Solutions for Unit Test 1: Probability and Statistics
Course: CSEG 2036P | *School of Computing Sciences, UPES*
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1. If $P(A) = \frac{1}{2}, P(B) = \frac{1}{3}, P(A \cap B) = \frac{1}{5}$, what is the value of $P(A \cap \overline{B})$?

   (a) $\frac{19}{20}$
   (b) $\frac{2}{15}$
   (c) $\frac{3}{10}$
   (d) $\frac{11}{30}$

   Answer: C

2. If A and B are mutually exclusive events, then

   (a) $P(A) \geq P(\overline{B})$
   (b) $P(A) \leq P(\overline{B})$
   (c) $P(A) = P(\overline{B})$
   (d) $P(A) = \frac{P(\overline{B})}{2}$

   Answer: B

3. The number of elements in the Power set $P(S)$ of the set $S = \{1, 2, 3\}$ is:

   (a) 4
   (b) 8
   (c) 7
   (d) None of these

   Answer: B

4. We are given $P = \{1, 2, 5\}, Q = \{6, 7\}$. Then $P \cap \overline{Q}$ is:

   (a) P
   (b) P - Q
   (c) Both (a) and (b)
   (d) Neither (a) nor (b)

   Answer: C

5. If $A \subset B$, then

   (a) $P(B|A) = P(B)$
   (b) $P(B|A) \geq P(B)$
   (c) $P(B|A) \leq P(B)$
   (d) None of the above

Answer: B

6. When events A and B are independent, then

    (a) $P(A \cup B) = P(\overline{A})P(\overline{B})$
    (b) $P(A \cup B) = 1 - P(\overline{A})P(\overline{B})$
    (c) $P(A \cup B) = P(A)P(\overline{B})$
    (d) $P(A \cup B) = P(A) - P(\overline{A})P(B)$

    Answer: A

7. A pair of dice are rolled once. Let A be the event that the first dice has a 1 on it, B the event that the second die has a 6 on it and C the event that the sum is 7. Which if of the following are true?

    (a) All are pairwise and mutually independent
    (b) All are neither pairwise nor mutually independent
    (c) All are pairwise independent only
    (d) Only A and B are pairwise independent

    Answer: C

8. In a specific neighborhood, 90% of the children are falling ill with the flu, while the remaining 10% are affected by measles, with no other diseases in consideration. When a child becomes sick, there's a 0.08 probability of developing rashes due to the flu, and a 0.95 probability of having rashes when afflicted by measles. Now, if a child does indeed develop rashes, what is the probability that this child is suffering from the flu?

    (a) 0.27
    (b) 0.43
    (c) 0.79
    (d) 0.36

    Answer: B

9. A pair of dice is tossed twice and X is the sum of values in the two die in one throw. What is the probability of scoring a sum of $X = 5$ atleast once?

    (a) $\frac{16}{81}$
    (b) $\frac{1}{81}$
    (c) $\frac{17}{81}$
    (d) $\frac{64}{81}$

    Answer: C

10. If an experiment has three possible and mutually exclusive events A, B and C, which of the following are permissible?

(a) $P(A) = 0.59, P(B) = 0.22, P(C) = 0.19$
(b) $P(A) = 0.35, P(B) = 0.65, P(C) = -0.03$
(c) $P(A) = 0.36, P(B) = 0.54, P(C) = 0.33$
(d) None of the above are permissible

Answer: A

11. If $P(A) = \frac{1}{2}, P(B) = \frac{1}{3}, P(A \cap B) = \frac{1}{5}$, what is the value of $P(\overline{A} \cap \overline{B})$?

(a) $\frac{19}{20}$
(b) $\frac{2}{15}$
(c) $\frac{3}{10}$
(d) $\frac{11}{30}$

Answer: D

12. The number of elements in the Power set $P(S)$ of the set $S = \{1, 3, 5, 7\}$ is:

(a) 10
(b) 8
(c) 16
(d) None of these

Answer: C

13. We are given $P = \{3, 5, 6, 11\}, Q = \{6, 7\}$. Then $P \cap \overline{Q}$ is:

(a) P
(b) P - Q
(c) Both (a) and (b)
(d) Neither (a) nor (b)

Answer: B

14. If $A \subseteq B$, then

(a) $\overline{A} \subseteq \overline{B}$
(b) $\overline{B} \subseteq \overline{A}$
(c) $\overline{A} = \overline{B}$
(d) None of the above

Answer: B

15. When we have an event E in the sample space S,

(a) $P(S|E) = 1$
(b) $P(E|S) = 1$
(c) $P(S|E \cap \overline{S}) = 0.5$

(d) None of the above

Answer: A

16. A pair of dice are rolled once. Let A be the event that the first dice has a 2 on it, B the event that the second die has a 3 on it and C the event that the sum is 5. Which if of the following are true?

    (a) All are pairwise and mutually independent
    (b) All are neither pairwise nor mutually independent
    (c) All are pairwise independent only
    (d) Only A and B are pairwise independent

    Answer: D

17. Three urns are there containing white and black balls. The first urn has 3 white and 2 black balls, second urn has 2 white and 3 black balls and third urn has 4 white and 1 black balls. Without any biasing one urn is chosen from that one ball is chosen randomly which was white. What is probability that it came from the third urn?

