

[N.B. – Answer all the questions. Each question carries ONE mark. Block fully, with a black ball- point pen, the circle of the letter that stands for the correct/best answer in the “Answer sheet” for the Multiple Choice Questions.]
Candidates are asked not to leave any mark or spot on the question paper.

1. **A die is rolled twice. How many possible outcomes are there?**
(a) 6 (b) 12 (c) 36 (d) 18
Answer the next TWO questions based on the following information.
An urn contains 5 red, 7 blue, and 8 green balls.
2. **What is the probability that the ball drawn is red?**
(a) 0.26 (b) 0.25 (c) 0.2 (d) 0.4
3. **P(The ball drawn is not blue)–**
(a) $\frac{13}{20}$ (b) 0.5 (c) $\frac{7}{20}$ (d) $\frac{8}{20}$
4. **The conditions for a cumulative distribution function (CDF) are–**
i. $F(x)$ is non-decreasing.
ii. $0 \leq F(x) \leq 1$
iii. $\lim_{x \rightarrow \infty} F(x) = 1$
Which one is correct?
(a) i and ii (b) ii and iii (c) i and iii (d) i, ii, and iii
5. **Which one is not a discrete random variable?**
(a) Summation two die throw outcome (b) Weight
(c) Number of heads in five coin tosses (d) Released version number of a software
6. **$f(x) = x^2; 0 < X < 4$; What is $F(4)$?**
(a) 16 (b) 0 (c) 4 (d) 1
Answer the next three questions based on the following information
The probability function of random variable x is given below:
$$P(x) = \frac{2x+1}{k}; x = 1, 2, 3, 4$$
7. **What is the value of k ?**
(a) 18 (b) 25 (c) 12 (d) 24
8. **What is $E(X)$?**
(a) 1.75 (b) 2.92 (c) 3.25 (d) 2.25
9. **What is $V(X)$?**
(a) 1.05 (b) 3.0 (c) 1.5 (d) 1.25
10. **The characteristics of binomial distribution–**
i. $E(X) > V(X)$
ii. $E(X) = V(X)$
iii. $E(X) = np$
Which one is correct?
(a) i and ii (b) i and iii (c) ii and iii (d) i, ii and iii
11. **The parameter of a Poisson Distribution is 5. What is its mean?**
(a) 2 (b) 5 (c) 2.24 (d) 25
12. **When does Binomial Distribution tend to Poisson Distribution?**
(a) $n \rightarrow \infty, p \rightarrow 0$ & np is finite (b) $n \rightarrow \infty, p \rightarrow 0$ & np is infinite
(c) $n \rightarrow \infty, p \rightarrow \infty$ & np is finite (d) $n \rightarrow 0, p \rightarrow \infty$ & np is infinite
13. **A City has a dependency ratio of 0.52. If its working-age population (15-64) is 50,000, what is the total number of dependents (0-14 and 65+)?**
(a) 15,600 (b) 20,000 (c) 26,000 (d) 30,000
Answer the next TWO questions using the following information
 $P(C) = \frac{2}{5}, P(D) = \frac{3}{4}, P(C \cup D) = \frac{9}{10}$

14. $P(C \cap D) = ?$
 (a) $\frac{1}{10}$ (b) $\frac{1}{4}$ (c) $\frac{7}{20}$ (d) $\frac{4}{5}$
15. $P(C \cap \bar{D}) = ?$
 (a) $\frac{1}{10}$ (b) $\frac{2}{5}$ (c) $\frac{2}{20}$ (d) $\frac{3}{10}$
16. What is the minimum value of variance a random variable?
 (a) $-\infty$ (b) 1 (c) 0 (d) -1
17. If $E(X) = -0.5$, then $E(1 - 2X) = ?$
 (a) 0 (b) -1 (c) 2 (d) 1
18. What is the Standard Deviation of Binomial Distribution?
 (a) np (b) npq (c) nq (d) $\sqrt{npq}$
19. The population of a city is 500,000, and the number of live births recorded in a year is 8,000. What is the Crude Birth Rate (CBR)?
 (a) 12 per 1,000 (b) 16 per 1,000 (c) 20 per 1,000 (d) 22 per 1,000
20. In a Binomial distribution, how are mean and variance related?
 (a) $Mean > Variance$ (b) $Mean < Variance$ (c) $Mean = Variance$ (d) $Mean = 2 \times Variance$
- Answer the next two questions based on the following information
 For a Poisson variate X, $P(2) = P(5)$.
21. What is standard deviation?
 (a) 1.978 (b) 1.998 (c) 1.989 (d) 1.889
22. What is the value of $P(2)$?
 (a) 0.25 (b) 0.14 (c) 0.15 (d) 0.02
23. If $P(2)$ in a Poisson distribution with parameter λ equals 0.2240, what is the parameter λ ?
 (a) 2.4551 (b) 1.2515 (c) 1.2115 (d) 2.5112

Answer the following 2 questions based on the information given below.

City	Population (in thousands)	Area (in km ²)
Gamma	1200	400
Delta	800	320

24. What is the population density of City Delta?
 (a) 2 people/km² (b) 4 people/km² (c) 2.5 people/km² (d) 2.2 people/km²
25. Which city is less densely populated?
 (a) Gamma (b) Delta (c) Both are equal (d) Cannot be determined

”It is a capital mistake to theorize before one has data.” – Sir Arthur Conan Doyle

Answer Key

1. (c) 36

2. (a) 0.26

3. (a) $\frac{13}{20}$

4. (d) i, ii, and iii

5. (d) Released version number of a software

6. (d) 1

7. (d) 24

8. (b) 2.92

9. (a) 1.05
10. (b) i and iii

11. (b) 5

12. (a) $n \rightarrow \infty, p \rightarrow 0$ & np is finite

13. (c) 26,000

14. (b) $\frac{1}{4}$

15. (c) $\frac{2}{20}$

16. (c) 0

17. (c) 2

18. (d) $\sqrt{npq}$
19. (b) 16 per 1,000

20. (a) $Mean > Variance$

21. (a) 1.978

22. (c) 0.15

23. (b) 1.2515

24. (b) 4 people/km²

25. (b) Delta