Probability

1. One ticket is selected at random from 50 tickets numbered 00, 01, 02, ... , 49. Then the probability that the sum of the digits on the selected ticket is 8, given that the product of these digits is zero, equals **[AIEEE-2009]**

(1) $\frac{1}{7}$ (2) $\frac{5}{14}$

(3) $\frac{1}{50}$ (4) $\frac{1}{14}$

2. An urn contains nine balls of which three are red, four are blue and two are green. Three balls are drawn at random without replacement from the urn. The probability that the three balls have different colours is **[AIEEE-2010]**

(1) $\frac{1}{3}$ (2) $\frac{2}{7}$

(3) $\frac{1}{21}$ (4) $\frac{2}{23}$

3. Four numbers are chosen at random (without replacement) from the set {1, 2, 3, …, 20}.

Statement-1 : The probability that the chosen numbers when arranged in some order will form an AP is $\frac{1}{85}$.

Statement-2 : If the four chosen numbers from an AP, then the set of all possible values of common difference is {+1, +2, +3, +4, +5}. **[AIEEE-2010]**

(1) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1

(2) Statement-1 is true, Statement-2 is true; Statement-2 is ***not*** a correct explanation for Statement-1

(3) Statement-1 is true, Statement-2 is false

(4) Statement-1 is false, Statement-2 is true

4. Let A, B, C be pairwise independent events with $P(C) > 0$ and $P(A \cap B \cap C) = 0$. Then $P(A^C \cap B^C | C)$ is equal to **[AIEEE-2011]**

(1) $P(A^C) - P(B^C)$

(2) $P(A^C) - P(B)$

(3) $P(A) - P(B^C)$

(4) $P(A^C) + P(B^C)$

5. Three numbers are chosen at random without replacement from {1, 2, 3, ..., 8}. The probability that their minimum is 3, given that their maximum is 6, is **[AIEEE-2012]**

(1) $\frac{1}{5}$ (2) $\frac{1}{4}$

(3) $\frac{2}{5}$ (4) $\frac{3}{8}$

6. A multiple choice examination has 5 questions. Each question has three alternative answers of which exactly one is correct. The probability that a student will get 4 or more correct answers just by guessing is **[JEE (Main)-2013]**

(1) $\frac{17}{3^5}$ (2) $\frac{13}{3^5}$

(3) $\frac{11}{3^5}$ (4) $\frac{10}{3^5}$

7. Let A and B be two events such that $P(\overline{A \cup B}) = \frac{1}{6}$, $P(A \cap B) = \frac{1}{4}$ and $P(\overline{A}) = \frac{1}{4}$, where $\overline{A}$ stands for the complement of the event A. Then the events A and B are **[JEE (Main)-2014]**

(1) Independent but not equally likely

(2) Independent and equally likely

(3) Mutually exclusive and independent

(4) Equally likely but not independent

8. If 12 identical balls are to be placed in 3 identical boxes, then the probability that one the boxes contains exactly 3 balls is **[JEE (Main)-2015]**

(1) $\frac{55}{3}\left(\frac{2}{3}\right)^{11}$ (2) $55\left(\frac{2}{3}\right)^{10}$

(3) $220\left(\frac{1}{3}\right)^{12}$ (4) $22\left(\frac{1}{3}\right)^{11}$

9. Let two fair six-faced dice A and B be thrown simultaneously. If E_1 is the event that die A shows up four E_2 is the event that die B shows up two and E_3 is the event that the sum of numbers on both dice is odd, then which of the following statements is NOT true? **[JEE (Main)-2016]**

(1) E_2 and E_3 are independent

(2) E_1 and E_3 are independent

(3) E_1, E_2 and E_3 are independent

(4) E_1 and E_2 are independent

10. A box contains 15 green and 10 yellow balls. If 10 balls are randomly drawn, one-by-one, with replacement, then the variance of the number of green balls drawn is **[JEE (Main)-2017]**

(1) 6 (2) 4

(3) $\frac{6}{25}$ (4) $\frac{12}{5}$

11. For three events A, B and C, P (Exactly one of A or B occurs) = P(Exactly one of B or C occurs) = P (Exactly one of C or A occurs) = $\frac{1}{4}$ and

P(All the three events occur simultaneously) = $\frac{1}{16}$.

