Time Interval = 4 Days B

(75%) ← PPF → Real Time

CDF → Exp-Distribution

$P(X \le 4) = \text{cdf} \rightarrow 1 - e^{-x/B}$

$0.75 = 1 - e^{-x/B}$

PPF × PMF → Discrete

PDF → Continuous

CDF

$\boxed{\text{PPF} \rightarrow \text{Value} \quad \text{inverse} \quad \text{CDF} \rightarrow \text{Cum-\%}}$

Question 1:

A transportation analyst models flight delays (in minutes) at a major airport. She collects the following data:

- 70% of flights are on time (0 minutes delay) 1
- 15% are delayed by exactly 30 mins 2
- 15% are delayed by exactly 60 mins 3

Tim

She reports this using a CDF plot to her non-technical team.

Later, another analyst claims:"We can also derive a PDF and compute the probability that a flight is delayed by more than 30 minutes."

What is the correct interpretation of this situation?

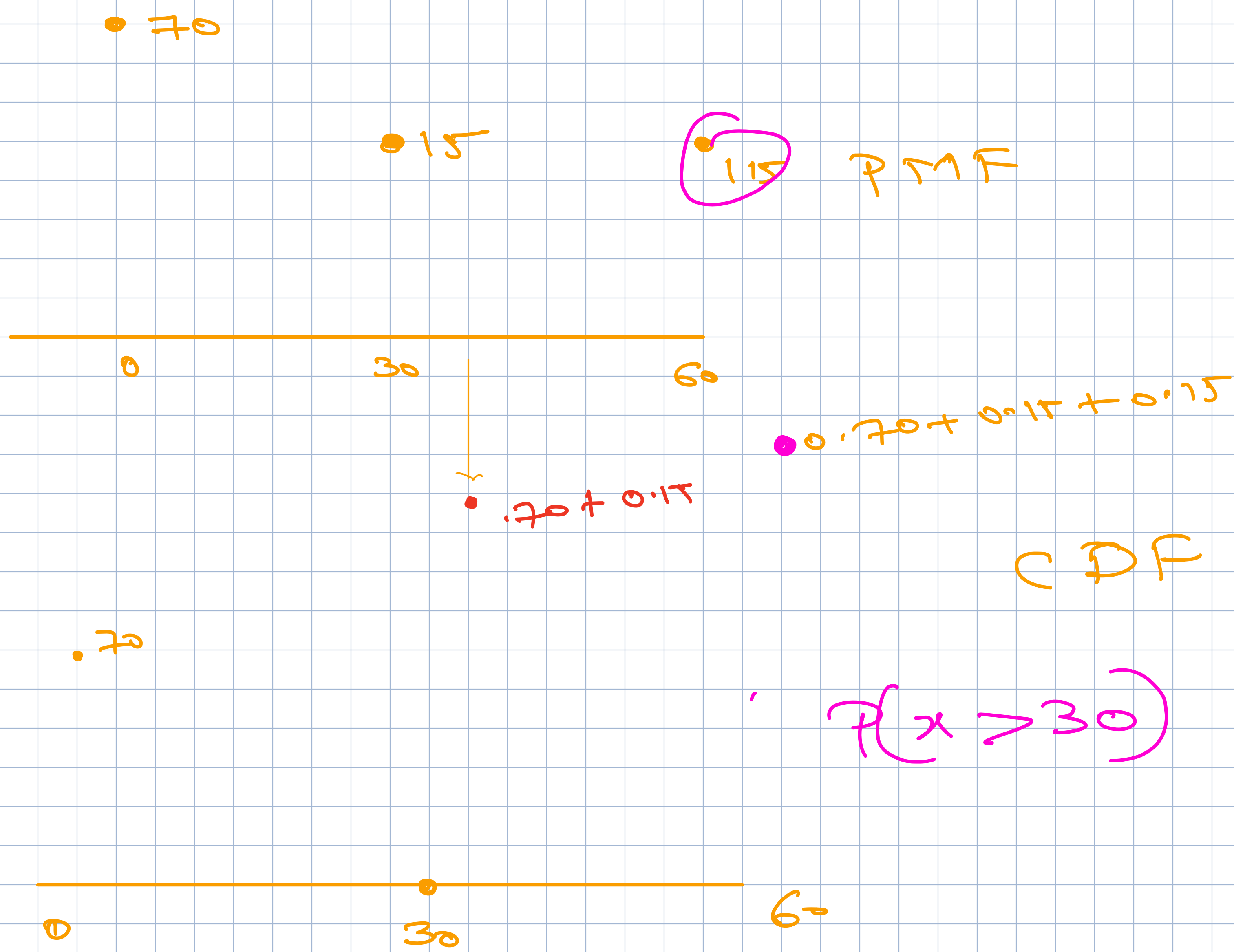
Options:

A. This is a PDF problem since the time is continuous ✓

B. The CDF allows computation of $P(X > 30) = 1 - CDF(30) = 0.15$ ✓

C. This is a PMF, so using CDF doesn't make sense ✗

D. The correct probability for $P(X > 30) = 0.3$ ✗



2% avg defect

Question 2:

A tire company claims that only 2% of their tires have manufacturing defects (theoretical probability).
A regional quality manager inspects a batch of 500 tires and finds 18 defective tires.

