

STAT 3332 Statistics for Life Sciences

Fall 2007

Midterm Test 1

- Do **not** turn in the question sheets. **Only the answer sheet** will be accepted.
- There are **15** questions, with **7** points per question. Total points: **105**.
- Allotted time: **75** minutes.
- For each question, choose or give the **best answer**. Explanations (clearly indicate for which question) provided **neatly** on the margin or the back of the answer sheet may count for **partial credit** if needed.

1. Give the *median* of the following 7 data values listed in increasing order:

-10 -4 -3 200 400 1200

2. Let X_1, \dots, X_{20} be a sample of temperatures measured in degrees Centigrade. Suppose that these are converted to measurements in degrees Fahrenheit, via $Y_i = 1.8X_i + 32$, $1 \leq i \leq 20$. Then the mean of the Y data is

- (A) 1.8 times the mean of the X -data
 (B) 32 plus the mean of the X -data
 32 plus 1.8 times the mean of the X -data
 (D) the mean of the X -data

3. (Continuation) The standard deviation of the Y -data is

- 1.8 times the standard deviation of the X -data
 (B) 32 plus the standard deviation of the X -data
 (C) 32 plus 1.8 times the standard deviation of the X -data
 (D) the standard deviation of the X -data

4. For modeling a randomly chosen digit in the decimal system, the appropriate sample space is $S = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$. The events $A = \{0, 1, 2\}$ and $B = \{3, 4, 5\}$ are

- mutually exclusive (B) independent (C) complements of each other

5. (Continuation) Place equal probability $1/10$ on the 10 outcomes in S . With A as above, let $C = \{2, 4, 6\}$. Then $P(A|C) =$

- (A) 0 (B) $\frac{1}{10} \times \frac{3}{10} = \frac{3}{100}$ $\frac{1/10}{3/10} = \frac{1}{3}$ (D) $\frac{3/10}{1/10} = 3$ (E) 1

6. For any events A and B in a probability model, $P(A \cup B) =$

- (i) $P(A) \times P(B|A)$ (ii) $P(B) + P(A)$ (iii) both (i) and (ii) none of these

7. *Screening for Possible Disease.* Suppose for a given disease and a given population of persons,

- $P(\text{randomly chosen person has the disease}) = .01$,
 $P(\text{randomly chosen person is normal}) = .99$,
 $P(\text{person has positive screening test} \mid \text{person has disease}) = .85$,
 $P(\text{person has positive screening test} \mid \text{person is normal}) = .05$.

Then the probability that a randomly chosen person is normal and has positive screening test is

- (A) .05 $.99 \times .05$ (C) $.99 - .05$ (D) $.99 \times .05 + .01 \times .85$

8. (Continuation) The conditional probability $P(\text{normal} \mid \text{positive screening test}) =$

- (A) .99 (B) $\frac{.99}{.01 \times .85 + .99 \times .05}$ $\frac{.99 \times .05}{.01 \times .85 + .99 \times .05}$

Over for Questions 9-15

9. For the sample space $S = \{HHH, HHT, HTH, HTT, THH, THT, TTH\}$ and probability function P placing equal probability $1/7$ on the outcomes s in S , the induced probability mass function for the random variable $X(s) =$ position of first Head in s is

x	1	2	3
$p(x)$	$p(1)$	$p(2)$	$p(3)$

where (state the probabilities) $p(1) = \boxed{4/7}$ $p(2) = \boxed{2/7}$ $p(3) = \boxed{1/7}$
(Write correct answers on the answer sheet)

10. For the discrete probability distribution

x	1	2	3
$p(x)$	$4/7$	$2/7$	$1/7$

the *expected value* $E(X)$ is (A) 0 (B) 1 (C) $11/7$ (D) $7/12$

11. A person with a new car that seats 5 persons wishes to invite 4 persons from 8 friends to go for a ride. In how many ways can the 4 passengers be selected?

(A) 0 (B) $\frac{4}{8}$ (C) $8!$ (D) $\binom{8}{4}$

12. (Continuation) In how many ways can the 4 passengers be assigned to seats?

(A) 4 (B) $\binom{4}{4}$ (C) $4!$ (D) 444

13. Suppose that a new watch has 200 components each with a very small chance $\frac{1}{1000}$ of failing during the first year of service. If the components perform independently, the random number of components failing in the first year has the model

(A) binomial(200, 0.001) (B) binomial(1000, 0.001) (C) Poisson(200) (D) Poisson(0.2)

14. (Continuation) Which of these is a good approximation to the exact model? (Choose from same answers.) (D)

15. How many ways are there to form a committee of size 8 with 2 persons each selected from 5 freshman, 5 sophomores, 5 juniors, and 5 seniors?

(A) $4 \times \binom{5}{2}$ (B) $\binom{5}{2} \times \binom{5}{2} \times \binom{5}{2} \times \binom{5}{2}$ (C) $\binom{5}{2} + \binom{5}{2} + \binom{5}{2} + \binom{5}{2}$ (D) $\binom{8}{5} / \binom{5}{2}$

- When you are finished, *please hand in only the answer sheet.*
- **KEEP THE QUESTION SHEETS.**
- Please **depart quietly**, and *leave the vicinity before discussing the test.*

Thank you for your attention to these details.