

STAT 3332 Statistics for Life Sciences

Spring 2007

Midterm Test 1

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- Do **not** turn in the question sheets. **Only the answer sheet** will be accepted.
  - There are **12** questions, with **8** points per question. Also, **4** points are allocated for *neatness of name and signature on the answer sheet*. Total points: **100**.
  - Allotted time: **45** minutes.
  - For each question, choose or give the **best answer**. Explanations for any question (clearly indicate which) may be provided **neatly** on the margin or back of the answer sheet and may count for **partial credit** in the case of a wrong answer.
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1. Give the *median* of the following 7 data values listed in increasing order:

-120   -40   -30    -20   0   40   120

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2. (Continuation) Adding the constant  $c = 25$  to each value in this data set adds 25 to the  
(A) mean   (B) median    (C) mean and median   (D) standard deviation   (E) IQR

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3. A *boxplot* does *not* use the

(A) 1st quartile   (B) median   (C) 3rd quartile    (D) standard deviation   (E) IQR

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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 *complement* of the event  $A = \{1, 3, 5, 7, 9\}$  in  $S$  is

(A)  $\{0, 2, 4, 6, 8\}$    (B)  $S$    (C)  $\emptyset$    (D)  $A \cup A$    (E)  $A \cap A$

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5. (Continuation) Place equal probability  $1/10$  on the 10 outcomes in  $S$ . With  $A$  as above, let  $B = \{1, 2, 3\}$ . Then  $P(A|B) =$

(A) 0   (B)  $\frac{1}{2} \times \frac{3}{10} = \frac{3}{20}$    (C)  $\frac{1/2}{3/10} = \frac{5}{3}$     (D)  $\frac{2/10}{3/10} = \frac{2}{3}$    (E) 1

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

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

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7. *Screening for Possible Disease*. Suppose for a given disease and a given population of persons it is known that

$$P(\text{randomly chosen person has the disease}) = .01,$$

$$P(\text{randomly chosen person is normal}) = .99,$$

$$P(\text{person with disease shows positive screening test}) = .85,$$

$$P(\text{normal person shows positive screening test}) = .05.$$

Then the probability that a randomly chosen person shows a positive screening test is

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

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

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

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Over for Questions 9-12

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9. For the sample space  $S = \{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT\}$  and probability function  $P$  placing equal probability  $1/8$  on the outcomes  $s$  in  $S$ , the induced probability mass function for the random variable  $X(s) = \text{number of Heads in } s$  is

$x$	0	1	2	3
$p(x)$	$p(0)$	$p(1)$	$p(2)$	$p(3)$

where (state the probabilities)

$$p(0) = \qquad p(1) = \qquad p(2) = \qquad p(3) =$$

(Write correct answers on the answer sheet)  $1/8, 3/8, 3/8, 1/8$

10. For the discrete probability distribution

$x$	0	1	2	3
$p(x)$	$1/2$	$1/6$	$1/6$	$1/6$

the *expected value*  $E(X)$  is

- (A) 0                      (B) 1                      (C) 2                      (D) 3

11. *Accuracy of self-reported angina.* If we have 50 self-reported cases of angina, and we want to select 5 for further review, in how many ways can we select these if order of selection does not matter?

- (A)  $50 \times 49 \times 48 \times 47 \times 46$                       (B)  $\binom{50}{5}$                       (C)  $50!$                       (D)  $\frac{50!}{5!}$

12. (Continuation) In how many ways can the 5 selected patients be placed in order for examination by the doctor? (Write correct answer on the answer sheet)  $5! (=120)$

- 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.*