Final for Statistics 113
Statistics and Society–Fall 2001
Material Covered: Chapters 1–27 of workbook and text
10th December

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

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1. The box model related to the *population* of the number of missing teeth for *nine* wolf hounds is given below.

0	1	2	3	2	4	1	0	3
wolf 1	wolf 2	wolf 3	wolf 4	wolf 5	wolf 6	wolf 7	wolf 8	wolf 9

(a) [1 point] Draw one ticket (at random, with replacement) out the box model. The expected number of missing teeth per wolf hound is
(circle one) $\mathbf{\frac{13}{9}}$ / $\mathbf{\frac{14}{9}}$ / $\mathbf{\frac{15}{9}}$ / $\mathbf{\frac{16}{9}}$ / $\mathbf{\frac{17}{9}}$.

(b) [1 point] Use the random numbers table to draw five tickets (at random, with replacement) out the box model. Start a row 1, column 1 and move left to right along the first row. The average number of missing teeth per wolf hound for the five chosen wolves, is given by (circle one) $\mathbf{\frac{7}{5}}$ / $\mathbf{\frac{8}{5}}$ / $\mathbf{\frac{9}{5}}$ / $\mathbf{\frac{10}{5}}$ / $\mathbf{\frac{11}{5}}$.

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2. There is a 17% chance a dog has fleas. There are eleven dogs in an animal shelter.

(a) [1 point] It (circle one) **is** / **is not** reasonable to assume the conditions for a binomial experiment are satisfied in this case.

(b) [1 point] Assume the conditions for a binomial experiment are satisfied. The chance three of the dogs have fleas is
(circle closest one) **0.16** / **0.18** / **0.20** / **0.22** / **0.24**.

(c) [1 point] Assume the conditions for a binomial experiment are satisfied. The expected number of dogs to have fleas is
(circle closest one) **1.0** / **1.5** / **2.0** / **2.5** / **3.0**.

3. A comparison of the number of defective genes on two different chromosomes is undertaken, with the following results.

	chromosome 1	chromosome 2
defective	451	322
total	39,345	17,834

(a) [1 point] The observed difference in the proportion of defective genes between the two chromosomes is (circle closest one)
−0.00659 / **−0.02976** / **0.01146** / **0.01806** / **0.02345**.

(b) [1 point] The sample SD in the proportion of defective genes for chromosome 1 is (circle closest one) **0.102** / **0.104** / **0.106** / **0.108** / **0.110**.

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4. Consider the following table of length (inches) versus weight (pounds) of five Atlantic salmon fish.

length	19	22	35	40	45
weight	2	4	12	16	21

average length $= 32.2$ SD length ≈ 10.11
average weight $= 11$ SD weight ≈ 7.16 $r \approx 0.996$

Use a least squares regression.

(a) [1 point] If length is the independent variable and equal to 30 inches, we would predict the weight to be, on average,
(circle closest one) **9.25** / **9.35** / **9.45** / **9.55** / **9.65**.

(b) [1 point] The slope of the regression equation is
(circle closest one) **0.61** / **0.71** / **0.81** / **0.91** / **1.01**.

(c) [1 point] If weight is the independent variable and equal to 8 pounds, we would predict the length to be, on average,
(circle closest one) **27.68** / **27.78** / **27.88** / **27.98** / **28.08**.

5. The effect of loudness and different musical artists on the heart rate of robins, chosen at random from the grounds of Purdue University North Central, is investigated.

	loudness →	soft	medium	loud
artist	Natalie Merchant	7.2, 8.1	8.4, 8.2	8.9, 9.2
	Matchbox Twenty	9.1, 8.7	9.2, 9.5	10.2, 12.7
	Handel	3.2, 4.1	4.3, 4.1	4.7, 4.5

	loudness →	soft	medium	loud
artist	Natalie Merchant	treatment 1	treatment 2	treatment 3
	Matchbox Twenty	treatment 4	treatment 5	treatment 6
	Handel	treatment 7	treatment 8	treatment 9

Another variable, breathing rate, which is thought to influence the heart rates of these birds is not investigated in this study.

(a) [1 point] Loudness is an example of a (circle none, one or more)
response / **treatment** / **confounding variable** / **factor** / **control**

(b) [1 point] It is discovered later, after the experiment is complete, that, *un*intentionally, all slow breathing rate robins are subjected to treatments 1,2 and 3, all medium breathing rate robins are subjected to 4, 5 and 6 and all fast breathing rate robins are subjected to 7, 8 and 9. In this case, (circle one)

(i) breathing rate is confounded with heart rate

(ii) breathing rate is confounded with artist

(iii) breathing rate is confounded with volume

(iv) heart rate is confounded with artist

(v) heart rate is confounded with volume

(c) [1 point] To reduce the influence of the breathing rate confounder, (circle one)

(i) breathing rate should be assigned to the robins at random.

