Name: _____

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AP Statistics — Practice Exam

Instructions: A graphing calculator and the AP Statistics formula sheet and tables may be used. 20 multiple-choice questions (four answer choices each, 1 point each) followed by one free-response question (10 points), 40 minutes in total. Wrong multiple-choice answers are not penalized. On the free-response question, show your work: define each random variable, name any distribution you use together with its parameters, and answer in the context of the question. Give probabilities to three decimal places.

Time Limit: 40 minutes

Multiple Choice (20 questions)

[1 point] 1. A carnival spinner has four equal sectors, one of which is red, and each spin is independent of the others. During the first 12 spins of the evening, the pointer landed on red 5 times. Which of the following statements is correct?

A. Red is now less likely than 0.25 on the next spin, so that the proportion of red spins can return to one quarter

B. The spinner must be unfair, because a fair spinner would have landed on red exactly 3 times in 12 spins

C. In the long run, the proportion of spins that land on red will tend to get closer to 0.25, even though the result of any single spin cannot be predicted

D. After 1,200 spins, the pointer will have landed on red exactly 300 times

[1 point] 2. A tennis player makes 60 percent of her first serves. Her coach wants to simulate the player's first serves with a table of random digits, assuming that serves are independent. Which of the following is a correct way to assign the digits?

A. Let the digits 0 to 5 represent a made serve and 6 to 9 a missed serve; read one digit per serve

B. Let the digits 0 to 6 represent a made serve and 7 to 9 a missed serve; read one digit per serve

C. Let the digits 1 to 6 represent a made serve and 7 to 9 a missed serve, skipping 0; read one digit per serve

D. Let the two-digit numbers 00 to 60 represent a made serve and 61 to 99 a missed serve; read two digits per serve

[1 point] 3. A true-false quiz has 3 questions. A teacher simulated 50 quizzes taken by a student who guesses on every question, flipping a fair coin three times for each quiz (heads = a correct answer). The table shows how many questions were answered correctly in the 50 simulated quizzes. Based on the simulation, what is the estimated probability that a student who guesses gets fewer than 2 questions right?

Number correct	0	1	2	3
Number of simulated quizzes	7	21	16	6

A. 0.32

B. 0.42

C. 0.44

D. 0.56

[1 point] 4. A teacher uses an app that is supposed to choose one of the 25 students in her class at random, each equally likely, every time she asks a question. During one week of 30 questions, the app chose Maya 5 times. To judge whether this is surprising, a student simulated 100 weeks of 30 fair choices and counted how many times Maya was chosen in each simulated week. The results are shown in the table. Which conclusion is best supported?

Times Maya chosen	0	1	2	3	4	5
Number of simulated weeks	29	37	22	9	2	1

A. The app must be fair, because Maya was chosen 5 times in one of the simulated weeks

B. Maya was chosen 5 or more times in only 1 of the 100 simulated weeks, so the result gives convincing evidence that the app chooses Maya more often than a fair app would

C. The probability that the app is fair is about 0.01

D. Being chosen 5 times is not surprising, because in the simulated weeks Maya was chosen anywhere from 0 to 5 times

[1 point] 5. Two fair four-sided dice, each with faces numbered 1, 2, 3 and 4, are rolled. What is the probability that the larger of the two numbers showing is 3? (If both dice show the same number, that number counts as the larger.)

A. $\frac{5}{16}$

B. $\frac{3}{8}$

C. $\frac{7}{16}$

D. $\frac{9}{16}$

[1 point] 6. Every student at a school has exactly one first-period class. For a randomly selected student, let M be the event that the first-period class is a mathematics course and S the event that it is a science course; no course counts as both. If $P(M) = 0.35$ and $P(S) = 0.25$, which of the following is true?

A. $P(M \cup S) = 0.60$, and M and S are independent

B. $P(M \cup S) = 0.5125$, because $P(M \cap S) = 0.0875$

C. $P(M \cup S) = 0.0875$

D. $P(M \cup S) = 0.60$, and M and S are not independent

[1 point] 7. A survey asked 400 randomly selected adults in a city which news source they prefer. The results, classified by age group, are shown in the table. If one of the surveyed adults is selected at random and prefers print news, what is the probability that the adult is under 40?

	Online	TV	Print	Total
Under 40	132	48	20	200
40 and over	68	92	40	200
Total	200	140	60	400

A. 0.100

B. 0.150

C. 0.333

D. 0.500

[1 point] 8. An email service estimates that 15 percent of incoming emails are spam. Its filter flags 92 percent of spam emails, and it also wrongly flags 4 percent of legitimate (non-spam) emails. If a randomly selected incoming email is flagged, what is the probability that it is legitimate? (Round to three decimal places.)

A. 0.034

B. 0.040

C. 0.172

D. 0.198

[1 point] 9. A school club has 12 members, 5 of whom are seniors. Two members are selected at random, without replacement, to attend a conference. What is the probability that both selected members are seniors? (Round to three decimal places.)

A. 0.152

B. 0.174

C. 0.318

D. 0.530

[1 point] 10. In a town, 62 percent of households subscribe to streaming service S, 35 percent subscribe to streaming service T, and 20 percent subscribe to both. What is the probability that a randomly selected household subscribes to neither service?

