Name KEY

Chapter 6 AP Statistics Practice Test

Section I: Multiple Choice *Select the best answer for each question.*

Questions T6.1 and T6.2 refer to the following setting. A psychologist studied the number of puzzles that subjects were able to solve in a five-minute period while listening to soothing music. Let X be the number of puzzles completed successfully by a subject. The psychologist found that X had the following probability distribution:

Value of X:	1	2	3	4
Probability:	0.2	0.4	0.3	0.1
$x_i p_i$	.2	.8	.9	.4

T6.1. What is the probability that a randomly chosen subject completes at least 3 puzzles in the five-minute period while listening to soothing music?

(a) 0.3
(b) 0.4
(c) 0.6
(d) 0.9
(e) Cannot be determined

$P(X \geq 3) = .3 + .1 = .4$

T6.2. Suppose that three randomly selected subjects solve puzzles for five minutes each. The expected value of the total number of puzzles solved by the three subjects is

(a) 1.8. (b) 2.3. (c) 2.5. (d) 6.9. (e) 7.5.

$E(x) = \Sigma x_i p_i = .2 + .8 + .9 + .4 = 2.3$

$E(3 \text{ Subjects}) = 2.3 + 2.3 + 2.3 = 6.9$

T6.3. Suppose a student is randomly selected from your school. Which of the following pairs of random variables are most likely independent?

(a) X = student's height; Y = student's weight NOT IND
(b) X = student's IQ; Y = student's GPA NOT IND
(c) X = student's PSAT Math score; Y = student's PSAT Verbal score NOT IND
(d) X = average amount of homework the student does per night; Y = student's GPA NOT IND
(e) X = average amount of homework the student does per night; Y = student's height INDEPENDENT — ONE DOES NOT INFLUENCE THE OTHER

T6.4. A certain vending machine offers 20-ounce bottles of soda for \$1.50. The number of bottles X bought from the machine on any day is a random variable with mean 50 and standard deviation 15. Let the random variable Y equal the total revenue from this machine on a given day. Assume that the machine works properly and that no sodas are stolen from the machine. What are the mean and standard deviation of Y?

(a) $\mu_Y = \$1.50, \sigma_Y = \$22.50$
(b) $\mu_Y = \$1.50, \sigma_Y = \$33.75$
(c) $\mu_Y = \$75, \sigma_Y = \$18.37$
(d) $\mu_Y = \$75, \sigma_Y = \$22.50$
(e) $\mu_Y = \$75, \sigma_Y = \$33.75$

$X: \mu_X = 50 \quad \sigma_X = 15$

Y = TOTAL Revenue ($\$1.50 \cdot X$)

$\mu_Y = 50 * 1.5 = \$75$

$\sigma_Y = 15 * 1.5 = \$22.50$

Questions T6.5 and T6.6 refer to the following setting. The weight of tomatoes chosen at random from a bin at the farmer's market is a random variable with mean $\mu = 10$ ounces and standard deviation $\sigma = 1$ ounce. Suppose we pick four tomatoes at random from the bin and find their total weight T.

Tomato $\mu = 10$ $\sigma = 1$

T6.5. The random variable T has a mean of
(a) 2.5 ounces.
(b) 4 ounces.
(c) 10 ounces.
(d) 40 ounces.
(e) 41 ounces.

$E(4 \text{ Tomatoes}) = 10 + 10 + 10 + 10 = 40$

T6.6. The random variable T has a standard deviati n (ounces) of
(a) 0.25. (b) 0.50. (c) 0.71. (d) 2. (e) 4.

SD (4 Tomatoes) =

$\sqrt{1^2 + 1^2 + 1^2 + 1^2} =$

$\sqrt{4} = 2$

T6.7. Which of the following random variables is geometric?
(a) The number of times I have to roll a die to get two 6s.
(b) The number of cards I deal from a well-shuffled deck of 52 cards until I get a heart.
(c) The number of digits I read in a randomly selected row of the random digits table until I find a 7. LOOKING FOR THE 1ST occurrence of 7
(d) The number of 7s in a row of 40 random digits.
(e) The number of 6s I get if I roll a die 10 times.