Then the probability that at least one of the events occurs, is **[JEE (Main)-2017]**

(1) $\frac{7}{16}$ (2) $\frac{7}{64}$

(3) $\frac{3}{16}$ (4) $\frac{7}{32}$

12. If two different numbers are taken from the set {0, 1, 2, 3, ..., 10}; then the probability that their sum as well as absolute difference are both multiple of 4, is **[JEE (Main)-2017]**

(1) $\frac{12}{55}$ (2) $\frac{14}{45}$

(3) $\frac{7}{55}$ (4) $\frac{6}{55}$

13. A bag contains 4 red and 6 black balls. A ball is drawn at random from the bag, its colour is observed and this ball along with two additional balls of the same colour are returned to the bag. If now a ball is drawn at random from the bag, then the probability that this drawn ball is red, is **[JEE (Main)-2018]**

(1) $\frac{3}{10}$ (2) $\frac{2}{5}$

(3) $\frac{1}{5}$ (4) $\frac{3}{4}$

14. Two cards are drawn successively with replacement from a well-shuffled deck of 52 cards. Let X denote the random variable of number of aces obtained in the two drawn cards. Then $P(X = 1) + P(X = 2)$ equals **[JEE (Main)-2019]**

(1) $\frac{24}{169}$ (2) $\frac{25}{169}$

(3) $\frac{49}{169}$ (4) $\frac{52}{169}$

15. An urn contains 5 red and 2 green balls. A ball is drawn at random from the urn. If the drawn ball is green, then a red ball is added to the urn and if the drawn ball is red, then a green ball is added to the urn; the original ball is not returned to the urn. Now, a second ball is drawn at random from it. The probability that the second ball is red, is **[JEE (Main)-2019]**

(1) $\frac{26}{49}$ (2) $\frac{21}{49}$

(3) $\frac{32}{49}$ (4) $\frac{27}{49}$

16. An unbiased coin is tossed. If the outcome is a head then a pair of unbiased dice is rolled and the sum of the numbers obtained on them is noted. If the toss of the coin results in tail then a card from a well-shuffled pack of nine cards numbered 1, 2, 3, ..., 9 is randomly picked and the number on the card is noted. The probability that the noted number is either 7 or 8 is **[JEE (Main)-2019]**

(1) $\frac{13}{36}$ (2) $\frac{15}{72}$

(3) $\frac{19}{36}$ (4) $\frac{19}{72}$

17. If the probability of hitting a target by a shooter, in any shot, is $\frac{1}{3}$, then the minimum number of independent shots at the target required by him so that the probability of hitting the target at least once is greater than $\frac{5}{6}$, is **[JEE (Main)-2019]**

(1) 4 (2) 5

(3) 3 (4) 6

18. Two integers are selected at random from the set {1, 2, ..., 11}. Given that the sum of selected numbers is even, the conditional probability that both the numbers are even is **[JEE (Main)-2019]**

(1) $\frac{3}{5}$ (2) $\frac{7}{10}$

(3) $\frac{1}{2}$ (4) $\frac{2}{5}$

19. A bag contains 30 white ball and 10 red balls. 16 balls are drawn one by one randomly from the bag with replacement. If X be the number of white balls drawn, then $\left(\frac{\text{mean of } X}{\text{Standard deviation of } X}\right)$ is equal to **[JEE (Main)-2019]**

(1) $3\sqrt{2}$ (2) $4\sqrt{3}$

(3) $\frac{4\sqrt{3}}{3}$ (4) 4

20. Let S = {1, 2, ..., 20}. A subset B of S is said to be "nice", if the sum of the elements of B is 203. Then the probability that a randomly chosen subset of S is "nice" is **[JEE (Main)-2019]**

(1) $\frac{7}{2^{20}}$ (2) $\frac{6}{2^{20}}$

(3) $\frac{4}{2^{20}}$ (4) $\frac{5}{2^{20}}$

21. In a random experiment, a fair die is rolled until two fours are obtained in succession. The probability that the experiment will end in the fifth throw of the die is equal to **[JEE (Main)-2019]**

(1) $\frac{150}{6^5}$ (2) $\frac{225}{6^5}$

(3) $\frac{175}{6^5}$ (4) $\frac{200}{6^5}$

22. In a class of 60 students, 40 opted for NCC, 30 opted for NSS and 20 opted for both NCC and NSS. If one of these students is selected at random, then the probability that the student selected has opted neither of NCC nor for NSS is **[JEE (Main)-2019]**

(1) $\frac{5}{6}$ (2) $\frac{1}{3}$

(3) $\frac{1}{6}$ (4) $\frac{2}{3}$

23. In a game, a man wins Rs. 100 if he gets 5 or 6 on a throw of a fair die and loses Rs. 50 for getting any other number on the die. If he decides to throw the die either till he gets a five or a six or to a maximum of three throws, then his expected gain/loss (in rupees) is **[JEE (Main)-2019]**

(1) $\frac{400}{3}$ gain (2) 0

(3) $\frac{400}{9}$ loss (4) $\frac{400}{3}$ loss

24. Let A and B be two non-null events such that $A \subset B$. Then, which of the following statements is always correct? **[JEE (Main)-2019]**

