Congratulations! You passed!

Grade received 80% **Latest Submission Grade** 80% **To pass** 75% or higher

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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 / 1 point

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

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

   Correct
   The probability of the union of disjoint events is the sum of their individual probabilities.
   $P(A \cup B) = P(A) + P(B) = \frac{1}{4} + \frac{1}{3} = \frac{7}{12}$

2. You throw 10 fair coins, what is the probability that coins **donot result in all heads**?

   1 / 1 point

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

   Correct
   By throwing 10 fair coins, there are 2^{10} possible outcomes and only one outcome results in HHHHHHHHHH or all heads. This means the
   $$P(\text{not all heads}) = 1 - P(\text{all heads}) = 1 - \frac{1}{2^{10}} = \frac{2^{10} - 1}{2^{10}}$$

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 / 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.

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

$$\frac{}{10}$$

○ $\frac{7}{20}$

Correct
Let S represent the number of people who like soccer and B represent the number of people who like basketball. Therefore, $P(B|S) = \frac{P(B\cap S)}{P(S)}$.

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 / 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 $P(\text{test}_{\text{neg}}|\text{sick})$). 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 $\text{not } E = E$'.

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

Correct
According to Bayes' Theorem,

$$P(\text{sick}|\text{test}_{\text{pos}}) = \frac{P(\text{test}_{\text{pos}}|\text{sick})\cdot P(\text{sick})}{P(\text{sick})\cdot P(\text{test}_{\text{pos}}|\text{sick})) + P(\text{not sick})\cdot P(\text{test}_{\text{pos}}|\text{not sick})}$$

.

From the problem description, you know that $P(\text{sick}) = 0.01$, $P(\text{test}_{\text{pos}}|\text{sick}) = 0.95$, and $P(\text{test}_{\text{neg}}|\text{not sick}) = 0.9$. You can use the complement rule to find $P(\text{test}_{\text{pos}}|\text{not sick}) = 1 - P(\text{test}_{\text{neg}}|\text{not sick}) = 1 - 0.9 = 0.1$.

Using these numbers, we get:

$$\frac{0.01\cdot 0.95}{0.01\cdot 0.95 + 0.99\cdot 0.1} \approx 0.0876$$

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

1 / 1 point

- [x] Time taken to run a 100-meter race.

Correct
Time is a **continuous** variable with infinitely many values within a range.

- [ ] Number of cars passing through a toll booth in an hour.
- [ ] Number of students in a classroom.
- [x] Temperature in degrees Celsius.

Correct
Temperature is a **continuous** variable with infinitely many values within a range.

- [x] Weight of a package.

Correct
Weight is a **continuous** variable with infinitely many values within a range.

- [ ] Number of goals scored in a soccer match.
- [x] Height of students in a class.

Correct
Height is a **continuous** variable with infinitely many values within a range.

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 / 1 point

- (●) $$P(X=7)=\binom{20}{7}\cdot\left(\frac{1}{6}\right)^{7}\cdot\left(\frac{5}{6}\right)^{13}$$
- ( ) $$P(X=4)=\binom{20}{4}\cdot\left(\frac{1}{6}\right)^{4}\cdot\left(\frac{5}{6}\right)^{16}$$
- ( ) $$P(X=7)=\binom{20}{7}\cdot\left(\frac{1}{6}\right)^{7}\cdot\left(\frac{5}{6}\right)^{7}$$
- ( ) $$P(X=7)=\binom{20}{7}\cdot\left(\frac{1}{6}\right)^{13}\cdot\left(\frac{5}{6}\right)^{7}$$

Correct
In this case, let $n = \text{total number of tosses} = 20, k = \text{number times 4 is rolled} = 7, p = \text{probability of rolling 4} = \frac{1}{6}$, and $q = \text{probability of not rolling 4} = \frac{5}{6}$.

