use this information (or the table of data) to calculate $P(W \text{ and } S)$.
 (a) 55/77 (b) 55/104 (c) 97/190 (d) 126/190 (e) 55/190
34. A density curve (i.e., a probability model) for a continuous random variable X has several well-known properties. Which of the following stated properties is INCORRECT?
 (a) The probability that X is less than c is never equal to the probability that X is less than or equal to c , for some measurement c .
 (b) The horizontal axis that serves as the scale for variable X (i.e., the baseline for the curve) is a Real Number line.
 (c) The probability of any event is the two-dimensional area under the density curve and above the horizontal scale for values of X that make up that event.
 (d) The total area under the density curve for X must be exactly 1.
 (e) For some constant c , the probability of any event of the form $X = c$ is equal to zero.
35. An instant lottery game give you probability 0.02 of winning on any one play. Plays are independent of each other. If you play 3 times, the probability that you win on none of your plays is about:
 (a) 0.98 (b) 0.94 (c) 0.000008 (d) 0.02 (e) 0.06
36. In the previous problem, the probability that you win on one or more of your 3 plays of the game is about
 (a) 0.98 (b) 0.94 (c) 0.999992 (d) 0.02 (e) 0.06

Use the following information in the next two questions. The nutritional status of 1000 elementary school children was assessed and recorded as “poor,” “adequate,” or “excellent.” The academic performance for those children was rated as “below average,” “average,” or “above average.” The data are displayed below.

	Poor	Adequate	Excellent	Totals
Below Average	70	95	35	200
Average	130	450	30	610
Above Average	90	30	70	190
Totals	290	575	135	1000

37. If you choose an elementary child at random, what is the probability that the child you choose is below average academically?
 (a) 0.2414 (b) 0.3500 (c) 0.2000 (d) 0.2900 (e) 0.0700
38. What is the probability that a randomly chosen child is below average academically, given that the child chosen had a poor nutritional status?
 (a) 0.3500 (b) 0.2000 (c) 0.2414 (d) 0.2900 (e) 0.0700

ANSWERS AND SOURCES OF QUESTIONS

#	Source	Answer
1.	Chapter 6 Quiz, #1	(c)
2.	Daily Quiz 2/26/2009 #1 BPS Exercise 6.15 Page 161	(d)
3.	Daily Quiz 2/26/2009 #2 BPS Exercise 6.16 Page 161	(d)
4.	BPS Exercise 6.17 page 161	(c)
5.	Stooges Example S.6.1	(b)
6.	Stooges Example S.6.1	(e)
7.	Chapter 6 Quiz, #3	(b)
8.	Chapter 6 Quiz, #5	(d)
9.	Departmental Final Fall 2008A #20	(c)
10.	Chapter 8 Quiz, #9	(d)
11.	Chapter 8 Quiz, #2	(b)
12.	Chapter 8 Quiz, #3	(e)
13.	Daily Quiz 3/3/2009 #2	(d)
14.	Stooges Example S.8.2	(e)
15.	BPS Exercise 8.18 page 206	(d)
16.	BPS Exercise 8.26, page 207	(a)
17.	Daily Quiz 3/17/2009 #1 BPS Exercise 9.16 page 228	(a)
18.	Chapter 9 Quiz, #4	(d)
19.	Chapter 9 Quiz, #5	(e)
20.	Chapter 9 Quiz, #10	(d)
21.	Departmental Final Fall 2008A #28	(e)
22.	Departmental Final Fall 2008A #29	(a)
23.	BPS Exercise 9.22 page 228	(c)
24.	Stooges Example S.10.1	(b)
25.	Stooges Example S.10.1	(e)
26.	BPS Exercise 10.22 page 264	(b)
27.	BPS Exercise 10.23 page 264	(d)
28.	BPS Exercise 10.19 page 263	(a)
29.	Departmental Final Spring 2008A #24	(b)
30.	Stooges Example S.10.2	(a)
31.	Daily Quiz 3/19/2009 #1 Stooges Example S.12.1	(d)
32.	Daily Quiz 3/19/2009 #2 Stooges Example S.12.1	(b)
33.	Stooges Example S.12.3	(e)
34.	Chapter 10 Quiz, #15 (covers a topic of Chapter 12)	(a)
35.	BPS Exercise 12.17 page 317	(b)
36.	BPS Exercise 12.18 page 317	(e)
37.	Departmental Final Spring 2008A #25	(c)
38.	Departmental Final Spring 2008A #26	(c)