The manager concludes: "The theoretical defect rate is wrong. It's clearly 3.6% now. We should update our models."

What's the correct interpretation of this situation?

Options:

A. Yes, empirical = 18/500 = 3.6%, much higher than 2%, so update the model. × No
B. No, theoretical probability should override any empirical values. × ✓ SD theoretical ✓
C. This single empirical observation doesn't override theory; it provides a basis to monitor further batches. SD
D. Both theoretical and empirical probabilities are always equal in large samples.

is close → Converge
sample → population

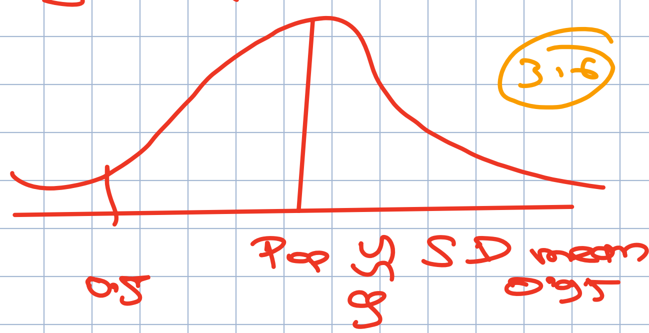
$n = 500$ 18 defective

3.6%

sample_defect_rate = 18/500

① increase sample_size is pop

② Sampling Distribution ✓



Question 3:

An insurance company receives 20 claims daily. The probability a claim is fraudulent is 0.15.

Find the probability that:

A. At least 5 claims are fraudulent ✓ $P(x \geq 5)$

B. Exactly 3 claims are fraudulent $P(x = 3)$

C. Expected fraudulent claims and its variance

$n * p * (1-p)$

Options:

A. A = 0.38, B = 0.25, Exp = 3, Var = 2.55

B. A = 0.17, B = 0.24, Exp = 3, Var = 2.55

C. A = 0.46, B = 0.25, Exp = 2, Var = 1.7

D. A = 0.28, B = 0.26, Exp = 3, Var = 2.1

$P = (0.15)$

$P(X \geq 5)$

Binomial Distribution

Question 4:

A system processes requests, and each request is either successful (1) with probability 0.97 or unsuccessful (0) with probability 0.03. Let X be the random variable representing success (1) or failure (0) for a request.

What is the expected value of X^2?

Options:

A. 0

B. 0.97 ✓

C. 0.03

D. 1

$P = 0.97$

$1 \times 0.97 + 1 \times 0.97 \ldots$

$E(x) = n \times P \leftarrow \sum_{i=1}^{n} P_i * X_i$

0, 1

(X_i^2)

$E(x^2)$

Question 5:

Scenario:
A YouTuber earns revenue based on the number of ads watched. Each ad generates an amount between ₹0.50 and ₹3 randomly.
The revenue per ad follows a Uniform Distribution: $X \sim U(0.5, 3)$
The YouTuber uploads 5 videos, and each video gets an average of 1,000 ad views.

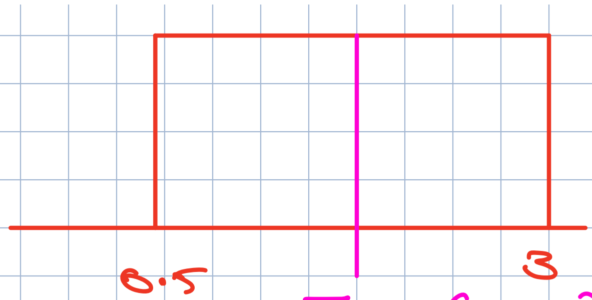
Question 1: What is the expected revenue per ad? Per Video $(a+b)/2$

Question 2: What is the expected total revenue from all 5 videos?

