(1) Three houses are available in a locality. Three persons apply for the houses. Each applies for one house without consulting others. The probability that all the three apply for the same house is

(a) \( \frac{2}{9} \)  \( \frac{1}{9} \)  \( \frac{8}{9} \)  \( \frac{7}{9} \)  \[ AIEEE 2005 \]

(2) A random variable \( X \) has Poisson distribution with mean 2. Then \( P( X > 1.5 ) \) equals

(a) \( \frac{2}{e^2} \)  \( \frac{2}{e^2} \)  \( 1 - \frac{3}{e^2} \)  \( \frac{3}{e^2} \)  \[ AIEEE 2005 \]

(3) Let \( A \) and \( B \) be two events such that \( P(\overline{A} \cap \overline{B}) = \frac{1}{6} \), \( P( A \cap B ) = \frac{1}{4} \) and \( P( \overline{A} ) = \frac{1}{4} \), where \( \overline{A} \) stands for complement of event \( A \). Then events \( A \) and \( B \) are

(a) equally likely and mutually exclusive
(b) equally likely but not independent
(c) independent but not equally likely
(d) mutually exclusive and independent  \[ AIEEE 2005 \]

(4) Let \( x_1, x_2, \ldots, x_n \) be \( n \) observations such that \( \sum x_i^2 = 400 \) and \( \sum x_i = 80 \). Then a possible value of \( n \) among the following is

(a) 15  \( \frac{1}{b} \) 18  \( c \) 9  \( d \) 12  \[ AIEEE 2005 \]

(5) Probability that \( A \) speaks truth is \( \frac{4}{5} \) while this probability for \( B \) is \( \frac{3}{4} \). The probability that they contradict each other when asked to speak on a fact is

(a) \( \frac{3}{20} \)  \( \frac{1}{5} \)  \( \frac{7}{20} \)  \( \frac{4}{5} \)  \[ AIEEE 2004 \]

(6) The mean and variance of a random variable \( x \) having a binomial distribution are 4 and 2 respectively. Then \( P( X = 1 ) \) is

(a) \( \frac{37}{256} \)  \( \frac{219}{256} \)  \( \frac{128}{256} \)  \( \frac{28}{256} \)  \[ AIEEE 2004 \]
(7) A random variable X has the following probability distribution.

<table>
<thead>
<tr>
<th>X</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>p(X)</td>
<td>0.15</td>
<td>0.23</td>
<td>0.12</td>
<td>0.10</td>
<td>0.20</td>
<td>0.08</td>
<td>0.07</td>
<td>0.05</td>
</tr>
</tbody>
</table>

For the events $E = \{X \text{ is a prime number}\}$ and $F = \{X < 4\}$, the probability $P(E \cup F)$ is

(a) 0.87 (b) 0.77 (c) 0.35 (d) 0.50 \[AIEEE 2004\]

(8) The events $A$, $B$, $C$ are mutually exclusive events such that $P(A) = \frac{3x + 1}{3}$, $P(B) = \frac{1 - x}{4}$ and $P(C) = \frac{1 - 2x}{2}$. The set of possible values of $x$ are in the interval

(a) $\left[\frac{1}{3}, \frac{2}{3}\right]$ (b) $\left[\frac{1}{3}, \frac{3}{3}\right]$ (c) $\left[\frac{2}{3}, \frac{1}{3}\right]$ (d) $[0, 1]$ \[AIEEE 2003\]

(9) Five horses are in a race. Mr. A elects two of the horses at random and bets on them. The probability that Mr. A selected the winning horse is

(a) $\frac{4}{5}$ (b) $\frac{3}{5}$ (c) $\frac{1}{5}$ (d) $\frac{2}{5}$ \[AIEEE 2003\]

(10) The mean and variance of a random variable $X$ having a binomial distribution are 4 and 2 respectively. Then, $P(X = 1)$ is

(a) $\frac{32}{32}$ (b) $\frac{1}{16}$ (c) $\frac{1}{8}$ (d) $\frac{1}{4}$ \[AIEEE 2003\]

(11) The probabilities of a student getting Ist, IInd and IIIrd division in an examination are respectively $\frac{1}{10}$, $\frac{3}{5}$ and $\frac{1}{4}$. The probability, that a student fails in the examination is

(a) $\frac{197}{200}$ (b) $\frac{27}{100}$ (c) $\frac{83}{100}$ (d) $\frac{33}{200}$ \[AIEEE 2002\]

(12) A bag contains 4 red and 3 black balls. A second bag contains 2 red and 4 black balls. One bag is selected at random. If from the selected bag one ball is drawn, then the probability that the ball drawn is red is

(a) $\frac{1}{42}$ (b) $\frac{3}{41}$ (c) $\frac{9}{42}$ (d) $\frac{19}{42}$ \[AIEEE 2002\]
14 - PROBABILITY