    (a) 0.21
    (b) 0.68
    (c) 0.44
    (d) 0.33

    Answer: C

18. A pair of dice is tossed twice and X is the sum of values in the two die in one throw. What is the probability of scoring a sum of $X = 5$ exactly once?

    (a) $\frac{16}{81}$
    (b) $\frac{8}{81}$
    (c) $\frac{17}{81}$
    (d) $\frac{64}{81}$

    Answer: A

19. If an experiment has three possible and mutually exclusive events A, B and C, which of the following are permissible?

    (a) $P(A) = 0.63, P(B) = 0.27, P(C) = 0.15$
    (b) $P(A) = -0.25, P(B) = 0.33, P(C) = 0.68$
    (c) $P(A) = 0.36, P(B) = 0.54, P(C) = 0.10$
    (d) None of the above are permissible

    Answer: C

20. A pair of dice are rolled once. Let A be the event that the first dice has a 4 on it, B the event that the second die has a 5 on it and C the event that the sum is 9. Which if of

the following are true?

(a) All are pairwise and mutually independent
(b) All are neither pairwise nor mutually independent
(c) All are pairwise independent only
(d) Only A and B are pairwise independent

Answer: D

21. In a bolt factory, machines A, B and C manufacture 20%, 30% and 50% of the total of their output and 6%, 3% and 2% are defective. A bolt is drawn at random and found to be defective. What is the probability that it is manufactured by machine A?

(a) 0.2903
(b) 0.3870
(c) 0.3225
(d) 0.4268

Answer: B

22. A pair of dice is tossed twice and X is the sum of values in the two die in one throw. What is the probability of scoring a sum of $X = 5$ exactly twice?

(a) $\frac{16}{81}$
(b) $\frac{8}{81}$
(c) $\frac{1}{81}$
(d) $\frac{64}{81}$

Answer: C

23. If an experiment has three possible and mutually exclusive events A, B and C, which of the following are permissible?

(a) $P(A) = 0.44, P(B) = 0.87, P(C) = 0.15$
(b) $P(A) = -0.15, P(B) = 0.41, P(C) = 0.22$
(c) $P(A) = 0.36, P(B) = 0.32, P(C) = 0.38$
(d) None of the above are permissible

Answer: D

24. If $P(A) = \frac{1}{2}, P(B) = \frac{1}{3}, P(A \cap B) = \frac{1}{5}$, what is the value of $P(\overline{A} \cap B)$?

(a) $\frac{19}{20}$
(b) $\frac{2}{15}$
(c) $\frac{3}{10}$
(d) $\frac{11}{30}$

Answer: B

25. The number of elements in the Power set $P(S)$ of the set $S = \{1, 7, 3\}$ is:

(a) 4
(b) 8
(c) 16
(d) None of these

Answer: B

26. We are given $P = \{8, 10, 14\}, Q = \{6, 7\}$. Then $P \cap \overline{Q}$ is:

(a) P
(b) P - Q
(c) Both (a) and (b)
(d) Neither (a) nor (b)

Answer: C

27. If $A \subseteq B$, then

(a) $A \cap B = A$ and $A \cup B = \overline{A}$
(b) $A \cap B = A$ and $A \cup B = B$
(c) $A \cap B = B$ and $A \cup B = A$
(d) $A \cap B = B$ and $A \cup B = \overline{B}$

Answer: B

28. When we have an event E with probability $P(E) = 0.27$ and consider the null event ϕ,

(a) $P(E|\phi) = 0.27$
(b) $P(E|\phi) = 1$
(c) $P(E|\phi)$ is undefined
(d) $P(\phi|E) = 0.73$

Answer: C

29. A pair of dice are rolled once. Let A be the event that the first dice has a 1 on it, B the event that the second die has a 1 on it and C the event that the sum is 2. Which if of the following are true?

(a) All are pairwise and mutually independent
(b) All are neither pairwise nor mutually independent
(c) All are pairwise independent only
(d) Only A and B are pairwise independent

Answer: D

30. Suppose we have 3 cards identical in form except that both sides of the first card are colored red, both sides of the second card are colored black, and one side of the third

card is colored red and the other side is colored black. The 3 cards are mixed up in a hat, and 1 card is randomly selected and put down on the ground. If the upper side of the chosen card is colored red, what is the probability that the other side is colored black?

(a) $\frac{1}{2}$
(b) $\frac{1}{3}$
(c) $\frac{2}{3}$
(d) $\frac{1}{9}$

Answer: B

31. How many elements are there in the set $\{1, 2, \{3, 5\}, 7, \{2, 4, 9\}\}$?

(a) 8
(b) 9
(c) 5
(d) 6

Answer: C

32. If an experiment has three possible and mutually exclusive events A, B and C, which of the following are permissible?