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 / 1 point

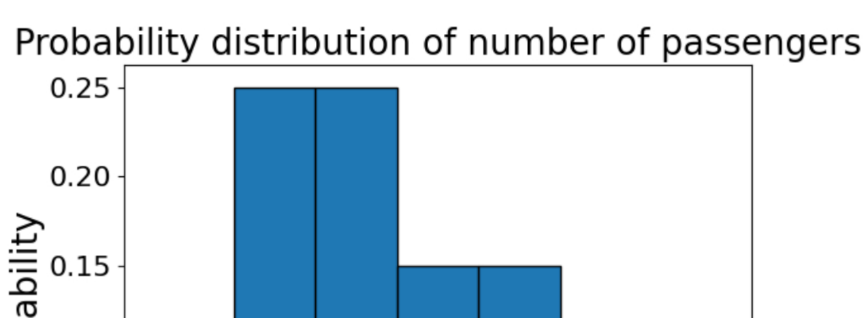
- (●) Normal Distribution
- ( ) Binomial Distribution
- ( ) Uniform Distribution

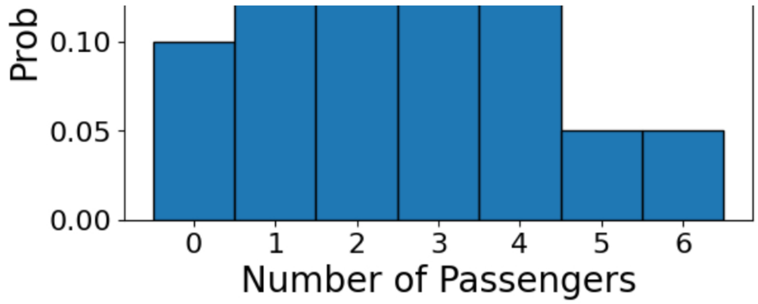
Correct
The normal distribution, often likened to a bell curve, is a fitting choice for modeling height variations in a country. It beautifully represents the natural diversity observed in the heights of individuals.

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 / 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**?

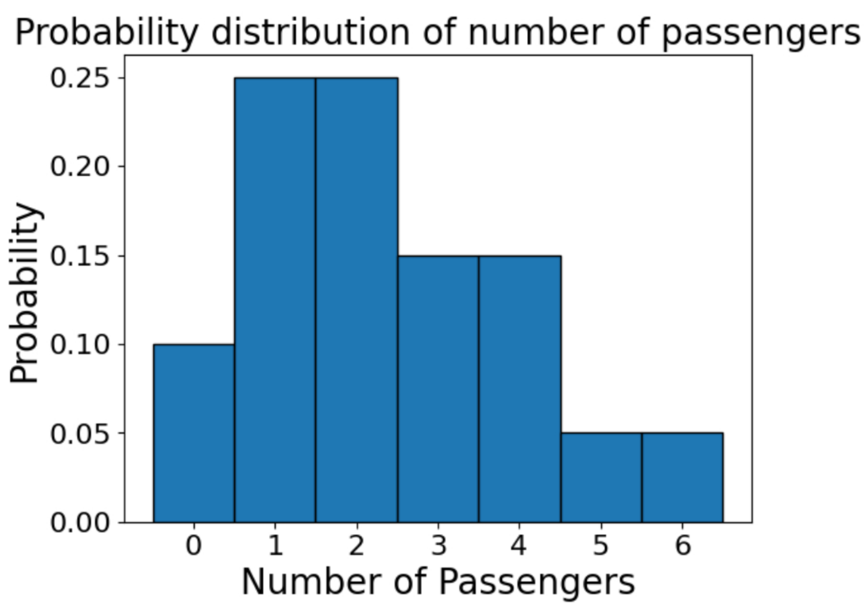
- ○ $P(X \leq 3) = 0$
- ○ $P(X \leq 3) = 0.25$
- ○ $P(X \leq 3) = 0.40$
- ○ $P(X \leq 3) = 0.60$
- ◉ $P(X \leq 3) = 0.75$

Correct
To find the probability that a randomly selected taxi ride will have **less than 3 passengers** means that you can *add* up the probabilities when $P(X = 3) + P(X = 2) + P(X = 1) + P(X = 0)$.

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.