$5 \times 1000 \times (a+b)/2$

Options:

A. Revenue per ad = ₹1.00, Total revenue = ₹5,000
B. Revenue per ad = ₹1.75, Total revenue = ₹8,750
C. Revenue per ad = ₹2.50, Total revenue = ₹12,500
D. Revenue per ad = ₹3.00, Total revenue = ₹15,000



$Ex \Rightarrow (a+b)/2$

Question 6:

Scenario:
A food delivery app records the time taken for deliveries in minutes:

- 50% of the orders are delivered in 25 minutes.
- 30% take 35 minutes.
- 20% take 45 minutes.

$25 \Rightarrow 50\%$
$35 \Rightarrow 30\%$
$45 \Rightarrow 20\%$

Question 1: What is the expected delivery time?

Question 2: If a customer places 3 independent orders, what is the expected total delivery time?

Options:

A. Expected time = 30 minutes, Total time = 90 minutes
B. Expected time = 32 minutes, Total time = 96 minutes
C. Expected time = 35 minutes, Total time = 105 minutes
D. Expected time = 40 minutes, Total time = 120 minutes

$$E(X) \Rightarrow \sum_{i=1}^{3} (x_i \times P_i) \Rightarrow 32$$

(2) $E(X) \times 3 \Rightarrow 32 \times 3$

Question 7:

$\rightarrow \frac{1}{5}$

Scenario: A user plays a Google Pay cashback scratch card where they win ₹10, ₹20, ₹50, ₹100, or ₹500, each with an equal chance.

Question 1: What is the probability of winning ₹50? (Use PMF)

Question 2: What is the expected cashback a user will receive? (Use Expectation)

Options:

A. Probability = 0.25, Expected cashback = ₹136 ✓
B. Probability = 0.20, Expected cashback = ₹136
C. Probability = 0.10, Expected cashback = ₹100
D. Probability = 0.20, Expected cashback = ₹50

$$\sum_{i=1}^{n} P_i \times x_i$$

Good Question

Question 8:

Scenario: An Uber driver tracks ride durations in a city. Data shows that rides follow a normal distribution with:

- Mean ride time (μ) = 15 minutes
- Standard deviation (σ) = 3 minutes

Question 1: What is the probability that a randomly selected ride takes more than 20 minutes? $P(x > 20)$

Question 2: What is the expected ride duration, and what is the variance? $\rightarrow E(x) = \mu$ Var = σ^2

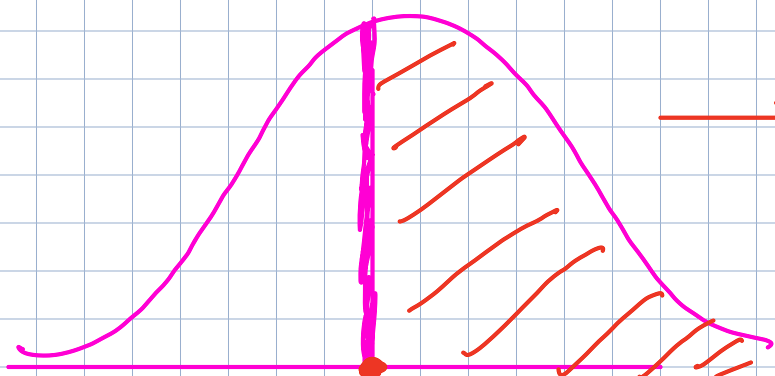
Question 3: What is the probability that a ride takes between 12 and 18 minutes?

12 and 18

Options:

A. P(X>20)=0.05, Expected = 15 min, Variance = 9, P(12<X<18)=0.68
B. P(X>20)=0.10, Expected = 18 min, Variance = 3, P(12<X<18)=0.50
C. P(X>20)=0.03, Expected = 15 min, Variance = 6, P(12<X<18)=0.70
D. P(X>20)=0.15, Expected = 12 min, Variance = 9, P(12<X<18)=0.60

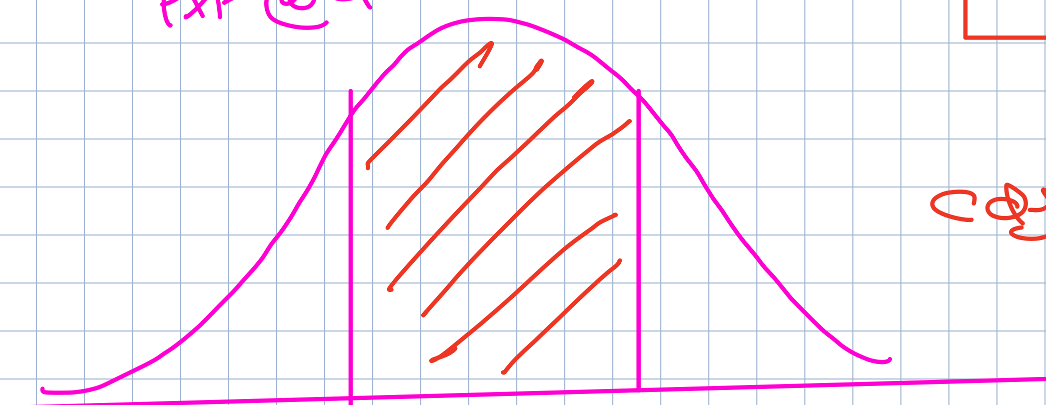
Normal :



