AP Statistics - BP: Basic Probability

AP Statistics Basic Probability (BP) - 33 questions

33 Questions | 66 min

1. The following is from a particular region's mortality table.

Age	0	20	40	60	80
Number Surviving	10,000	9,800	9,350	8,600	5,100

What is the probability that a 20-year-old will survive to be 60?

(A) $\frac{1400}{9800}$

(B) $\frac{1400}{10000}$

(C) $\frac{8600}{9800}$

(D) $\frac{8600}{10000}$

(E) $\frac{9800}{10000}$

2. The pattern on the back of an insect causes an entomologist to suspect that she has found a rare subspecies of the insect. In the rare subspecies, 96 percent have the pattern. In the common subspecies, only 3 percent have the pattern. The rare subspecies accounts for 0.2 percent of the population. Which expression is used to calculate the probability that a bug having this pattern is rare?

(A) $(0.002)(0.96)$

(B) $1-(0.002)(0.96)$

(C) $\frac{(0.002)(0.96)}{(0.998)(0.03)}$

(D) $\frac{(0.002)(0.96)}{(0.002)(0.96)+(0.998)(0.03)}$

(E) $\frac{(0.998)(0.03)}{(0.002)(0.96)+(0.998)(0.03)}$

3. A student calculates the probabilities of the four outcomes of an experiment to be 0, 0.25, 0.80, and −0.05. The proper conclusion is that

(A) the sum of the individual probabilities is 1

(B) one of the outcomes will never occur

(C) one of the outcomes will occur over 50 percent of the time

(D) all of the above are true

(E) the student made an error

4. There are two games involving flipping a fair coin. In the first game, you win a prize if you can throw between 40% and 60% heads. In the second game, you win a prize if you can throw more than 60% heads. For each game, would you rather flip the coin 15 times or 150 times?

(A) 15 times for each game

(B) 150 times for each game

(C) 15 times for the first game, and 150 times for the second game

(D) 150 times for the first game, and 15 times for the second game

(E) The outcomes of the games do not depend on the number of flips.

5. Which of the following is not a probability density function?

(A) $f(x) = 1, 0 \leq x \leq 1$

(B) $f(x) = 0.05, 0 \leq x \leq 20$

(C) $f(x) = 0.3, 0 \leq x \leq 2 \setminus 0.2, 2 < x \leq 4$

(D) $f(x) = 2x, 0 \leq x \leq 1$

(E) $f(x) = 4x, 0 \leq x \leq 0.25$

6. Suppose that during any weekend afternoon, the probabilities that you receive a text message is 0.94, an e-mail is 0.75, and both a text and an e-mail is 0.705. Are receiving a text message and receiving an e-mail independent events?

(A) Yes, because $(0.94)(0.75) = 0.705$

(B) No, because $(0.94)(0.75) = 0.705$

(C) Yes, because $0.94 > 0.75 > 0.705$

(D) No, because $0.5(0.94 + 0.75) \neq 0.705$

(E) There is insufficient information to answer this question.

7. Suppose you toss a fair coin five times and it comes up tails every time. Which of the following is a true statement?

(A) By the law of large numbers, the next toss is more likely to be heads rather than another tail.

(B) By the properties of conditional probability, the next toss is more likely to be tails given that five tosses in a row have been tails.

(C) Coins actually do have memories, and thus what comes up on the next toss is influenced by the past tosses.

(D) The law of large numbers tells how many tosses will be necessary before the percentages of heads and tails are again in balance.

(E) None of the above are true statements.

8. Suppose $P(X) = 0.36$ and $P(Y) = 0.41$. If $P(X \texttt{ mid } Y) = 0.27$, what is $P(Y \texttt{ mid } X)$?

(A) $\dfrac{(0.36)(0.41)}{0.27}$

(B) $\dfrac{(0.36)(0.27)}{0.41}$

(C) $\dfrac{(0.27)(0.41)}{0.36}$

(D) $\dfrac{0.27}{(0.36)(0.41)}$

(E) $\dfrac{0.27}{0.36 + 0.41}$

9. Body temperatures of healthy humans are roughly normal. If 10 percent of people have temperatures above 37.333°C and if 20 percent have temperatures below 36.781°C, what is the mean of this distribution?

