AP Statistics Name:

Probability Test #3**A** – Binomial, Geometric, et al

There are 24 questions on this test, mostly multiple choice. The total possible points are 84 with 80 points needed to score 100%. You have two choices on how your test will be scored:

1. **Leave all point values blank and each question will be worth 3.5 points.**
2. **Assign a point value of any whole number from 1 to 6 for every question in the blank next to the question number. There MUST be <u>four questions receiving each point value</u> (ie. Four 1's, four 2's, four 3's, …etc.).**

There is a 72% chance that Mr. Coleman will hum the Darth Vader theme song while walking down the hall. If you typically pass by him 5 times in one day, what is the probability that…

_____1. You will catch him humming **at least** 3 times in one day?

_____2. You will hear him humming **on or after** your 4th pass?

_____3. How many times would you expect to hear him hum **in a normal week** *at school*?

_____4. What is the standard deviation of the number of times you catch him humming **in a week**?

_____5. In November 1994, Intel announced that a "subtle flaw" in its Pentium chip would affect 1 in 9 billion division problems. Suppose a computer performs 20 million divisions (not an unreasonable number) in the course of a particular program. What is the probability of no error? Of at least one error?

(A) .99778, .00222

(B) .000000000111, .00222

(C) .000000000111, .999999999889

(D) .999999999889, .000000000111

(E) .999999999889, .00222

_____6. According to a CBS/*New York Times* poll taken in 1992, 15% of the public have responded to a telephone call-in-poll. In a random group of five people, what is the probability that exactly two have responded to a call-in poll?

(A) .138 (B) .165 (C) .300

(D) .835 (E) .973

In a 1974 "Dear Abby" letter a woman lamented that she had just given birth to her eighth child, and all were girls! Her doctor had assured her that the chance of the eighth child being a girl was only 1 in 100.

_____7. What was the real probability that the eighth child would be a girl?

(A) .0039
(B) .01
(C) .2
(D) .5
(E) 1

_____8. Before the birth of the first child, what was the probability that the woman would give birth to eight girls in a row?

(A) .0039
(B) .01
(C) .2
(D) .5
(E) 1

_____9. Senior citizens make up about 12.4% of the American population. If a random sample of 200 Americans is selected, what is the probability that more than 180 of them are senior citizens?

(A) binompdf(200, .124, 181)

(B) binomcdf(200, .124, 180)

(C) 1 – binompdf(200, .124, 180)

(D) 1 – binomcdf(200, .124, 180)

(E) 1 – binomcdf(200, .124, 181)

_____10. Which of the following are true statements?

I. The histogram of a binomial distribution with $p = .5$ is always symmetric no matter what n, the number of trials, is.
II. The histogram of a binomial distribution with $p = .9$ is skewed to the right.
III. The histogram of a binomial distribution with $p = .9$ is almost symmetric if n is very large.

(A) I and II
(B) I and III
(C) II and III
(D) I, II, and III
(E) None of the above gives the complete set of true responses.

_____11. The yearly mortality rate for American men from prostate cancer has been constant for decades at about 25 for every 100,000 men. (This rate has not changed in spite of new diagnostic techniques and new treatments.) In a group of 100 American men, what is the probability that at least 1 will die from prostate cancer in a given year?
(A) .00025
(B) .0247
(C) .025
(D) .9753
(E) .99975

_____12. Alan Dershowitz, one of O.J. Simpson's lawyers, has stated that only 1 out of every 1000 abusive relationships ends in murder each year. If he is correct, and if there are approximately 1.5 million abusive relationships in the United States, what is the expected value for the number of people who are killed each year by an abusive partner?
(A) 1
(B) 500
(C) 1000
(D) 1500
(E) None of the above

_____13. Suppose that among the 6000 students at a high school, 1500 are taking honor courses and 1800 prefer watching basketball to watching football. If taking honors courses and preferring basketball are independent, how many students are both taking honors courses and prefer basketball to football?
(A) 300
(B) 330
(C) 450
(D) 825
(E) There is insufficient information to answer this question.

_____14. As reported in *The New York Times* (February 19, 1995, p. 12), the Russian Health Ministry announced that one-quarter of the country's hospitals had no sewage system and one-seventh had no running water. What is the probability that a Russian hospital will have at least one of these problems if the two problems are independent?

