

Final for Statistics 113
Statistics and Society–Spring 2002
Material Covered: Chapters 1–27 of Workbook and text
29th April

This is a 2 hour final, worth 25% and marked out of 25 points. The total possible points awarded for each question is given in square brackets at the beginning of each question. Anything that can fit on two sides of an $8\frac{1}{2}$ by 11 inch piece of paper may be used as a reference during this quiz. A calculator may also be used. No other aids are permitted.

Name (please print): _____ . ID Number: _____
last first

1. Consider the following distribution table for the time length, in minutes, of rapid eye movements (REMs) a patient experiences during a night's sleep.

class interval	number of patients	relative number	proportion per 1 minute	percent (%)
0.5 to 11.5	5	$\frac{5}{20} = 0.25$	$\frac{.25}{11} \approx 0.023$	2.3%
11.5 to 20.5	7	$\frac{7}{20} = 0.35$	$\frac{.35}{9} \approx 0.039$	3.9%
20.5 to 27.5	4	$\frac{4}{20} = 0.20$	$\frac{.20}{7} \approx 0.029$	2.9%
27.5 to 40.5	4	$\frac{4}{20} = 0.20$	$\frac{.20}{13} \approx 0.015$	1.5%
total	20	1		

- (a) [1 point] The percentage of patients who have between 0.5 and 11.5 minutes of REM is (circle closest one) **0.023** / **0.039** / **0.102** / **0.250** / **0.350**.
- (b) [1 point] The number of patients who have between 3.5 and 18.5 minutes of REM is (circle closest one) **0.457** / **3.514** / **8.626** / **9.140** / **12.516**.
- (c) [1 point] The number of patients who have at least 3.5 minutes of REM is (circle closest one) **1.264** / **6.818** / **10.353** / **14.452** / **18.636**.

2. Selected percentiles for the weight (in pounds) of males at Purdue University, North Central is given in the table below.

percentile	25	35	60	75	90	95
weight	150	165	180	190	210	245

- (a) [1 point] About 25% of the males had weights above
(circle closest one) **25** / **150** / **165** / **190** / **245** pounds.
- (b) [1 point] The percentage of males with weights between 165 and 180 pounds is
(circle closest one) **25** / **35** / **60** / **65** / **70** percent.

3. The family income, husband's income, wife's income and children's income are related in the following way:

$$\text{family income} = \text{husband's income} + \text{wife's income} + \text{children's income}$$

- (a) [1 point] The correlation between the children's income and family income is
(circle closest one) **-1** / **somewhat negative** / **0** / **somewhat positive** / **1**.
- (b) [1 point] For family incomes around \$50,000, the correlation between husband's income and the combined wife's and children's income is (circle closest one)
-1 / **somewhat negative** / **0** / **somewhat positive** / **1**.

4. The predicted tomato yield is related to the amount of nitrogen fertilizer applied to a number of 10-square-meter experimental plots in the following way:

$$\text{predicted tomato yield} = (15 \text{ kilograms tomato per kilogram nitrogen}) \times (\text{nitrogen}) + 300 \text{ kilograms}$$

- (a) [1 point] An unfertilized plot can be expected to yield
(circle closest one) **0** / **15** / **205** / **300** / **315** kilograms of tomatoes.
- (b) [1 point] Each extra kilogram of nitrogen fertilizer can be expected to increase the tomato yield by
(circle closest one) **0** / **15** / **205** / **300** / **315** kilograms.
- (c) [1 point] If

$$\begin{aligned} \text{average nitrogen} &= 5 & \text{SD nitrogen} &\approx 2 \\ \text{average yield} &= 375 & \text{SD yield} &\approx 45 \end{aligned}$$

then $r =$ (circle closest one) $\frac{1}{6}$ / $\frac{2}{6}$ / $\frac{3}{6}$ / $\frac{4}{6}$ / $\frac{5}{6}$.

5. For every five flips of a coin, a head comes up three (3) times and a tail comes up two (2) times.

(a) [1 point] The chance of flipping seven heads in a row is
(circle closest one) $\frac{2185}{78125}$ / $\frac{2186}{78125}$ / $\frac{2187}{78125}$ / $\frac{2188}{78125}$ / $\frac{2189}{78125}$.

(b) [1 point] The chance of flipping three heads, followed by four tails, is
(circle closest one) $\frac{432}{78125}$ / $\frac{433}{78125}$ / $\frac{434}{78125}$ / $\frac{435}{78125}$ / $\frac{436}{78125}$.

(c) [1 point] The chance of flipping at least one head in seven flips is
(circle closest one) $\frac{77994}{78125}$ / $\frac{77995}{78125}$ / $\frac{77996}{78125}$ / $\frac{77997}{78125}$ / $\frac{77998}{78125}$.