$\rightarrow 1 - \text{cdf}(20)$

PDF @ 20

Tip: CDF or Gradient



12 18

$\text{cdf}(18) - \text{cdf}(12)$

Question 9:

Scenario: An iPhone's battery charging time (0% to 100%) is uniformly distributed between 1 hour and 2.5 hours.

Question 1:What is the probability that the phone is fully charged in less than 1.5 hours?

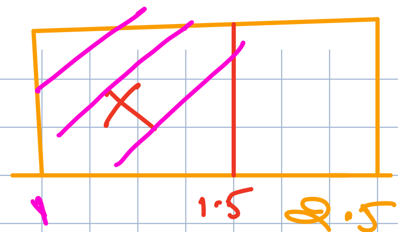
Question 2: What is the probability density (PDF) for any given charging time?

PDF

Options:

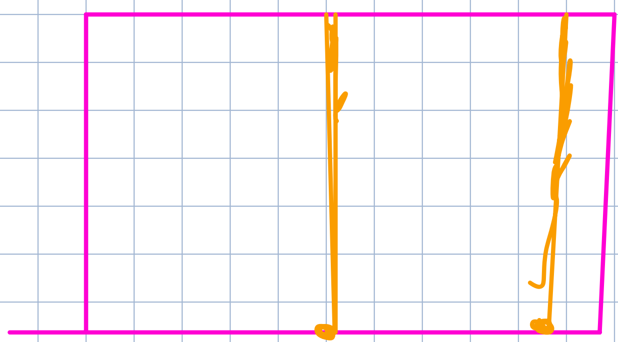
A. Probability = 0.33, PDF = 0.67 ✓
B. Probability = 0.50, PDF = 0.40
C. Probability = 0.25, PDF = 0.75
D. Probability = 0.67, PDF = 0.33

$P(X \leq 1.5) \Rightarrow$ C.D.F



area = 1

$2 \Rightarrow (2.5 - 1) \times$



Question 10:

P Positive 0.5

Scenario: A job seeker applies to multiple companies via LinkedIn. The probability of receiving a positive response from any company is 15% (0.15).

Question 1: What is the probability that the first positive response comes on the 5th application?

Question 2: What is the expected number of applications the user will need to send before getting a job offer?

Options:

A. Probability = 0.0783, Expected applications = 6.67
B. Probability = 0.1028, Expected applications = 5.50
C. Probability = 0.1250, Expected applications = 7.00
D. Probability = 0.0500, Expected applications = 8.00

$(1-0.15)^4 \quad (0.15)$

$E(X) = \frac{1}{P} = \frac{1}{0.15}$

b → S F F F F

F S F F F

— — S

S

S

5

G → F F F F S

→ Discrete

Question 11:

Scenario: A WhatsApp user receives an average of 5 messages per minute. The number of messages follows a Poisson distribution with λ=5.

Question 1: What is the probability that the user receives exactly 7 messages in a minute? → PMF

Question 2: What is the probability that the user receives at least 3 messages in a minute? → 3 4 5 —

Options:

A. P(X=7) = 0.1044, P(X≥3) = 0.8753
B. P(X=7) = 0.1200, P(X≥3) = 0.8600
C. P(X=7) = 0.0900, P(X≥3) = 0.8900
D. P(X=7) = 0.1100, P(X≥3) = 0.8800

1 − cdf(2)

5 Events/minute

Question 12:

Scenario: A Netflix user experiences buffering intervals that follow an Exponential distribution with rate $\lambda = 1/15$.(mean time 15 minutes).

Question 1: What is the probability that the next buffering occurs within 10 minutes? → Exp. cdf(10) $T \leq 10$

Question 2: What is the expected time until the next buffering, and what is the variance?