(A) 11/28 (B) 1/7 (C) 9/28

(D) 1/4 (E) 5/14

_____15. An inspection procedure at a manufacturing plant involves picking three items at random and then accepting the whole lot if at least two of the three items are in perfect condition. If in reality 90% of the whole lot is perfect, what is the probability that the lot will be accepted?

(A) .600 (B) .667 (C) .729

(D) .810 (E) .972

_____16. Suppose that for any given year the probabilities that the stock market declines, that women's hemlines are lower, and that both event occur are, respectively, .4, .35, and .3. Are the two events independent?

(A) Yes, because $(.4)(.35) \neq .3$.
(B) No, because $(.4)(.35) \neq .3$.
(C) Yes, because $.4 > .35 > .3$.
(D) No, because $.5(.3 + .4) = .35$.
(E) There is insufficient information to answer this question.

_____17. If P(A) = .2 and P(B) = .1, what is P(A U B) if A and B are independent?
(A) .02
(B) .28
(C) .30
(D) .32
(E) There is insufficient information to answer this question.

_____18. Suppose we have a random variable X where the probability associated with the value k = 0, …, 10 is $\binom{10}{k}(.37)^k(.63)^{10-k}$. What is the mean of X?

(A) 0.37 (B) 0.63 (C) 3.7

(D) 6.3 (E) None of the above

_____19. Which of the following lead to binomial distributions?

I. An inspection procedure at an automobile manufacturing plant involves selecting a sample of cars from the assembly line and noting for each car whether there are no defects, at least one major defect, or only minor defects.

II. As students study more and more during their AP Statistics class, their chances of getting an A on any given test continue to improve. The teacher is interested in the probability of any given student receiving various numbers of A's on the class exams.

III. A committee of two is to be selected from among the five teachers and ten students attending a meeting. What are the probabilities that the committee will consist of two teachers, of two students, or of exactly one teacher and one student?

(A) I only
(B) II only
(C) III only
(D) II and III
(E) None of the above give the complete set of true responses

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_____20. Senior citizens make up about 12.4% of the American population. If a random sample of 200 Americans is selected, what is the probability that more than 180 of them are senior citizens?

(A) $\binom{200}{180}(.124)^{180}(.876)^{20}$

(B) $\binom{200}{0}(.124)^{0}(.876)^{200}+\binom{200}{1}(.124)^{1}(.876)^{199}+\cdots+\binom{200}{180}(.124)^{180}(.876)^{20}$

(C) $\binom{200}{180}(.124)^{180}(.876)^{20}+\binom{200}{181}(.124)^{181}(.876)^{19}+\ldots\ldots\ldots+\binom{200}{200}(.124)^{200}(.876)^{0}$

(D) $1-\left[\binom{200}{0}(.124)^{0}(.876)^{200}+\binom{200}{1}(.124)^{1}(.876)^{199}+\cdots+\binom{200}{180}(.124)^{180}(.876)^{20}\right]$

(E) $1-\left[\binom{200}{181}(.124)^{181}(.876)^{19}+\binom{200}{182}(.124)^{182}(.876)^{18}+\cdots+\binom{200}{200}(.124)^{200}(.876)^{0}\right]$

_____21. Which of the following is NOT a condition for a binomial setting?

(A) There are only two possible outcomes for each trial.

(B) The probability of success is the same for each trial.

(C) The trials are independent.

(D) There are a fixed number of observations.

(E) The variable of interest is the number of trials required to find the first success.

_____22. As a promotional gimmick, a cereal manufacturer packages boxes of cereal with CD-ROMs of popular games. There are five different games, but the purchasers do not know which game they are receiving when they purchase the cereal. A child would like to receive one game in particular. What is the probability that the child opens three boxes of cereal before receiving the desired game?

(A) $({}_5C_3)(.2)^3(.8)^2$
(B) $({}_5C_3)(.2)^2(.8)^3$
(C) $({}_5C_1)(.6)^1(.4)^4$
(D) $(.8)^2(.2)$
(E) $(.2)^2(.8)$

An airline has an on time probability of 82.4%.

_____23. What is the probability that if you travel on this airline, no more than 3 of your next 10 flights will be on time?

_____24. What is the probability that your 4th flight will be the first one that is on time?