1. In a bag of marbles, there are two disjoint events: A represents selecting a red marble, and B represents selecting a blue marble. The probability of selecting a red marble is $P(A) = \frac{1}{4}$, and the probability of selecting a blue marble is $P(B) = \frac{1}{3}$.

1 point

What is the probability of selecting either a red or a blue marble, $P(A \cup B)$, from the bag?

- ○ $P(A \cup B) = \frac{2}{3}$
- ○ $P(A \cup B) = \frac{1}{12}$
- ○ $P(A \cup B) = \frac{5}{12}$
- ◉ $P(A \cup B) = \frac{7}{12}$

2. You throw 10 fair coins, what is the probability that coins **do not result in all heads**?

1 point

- ○ $$\frac{10^2 - 1}{10^2}$$
- ○ $$\frac{1}{10^2}$$
- ○ $$\frac{1}{2^{10}}$$
- ◉ $$\frac{2^{10} - 1}{2^{10}}$$

3. In a room, there are 200 people: 30 people only like soccer, 100 people only like basketball, and 70 people like **both** soccer and basketball.

1 point

What is the probability that a randomly selected person likes **basketball given they like soccer?**

Hint: Find $P(B|S)$, where B is the event of liking basketball and S is the event of liking soccer.

- ◉ $$\frac{7}{10}$$
- ○ $$\frac{7}{20}$$
- ○ $$\frac{1}{2}$$
- ○ $$\frac{3}{7}$$

4. Imagine there is a disease that impacts 1% of the population. Researchers devised a test so that people with the disease test positive 95% of the time. People who do not have the disease test negative 90% of the time. If an individual receives a positive test result for the disease, what is the probability that they truly have the disease or $P(\text{sick}|\text{test}_{\text{pos}})$?

1 point

Hint: In the description above, you were given $P(\text{sick})$, probability for true positive (or $P(\text{test}_{\text{pos}}|\text{sick})$), and probability for true negative (or $P(\text{test}_{\text{neg}}|\text{not sick})$). Use this information to find $P(\text{not sick})$ and $P(\text{test}_{\text{pos}}|\text{not sick})$.

Remember that Bayes' Theorem is $P(A|B) = \frac{P(B|A) \cdot P(A)}{P(B)}$. Also, remember that you may write $P(B) = P(B|E) \cdot P(E) + P(B|\text{not } E) \cdot P(\text{not } E)$, where E is any event and $\text{not } E = E'$.

- ◉ 8.76%
- ○ 90%
- ○ 15.58%
- ○ 42.76%

5. Which of the following are examples of continuous random variables? Select all that apply.

1 point

- [x] Temperature in degrees Celsius.
- [x] Time taken to run a 100-meter race.
- [ ] Number of cars passing through a toll booth in an hour.
- [ ] Number of students in a classroom.
- [ ] Number of goals scored in a soccer match.
- [x] Weight of a package.
- [x] Height of students in a class.

6. You roll a six-sided die 20 times and want to find the probability that the number 4 appears exactly 7 times. Which of the following equations correctly represents the probability distribution for this scenario?

1 point

- ○ $$P(X = 4) = \binom{20}{4} \cdot \left(\frac{1}{6}\right)^4 \cdot \left(\frac{5}{6}\right)^{16}$$

$$P(X=7)=\binom{20}{7}\cdot\left(\frac{1}{6}\right)^{7}\cdot\left(\frac{5}{6}\right)^{13}$$

$$P(X=7)=\binom{20}{7}\cdot\left(\frac{1}{6}\right)^{13}\cdot\left(\frac{5}{6}\right)^{7}$$

$$P(X=7)=\binom{20}{7}\cdot\left(\frac{1}{6}\right)^{7}\cdot\left(\frac{5}{6}\right)^{7}$$

7. Imagine you are tasked with modeling the heights of individuals in a diverse country. Which probability distribution would be most suitable for capturing the patterns in the heights of the population?

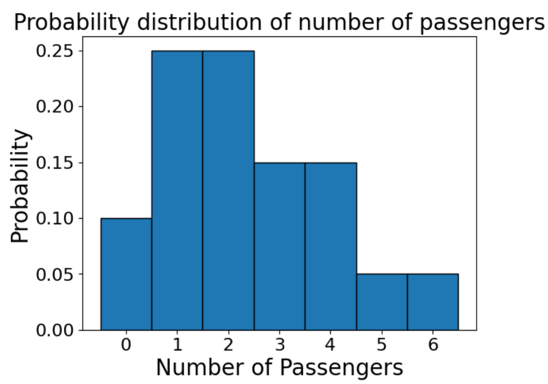
1 point

- Binomial Distribution
- Normal Distribution
- Uniform Distribution

8. A taxi cab service analyzes the number of passengers in its daily rides. The table and graph below show the number of passengers, X, in a single taxi cab and the observed probabilities at a randomly selected time.

