Final for Statistics 301
Elementary Statistical Methods - Fall 2001
Material Covered: Chapters 1–11 of Workbook and text
For: 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 final. A calculator and appropriate statistical tables 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* boxers is given below.

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

(a) [1 point] Draw one ticket (at random, with replacement) out the box model. We *expect* the ticket to have a value of (circle one) $\frac{13}{9}$ / $\frac{14}{9}$ / $\frac{15}{9}$ / $\frac{16}{9}$ / $\frac{17}{9}$.

(b) [1 point] Use your *calculator* (with *seed* 7) to draw five tickets (at random, with replacement) out the box model. The average number of missing teeth per boxer for the five chosen boxers, is given by
(circle one) $\frac{7}{5}$ / $\frac{8}{5}$ / $\frac{9}{5}$ / $\frac{10}{5}$ / $\frac{11}{5}$.

2. Consider the following discrete distribution table for a sample of 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 standard deviation in the number of tests taken is
(circle closest one) **1.05** / **1.07** / **1.09** / **1.11** / **1.13**.

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

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3. 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**.

4. The number of sales of household appliances, X, Whirlpool representative Darlene makes in a day is given by the following probability distribution.

X	0	1	2	3	4	5
P(X = x)	0.10	0.28	0.18	0.11	0.16	0.17

(a) [1 point] The chance Darlene makes at least 2 sales is:
(circle closest one) **0.18** / **0.38** / **0.56** / **0.62** / **0.65**.

(b) [1 point] The expected number of sales she makes is:
(circle closest one) **0.41** / **1.45** / **2.46** / **3.45** / **3.76**.

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

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5. There is a 17% chance a dog has fleas. Of eighty–seven dogs at the Animal Shelter, let X represent the number of dogs who have fleas.

(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] The chance nine of the dogs have fleas is:
(circle closest one) **0.02966** / **0.02976** / **0.02986** / **0.02996** / **0.03006**.

(c) [1 point] Using a normal approximation, the chance nine of the dogs have fleas is (circle closest one) **0.02913** / **0.02923** / **0.02933** / **0.02943** / **0.02953**.

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6. [1 point] The number of glasses of wine that Mike drinks at a typical dinner party, X, is a random variable with the following distribution,

x	0	2	4
$P(X = x)$	0.4	0.4	0.2

Complete the sampling distribution of the average number of glasses of wine he has over two dinner parties, $\bar{X}$,

$\bar{x}$	0	1	2	3	4
$P(\bar{X} = \bar{x})$	_____	_____	_____	_____	_____

7. A comparison of the number of defective calculators on two different work shifts was undertaken, with the following results.

	day shift (1)	night shift (2)
defective	451	322
total	39,345	17,834

(a) [1 point] The observed difference in the proportion of defective calculators between day shift and night shift is:
(circle closest one) **−0.00659** / **−0.02976** / **0.01146** / **0.01806** / **0.02345**.

(b) [1 point] The 95% CI for $p_1 - p_2$ is (circle closest one):
(−0.0068, −0.0044) / **(−0.0078, −0.0044)** / **(−0.0088, −0.0044)**
(−0.0098, −0.0044) / **(−0.0108, −0.0044)**

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8. The number of bills processed per hour for each of two computer billing systems for a number of different clerks is compared below. Test if there is a difference in the average number of bills for the two systems at $\alpha = 0.05$.

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

(a) [1 point] If a paired average difference test is used with five clerks, the p–value is
(circle closest one) **0.08** / **0.16** / **0.18** / **0.20** / **0.22**.

(b) [1 point] If a difference test is used with ten clerks, the p–value is
(circle closest one) **0.39** / **0.43** / **0.78** / **0.80** / **0.82**.

(c) [1 point] In this case, it is most appropriate to (circle one) **pool** / **not pool**.

9. 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

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] 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**.

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10. The observed data from a random sample of 354 patients in an investigation of the effect of taking aspirin on hearing is given in the table below.

	aspirin	no aspirin	subtotals
hearing enhanced	100	101	201
hearing unaffected	70	83	153
subtotals	170	184	354

Test whether taking aspirin or not is dependent on whether hearing is enhanced or not at $\alpha = 0.01$.

(a) [1 point] The p–value is (circle closest one)
0.44 / **0.45** / **0.46** / **0.47** / **0.48**.

(b) [1 point] The critical value is (circle closest one)
5.63 / **6.63** / **7.63** / **8.63** / **8.63**.

(c) [1 point] We (circle one) **accept** / **reject** the null hypothesis that taking aspirin or not is independent of whether hearing is enhanced or not.

(1) (a) **16/9** (b) **10/5**

(2) (a) **2.35** (b) **1.09** (c) **3**

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

(4) (a) **0.62** (b) **2.46** (c) **1.66**

(5) (a) **is** (b) **0.02966** (c) **0.02923**

(6) 0.16, 0.32, 0.32, 0.16, 0.04

(7) (a) $\mathbf{-0.00659}$ (b) $\mathbf{(-0.0088, -0.0044)}$

(8) (a) **0.16** (b) **0.78** (c) **not pool**

(9) (a) **9.45** (b) **27.98**

(10) (a) **0.46** (b) **6.63** (c) **accept**