(a) $P(A) = 0.03, P(B) = 0.82, P(C) = 0.15$
(b) $P(A) = -0.24, P(B) = 0.39, P(C) = 0.17$
(c) $P(A) = 0.25, P(B) = 0.32, P(C) = 0.61$
(d) None of the above are permissible

Answer: A

33. If $P(A) = \frac{1}{2}, P(B) = \frac{1}{3}, P(A \cap B) = \frac{1}{5}$, what is the value of $P((\overline{A} \cap B) \cup (A \cap \overline{B}))$?

(a) $\frac{19}{20}$
(b) $\frac{2}{15}$
(c) $\frac{3}{10}$
(d) $\frac{13}{30}$

Answer: D

34. The number of elements in the Power set $P(S)$ of the set $S = \{1, 3, 5, 7, 9\}$ is:

(a) 4
(b) 8
(c) 16
(d) 32

Answer: D

35. We are given $P = \{1, 2, 3, 7, 8, 10, 14\}, Q = \{3, 5, 6, 7\}$. Then $P \cap \overline{Q}$ is:

(a) P

(b) P - Q

(c) Both (a) and (b)

(d) Neither (a) nor (b)

Answer: B

36. If S and T are sets, then

(a) $S \subseteq S \cup T,\ T \subseteq S \cup T,\ S \cap T \subseteq S,\ S \cap T \subseteq T$

(b) $S \subseteq S \cap T,\ T \subseteq S \cap T,\ S \cup T \subseteq S,\ S \cup T \subseteq T$

(c) $S \subseteq S \cup T,\ T \subseteq S \cap T,\ S \cap T \subseteq S,\ S \cup T \subseteq T$

(d) $S \subseteq S \cap T,\ T \subseteq S \cup T,\ S \cup T \subseteq S,\ S \cap T \subseteq T$

Answer: A

37. When we have an event E with probability $P(E) = 0.54$,

(a) $P(E|\overline{E}) = 0.54$

(b) $P(E|\overline{E})$ is undefined

(c) $P(E|\overline{E}) = 0$

(d) $P(E|\overline{E}) = 0.46$

Answer: C

38. Given $P(B|A) = 0.4$ and $P(A \cup B) = 0.7$, as well as that A and B are independent, what is the value of $P(B)$?

(a) 0.35

(b) 0.7

(c) 0.4

(d) None of the above

Answer: C

39. If an experiment has three possible and mutually exclusive events A, B and C, which of the following are permissible?

(a) $P(A) = 0.12, P(B) = 0.70, P(C) = 0.26$

(b) $P(A) = -0.35, P(B) = 0.43, P(C) = 0.09$

(c) $P(A) = 0.21, P(B) = 0.66, P(C) = 0.11$

(d) None of the above are permissible

Answer: D

40. If $P(A) = \frac{1}{2}, P(B) = \frac{1}{3}, P(A \cap B) = \frac{1}{5}$, what is the value of $P((\overline{A} \cup B) \cap (A \cup \overline{B}))$?

(a) $\frac{1}{2}$

(b) 0

(c) $\frac{1}{5}$

(d) $\frac{3}{10}$

Answer: B

41. The number of elements in the Power set $P(S)$ of the set $S = \{101, 135, 777\}$ is:

(a) 4
(b) 8
(c) 16
(d) 32

Answer: B

42. We are given $P = \{x | x \in \mathbb{Z} - \text{Integers}\}, Q = \{x^2 | x \in \mathbb{N} - \text{Natural Numbers}\}$. Then $P \cap \overline{Q}$ is:

(a) P
(b) P - Q
(c) Both (a) and (b)
(d) Neither (a) nor (b)

Answer: B

43. If S and T are sets, then which of these is not true?

(a) $S - T \subseteq S \cup (T \cap S)$
(b) $S - T \subseteq S \cap (T \cup S)$
(c) $S - T \subseteq S \cup (T \cap \overline{S})$
(d) $S - T \subseteq S \cap (T \cap \overline{S})$

Answer: D

44. When we have an event E and sample space S with probability $P(E) = 0.33$,

(a) $P(E | S \cap \overline{E}) = 0.33$
(b) $P(E | S \cup \overline{E})$ is undefined
(c) $P(E | S \cap \overline{E}) = 0$
(d) $P(E | S \cup \overline{E}) = 0.67$

Answer: C

45. A pair of dice are rolled once. Let A be the event that the first dice has a 2 on it, B the event that the second die has a 6 on it and C the event that the sum is 8. Which if of the following are true?

(a) All are pairwise and mutually independent
(b) All are neither pairwise nor mutually independent
(c) All are pairwise independent only
(d) Only A and B are pairwise independent

Answer: D

46. It is estimated that 50% of emails are spam emails. Some software has been applied to filter these spam emails before they reach your inbox. A certain brand of software claims that it can detect 99% of spam emails, and the probability for a false positive (a non-spam email detected as spam) is 5%. Now if an email is detected as spam, then what is the probability that it is in fact a non-spam email?

   (a) $\frac{99}{104}$
   (b) $\frac{25}{104}$
   (c) $\frac{5}{104}$
   (d) $\frac{57}{104}$

   Answer: C