A. 0.030

B. 0.230

C. 0.247

D. 0.770

[1 point] 11. A random sample of 200 students at a high school was classified by whether they walk to school and whether they eat breakfast every day, as shown in the table. For a student selected at random from these 200, which of the following statements about the events "walks to school" and "eats breakfast daily" is correct?

	Walks to school	Does not walk	Total
Eats breakfast daily	36	84	120
Does not eat breakfast daily	24	56	80
Total	60	140	200

A. They are not independent, because more breakfast eaters (36) than non-breakfast eaters (24) walk to school

B. They are not independent, because $P(\text{walks} \cap \text{breakfast}) = 0.18$ is not 0

C. They are independent, because $P(\text{walks} \mid \text{breakfast}) = P(\text{walks}) = 0.30$

D. They are not independent, because $P(\text{walks} \mid \text{breakfast}) = 0.30$ but $P(\text{breakfast} \mid \text{walks}) = 0.60$

[1 point] 12. A kitchen has two smoke detectors that work independently. In a fire, detector A sounds with probability 0.92 and detector B sounds with probability 0.85. What is the probability that at least one of the detectors sounds in a fire?

A. 0.012

B. 0.206

C. 0.782

D. 0.988

[1 point] 13. Let X be the number of televisions in a randomly selected household in a town. The probability distribution of X is shown in the table, where k is an unknown probability. What is $P(X \geq 2)$?

x	0	1	2	3	4
$P(X = x)$	0.08	0.32	0.35	k	0.05

A. 0.25

B. 0.35

C. 0.60

D. 0.75

[1 point] 14. A hotel records the number of guests with reservations who fail to arrive (no-shows) each night. Let X be the number of no-shows on a randomly selected night. The mean of X is $\mu_X = 2.4$. Which of the following is the best interpretation of μ_X?

A. On most nights, either 2 or 3 guests fail to arrive

B. Over a large number of nights, the average number of no-shows per night is about 2.4

C. On about half of all nights, more than 2.4 guests fail to arrive

D. Over any 5 nights, there will be exactly 12 no-shows in total

[1 point] 15. Let X be the number of goals a school soccer team scores in a randomly selected game. The probability distribution of X is shown in the table. What is the standard deviation of X? (Round to three decimal places.)

x	0	1	2	3	4
$P(X = x)$	0.15	0.30	0.25	0.20	0.10

A. 1.208
B. 1.460
C. 1.800
D. 2.168

[1 point] 16. Let X be the number of library books a randomly selected student at a school borrows in a week. The probability distribution of X is shown in the table. What is the probability that a randomly selected student borrows more than μ_X books, where μ_X is the mean of X?

x	0	1	2	3	4
$P(X = x)$	0.10	0.20	0.25	0.30	0.15

A. 0.30
B. 0.45
C. 0.55
D. 0.70

[1 point] 17. In a large city, 15 percent of registered cars are electric. A random sample of 10 registered cars is selected. What is the probability that exactly 2 of the cars in the sample are electric? (Round to three decimal places.)

A. 0.006
B. 0.023
C. 0.276
D. 0.456

[1 point] 18. A seed company states that 90 percent of its tomato seeds germinate, independently of one another. A gardener plants 6 of these seeds. What is the probability that at least 5 of the 6 seeds germinate? (Round to three decimal places.)

A. 0.114
B. 0.354
C. 0.531
D. 0.886

[1 point] 19. A box contains 20 light bulbs, 4 of which are defective. An inspector selects 5 bulbs at random from the box without replacement, and X is the number of defective bulbs selected. Why is a binomial distribution NOT an appropriate model for X?

A. The selections are not independent: the probability that the next bulb is defective changes after each draw, and the 5 bulbs are 25 percent of the box
B. Each selected bulb has more than two possible outcomes
C. The number of trials is not fixed in advance
D. A binomial distribution requires the probability of success on each trial to be 0.5

[1 point] 20. At a large online store, 30 percent of orders use a discount code. For a random sample of 50 orders, let X be the number of orders that use a discount code. What are the mean and standard deviation of X? (Standard deviations are rounded to three decimal places.)

A. Mean 15, standard deviation 3.873

B. Mean 15, standard deviation 3.240

C. Mean 15, standard deviation 10.500

D. Mean 15, standard deviation 0.065

Calculations (1 question)

[10 points] 21. Random variables and the binomial distribution. At a phone-accessory kiosk in a shopping mall, let X be the number of phone cases bought by a randomly selected customer. The probability distribution of X is shown in the table. Assume that customers make their decisions independently of one another and that every customer follows this distribution. Give probabilities to three decimal places.

x	0	1	2	3
$P(X = x)$	0.60	0.25	0.10	0.05

[3 points] (a) Calculate the mean of X and interpret it in context. Then calculate the standard deviation of X.

[2 points] (b) A customer is selected at random. Given that the customer buys at least one phone case, what is the probability that the customer buys more than one? Show your work.

[3 points] (c) Let B be the number of customers, among the next 12 customers, who buy at least one phone case. (i) Explain why B has a binomial distribution, and state the values of its parameters. (ii) Find $P(B \geq 5)$. (iii) Calculate the mean and the standard deviation of B.

[2 points] (d) On one Saturday morning, only 1 of the first 12 customers bought a phone case. (i) Assuming the probability distribution in the table is correct, find the probability that 1 or fewer of 12 customers buy at least one phone case. (ii) Does your answer to (i) give the kiosk owner a reason to doubt that the distribution in the table applies to Saturday-morning customers? Explain.

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