(1) $P(A \mid B) = P(B) - P(A)$

(2) $P(A \mid B) \le P(A)$

(3) $P(A \mid B) \ge P(A)$

(4) $P(A \mid B) = 1$

25. The minimum number of times one has to toss a fair coin so that the probability of observing at least one head is at least 90% is **[JEE (Main)-2019]**

(1) 5 (2) 2

(3) 4 (4) 3

26. Four persons can hit a target correctly with probabilities $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ and $\frac{1}{8}$ respectively. If all hit at the target independently, then the probability that the target would be hit, is **[JEE (Main)-2019]**

(1) $\frac{7}{32}$ (2) $\frac{25}{192}$

(3) $\frac{1}{192}$ (4) $\frac{25}{32}$

27. Assume that each born child is equally likely to be a boy or a girl. If two families have two children each, then the conditional probability that all children are girls given that at least two are girls is **[JEE (Main)-2019]**

(1) $\frac{1}{11}$ (2) $\frac{1}{12}$

(3) $\frac{1}{10}$ (4) $\frac{1}{17}$

28. Minimum number of times a fair coin must be tossed so that the probability of getting at least one head is more than 99% is **[JEE (Main)-2019]**

(1) 8 (2) 6

(3) 5 (4) 7

29. Let a random variable X have a binomial distribution with mean 8 and variance 4.

If $P(X \le 2) = \frac{k}{2^{16}}$, then k is equal to **[JEE (Main)-2019]**

(1) 121 (2) 1

(3) 17 (4) 137

30. For an initial screening of an admission test, a candidate is given fifty problems to solve. If the probability that the candidate can solve any problem is $\frac{4}{5}$, then the probability that he is unable to solve less than two problems is **[JEE (Main)-2019]**

(1) $\frac{316}{25}\left(\frac{4}{5}\right)^{48}$ (2) $\frac{54}{5}\left(\frac{4}{5}\right)^{49}$

(3) $\frac{201}{5}\left(\frac{1}{5}\right)^{49}$ (4) $\frac{164}{25}\left(\frac{1}{5}\right)^{48}$

31. A person throws two fair dice. He wins Rs. 15 for throwing a doublet (same numbers on the two dice), wins Rs. 12 when the throw results in the sum of 9, and loses Rs. 6 for any other outcome on the throw. Then the expected gain/loss (in Rs.) of the person is: **[JEE (Main)-2019]**

(1) $\frac{1}{2}$ loss (2) 2 gain

(3) $\frac{1}{2}$ gain (4) $\frac{1}{4}$ loss

32. An unbiased coin is tossed 5 times. Suppose that a variable X is assigned the value k when k consecutive heads are obtained for k = 3, 4, 5, otherwise X takes the value –1. Then the expected value of X, is **[JEE (Main)-2020]**

(1) $\frac{3}{16}$ (2) $-\frac{1}{8}$

(3) $-\frac{3}{16}$ (4) $\frac{1}{8}$

33. In a workshop, there are five machines and the probability of any one of them to be out of service on a day is $\frac{1}{4}$. If the probability that at most two machines will be out of service on the same day is $\left(\frac{3}{4}\right)^3 k$, then k is equal to **[JEE (Main)-2020]**

(1) 4 (2) $\frac{17}{4}$

(3) $\frac{17}{8}$ (4) $\frac{17}{2}$

34. Let A and B be two independent events such that $P(A) = \frac{1}{3}$ and $P(B) = \frac{1}{6}$. Then, which of the following is TRUE? **[JEE (Main)-2020]**

(1) $P(A/B) = \frac{2}{3}$

(2) $P(A'/B') = \frac{1}{3}$

(3) $P(A/B') = \frac{1}{3}$

(4) $P(A/(A \cup B)) = \frac{1}{4}$

35. Let A and B be two events such that the probability that exactly one of them occurs is $\frac{2}{5}$ and the probability that A or B occurs is $\frac{1}{2}$, then the probability of both of them occur together is **[JEE (Main)-2020]**

(1) 0.01 (2) 0.20

(3) 0.02 (4) 0.10

36. In a box, there are 20 cards, out of which 10 are labelled as *A* and the remaining 10 are labelled as *B*. Cards are drawn at random, one after the other and with replacement, till a second *A*-card is obtained. The probability that the second *A*-card appears before the third *B*-card is **[JEE (Main)-2020]**

(1) $\frac{9}{16}$ (2) $\frac{13}{16}$

(3) $\frac{11}{16}$ (4) $\frac{15}{16}$

37. If 10 different balls are to be placed in 4 distinct boxes at random, then the probability that two of these boxes contain exactly 2 and 3 balls is **[JEE (Main)-2020]**