( Answers at the end of all questions )

(13) A box contains 6 nails and 10 nuts. Half of the nails and half of the nuts are rusted. If one item is chosen at random, then the probability that it is rusted or a nail is

(a) \( \frac{3}{16} \)  (b) \( \frac{5}{16} \)  (c) \( \frac{11}{16} \)  (d) \( \frac{14}{16} \)

[ AIEEE 2002 ]

(14) A bag contains 5 brown and 4 white socks. A man pulls out two socks. The probability that both the socks are of the same colour is

(a) \( \frac{9}{108} \)  (b) \( \frac{18}{108} \)  (c) \( \frac{36}{108} \)  (d) \( \frac{48}{108} \)

[ AIEEE 2002 ]

(15) A 6-faced fair dice is rolled repeatedly till 1 appears for the first time. The probability that the dice is rolled for even number of times is

(a) \( \frac{1}{6} \)  (b) \( \frac{5}{36} \)  (c) \( \frac{6}{11} \)  (d) \( \frac{5}{11} \)

[IIT 2005]

(16) Three distinct numbers are chosen randomly from first 100 natural numbers, then the probability that all are divisible by 2 and 3 both is

(a) \( \frac{4}{33} \)  (b) \( \frac{35}{1155} \)  (c) \( \frac{4}{25} \)  (d) \( \frac{4}{1155} \)

[IIT 2004]

(17) Two numbers are chosen from \( \{1, 2, 3, 4, 5, 6\} \) one after another without replacement. Find the probability that the smaller of the two is less than 4.

(a) \( \frac{4}{5} \)  (b) \( \frac{1}{15} \)  (c) \( \frac{1}{5} \)  (d) \( \frac{14}{15} \)

[IIT 2003]

(18) If \( P(B) = \frac{3}{4} \), \( P(\overline{A} \cap B \cap \overline{C}) = \frac{1}{3} \) and \( P(A \cap B \cap \overline{C}) = \frac{1}{3} \), then \( P(B \cap C) \) is

(a) \( \frac{1}{12} \)  (b) \( \frac{3}{4} \)  (c) \( \frac{5}{12} \)  (d) \( \frac{23}{36} \)

[IIT 2003]

(19) If the integers \( m \) and \( n \) are chosen at random between 1 and 100, then the probability that the number of the form \( 7^m + 7^n \) is divisible by 5 equals

(a) \( \frac{1}{4} \)  (b) \( \frac{1}{7} \)  (c) \( \frac{1}{8} \)  (d) \( \frac{1}{49} \)

[IIT 1999]
20) The probabilities that a student passes in Mathematics, Physics and Chemistry are \( m, p \) and \( c \) respectively. Of these subjects, the student has a 75% chance of passing in at least one, a 50% chance of passing in at least two and 40% chance of passing in exactly two. Which of the following relations are true?

(a) \( p + m + c = \frac{19}{20} \)  
(b) \( p + m + c = \frac{27}{20} \)  
(c) \( pmc = \frac{1}{10} \)  
(d) \( pms = \frac{1}{4} \)  

[ IIT 1999 ]

21) If from each of the three boxes containing 3 white and 1 black, 2 white and 2 black, 1 white and 3 black balls, one ball is drawn at random, then the probability that 2 white and 1 black ball will be drawn is

(a) \( \frac{13}{32} \)  
(b) \( \frac{1}{4} \)  
(c) \( \frac{1}{32} \)  
(d) \( \frac{3}{16} \)  

[ IIT 1998 ]

22) A fair coin is tossed repeatedly. If tail appears on first four tosses, then the probability of head appearing on fifth toss equals

(a) \( \frac{1}{2} \)  
(b) \( \frac{1}{32} \)  
(c) \( \frac{31}{32} \)  
(d) \( \frac{1}{5} \)  

[ IIT 1998 ]

23) Seven white balls and three black balls are randomly placed in a row. The probability that no two black balls are placed adjacently equals

(a) \( \frac{1}{2} \)  
(b) \( \frac{7}{15} \)  
(c) \( \frac{2}{15} \)  
(d) \( \frac{1}{3} \)  

[ IIT 1998 ]

24) \( E \) and \( F \) are events with \( P(\ E \) \( \leq P(\ F) \) and \( P(\ E \cap F) > 0 \), then

(a) occurrence of \( E \Rightarrow \) occurrence of \( F \)  
(b) occurrence of \( F \Rightarrow \) occurrence of \( E \)  
(c) non-occurrence of \( E \Rightarrow \) non-occurrence of \( F \)  
(d) none of the above implications holds  

[ IIT 1998 ]