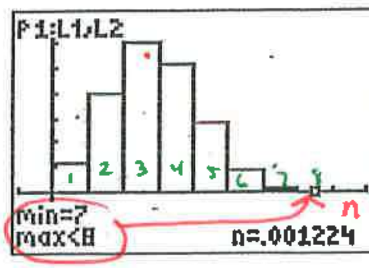
T6.8. Seventeen people have been exposed to a particular disease. Each one independently has a 40% chance of contracting the disease. A hospital has the capacity to handle 10 cases of the disease. What is the probability that the hospital's capacity will be exceeded?
(a) 0.011 (b) 0.035 (c) 0.092 (d) 0.965 (e) 0.989

$n = 17$
$p = .40$
BINS ✓✓✓✓
$B(17, .4)$

$P(X > 10) = 1 - P(X \leq 10)$
$1 - .965 = .0348$

binomcdf$(17, .4, 10) = .965$

T6.9. The figure shows the probability distribution of a discrete random variable X. Which of the following best describes this random variable?



$n = 8$

(a) Binomial with $n = 8, p = 0.1$
(b) Binomial with $n = 8, p = 0.3$ ✓
(c) Binomial with $n = 8, p = 0.8$
(d) Geometric with $p = 0.1$
(e) Geometric with $p = 0.2$

Geometric is typically skewed RIGHT

T6.10. A test for extrasensory perception (ESP) involves asking a person to tell which of 5 shapes—a circle, star, triangle, diamond, or heart—appears on a hidden computer screen. On each trial, the computer is equally likely to select any of the 5 shapes. Suppose researchers are testing a person who does not have ESP and so is just guessing on each trial. What is the probability that the person guesses the first 4 shapes incorrectly but gets the fifth correct?

(a) 1/5
(b) $\left(\frac{4}{5}\right)^4$
(c) $\left(\frac{4}{5}\right)^4 \cdot \left(\frac{1}{5}\right)$
(d) $\binom{5}{1} \cdot \left(\frac{4}{5}\right)^4 \cdot \left(\frac{1}{5}\right)$
(e) 4/5

$P(S) = 1/5$
$P(F) = 4/5$
$P(FFFFS)$

Multiple choice: Select the best answer for Exercises 27 to 30.

Exercises 27 and 28 refer to the following setting. Choose an American household at random and let the random variable X be the number of cars (including SUVs and light trucks) they own. Here is the probability model if we ignore the few households that own more than 5 cars:

Number of cars X:	0	1	2	3	4	5
Probability:	0.09	0.36	0.35	0.13	0.05	0.02 = 100%

27. A housing company builds houses with two-car garages. What percent of households have more cars than the garage can hold? $P(x \geq 3) = .13 + .05 + .02 = 20\%$

(a) 13% (c) 45% (e) 80%

(b) 20% (d) 55%

28. What's the expected number of cars in a randomly selected American household?

(a) Between 0 and 5 (d) 1.84

(b) 1.00 (e) 2.00

(c) 1.75

$E(x) = \sum x_i p_i =$

$0 + .36 + 2(.35) + 3(.13) + 4(.05) + 5(.02) =$

$0 + .36 + .70 + .39 + .2 + .1 = 1.75$

$\boxed{\text{OR}}$

① PUT IN $\boxed{L1}$ and $\boxed{L2}$
x_i p_i

② 1VARSTATS L1, L2 $E(x) \rightarrow \sum x$

X	\$10	−1
P(x)	4/52	48/52

29. A deck of cards contains 52 cards, of which 4 are aces. You are offered the following wager: Draw one card at random from the deck. You win \$10 if the card drawn is an ace. Otherwise, you lose \$1. If you make this wager very many times, what will be the mean amount you win?

(a) About −\$1, because you will lose most of the time.

(b) About \$9, because you win \$10 but lose only \$1.

