1. Let N denote the sum of the numbers obtained when two dice are rolled. If the probability that $2^N < N!$ is $\frac{m}{n}$ where m and n are coprime, then $4m - 3n$ is equal to

(1) 6
(2) 12
(3) 10
(4) 8

2. The probability, that in a randomly selected 3-digit number at least two digits are odd, is

(1) $\frac{19}{36}$
(2) $\frac{16}{36}$
(3) $\frac{19}{33}$
(4) $\frac{13}{36}$

3. Five numbers x_1, x_2, x_3, x_4, x_5 are randomly selected from the numbers$1, 2, 3, \ldots\ldots, 18$ and are arranged in the increasing order $(x_1 < x_2 < x_1 < x_4 < x_2)$. The probability that $x_2 = 7$ and $x_4 = 11$ is

(1) $\frac{1}{136}$
(2) $\frac{1}{68}$
(3) $\frac{7}{68}$
(4) $\frac{5}{68}$

4. Out of 11 consecutive natural number if three numbers are selected at random (without repetition), then the probability that they are in A.P. with positive common difference is :

(1) $\frac{15}{101}$
(2) $\frac{5}{101}$
(3) $\frac{5}{33}$
(4) $\frac{10}{99}$

5. If the numbers appeared on the two throws of a fair six faced die are α and β, then the probability that $x^2 + \alpha x + \beta > 0$, for all $x \in R$, is

(1) $\frac{17}{36}$
(2) $\frac{4}{9}$
(3) $\frac{1}{2}$
(4) $\frac{19}{36}$

6. Words with or without meaning are to be formed using all the letters of the word EXAMINATION. The probability that the letter M appears at the fourth position in any such word is:

(1) $\frac{1}{66}$
(2) $\frac{1}{11}$
(3) $\frac{1}{9}$
(4) $\frac{2}{11}$

7. Let $S = \{M = [a_{ij}],\ a_{ij} \in \{0, 1, 2\},\ \{1 \leq i, j \leq 2\}\}$ be a sample space and $A\{M \in S : M \text{ is invertible}\}$ be an even. Then $P(A)$ is equal to

(1) $\frac{16}{27}$
(2) $\frac{47}{81}$
(3) $\frac{49}{81}$
(4) $\frac{50}{81}$

8. Let M be the maximum value of the product of two positive integers when their sum is 66 . Let the sample space $S = \left\{x \in Z : x\left(66 - x\right) \geq \frac{5}{9}M\right\}$ and the event $\mathrm{A} = \{\mathrm{x} \in \mathrm{S} : \mathrm{x} \text{ is a multiple of } 3\}$. Then P(A) is equal to

(1) $\frac{15}{44}$
(2) $\frac{1}{3}$
(3) $\frac{1}{5}$
(4) $\frac{7}{22}$

9. Let $S = \{1, 2, 3, \ldots, 2022\}$. Then the probability, that a randomly chosen number n from the set S such that $HCF(n, 2022) = 1$, is

(1) $\frac{128}{1011}$
(2) $\frac{166}{1011}$
(3) $\frac{127}{337}$
(4) $\frac{112}{337}$

10. Let $S = \{1,\ 2,\ 3,\ 4,\ 5,\ 6\}$. Then the probability that a randomly chosen onto function g from S to S satisfies $g(3) = 2\, g(1)$ is :

(1) $\frac{1}{15}$
(2) $\frac{1}{5}$
(3) $\frac{1}{30}$
(4) $\frac{1}{10}$

11. 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

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

12. In a bombing attack, there is 50% chance that a bomb will hit the target. At least 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 .....

13. Two dice are thrown independently. Let A be the event that the number appeared on the 1st die is less than the number appeared on the 2nd die, B be the event that the number appeared on the 1st die is even and that on the second die is odd, and C be the event that the number appeared on the 1st die is odd and that on the 2nd is even. Then

(1) The number of favourable cases of the event $(\mathrm{A} \cup \mathrm{B}) \cap \mathrm{C}$ is 6
(2) A and B are mutually exclusive
(3) The number of favourable cases of the events A, B and C are 15, 6 and 6 respectively
(4) B and C are independent

14. Let a computer program generate only the digits 0 and 1 to form a string of binary numbers with probability of occurrence of 0 at even places be $\frac{1}{2}$ and probability of occurrence of 0 at the odd place be $\frac{1}{3}$. Then the probability that 10 is followed by 01 is equal to :