(A) 36.965°C

(B) 37.000°C

(C) 37.057°C

(D) 37.149°C

(E) The mean cannot be calculated from the given information.

10. Given the probabilities $P(E) = 0.25$ and $P(E \cup F) = 0.64$, what is the probability $P(F)$ if E and F are mutually exclusive?

(A) $\dfrac{0.25}{0.64}$

(B) $0.64 - 0.25$

(C) $0.25 + 0.64$

(D) $\dfrac{0.64 - 0.25}{0.75}$

(E) $\dfrac{0.64 - 0.25}{1.25}$

11. Given the probabilities $P(E) = 0.35$ and $P(E \cup F) = 0.73$, what is the probability $P(F)$ if E and F are independent?

(A) $\dfrac{0.35}{0.73}$

(B) $0.73 - 0.35$

(C) $0.35 + 0.73$

(D) $\dfrac{0.73 - 0.35}{0.65}$

(E) $\dfrac{0.73 - 0.35}{1.35}$

12. If $P(A) = 0.32$ and $P(B) = 0.45$, what is $P(A \cup B)$ if A and B are independent?

(A) 0.144

(B) 0.626

(C) 0.770

(D) 0.856

(E) There is insufficient information to answer this question.

13. A marksman hits exactly one of the first two clay pigeons thrown. From that point on, the probability that he makes the next shot is equal to the proportion of shots made up to that point. If he takes two more shots, what is the probability he ends up making a total of exactly two shots?

(A) $\frac{1}{4}$
(B) $\frac{1}{3}$
(C) $\frac{1}{2}$
(D) $\frac{2}{3}$
(E) $\frac{3}{4}$

14. In wake of the 2016 Ebola crisis, a rapid test was developed that tested positive in 99.5 percent of patients with Ebola but gave a false positive in 3 percent of healthy people. Suppose 0.1 percent of the population in a particular area has Ebola. If a person in this area tests positive, what is the probability he or she has Ebola?

(A) $\frac{0.001}{0.995}$
(B) $\frac{(0.001)(0.995)}{(0.001)(0.995)+(0.999)(0.03)}$
(C) $\frac{(0.999)(0.03)}{(0.001)(0.995)+(0.999)(0.03)}$
(D) $\frac{(0.995)(0.03)}{(0.001)(0.995)+(0.999)(0.03)}$
(E) $\frac{(0.001)(0.999)}{(0.001)(0.995)+(0.999)(0.03)}$

15. Given two events, E and F, such that $P(E) = 0.420$, $P(F) = 0.350$, and $P(E \cup F) = 0.623$, the two events are

(A) independent and mutually exclusive

(B) independent but not mutually exclusive

(C) mutually exclusive but not independent

(D) neither independent nor mutually exclusive

(E) There is not enough information to answer this question.

16. Which of the following is not a valid discrete probability distribution for the set $\{x_1, x_2, x_3\}$?

(A) $P(x_1) = 0$, $P(x_2) = 1$, $P(x_3) = 0$

(B) $P(x_1) = \frac{1}{3}$, $P(x_2) = \frac{1}{3}$, $P(x_3) = \frac{1}{3}$

(C) $P(x_1) = \frac{1}{6}$, $P(x_2) = \frac{1}{3}$, $P(x_3) = \frac{1}{2}$

(D) $P(x_1) = \frac{2}{5}$, $P(x_2) = \frac{4}{5}$, $P(x_3) = -\frac{1}{5}$

(E) All of the above are valid probability distributions.

17. Suppose that when taking a multiple-choice exam and when students have no idea what an answer is, 45 percent will guess, 35 percent will choose answer (C), and the rest will choose the longest answer. If a student who has no idea of the answer doesn't guess, what is the probability he chooses the longest answer?