25) There are four machines and it is known that exactly two of them are faulty. They are tested, one by one, in a random order till both the faulty machines are identified. Then the probability that only two tests are needed is

(a) \( \frac{1}{3} \)  
(b) \( \frac{1}{6} \)  
(c) \( \frac{1}{2} \)  
(d) \( \frac{1}{4} \)  

[ IIT 1998 ]
26) If $\bar{E}$ and $\bar{F}$ are the complementary events of the events $E$ and $F$ respectively and if $0 < P(F) < 1$, then

(a) $P(E/F) + P(\bar{E}/F) = 1$  
(b) $P(E/F) + P(E/\bar{F}) = 1$  
(c) $P(\bar{E}/F) + P(E/\bar{F}) = 1$  
(d) $P(E/\bar{F}) + P(\bar{E}/\bar{F}) = 1$  
[IIT 1998]

27) If for the three events $A$, $B$ and $C$, $P$ (exactly one of the events $A$ or $B$ occurs) = $P$ (exactly one of the events $B$ or $C$ occurs) = $P$ (exactly one of the events $C$ or $A$ occurs) = $p$ and $P$ (all the three events occur simultaneously) = $p^2$, where $0 < p < \frac{1}{2}$, then the probability of at least one of the three events $A$, $B$ and $C$ occurring is

(a) $\frac{3p + 2p^2}{2}$  
(b) $\frac{p + p^2}{4}$  
(c) $\frac{p + p^2}{4}$  
(d) $\frac{3p + 2p^2}{4}$  
[IIT 1996]

28) Three of the six vertices of a regular hexagon are chosen at random. The probability that the triangle with these three vertices is equilateral equals

(a) $\frac{1}{2}$  
(b) $\frac{1}{5}$  
(c) $\frac{1}{10}$  
(d) $\frac{1}{20}$  
[IIT 1995]

29) The probability of India winning a test match against West Indies is $\frac{1}{2}$. Assuming independence from match to match, the probability that in a 5 match series India’s second win occurs at the third test is

(a) $\frac{1}{8}$  
(b) $\frac{1}{4}$  
(c) $\frac{1}{2}$  
(d) $\frac{2}{3}$  
[IIT 1995]

30) $0 < P(A) < 1$, $0 < P(B) < 1$ and $P(A \cup B) = P(A) + P(B) - P(A)P(B)$, then

(a) $P(B/A) = P(B) - P(A)$  
(b) $P(A' \cup B') = P(A') + P(B')$  
(c) $P(A \cup B') = P(A')P(B')$  
(d) $P(A/B) = P(A)$  
[IIT 1995]

31) An unbiased die with faces marked 1, 2, 3, 4, 5 and 6 is rolled four times. Out of four face values obtained, the probability that the minimum face value is not less than 2 and the maximum face value is not greater than 5 is then,

(a) $\frac{16}{81}$  
(b) $\frac{1}{81}$  
(c) $\frac{80}{81}$  
(d) $\frac{65}{81}$  
[IIT 1993]
(32) Let $E$ and $F$ be two independent events. If the probability that both $E$ and $F$ happen is $\frac{1}{12}$ and the probability that neither $E$ nor $F$ happens is $\frac{1}{2}$, then $P(E)$ and $P(F)$ respectively are

(a) $\frac{1}{3} \cdot \frac{1}{4}$  
(b) $\frac{1}{2} \cdot \frac{1}{6}$  
(c) $\frac{1}{6} \cdot \frac{1}{2}$  
(d) $\frac{1}{4} \cdot \frac{1}{3}$  

[ IIT 1993 ]

(33) India plays two matches each with West Indies and Australia. In any match, the probabilities of India getting points 0, 1 and 2 are 0.45, 0.50 and 0.50 respectively. Assuming that the outcomes are independent, the probability of India getting at least 7 points is

(a) 0.8750  
(b) 0.0875  
(c) 0.0625  
(d) 0.0250  

[ IIT 1992 ]

(34) For any two events $A$ and $B$ in a sample space,

(a) $P\left( \frac{A}{B} \right) \geq \frac{P(A) + P(B) - 1}{P(B)}$, if $P(B) \neq 0$ is always true

(b) $P(\overline{A}) = P(A) - P(\overline{A})P(B)$ does not hold

(c) $P(A \cup B) = 1 - P(\overline{A})P(B)$, if $A$ and $B$ are independent

(d) $P(A \cup B) = 1 - P(A)P(\overline{B})$, if $A$ and $B$ are disjoint  

[ IIT 1991 ]

(35) If $E$ and $F$ are independent events such that $0 < P(E) < 1$ and $0 < P(F) < 1$, then

(a) $E$ and $F$ are mutually exclusive

(b) $E$ and $F^c$ (the complement of event $F$) are independent

(c) $E^c$ and $F^c$ are independent  
(d) $P(E/F) + P(E^c/F) = 1$  

[ IIT 1989 ]