0 / 1 point

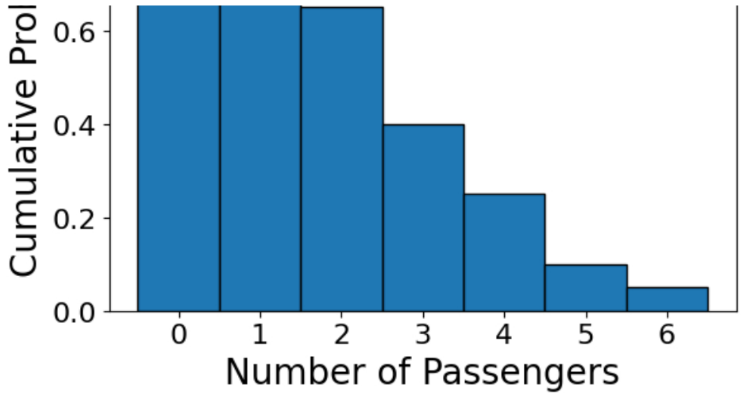
Number of passengers xi	0	1	2	3	4	5	6
Probability, pi	0.10	0.25	0.25	0.15	0.15	0.05	0.05



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

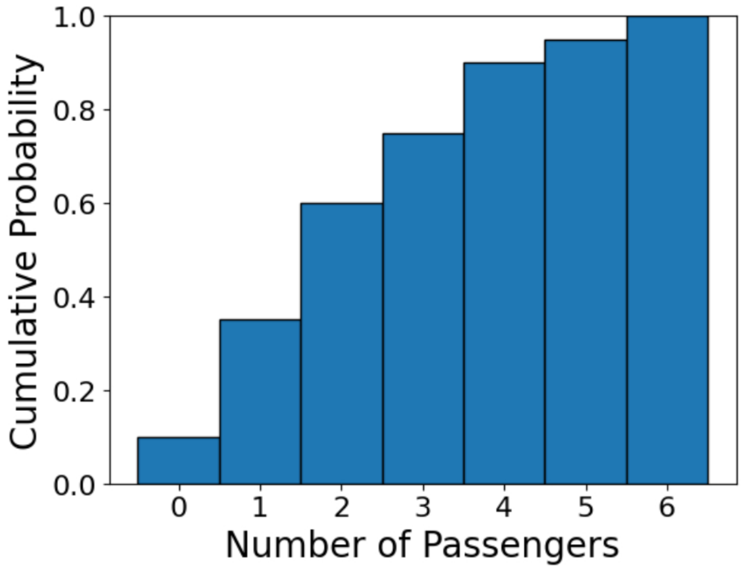
◉

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



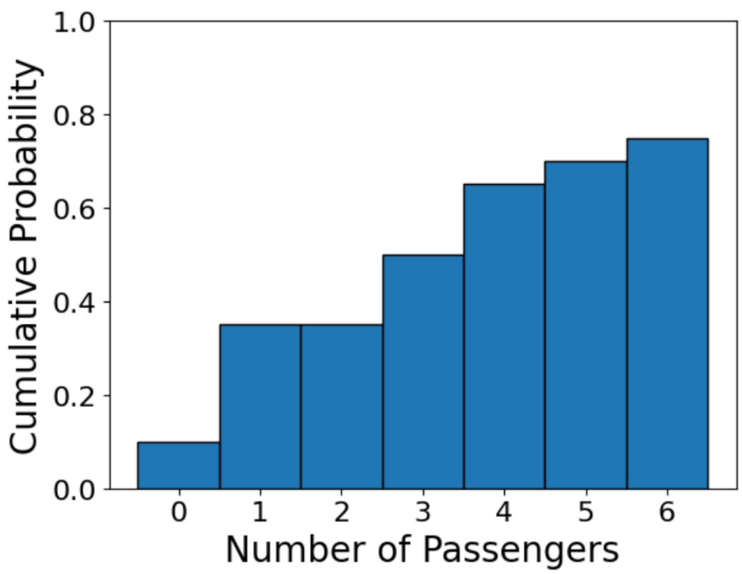
○

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

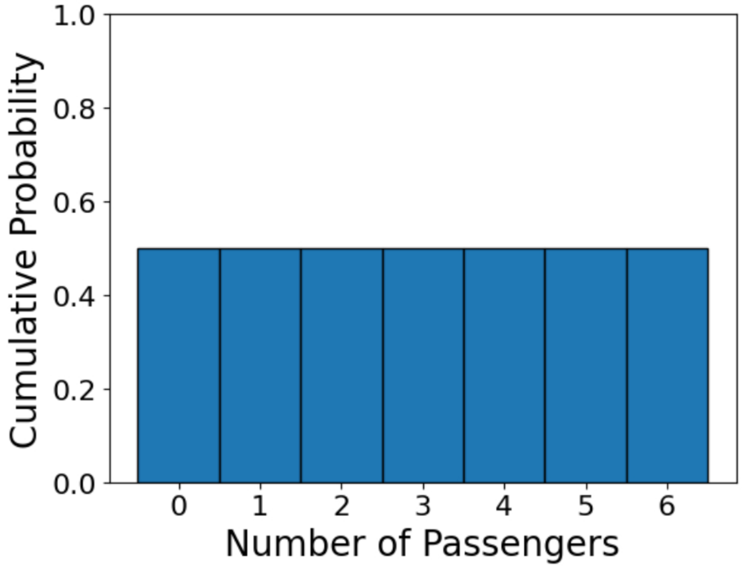


○

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

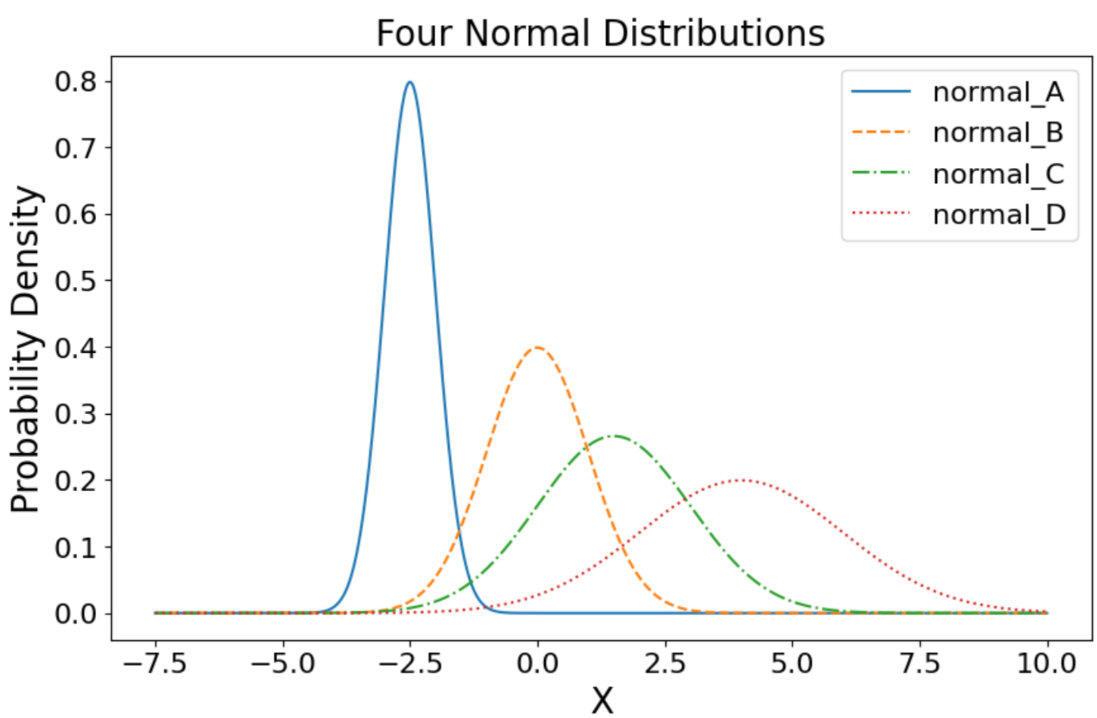


Incorrect

A CDF calculates the probability of a random variable being **less than or equal to a specific point**. It accumulates probabilities such that its values are **non-decreasing**, **starting at 0** and ending at 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.

0 / 1 point



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

- [ ] $\sigma_{\text{normal\_A}} > \sigma_{\text{normal\_B}}$

- [ ] $\sigma_{\text{normal\_D}} > \sigma_{\text{normal\_A}}$

- [x] $\sigma_{\text{normal\_C}} > \sigma_{\text{normal\_B}}$

Correct

The parameter σ, or standard deviation, controls the spread of the distribution. Therefore, the higher the σ, the wider (more spread) the graph is around the center.

- [ ] $\mu_{\text{normal\_A}} > \mu_{\text{normal\_B}}$

- [x] $\mu_{\text{normal\_D}} > \mu_{\text{normal\_C}}$

Correct

The parameter μ, or mean, controls the center of the distribution. Therefore the higher the μ, the farther the center is from the origin.

You didn't select all the correct answers