(A) 0.20

(B) $\frac{0.20}{0.45}$

(C) $\frac{0.20}{0.55}$

(D) $\frac{0.20}{0.80}$

(E) $\frac{1-0.20}{0.80}$

18. Given that 51.0 percent of the U.S. population are female and that 5.9 percent of the population are over 75 years of age, can we conclude that $(0.510)(0.059) = 3.01$ percent of the population are women older than 75?

(A) Yes, by the multiplication rule

(B) Yes, by conditional probabilities

(C) Yes, by the law of large numbers

(D) No, because the events are not independent

(E) No, because the events are not mutually exclusive

19. In a set of 10 boxes, 7 boxes each contain 3 red and 2 blue marbles, while the remaining boxes each contain 1 red and 4 blue marbles. A player randomly picks a box and then randomly picks a marble from that box. She wins if she ends up with a red marble. If she plays 4 times, what is the probability she wins exactly twice?

(A) $4(0.48)^2(0.52)^2$

(B) $6(0.48)^2(0.52)^2$

(C) $4(0.7)^2(0.3)^2$

(D) $6(0.8)^2(0.2)^2$

(E) $4(0.32)^2(0.68)^2$

20. Suppose E and F are independent events with $P(E) = 0.4$ and $P(E \text{ and } F) = 0.15$. Which of the following is a true statement?

(A) $P(F) = 0.4$

(B) $P(F) = 0.6$

(C) $P(E \text{ or } F) = 0.375$

(D) $P(E \text{ or } F) = 0.625$

(E) $P(E \text{ or } F) = 0.775$

21. Suppose that for a certain midwestern city, in any given year the probability of a tornado hitting is 0.15, the probability of flooding from the river running through the city is 0.08, and the probability of both a tornado and flooding is 0.02. What is the probability of flooding given that a tornado hits?

(A) $\frac{0.02}{0.08}$
(B) $\frac{0.02}{0.15}$
(C) $\frac{0.08}{0.15}$
(D) $\frac{0.02}{(0.15)(0.08)}$
(E) $\frac{(0.02)(0.08)}{0.15}$

22. A dentist compiles the following summary data from interviews of her patients.
- 55% floss once a day, and these patients have a 0.04 probability of a cavity each year.
- 30% floss twice a day, and these patients have a 0.01 probability of a cavity each year.
- 15% don't floss, and these patients have a 0.10 probability of a cavity each year.

What is the probability that one of the dentist's patients flosses and has a cavity for any given year?

(A) $0.04 + 0.01$

(B) $0.04 + 0.01 + 0.10$

(C) $(0.55 + 0.30)(0.04 + 0.01)$

(D) $(0.55)(0.04) + (0.30)(0.01)$

(E) $\frac{(0.55)(0.04) + (0.30)(0.01)}{(0.55)(0.04) + (0.30)(0.01) + (0.15)(0.10)}$

23. A game show offers the contestant who wins the grand prize a choice of three boxes, one containing 4 red chips and 1 white chip, one containing 2 red chips and 2 white chips, and one containing 1 red chip and 3 white chips. The contestant randomly picks a box and with eyes closed, reaches in and picks a chip. A white chip earns $5,000 and a red chip earns $10,000. The contestant then tosses a fair die. If it comes up "6," the prize is doubled. Does the contestant have more than an even chance of walking away with exactly $10,000?

(A) Yes, because $\frac{23}{45} > \frac{1}{2}$
(B) No, because $\frac{22}{45} < \frac{1}{2}$
(C) Yes, because $\frac{31}{60} > \frac{1}{2}$
(D) No, because $\frac{29}{60} < \frac{1}{2}$
(E) The contestant has a 0.5 chance of walking away with exactly $10,000.

24. Nine-tenths of adults change their jobs at least once. The reasons for changing and what they change to are as shown in the following tables.

Reason	Career Interests	Higher Salary	Fired	Other Reason
Probability	0.55	0.10	0.20	0.15
Change To	Related Field	New Field	Unemployed	
Probability	0.40	0.55	0.05	

Assuming independence of all variables, what is the probability that an adult decides to change a job, based on higher salary, and move into a new field?

(A) 0.0495 (B) 0.055 (C) 0.585 (D) 0.595 (E) 0.65

25. Suppose two events, S and T, have the nonzero probabilities p and q, respectively. Which of the following is impossible?