(1) $\frac{1}{18}$
(2) $\frac{1}{3}$
(3) $\frac{1}{6}$
(4) $\frac{1}{9}$

15. If A and B are two events such that $P(A)=\frac{1}{3}, P(B)=\frac{1}{5}$ and $P(A\cup B)=\frac{1}{2}$, then $P\left(A|B'\right)+P\left(B|A'\right)$ is equal to

(1) $\frac{3}{4}$
(2) $\frac{5}{8}$
(3) $\frac{5}{4}$
(4) $\frac{7}{8}$

16. If an unbiased die, marked with $-2,-1,0,1,2,3$ on its faces is thrown five times, then the probability that the product of the outcomes is positive, is :

(1) $\frac{881}{2592}$
(2) $\frac{521}{2592}$
(3) $\frac{440}{2592}$
(4) $\frac{27}{288}$

17. In an examination, there are 10 true-false type questions. Out of 10, a student can guess the answer of 4 questions correctly with probability $\frac{3}{4}$ and the remaining 6 questions correctly with probability $\frac{1}{4}$. If the probability that the student guesses the answers of exactly 8 questions correctly out of 10 is $\frac{27k}{4^{10}}$, then k is equal to

18. Box 1 contains 30 cards numbered 1 to 30 and Box 2 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 1 is

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

19. In a bolt factory, machines A, B and C manufacture respectively 20%, 30% and 50% of the total bolts. Of their output 3, 4 and 2 percent are respectively defective bolts. A bolt is drawn at random from the product. If the bolt drawn is found the defective then the probability that it is manufactured by the machine C is

(1) $\frac{5}{14}$
(2) $\frac{9}{28}$
(3) $\frac{3}{7}$
(4) $\frac{2}{7}$

20. A bag contains 6 balls. Two balls are drawn from it at random and both are found to be black. The probability that the bag contains at least 5 black balls is

(1) $\frac{5}{7}$
(2) $\frac{2}{7}$
(3) $\frac{3}{7}$
(4) $\frac{5}{6}$

21. Bag A contains 2 white, 1 black and 3 red balls and bag B contains 3 black, 2 red and n white balls. One bag is chosen at random and 2 balls drawn from it at random are found to be 1 red and 1 black. If the probability that both balls come from Bag A is $\frac{6}{11}$, then n is equal to _____

(1) 13
(2) 6
(3) 4
(4) 3

22. If a point $A(x,y)$ lies in the region bounded by the y-axis, straight lines $2y+x=6$ and $5x-6y=30$, then the probability that $y<1$ is

(1) $\frac{1}{6}$
(2) $\frac{5}{6}$
(3) $\frac{2}{3}$
(4) $\frac{6}{7}$

23. Let A be the event that the absolute difference between two randomly chosen real numbers in the sample space $[0,60]$ is less than or equal to a. If $P(A)=\frac{11}{36}$, then a is equal to _____ .

24. If the probability that the random variable X takes values x is given by $P(X=x)=k(x+1)3^{-x}$, $x=0,1,2,3,\ldots\ldots$, where k is a constant, then $P(X\geq 2)$ is equal to

(1) $\frac{7}{27}$
(2) $\frac{7}{18}$
(3) $\frac{11}{18}$
(4) $\frac{20}{27}$

25. Three rotten apples are mixed accidently with seven good apples and four apples are drawn one by one without replacement. Let the random variable X denote the number of rotten apples. If μ and σ^2 represent mean and variance of X, respectively, then $10\left(\mu^2+\sigma^2\right)$ is equal to

(1) 20
(2) 250
(3) 25
(4) 30

26. A random variable X has the following probability distribution:

X	0	1	2	3	4
$P(X)$	k	$2k$	$4k$	$6k$	$8k$

The value of $P\left(\frac{1<x<4}{x\leq 2}\right)$ is equal to

(1) $\frac{4}{7}$
(2) $\frac{2}{3}$
(3) $\frac{3}{7}$
(4) $\frac{4}{5}$

27. 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

28. 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:

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

29. Two dice A and B are rolled. Let the numbers obtained on A and B be α and β respectively. If the variance of $\alpha - \beta$ is $\frac{p}{q}$, where p and q are co-prime, then the sum of the positive divisors of p is equal to

(1) 72
(2) 36
(3) 48
(4) 31

30. Let $S = \{E, E_2 \ldots E_8\}$ be a sample space of random experiment such that $P(E_n) = \frac{n}{36}$ for every $n = 1, 2 \ldots . 8$. Then the number of elements in the set $\left\{A \subset S : P(A) \geq \frac{4}{5}\right\}$ is _____.