(c) About −\$0.15; that is, on average you lose about 15 cents. $10(4/52) + (-1)(48/52) = -.1538$

(d) About \$0.77; that is, on average you win about 77 cents.

(e) About \$0, because the random draw gives you a fair bet.

30. The deck of 52 cards contains 13 hearts. Here is another wager: Draw one card at random from the deck. If the card drawn is a heart, you win \$2. Otherwise, you lose \$1. Compare this wager (call it Wager 2) with that of the previous exercise (call it Wager 1). Which one should you prefer?

(a) Wager 1, because it has a higher expected value.

(b) Wager 2, because it has a higher expected value.

(c) Wager 1, because it has a higher probability of winning.

(d) Wager 2, because it has a higher probability of winning.

(e) Both wagers are equally favorable.

X	\$2	−\$1
P(x)	1/4	3/4

$E(x) = 2(\frac{1}{4}) + (-1)(\frac{3}{4})$

$E(x) = -.25$

WAGER 1 (#29) = $\mu = -.15$

WAGER 2 (#30) = $\mu = -.25$

Multiple choice: Select the best answer for Exercises 65 and 66, which refer to the following setting. The number of calories in a one-ounce serving of a certain breakfast cereal is a random variable with mean 110 and standard deviation 10. The number of calories in a cup of whole milk is a random variable with mean 140 and standard deviation 12. For breakfast, you eat one ounce of the cereal with 1/2 cup of whole milk. Let T be the random variable that represents the total number of calories in this breakfast.

$\boxed{65.}$ The mean of T is

(a) 110. (b) 140. (c) 180. (d) 195. (e) 250.

$\boxed{66.}$ The standard deviation of T is

(a) 22. (b) 16. (c) 15.62. (d) 11.66. (e) 4.

1oz Cereal $\mu_C = 110$ $\sigma_C = 10$

1cup milk $\mu_M = 140$ $\sigma_M = 12$

T = 1oz cereal + 1/2 cup milk

$E(T) = 110 + \frac{1}{2}(140) = 180 \leftarrow$ #65

$VAR(T) = 10^2 + (\frac{1}{2} \cdot 12)^2 = 136$

$\sigma_T = \sqrt{136} = 11.66 \leftarrow$ #66

Multiple choice: Select the best answer for Exercises 101 to 105.

$\boxed{101.}$ Joe reads that 1 out of 4 eggs contains salmonella bacteria. So he never uses more than 3 eggs in cooking. If eggs do or don't contain salmonella independently of each other, the number of contaminated eggs when Joe uses 3 chosen at random has the following distribution:

(a) binomial; $n = 4$ and $p = 1/4$

(b) binomial; $n = 3$ and $p = 1/4$

(c) binomial; $n = 3$ and $p = 1/3$

(d) geometric; $p = 1/4$

(e) geometric; $p = 1/3$

B(3, 1/4)

n = 3 EGGS

p = 1/4 = .25

binomial bad or NOT

independent stated

$\boxed{102.}$ In the previous exercise, the probability that at least 1 of Joe's 3 eggs contains salmonella is about

(a) 0.84. (b) 0.68. (c) 0.58. (d) 0.42. (e) 0.…

P(at least 1 of 3 bad) = 1 − P(None) =

$1 - (.75)^3 = .578$

$\boxed{105.}$ In which of the following situations would it be appropriate to use a Normal distribution to approximate probabilities for a binomial distribution with the given values of n and p? Check $np + nq \geq 10$

~~(a)~~ $n = 10, p = 0.5$ 10(.5) = 5 X

(b) $n = 40, p = 0.88$ 40(.12) = 4.8 X

(c) $n = 100, p = 0.2$ BOTH check

~~(d)~~ $n = 100, p = 0.99$ 100(.01) = 1 X

~~(e)~~ $n = 1000, p = 0.003$ 1000(.003) = 3 X

$np = 100(.2) = 20 \geq 10$ ✓

$nq = 100(.8) = 80 \geq 10$ ✓