(A) $p + q > 1$

(B) $p - q < 0$

(C) $\frac{p}{q} > 1$

(D) S and T are both independent and mutually exclusive.

(E) S and T are neither independent nor mutually exclusive.

26. A computer security company puts in bids for a state contract and for a federal contract. The company's chief financial officer believes that the probabilities of being awarded the state and federal grants are 0.32 and 0.15, respectively. If the probability of receiving both grants is 0.048 and if these three probabilities are correct, which of the following statements is true?

(A) Receiving the two grants are independent and mutually exclusive events.

(B) Receiving the two grants are independent but not mutually exclusive events.

(C) Receiving the two grants are mutually exclusive but not independent events.

(D) Receiving the two grants are not mutually exclusive and not independent events.

(E) None of the above statements can be known for sure until the probability of receiving at least one grant is known.

27. According to a college's records, 46 percent of its students live in the dorms, 65 percent have meal contracts, and 33 percent do both. For a randomly selected student, what is the probability that he/she either lives in a dorm or has a meal contract, but not both?

(A) 0.13 (B) 0.22 (C) 0.32 (D) 0.45 (E) 0.78

28. The distribution of jelly beans in a large assorted bag is shown in the following table.

Flavor	Cherry	Vanilla	Apple	Very Green Licorice	Peach
Probability	0.4	0.2	0.2	0.1	0.1

If two jelly beans are picked at random, what is the probability they are different flavors?

(A) 0.2 (B) 0.26 (C) 0.37 (D) 0.74 (E) 0.63

29. A medical researcher examines the records of cases where a child comes in to a pediatrician complaining of a sore throat and the next day a sibling comes in also complaining of a sore throat. Suppose 20 percent of children with sore throats test positive for strep throat. If a child tests positive for strep, there is a 0.7 probability that his/her sibling who comes in the next day will also test positive for strep. If a child tests negative for strep, there is a 0.1 probability that his/her sibling who comes in the next day will test positive for strep. Let S be the random variable for the number of children in such pairs who test positive for strep. What is the probability distribution for S?

(A)

x	0	1	2
$P(x)$	1/3	1/3	1/3

(B)

x	0	1	2
$P(x)$	0.5	0.25	0.25

(C)

x	0	1	2
$P(x)$	0.5	0.33	0.17

(D)

x	0	1	2
$P(x)$	0.72	0.14	0.14

(E)

x	0	1	2
$P(x)$	0.8	0.06	0.14

30. 85 percent of people wear seat belts. The probability of serious injury in an accident is 8 percent for those wearing seat belts and 36 percent for those not wearing seat belts. What is the probability of serious injury in an accident?

(A) 0.054 (B) 0.068 (C) 0.122 (D) 0.318 (E) 0.44

31. At many colleges, many nonmath majors choose to take at least one math/computer science course. Suppose 16 percent take computer science, 53 percent take statistics, and 62 percent take at least one of these two offerings. What is the probability a randomly chosen nonmath major takes both a computer science class and a statistics class?

(A) $(0.16)(0.53)$

(B) $0.16 + 0.53 - 0.62$

(C) $0.62 - (0.16)(0.53)$

(D) $(0.62 - 0.16)(0.62 - 0.53)$

(E) $\dfrac{(0.16)(0.53)}{0.62}$

32. The following are parts of the probability distributions for the If X and Y are independent and the joint probability $P(X = 3, Y = 2) = 0.1$, what is $P(Y = 4)$?

(A) 0.1 (B) 0.2 (C) 0.3 (D) 0.4 (E) 0.5

33. A research firm is successful in contacting 65 percent of the households randomly selected for telephone surveys. What is the probability that the firm is successful in contacting a household given that it was unsuccessful in contacting the previous two households?

(A) 0.65

(B) $(0.35)^2(0.65)$

(C) $3(0.35)^2(0.65)$

(D) $1 - (0.35)^2(0.65)$

(E) $1 - [(0.35)^3 + (0.35)^2(0.65)]$ PROBABILITIES