1 point

Number of passengers xi	0	1	2	3	4	5	6
Probability, pi	0.10	0.25	0.25	0.15	0.15	0.05	0.05



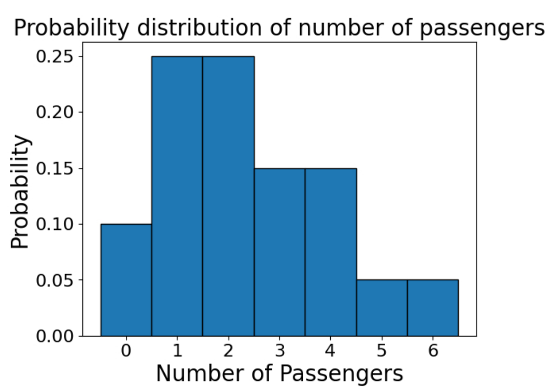
What is the probability that a randomly selected taxi ride will have **less than or equal to 3 passengers**?

- $P(X \leq 3) = 0$
- $P(X \leq 3) = 0.25$
- $P(X \leq 3) = 0.40$
- $P(X \leq 3) = 0.60$
- $P(X \leq 3) = 0.75$

9. A taxi cab service analyzes the number of passengers in its daily rides. The table and graph below show the number of passengers, X, in a single taxi cab and the observed probabilities at a randomly selected time.

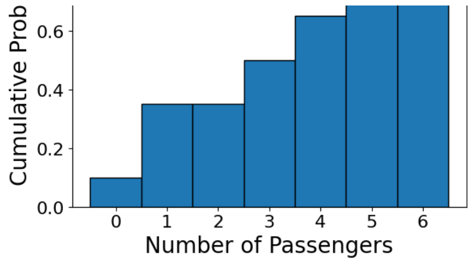
1 point

Number of passengers xi	0	1	2	3	4	5	6
Probability, pi	0.10	0.25	0.25	0.15	0.15	0.05	0.05

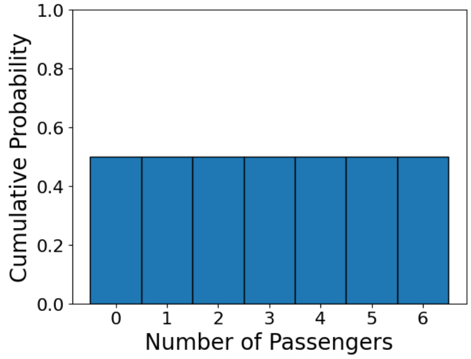


Select the correct Cumulative Distribution Function (CDF) based on the observed probabilities.

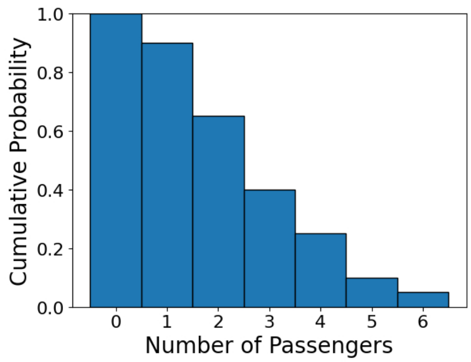
Number of passengers(x)	0	1	2	3	4	5	6
Cumulative probability (Fx)	0.10	0.35	0.35	0.5	0.65	0.7	0.75



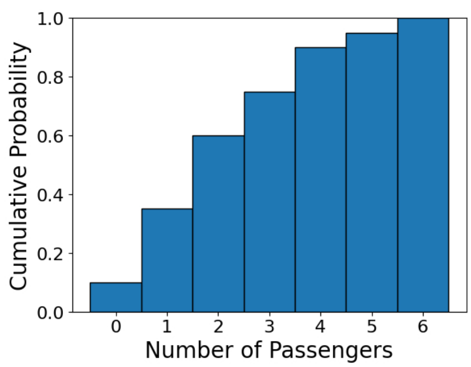
Number of passengers(x)	0	1	2	3	4	5	6
Cumulative probability (Fx)	0.5	0.5	0.5	0.5	0.5	0.5	0.5



Number of passengers(x)	0	1	2	3	4	5	6
Cumulative probability (Fx)	1	0.90	0.65	0.4	0.25	0.1	0.05

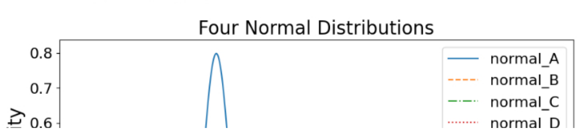


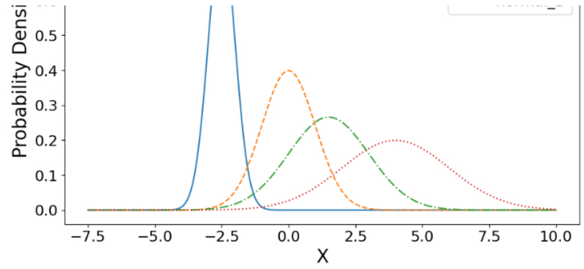
Number of passengers(x)	0	1	2	3	4	5	6
Cumulative probability (Fx)	0.1	0.35	0.6	0.75	0.9	0.95	1



10. Consider the graph below, depicting four normal, or Gaussian, distributions labeled *normal_A* in blue, *normal_B* in orange, *normal_C* in green, and *normal_D* in red.

1 point





Select all statements that are true based on the provided graph.

- [x] $\mu_{normal\_D} > \mu_{normal\_C}$
- [x] $\sigma_{normal\_D} > \sigma_{normal\_A}$
- [x] $\sigma_{normal\_C} > \sigma_{normal\_B}$
- [ ] $\sigma_{normal\_A} > \sigma_{normal\_B}$
- [ ] $\mu_{normal\_A} > \mu_{normal\_B}$