

All answers must be in reduced fractions, or rounded in decimal to 2 significant digits.

1. (1pt) In the next 2026 World Cup, there will be 48 football teams competing for first, second, and third place. Count the number of possible outcomes.
2. (1pt) In a supermarket there are 59 apples, and 8 of them are bad. If we randomly pick 2 apples, compute the probability that both are bad.
3. (5pt) A coin is tossed 6 times.
Let $A = \{\text{at least 5 Heads}\}$ and $B = \{\text{the first is Heads}\}$.

- (a) Compute $P(A)$
- (b) Compute $P(B)$
- (c) Compute $P(A \cap B)$
- (d) Compute $P(A \cup B)$
- (e) Prove A and B are dependent or independent.

4. (2pt) An airline flight has a probability 34% of getting delayed when it is raining, and 19% when not raining. The probability that today will rain is 81%. Find the probability that this flight will be delayed today.
5. (2pt) Assume that 68% of the Samsung mobile phones in the country come from China, 9% from Malaysia, and 23% from India. From China, an average 3.2% of the phones are defective, from Malaysia 2.9%, and from India 1.7%. Given that a phone is found defective, what is the probability it came from India?
6. (2pt) Given the probability density function $f(x)$. Compute $P(X > 1)$.

$$f(x) = \begin{cases} \frac{1}{4}x^3 & \text{for } 0 < x < 2 \\ 0 & \text{else} \end{cases}$$

7. (2pt) Given the probability density function $f(x)$. Find $F(x)$.

$$f(x) = \begin{cases} \frac{1}{6\sqrt{x}} & \text{for } 0 < x < 9 \\ 0 & \text{else} \end{cases}$$

8. (2pt) Given the distribution function $F(x)$ for a discrete random variable X .

$$F(x) = \begin{cases} 0 & \text{for } x < 1 \\ \frac{1}{4} & \text{for } 1 \leq x < 3 \\ \frac{3}{5} & \text{for } 3 \leq x < 5 \\ 1 & \text{for } x \geq 5 \end{cases}$$

- (a) Find $P(X \leq 3)$
- (b) Find $P(X = 3)$

9. (2pt) Given the joint probability distribution $f(x, y) = k \binom{x}{y}$ where $x \in \{3, 4\}$ and $y \in \{1, 2\}$.

(a) Find k

(b) Find $F(3, 3)$

10. (3pt) Given the joint probability density function $f(x, y)$. Compute $P(X, Y \leq \frac{3}{2})$.

$$f(x, y) = \begin{cases} \frac{1}{3}(x + y) & \text{for } 0 < x < 1; 0 < y < 2 \\ 0 & \text{otherwise} \end{cases}$$

11. (4pt) Given the joint probability density function $f(x, y)$. Find k .

$$f(x, y) = \begin{cases} k(x^2 - xy) & \text{for } x < 1; -x < y < x \\ 0 & \text{otherwise} \end{cases}$$

12. (4pt) Given the joint distribution function $F(x, y)$. Compute $P(X + Y > 3)$.

$$F(x, y) = \begin{cases} 1 - e^{-x} - e^{-y} + e^{-x-y} & \text{for } x, y > 0 \\ 0 & \text{otherwise} \end{cases}$$