

Final for Statistics 113
Statistics and Society–Fall 2000
Material Covered: Chapters 1–27 of Workbook and text
11th 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 8½ 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. [2 points] One hundred and twenty pea plants are selected at random and the number of pea pods produced per plant is measured (observed). From this group, an average of 37 pea pods per plant is computed. Match columns: *All* of the items in the first column will be used up in the matching procedure; however, one item in the second column will be left unmatched.

statistical terms	pea pods example
(a) observation	(a) average number of pea pods per plant for 120 pea plants
(b) variable	(b) all pea plants
(c) parameter	(c) number of pea pods per plant for all pea plants
(d) statistical population	(d) number of pea pods for a pea plant
(e) sample	(e) average number of pods per plant for all pea plants
(f) statistic	(f) 120
(g) sample size	(g) number of pea pods per plant for 120 pea plants
	(h) 37 pea pods for a particular pea plant

terms	(a)	(b)	(c)	(d)	(e)	(f)	(g)
pea pod example							

2. [2 points] The chance the sum of 1500 rolls of a die is greater than 5520 is _____.

3. A tumor is cancerous 16% of the time; seven tumors are inspected. Assume this problem obeys the conditions of a binomial experiment.

(a) [1 point] The chance that at least 5 of the tumors are cancerous is
(circle one) **0.0017** / **0.1721** / **0.3334** / **0.6734** / **0.9983**

(b) [1 point] Match the four general conditions of a binomial experiment on the left with how these conditions appear in this question.

binomial conditions	tumor example
(a) There are n trials, where n is fixed in advance of the experiment.	(a) There is a 16% chance a tumor is cancerous.
(b) The trials are identical and there are only two possible outcomes: success (S) or failure (F).	(b) Each tumor inspection is independent of one another.
(c) The trials are independent of one another.	(c) There are 7 tumor inspections.
(d) The probability of success is p and remains constant from one trial to the next.	(d) The tumor inspections are identical and can only be cancerous or not.

binomial conditions	(a)	(b)	(c)	(d)
tumor example				

4. The average survival of leukemia patients in the midwest is assumed to be 17 months from time of diagnosis. The Cancer Research Society (CRS), however, claims the average survival time to be longer than this. The average survival time of a random sample of size $n = 15$ patients is 18.5 months and the standard deviation in survival time is 5.5 months. Does this data support the CRS's claim? Assume normality.

(a) [1 point] A test of the CRS claim involves using the (circle best one)

- (i) normal curve.
- (ii) normal curve with 15 degrees of freedom.
- (iii) t curve with 14 degrees of freedom.
- (iv) t curve with 15 degrees of freedom.
- (v) binomial distribution.

(b) [2 points] The t -test statistic

is $t =$ _____.

(c) [1 point] The p-value

is $P =$ _____.

5. Consider the following table and summary statistics of wheat yield (kilograms) versus amount of water (liters per square meter).

amount of water, x	0.13	0.54	0.73	1.11	1.32	1.54	1.78	2.31	2.54	2.88
wheat yield, y	7.1	7.0	7.5	8.8	9.1	9.4	10.0	9.2	9.0	8.5

average water amount = 1.488 SD water amount \approx 0.854
 average wheat yield = 8.56 SD wheat yield \approx 0.971 $r \approx$ 0.658

(a) [2 points] Use the regression line to predict the average wheat yield when watered with 1.11 liters per square meter (circle closest one)

7.73 / 7.94 / 8.00 / 8.28 / 8.59

(b) [1 point] The residual at $x = 1.11$

is _____.

6. The observed data of the incidence of colon cancer in parents and their children from a random sample of 329 families in a midwestern city is given in the table below.

	children have colon cancer	children do not have colon cancer	
parents have colon cancer	18	12	30
parents do not have colon cancer	22	277	299
	40	289	329

(a) [1 point] The chance a child, in a randomly chosen family, has colon cancer is (circle closest one) **0.05 / 0.09 / 0.12 / 0.45 / 0.60**

(b) [1 point] The chance a child, in a randomly chosen family with parents who have colon cancer, has colon cancer is

(circle closest one) **0.05 / 0.09 / 0.12 / 0.45 / 0.60**

(c) [1 point] The event “a child has colon cancer” is (circle one) **dependent on / independent of** the event “parents have colon cancer”.

8. [2 points] Circle true or false.

- (a) **True / False.** The t curve is a “flatter” version of the standard normal curve. The larger the random sample size, n , the less flat the t curve becomes and the more like the standard normal it becomes.
- (b) **True / False.** Even though the probability histogram for the *sum* becomes more normal-shaped as the random sample size increases, this is not true for the probability histogram for the *product*.
- (c) **True / False.** The probability histogram for the *average* becomes more normal-shaped as the random sample size increases.
- (d) **True / False.** The probability histogram for the sum of 100 draws from the following box model

5 tickets	<input type="checkbox"/>	5 tickets	<input type="checkbox"/>
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is more normal shaped than the probability histogram for the sum of 100 draws from the following box model

4 tickets	<input type="checkbox"/>	6 tickets	<input type="checkbox"/>
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9. Consider the following table of the sweetness measurements taken from a sample of Yummy chocolate bars.

sweetness measurements	13	54	73	111	132	154	178	231	254	288
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$$\text{average sweetness} = 148.8 \quad \text{SD sweetness} \approx 85.42$$

- (a) [1 point] According to the Empirical rule, about 95% of the 10 sweetness measurements should be within two SDs of the average, or, in other words, in the interval (circle closest one)
- (63.38, 234.22)** / **(10.11, 205.06)** / **(-22.04, 319.64)** / **(-56.78, 334.57)** / **(-107.46, 405.06)**
- (b) [1 point] In fact, there are six sweetness measurements within one SD of the average, ten within two SDs of the average and ten with three SDs of the average. Consequently, this indicates the data (circle one) **does** / **does not** follow a normal curve.

10. [1 point] It is known that the toner cartridge made by Laser.Com lasts 5.5 months under regular office use. To test a new sampling method, nine Laser.Com toner cartridges are sampled at random. It is found these toner cartridges lasted the following number of months:

4.9, 4.7, 4.8, 4.8, 5.0, 4.7, 4.9, 4.8, 4.8

The sampling method appears to have (circle one)

- (i) high bias and high chance error
- (ii) high bias and low chance error
- (iii) low bias and high chance error
- (iv) low bias and low chance error
- (v) not enough information to say

- (1) h, d, e, c, g, a, f
- (2) 0%
- (3) (a) **0.0017**; (b) c, d, b, a
- (4) (a) (iii) t curve with 14 degrees of freedom; (b) **1.02** (c) (**0.10, 0.25**).
- (5) (a) **8.28**; (b) **0.52**.
- (6) (a) **0.12**; (b) **0.60**; (c) **dependent on**.
- (7) (a) (iv) decrease the SD in the mean response for each treatment,
(v) make the results more representative.
(b) **True, True**
(c) 01, ..., 09 L salt; 10, ..., 18 M salt; 19, ..., 27 H salt
- (8) (a) **True**; (b) **True**; (c) **True**; (d) **True**
- (9) (**-22.04, 319.64**) (b) **does**
- (10) (ii) high bias and low chance error.