(36) One hundred identical coins, each with probability $p$, of showing heads are tossed once. If $0 < p < 1$ and the probability of heads showing on 50 coins is equal to heads showing on 51 coins, then the value of $p$ is

(a) $\frac{1}{2}$  
(b) $\frac{49}{101}$  
(c) $\frac{50}{101}$  
(d) $\frac{51}{101}$  

[ IIT 1988 ]

(37) For two events $A$ and $B$, $P(A \cup B)$ is

(a) not less than $P(A) + P(B) - 1$  
(b) not greater than $P(A) + P(B)$

(c) equal to $P(A) + P(B) - P(A \cup B)$  
(d) equal to $P(A) + P(B) + P(A \cup B)$  

[ IIT 1988 ]

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(38) The probability that at least one of the events $A$ and $B$ occur is 0.6. If $A$ and $B$ occur simultaneously with probability 0.2, then $P(\overline{A}) + P(\overline{B})$ is

(a) 0.4  (b) 0.8  (c) 1.2  (d) 1.4  (e) none of these  [IIT 1987]

(39) A student appears for tests I, II and III. The student is successful if he passes either in tests I and II or tests I and III. The probabilities of the student passing in tests I, II and III are $p$, $q$ and $\frac{1}{2}$ respectively. If the probability that the student is successful is $\frac{1}{2}$, then

(a) $p = q = 1$  (b) $p = q = \frac{1}{2}$  (c) $p = 0, q = 0$

(d) $p = 1, q = \frac{1}{2}$  (e) none of these  [IIT 1986]

(40) Three identical dice are rolled. The probability that the same number will appear on each of them is

(a) $\frac{1}{6}$  (b) $\frac{1}{36}$  (c) $\frac{1}{18}$  (d) $\frac{3}{28}$  [IIT 1984]

(41) If $M$ and $N$ are two events, the probability that exactly one of them occurs is

(a) $P(M) + P(N) - 2P(M \cap N)$  (b) $P(M) + P(N) - P(M \cap N)$

(c) $P(M^c) + P(N^c) - 2P(M^c \cap N^c)$  (d) $P(M \cap N^c) + P(M^c \cap N)$  [IIT 1984]

(42) Fifteen coupons are numbered 1, 2, ..., 15, respectively. Seven coupons are selected at random one at a time with replacement. The probability that the largest number appearing on a selected coupon is 9, is

(a) $\left( \frac{9}{16} \right)^6$  (b) $\left( \frac{8}{15} \right)^7$  (c) $\left( \frac{3}{5} \right)^7$  (d) none of these  [IIT 1983]

(43) If $A$ and $B$ are two events such that $P(A) > 0$ and $P(B) \neq 1$, then $P(\overline{A} \mid \overline{B})$ is equal to

(a) $1 - P(A \mid B)$  (b) $1 - P(\overline{A} \mid B)$

(c) $\frac{1 - P(A \cup B)}{P(B)}$  (d) $\frac{P(\overline{A})}{P(\overline{B})}$  [IIT 1982]
14 - PROBABILITY
(Answers at the end of all questions)

(44) Two fair dice are tossed. Let $X$ be the event that the first die shows an even number, and $Y$ be the event that the second die shows an odd number. The two events $X$ and $Y$ are

(a) mutually exclusive  (b) independent and mutually exclusive  (c) dependent  (d) none of these

[IIT 1979]

(45) There are $n$ persons ($n \geq 3$), among whom are A and B, who are made to stand in a row in random order. Probability that there are exactly $r$ ($r \leq n - 2$) persons between A and B is

$$\frac{n - r}{n(n - 1)} \quad \frac{n - r - 1}{n(n - 1)} \quad \frac{2(n - r - 1)}{n(n - 1)} \quad \frac{2r}{n}$$

(a) (b) (c) (d)

(46) There are 8 players from which four teams each of two players are formed. What is the probability that two specific players are in one team?

$$\frac{1}{4} \quad \frac{15}{28} \quad \frac{1}{8} \quad \frac{1}{7}$$

(a) (b) (c) (d)

(47) A natural number is selected from the first 20 natural numbers. The probability that

$$\frac{x^2 - 15x + 50}{x - 15} < 0$$

is

$$\frac{1}{5} \quad \frac{2}{5} \quad \frac{3}{5} \quad \frac{4}{5}$$

(a) (b) (c) (d)

Answers

1234567891011121314151617181920
b c c b c d b a d a b d d d a a a a b

2122232425262728293031323334353637383940
a a b d b a d a c b c a d a d b a c b c d d a b c c c b

4142434445464748495051525354555657585960
a c d c c d c d b

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