(ii) volume should be assigned to the robins at random.

(iii) artist should be assigned to the robins at random.

(iv) the treatments should be assigned to the robins at random.

(v) heart rate is confounded with volume

6. Consider the following discrete distribution table for the number of tests a statistics student takes during a semester.

number of tests	class interval	number of students	relative number	proportion per 1 unit	percent (%)
1	0.5 to 1.5	5	$\frac{5}{20} = 0.25$	0.25	25%
2	1.5 to 2.5	7	$\frac{7}{20} = 0.35$	0.35	35%
3	2.5 to 3.5	4	$\frac{4}{20} = 0.20$	0.20	20%
4	3.5 to 4.5	4	$\frac{4}{20} = 0.20$	0.20	20%
total		20	1.0		

(a) [1 point] The average number of tests taken is
(circle closest one) **2.15** / **2.25** / **2.35** / **2.45** / **2.55**.

(b) [1 point] The 68th percentile of the number of tests taken is
(circle closest one) **0** / **1** / **2** / **3** / **4**.

(c) [1 point] The percentage of students who take between 1.2 and 2.9 tests is
(circle closest one) **0.205** / **0.305** / **0.405** / **0.505** / **0.605**.

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7. A survey was conducted which compared age with number of visits per year to the doctor.

	age →	youth	middle–aged	elderly	row totals
visits	1 to 3	70	95	35	200
	4 to 8	130	450	30	610
	9 to 11	90	30	70	190
	column totals	290	575	135	1000

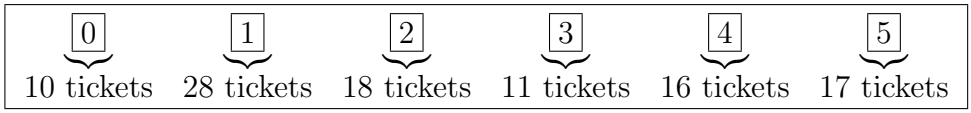
One person is chosen at random.

(a) [1 point] The chance this person is not elderly is:
(circle closest one) **0.135** / **0.190** / **0.810** / **0.865** / **0.905**.

(b) [1 point] The chance this person is a youth, given that s/he makes 4–8 visits is:
(circle closest one) **0.70** / **0.130** / **0.213** / **0.290** / **0.610**.

(c) [1 point] The chance this person is middle–aged or makes 9–11 visits is:
(circle closest one) **0.030** / **0.190** / **0.575** / **0.735** / **0.765**.

8. A box model for the number of snails eaten by a bird in a day is given below. For example, there is a 28% chance that one (1) snail is eaten by a bird in a day.



(a) [1 point] The chance at least 2 snails are eaten is:
(circle closest one) **18%** / **38%** / **56%** / **62%** / **65%**.

(b) [1 point] The expected number of snails eaten (average of box) is:
(circle closest one) **0.41** / **1.45** / **2.46** / **3.45** / **3.76**.

(c) [1 point] The standard deviation in the number of snails eaten is:
(circle closest one) **0.37** / **0.40** / **1.66** / **2.75** / **3.76**.

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9. Suppose 5% of the 15,000 residences of Benton Harbor are Purdue University North Central alumni.

(a) [1 point] The *most appropriate* box model for this population, if we designate alumni by "1" and others by "0", is (circle one)

(i) | 5 tickets [1] 15000 tickets [0] |

(ii) | 750 tickets [1] 14250 tickets [0] |

(iii) | 5 tickets [1] 100 tickets [0] |

(iv) | 5 tickets [1] 95 tickets [0] |

(v) | 50 tickets [1] 925 tickets [0] |

(b) [1 point] What is the chance, in a random sample of 300 residences, that less than 3% of these individuals are alumni? Circle closest one.
1.5% / **5.5%** / **9.5%** / **14.5%** / **18.5%**.

10. [1 point] The number of bills processed per hour for each of two computer billing systems for a number of different clerks is compared below.

System A	116	109	92	87	133
System B	121	112	98	83	142

Calculate the p–value, P, to decide if this data supports the claim the population average number of bills for System A is different than the population average number of bills for System B. Assume the SD of system A is 16.64 and the SD of system B is 20.07. Use the normal tables, rather than the t tables.

(1) (a) **16/9** (b) $\frac{8}{5}$

(2) (a) **is not** (b) **0.18** (c) **2.0**

(3) (a) **−0.00659** (b) **0.106**

(4) (a) **9.45** (b) **0.71** (c) **27.98**

(5) (a) **factor** (b) **(ii)** (c) **(iv)**

(6) (a) **2.35** (b) **3** (c) **0.505**

(7) (a) **0.865** (b) **0.213** (c) **0.735**

(8) (a) **62%** (b) **2.46** (c) **1.65**

(9) (a) **(ii)** (b) **5.5%**

(10) 77%