30 Probability Distribution Practice Questions

Question 1 — Level 1: Probability

Define a probability and state its numerical bounds.

Show your formula, substitution, answer, and short interpretation.

Question 2 — Level 1: Random variable

What does a random variable assign to outcomes?

Show your formula, substitution, answer, and short interpretation.

Question 3 — Level 1: Discrete vs continuous

Classify number of correct answers and an idealized measured time.

Show your formula, substitution, answer, and short interpretation.

Question 4 — Level 1: Probability distribution

What does a distribution describe?

Show your formula, substitution, answer, and short interpretation.

Question 5 — Level 1: PMF

Explain $p(k)=P(X=k)$ for discrete X.

Show your formula, substitution, answer, and short interpretation.

Question 6 — Level 1: PDF

Can the height of a normal density at 70 equal $P(X=70)$?

Show your formula, substitution, answer, and short interpretation.

Question 7 — Level 1: CDF

What does $F(3)$ mean for a discrete count variable?

Show your formula, substitution, answer, and short interpretation.

Question 8 — Level 1: Expected value

A fair two-outcome variable is 0 or 2, each with probability .5. Find $E[X]$.

Show your formula, substitution, answer, and short interpretation.

Question 9 — Level 1: Complement

If $P(A)=0.37$, what is $P(\text{not } A)$?

Show your formula, substitution, answer, and short interpretation.

Question 10 — Level 1: Model selection

Choose normal/binomial/Poisson for ten independent pass-fail tests with common p.

Show your formula, substitution, answer, and short interpretation.

Question 11 — Level 2: Z-score

For $\mu=70$, $\sigma=10$, calculate z when $x=85$.

Show your formula, substitution, answer, and short interpretation.

Question 12 — Level 2: Normal left tail

For $X \sim N(70,10^2)$, find $P(X<80)$.

Show your formula, substitution, answer, and short interpretation.

Question 13 — Level 2: Normal right tail

For $X \sim N(70,10^2)$, find $P(X>85)$.

Show your formula, substitution, answer, and short interpretation.

Question 14 — Level 2: Normal interval

For the same normal X, find $P(60<X<80)$.

Show your formula, substitution, answer, and short interpretation.

Question 15 — Level 2: Combinations

Compute $C(10,3)$.

Show your formula, substitution, answer, and short interpretation.

Question 16 — Level 2: Binomial exact

For $Y \sim \text{Binomial}(10,.30)$ find $P(Y=3)$.

Show your formula, substitution, answer, and short interpretation.

Question 17 — Level 2: Binomial cumulative

For $Y \sim \text{Binomial}(10,.3)$, find $P(Y \leq 2)$.

Show your formula, substitution, answer, and short interpretation.

Question 18 — Level 2: Binomial mean and variance

For $n=10, p=.3$ find $E[Y]$, $\text{Var}(Y)$, $\text{SD}(Y)$.

Show your formula, substitution, answer, and short interpretation.

Question 19 — Level 2: Poisson exact

For $\lambda=2.5$, calculate $P(Z=3)$.

Show your formula, substitution, answer, and short interpretation.

Question 20 — Level 2: Poisson complement

For $\lambda=2.5$, find $P(Z \geq 1)$.

Show your formula, substitution, answer, and short interpretation.

Question 21 — Level 3: Normal shaded area

What does a shaded normal area from 60 to 80 represent with $\mu 70$, $\sigma 10$?

Show your formula, substitution, answer, and short interpretation.

Question 22 — Level 3: Compare normal models

Two normal models both mean70 but SD 5 versus 10. Which is more concentrated?

Show your formula, substitution, answer, and short interpretation.

Question 23 — Level 3: Binomial assumptions

Would ten responses with success probability increasing after feedback necessarily follow Binomial(10,p)?

Show your formula, substitution, answer, and short interpretation.

Question 24 — Level 3: Poisson assumptions

Support requests spike every evening. Is one constant hourly λ always appropriate?

Show your formula, substitution, answer, and short interpretation.

Question 25 — Level 3: Rate conversion

For 2.5 requests/hour, find expected count and P(0) in 30 minutes.

Show your formula, substitution, answer, and short interpretation.

Question 26 — Level 3: Poisson approximation

For Bin(100,.03), compare P(0) with Poi(3) P(0).

Show your formula, substitution, answer, and short interpretation.

Question 27 — Level 3: Continuity correction

Approximate $P(\text{Bin}(50,.4) \leq 20)$ by normal continuity correction.

Show your formula, substitution, answer, and short interpretation.

Question 28 — Level 3: Simulation vs model

If 1000 Bin(10,.3) experiments yield a frequency of exactly 3 different from .2668, is the model contradicted?

Show your formula, substitution, answer, and short interpretation.

Question 29 — Level 3: Spreadsheet flags

How should NORM.DIST(80,70,10,FALSE) be described?

Show your formula, substitution, answer, and short interpretation.

Question 30 — Level 3: Integrated three models

Calculate $P(60<X<80)$, $P(Y=3)$, $P(Z=3)$ for the project three variables.

Show your formula, substitution, answer, and short interpretation.