GRE Math Subject Prep Course: Probability

July 21, 2021

1. (Practice Book Prob 13)[1] A drawer contains 2 blue, 4 red, and 2 yellow socks. If 2 socks are to be randomly selected from the drawer, what is the probability that they will be the same color?

   (A) $\frac{2}{7}$ (B) $\frac{2}{5}$ (C) $\frac{3}{7}$

   (D) $\frac{1}{2}$ (E) $\frac{3}{5}$

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2. (Practice Book Prob 40) A fair coin is to be tossed 8 times. What is the probability that more of the tosses will result in heads than will result in tails?

   (A) $\frac{1}{4}$ (B) $\frac{1}{3}$ (C) $\frac{87}{256}$

   (D) $\frac{23}{64}$ (E) $\frac{93}{256}$

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3. (Exam III Prob 48)[2] On average, a baseball player gets a hit in one out of three attempts. Assuming that the attempts are independent, what is the probability that he gets exactly three hits in six attempts?

   (A) $\frac{160}{3^6}$ (B) $\frac{160}{3^5}$ (C) $\frac{1}{2}$

   (D) $\frac{80}{3^6}$ (E) $\frac{40}{3^6}$

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4. (Exam V Prob 66) If $P(A) = 0.7$, $P(B) = 0.5$ and $P(A \cup B) = 0.9$, then $P(A|B)$ is

   (A) $\frac{3}{7}$ (B) $\frac{3}{5}$ (C) $\frac{5}{7}$

   (D) $\frac{7}{9}$ (E) 1

[1] The problems with "Practice Book" are taken from the mathematics test practice book by ETS, which can be found at http://www.ets.org/Media/Tests/GRE/pdf/Math.pdf

[2] The problems with "Exam I" – "Exam VI" are taken from the REA book "The Best Test Preparation for the GRE Mathematics Test", 4th edition.

5. (Exam I Prob 45) From a group of 15 mathematics graduate school applicants, 10 are selected at random. Let P be the probability that 4 out of the 5 best applicants are included in the 10 selected. Which of the following statements is true?

(A) $0 \leq P \leq \frac{1}{5}$ (B) $\frac{1}{5} < P \leq \frac{2}{5}$ (C) $\frac{2}{5} < P \leq \frac{3}{5}$

(D) $\frac{3}{5} < P \leq \frac{4}{5}$ (E) $\frac{4}{5} < P \leq 1$

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6. (Exam VI Prob 48) In a sequence of consecutive throws of a die, find the probability that six will show before a one or a two.

(A) $\frac{1}{6}$ (B) $\frac{1}{2}$ (C) $\frac{2}{3}$

(D) $\frac{5}{6}$ (E) $\frac{1}{3}$

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7. (Exam II Prob 60) A biased coin is tossed repeatedly until the first "tail" occurs. The expected number of tosses required to produce the first tail is estimated as T. Assuming this is true, find the probability of at least two tails in $3T$ tosses.

(A) $\frac{T^{3T} - (T-1)^{3T-1}(4T)}{T^{3T}}$

(B) $\frac{T^{3T} - (T-1)^{3T-1}(3T)}{T^{3T}}$

(C) $\frac{T^{3T} - (T-1)^{3T-1}(3T-1)}{T^{3T}}$

(D) $\frac{T^{3T} - (T-1)^{3T-1}(4T-1)}{T^{3T}}$

(E) None of these

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8. (Chapter 7 Prob 32)[3] Let $f(x) = \begin{cases} \frac{x}{2} + c & \text{for } 0 \leq t \leq 1 \\ 0 & \text{otherwise} \end{cases}$, for what value of c is $f(x)$ the probability density function of a random variable?

(A) 0 (B) $\frac{1}{4}$ (C) $\frac{1}{2}$

(D) $\frac{3}{4}$ (E) 1

[3]The problems with "Chapter *" are taken from "Cracking the GRE Mathematics Test", 4th Edition.

9. (Exam IV Prob 3) The random variable X is discrete, and is uniformly distributed with values $1, 2, 3, 4, 5$. The variance of X is

(A) 1 (B) 2 (C) 3

(D) 4 (E) None of these

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10. (Practice Book Prob 47) Let x and y be uniformly distributed, independent random variables on $[0, 1]$. The probability that the distance between x and y is less than $\frac{1}{2}$ is

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

(D) $\frac{2}{3}$ (E) $\frac{3}{4}$

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11. (Exam I Prob 8) Let x be a random variable possessing the probability density function

$$f(x) = \begin{cases} cx & x \in [0, 10] \\ 0 & \text{otherwise} \end{cases}$$

where $c \in \mathbb{R}$. The probability that x is an element of $[1, 2]$ is

(A) $\frac{1}{100}$ (B) $\frac{3}{100}$ (C) $\frac{5}{100}$

(D) $\frac{7}{100}$ (E) $\frac{9}{100}$

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12. (Chapter 7 Prob 44) A fair coin is flipped 100 times. What's the probability of getting between 40 and 50 heads? (Note: $\Phi(0) = 0.5$, $\Phi(1) \approx 0.84$, $\Phi(2) \approx 0.97$, $\Phi(2.5) \approx 0.99$)

(A) 10% (B) 38% (C) 41%

(D) 47% (E) 53%

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13. (Exam VI Prob 29) A random variable X has mean μ, variance σ^2, and an unknown density function. Determine the constant c so that $P(|X - \mu| \geq c) \leq P_0$, where P_0 is a given constant probability. (Hint: use Chebyshev's inequality.)

(A) σ (B) $\sigma/\sqrt{P_0}$ (C) $P_0\sigma$

(D) σ/P_0 (E) σ^2/P_0^2

Answer: AEAB BEDD BEBDB