Options:

A. P(buffering within 10 min) = 0.4866, Expected time = 15.00 min, Variance = 225.00 min²
B. P(buffering within 10 min) = 0.6000, Expected time = 10.00 min, Variance = 100.00 min²
C. P(buffering within 10 min) = 0.4000, Expected time = 15.00 min, Variance = 150.00 min²
D. P(buffering within 10 min) = 0.3500, Expected time = 20.00 min, Variance = 400.00 min²

Search for this part

meantime → 15

Question 13:

A data analyst is studying the daily checkout times (in minutes) at a busy supermarket. These times are naturally right-skewed, meaning most customers check out quickly, but a few take significantly longer.

To simulate and validate the Central Limit Theorem (CLT) using synthetic data, your task is to:

1. Generate 10,000 checkout times from an exponential distribution. ← Size
2. Compute the mean of the entire population. ←
3. Randomly sample 30 values (with replacement) from the population.
4. Compute the sample mean.

   Compare the sample mean with the population mean and interpret the result.

Input Format:

Pop ⇒ Exp (1000)

Pop-mean ⇒

Question 14:

Scenario: A social media analytics firm is measuring the average watch time (in minutes) of videos. The standard deviation in watch time is 12 minutes.

They collect three random samples:

- Group A: 36 users minute
- Group B: 144 users minute
- Group C: 36 users (but values are scaled up (watch time measured in seconds, not minutes) Seconds

Sec → 2 min → 120 sec

Which of the following statements are TRUE about the Standard Error of each group?

A. SE of Group B is half that of Group A
B. SE of Group C is 60× SE of Group A
C. SE of Group A = 2 minutes
D. SE of Group B = 1 minute
E. SE of Group C = 120 seconds
F. Group C has same SE as A, just in different units
G. SE is independent of units used 120 2min

C → 120
D → 2 (different)

$\sigma = 12$ minute

SE → Group A → $\frac{\sigma_{pop}}{\sqrt{n}}$

$\Rightarrow \frac{12}{\sqrt{36}} = 2$

SE_B $\frac{12}{\sqrt{144}} = \frac{12}{12} = 1$

SE 2 mintue → 120 Secs

[120 150 300 -- 36]

Seconds

Question 15:

Scenario:
A tea company wants to estimate the average weight of tea in their new eco-friendly teabags. They randomly select a sample of teabags and weigh them. You are asked to compute:

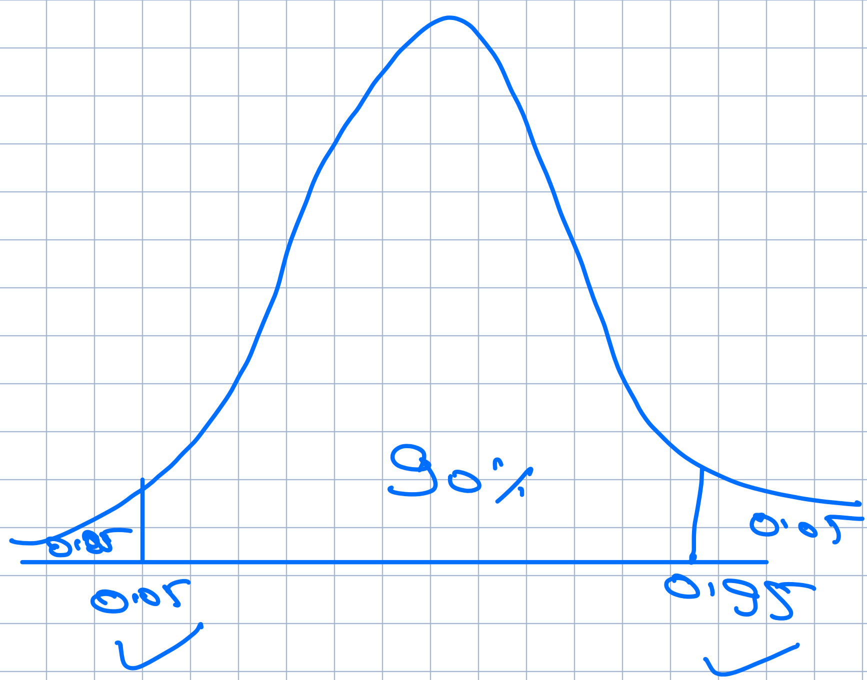
- The point estimate (mean weight), →
- The margin of error (MOE), and →
- The confidence interval (CI) using a specified confidence level. → CI

Input:

- A list of float values (weights of teabags in grams)
- A confidence level (e.g., 0.90, 0.95, 0.99) ⇒ 0.90

Output:

- Point Estimate (rounded to 2 decimal places)
- Margin of Error (rounded to 2 decimal places)
- Confidence Interval as a tuple (lower bound, upper bound) rounded to 2 decimal places



Z @ 0.005 or
0.995

99% CL