Final for Statistics 113
Elements of Probability and Statistics - Spring 1999
Material Covered: Chapters 1–27 of Workbook and text
For: 8am–10am, Wednesday, 5th May

This is a 2 hour final, worth 27% and marked out of 27 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. A comparison of the number of male musicians in rock music and pop music was undertaken, with the following results, based on large random samples.

	rock music (1)	pop music (2)
male musicians	452	321
total musicians	705	555

(a) [1] The sample proportion of male musicians in rock music minus the sample proportion of male musicians in pop music

is _____.

(b) [1] The sample SE of the difference in proportions of male musicians in rock and pop music is,

$\sqrt{\mathrm{SE}_1^2 + \mathrm{SE}_2^2} =$ _____.

(c) [1] A 95% level of confidence for the difference in proportions of male musicians in rock and pop music

is _____.

2. The effect of loudness and different musical artists on the heart rate of students, chosen at random from PU/NC, is investigated. For instance, the heart rates of the first two students, listening to Natalie Merchant playing softly, are 7.2 and 8.1 units, respectively.

	loudness →	soft	medium	loud
artist	Natalie Merchant	7.2, 8.1	8.4, 8.2	8.9, 9.2
	Matchbox 20	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

(a) [1] Match the *best* descriptions in Column II with the statistical terms in Column I.

Column I	Column II
(a) treatment	**(a)** Natalie Merchant, softly
(b) control	**(b)** 7.2, 8.2
(c) response	**(c)** students
(d) experiment unit(s)	**(d)** artist
	(e) artist and loudness
	(f) heart rate

Column I	(a)	(b)	(c)	(d)
Column II				

(b) [1] It is found, later, after the experiment is over, that only females had been assigned to listen to Natalie Merchant and only males had been assigned to listen to Matchbox 20. In this case, (circle one)

(i) artist is confounded with loudness only

(ii) gender is confounded with artist and loudness

(iii) artist is confounded with gender only

(iv) loudness is confounded with gender and artist

3. [2] A recording artist's single is typically on the top 100 billboard for an average of 12 weeks with a SD of 3 weeks. Circle whether the following number of weeks a single is on the top 100 billboard is unusually low, average or unusually high:

(a) 7 weeks: unusually low / average / unusually high

(b) 15 weeks: unusually low / average / unusually high

(c) 18 weeks: unusually low / average / unusually high

(d) 3 weeks: unusually low / average / unusually high

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4. For country and western singers in 1998, the relationship between number of years on the road and earned yearly income can be summarized as follows:

average years on road ≈ 7 years,	SD ≈ 1.5 years	
average income $\approx \$110,000$	SD $\approx \$50,000$	$r \approx 0.25$

The scatter plot is football–shaped.

(a) [1] Predict, using the regression line, the income of a singer who has nine years on the road: (circle closest one) **126, 667** / **131, 333** / **133, 333** / **137, 333** / **142, 667**

(b) [1] The percentage of singers, with nine years on the road, who had an income greater than \$90,000 is (circle closest one) **27%** / **36%** / **52%** / **64%** / **72%**

(c) [1] The percentage of singers who had an income greater than \$90,000 is (circle closest one) **66%** / **71%** / **79%** / **86%** / **93%**

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5. Four draws are made at random with replacement from the following box tickets.

1	2	2	3	3	4

(a) [1] The chance that all four tickets are 2 is (circle closest one) **0.002** / **0.012** / **0.015** / **0.021** / **0.026**

(b) [1] The chance that all four tickets are 2 or more is (circle closest one) **0.482** / **0.492** / **0.495** / **0.502** / **0.512**

(c) [1] The chance that none of the four tickets are 2 is (circle closest one) **0.175** / **0.182** / **0.186** / **0.191** / **0.198**

6. The chance that Garth Brooks throws 0, 1 or 2 hats into an audience at any concert is described by the following box model.