(1) $\frac{945}{2^{10}}$ (2) $\frac{965}{2^{11}}$

(3) $\frac{965}{2^{10}}$ (4) $\frac{945}{2^{11}}$

38. A random variable *X* has the following probability distribution

X :	1	2	3	4	5
P(*X*) :	K^2	$2K$	K	$2K$	$5K^2$

Then $P(X > 2)$ is equal to **[JEE (Main)-2020]**

(1) $\frac{7}{12}$ (2) $\frac{23}{36}$

(3) $\frac{1}{36}$ (4) $\frac{1}{6}$

39. Box I contains 30 cards numbered 1 to 30 and Box II contains 20 cards numbered 31 to 50. A box is selected at random and a card is drawn from it. The number on the card is found to be a non-prime number. The probability that the card was drawn from Box I is **[JEE (Main)-2020]**

(1) $\frac{4}{17}$ (2) $\frac{2}{3}$

(3) $\frac{2}{5}$ (4) $\frac{8}{17}$

40. Let E^C denote the complement of an event *E*. Let E_1, E_2 and E_3 be any pairwise independent events with $P(E_1) > 0$ and $P(E_1 \cap E_2 \cap E_3) = 0$. Then $P(E_2^C \cap E_3^C / E_1)$ is equal to **[JEE (Main)-2020]**

(1) $P\left(E_3^C\right) - P\left(E_2^C\right)$ (2) $P\left(E_2^C\right) + P(E_3)$

(3) $P(E_3) - P\left(E_2^C\right)$ (4) $P\left(E_3^C\right) - P(E_2)$

41. A die is thrown two times and the sum of the scores appearing on the die is observed to be a multiple of 4. Then the conditional probability that the score 4 has appeared atleast once is **[JEE (Main)-2020]**

(1) $\frac{1}{3}$ (2) $\frac{1}{4}$

(3) $\frac{1}{8}$ (4) $\frac{1}{9}$

42. The probability that a randomly chosen 5-digit number is made from exactly two digits is **[JEE (Main)-2020]**

(1) $\frac{150}{10^4}$ (2) $\frac{134}{10^4}$

(3) $\frac{121}{10^4}$ (4) $\frac{135}{10^4}$

43. In a game two players *A* and *B* take turns in throwing a pair of fair dice starting with player *A* and total of scores on the two dice, in each throw is noted. *A* wins the game if he throws a total of 6 before *B* throws a total of 7 and *B* wins the game if he throws a total of 7 before *A* throws a total of six. The game stops as soon as either of the players wins. The probability of A winning the game is **[JEE (Main)-2020]**

(1) $\frac{5}{31}$ (2) $\frac{31}{61}$

(3) $\frac{5}{6}$ (4) $\frac{30}{61}$

44. Out of 11 consecutive natural numbers if three numbers are selected at random (without repetition), then the probability that they are in A.P. with positive common difference, is **[JEE (Main)-2020]**

(1) $\frac{5}{101}$ (2) $\frac{10}{99}$

(3) $\frac{5}{33}$ (4) $\frac{15}{101}$

45. The probabilities of three events *A*, *B* and *C* are given by $P(A) = 0.6$, $P(B) = 0.4$ and $P(C) = 0.5$. If $P(A \cup B) = 0.8$, $P(A \cap C) = 0.3$, $P(A \cap B \cap C) = 0.2$, $P(B \cap C) = \beta$ and $P(A \cup B \cup C) = \alpha$, where $0.85 \le \alpha \le 0.95$, then β lies in the interval **[JEE (Main)-2020]**

(1) [0.25, 0.35] (2) [0.35, 0.36]

(3) [0.36, 0.40] (4) [0.20, 0.25]

46. An urn contains 5 red marbles, 4 black marbles and 3 white marbles. Then the number of ways in which 4 marbles can be drawn so that at the most three of them are red is _____

[JEE (Main)-2020]

47. The probability of a man hitting a target is $\frac{1}{10}$. The least number of shots required, so that the probability of his hitting the target at least once is greater than $\frac{1}{4}$, is _____. **[JEE (Main)-2020]**

48. Four fair dice are thrown independently 27 times. Then the expected number of times, at least two dice show up a three or a five, is _____. **[JEE (Main)-2020]**

49. In a bombing attack, there is 50% chance that a bomb will hit the target. Atleast two independent hits are required to destroy the target completely. Then the minimum number of bombs, that must be dropped to ensure that there is at least 99% chance of completely destroying the target, is _____. **[JEE (Main)-2020]**

❑ ❑ ❑