6. A box contains a number of bills: one hundred \$1 bills, twenty \$5 bills, ten \$10 bills and five \$20 bills.

(a) [1 point] If one bill is taken out of the box at random, the expected value of this bill is (circle closest one) **\$2.95** / **\$2.96** / **\$2.97** / **\$2.98** / **\$2.99**.

(b) [1 point] The SD of the box is
(circle closest one) **\$2.46** / **\$3.38** / **\$4.23** / **\$5.31** / **\$6.45**.

(c) [1 point] One bill is taken out of the box at random and then replaced. This is repeated many times. The chance that \$5 or greater will appear more frequently is greater if a bill is repeatedly sampled and replaced at random
(circle one) **one hundred** / **one thousand** times.

7. In a particular Statistics and Society class, there are 80% females and 20% males. Also, there are 85% freshman and 15% sophomores. This information is given in following table.

year →	freshman	sophomores	
females			80%
males			20%
	85%	15%	100%

(a) [1 point] The percentage of freshman males in the class can be as small as:
(circle closest one) **0%** / **5%** / **10%** / **15%** / **20%**.

(b) [1 point] The percentage of freshman males in the class can be as large as:
(circle closest one) **0%** / **5%** / **10%** / **15%** / **20%**.

(c) [1 point] If year and gender are independent of one another, the percentage of freshman males is: (circle closest one) **3%** / **12%** / **17%** / **19%** / **21%**.

8. The registrar keeps an alphabetical list of the 3,500 students at Purdue University, North Central (PU/NC). A number between 1 and 25 is chosen at random, say 12. The twelfth student on the alphabetical list and every twenty-fifth person after that is chosen for a sample of 140 students. We are interested in estimating the average GPA of students.

- (a) [1 point] This (circle one) **is** / **is not** a simple random sample students although there is no selection bias in this method of sampling.
- (b) [1 point] The chance error is measured by the (circle one) **parameter** / **sample** / **SD** / **ave** / **statistic**
- (c) [1 point] Match the two columns below.

statistical terms	GPA example
(i) population	(i) all PU/NC students
(ii) sample	(ii) average GPA of all PU/NC students
(iii) statistic	(iii) GPAs of 140 PU/NC students
(iv) parameter	(iv) average GPA of 140 PU/NC students
	(v) 140 PU/NC students
	(vi) GPA of 3,500 PU/NC students

statistical terms	(i)	(ii)	(iii)	(iv)
GPA example				

9. [1 point] Professor Bumble compares the average number of late homework assignments for the Spring 2001 internet students with the average number of late homework assignments for internet students in previous semesters. He finds that, in previous semesters, an average of 2.3 homework assignments were late, whereas an average of 1.9 homework assignments were late with a SD of 1.1 for 1000 Spring 2001 internet students chosen at random.

Calculate the p-value, P , to decide if this data supports the claim the average number of late homework assignments for the Spring 2001 internet students is different than the average number of late homework assignments of previous internet students.

10. [2 points] Of a simple random sample of five hundred (500) students taken from the students at Purdue University, North Central (PU/NC), 134 have a GPA greater than or equal to 3.3 (and so 366 students have a GPA less than 3.3). Do not make any corrections due to the fact that a large sample (500) has been taken from the population (3500). Circle true or false.

- (a) **True / False** The SE% is given by 2.0%.
- (b) **True / False** The SE% measures the likely size of the chance error in the percentage of students at PU/NC that have a GPA greater than or equal to 3.3.
- (c) **True / False** The 26.8% is likely to be off the percentage of students at PU/NC that have a GPA greater than or equal to 3.3, by 2.0%.
- (d) **True / False** A 95% confidence interval of the percentage of students at PU/NC that have a GPA greater than or equal to 3.3 is 22.8% to 30.8%.
- (e) **True / False** A 95% confidence interval of the percentage of 500 students that have a GPA greater than or equal to 3.3 is 22.8% to 30.8%.
- (f) **True / False** If a second simple random sample of 500 students is taken, the 95% confidence interval in this second sample is 22.8% to 30.8%.

- (1) (a) **0.250** (b) **9.140** (c) **18.636**
- (2) (a) **190** (b) **25**
- (3) (a) **somewhat positive** (b) **-1**
- (4) (a) **300** (b) **15** (c) $\frac{4}{6}$
- (5) (a) $\frac{2187}{78125}$ (b) $\frac{432}{78125}$ (c) $\frac{77997}{78125}$
- (6) (a) **\$2.96** (b) **\$4.23** (c) **one hundred**
- (7) (a) **5%** (b) **20%** (c) **17%**
- (8) (a) **is not** (b) **SD** (c) (vi), (iii), (iv), (ii)
- (9) **P is 0%**
- (10) **True, False, True, True, False, False**