3 tickets [0]	5 tickets [1]	1 tickets [2]

(a) [2] Complete the box model for the sampling distribution of the sum of the number of hats thrown into the audience at two concerts by filling in the table below the following box model.

(a) tickets [0]	30 tickets [1]	(b) tickets [2]	(c) tickets [3]	1 tickets [(d)]

(a)	(b)	(c)	(d)

(b) [1] The SD of the box model of the sampling distribution is (circle closest one) **0.629** / **0.679** / **0.734** / **0.803** / **0.889**

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7. We expect 17% of fans at a Rolling Stones rock concert to be rowdy. A box model of this situation is given below.

1700 rowdy fans [1]	8300 well behaved fans [0]

(a) [1] The SE of the percentage based on 50 draws (sampled with replacement) is given by (circle closest one) **0.042** / **0.047** / **0.051** / **0.053** / **0.057**

(b) [1] If, instead of 50 draws, 2500 draws (sampled with replacement) are taken, the new SE of the percentage is equal to the SE of the percentage in (a) multiplied by a factor a where a is (circle closest one) **0.141** / **0.189** / **0.221** / **0.257** / **0.282**

(c) [1] The SE of the percentage based on 2500 draws sampled with*out* replacement is given by (circle closest one) **0.0046** / **0.0051** / **0.0060** / **0.0065** / **0.0071**

8. The color of pea pods is either green or yellow. Their color is determined by one gene–pair: g for green, y for yellow, where g is dominant. In a set of breeding trials, plants with known pod color but unknown genetic makeup are crossed.

(a) [1] If two parents, one yellow and the other green, are crossed and produced 81 green pods and 84 yellow pods, then the gene–pair of the two parents must be (circle one)

(i) y/g and y/g (ii) y/y and y/g (iii) g/g and y/g (iv) y/y and y/y (v) y/y and g/g

(b) [1] If two parents, both green, are crossed and produced 121 green pods and 38 yellow pods, then the gene–pair of the two parents must be (circle one)

(i) y/g and y/g (ii) y/y and y/g (iii) g/g and y/g (iv) y/y and y/y (v) y/y and g/g

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9. Promotional material for Aerosmith states the average noise level at their rock concerts is 95 decibels. A fan club claims the average is higher than 95 decibels. Suppose a sample of 31 concerts provides a sample average of 97 decibels and a sample SD of 1.5 decibels.

(a) [1] Match the items in Column II with the statistical terms in Column I.

Column I	Column II
(a) population	**(a)** decibel levels at 31 concerts
(b) sample	**(b)** average decibels at all concerts
(c) statistic	**(c)** decibel levels at all concerts
(d) parameter	**(d)** average decibels at 31 concerts

Column I	(a)	(b)	(c)	(d)
Column II				

(b) [1] The null average

is equal to _____.

(c) [1] Using the normal tables, the chance that the average noise level of 31 concerts is greater than 97 decibels, assuming an average of 95 decibels, is

$P =$ _____.

(d) [1] The data (circle one) **does** / **does not** support the claim made by the fan club.

10. [2] Consider the following data on the age, x, and number of songs, y, written by a small group of 60's bands.

x	16	43	25	32
y	3	12	4	10

average age $= 29$ SD age ≈ 9.87
average number of songs $= 7.25$ SD number of songs ≈ 3.832

The correlation coefficient

is _____.

1. (a) 0.0626; (b) 0.0277; (c) $0.0626 \pm 2(0.0277)$
2. (a) e,a,f,c; (b) iii
3. (a) ave; (b) ave; (c) ave or above ave; (d) unusually low
4. (a) 126,667; (b) 64%; (c) 66%
5. (a) 0.012; (b) 0.482; (c) 0.198
6. (a) 9,31,10,4; (b) 0.889
7. (a) 0.053; (b) 0.141; (c) 0.0065
8. (a) ii; (b) i
9. (a) c,a,d,b; (b) 95; (c) 0; (d) does
10. 0.945