# Continuous Probability Distributions – Questions and Answers

## Normal Distribution

### Test Scores Problem

Given: X ~ N(µ = 500, σ = 100)

a) P(400 < X < 600) = Φ(1) - Φ(-1) = 0.6827 ≈ 0.6826

b) Score below which 90% fall = µ + z(0.90)\*σ = 500 + 1.2816×100 = 628.16

c) Top 5% score cutoff = µ + z(0.95)\*σ = 500 + 1.645×100 = 664.49

### Height Problem

Given: X ~ N(µ = 175, σ = 8)

a) P(X > 185) = 1 - Φ((185 - 175)/8) = 0.1056 ≈ 0.1056

b) Maximum height for shortest 10% = 175 + (-1.2816×8) = 164.75 cm

c) P(170 < X < 190) = Φ(1.875) - Φ(-0.625) = 0.7036 ≈ 0.6591

### Manufacturing Tolerance

Given: X ~ N(µ = 50, σ = 0.5)

a) % rejected = [4.55]%

b) P(49.5 < X < 50.5) = 0.6827 ≈ 0.6826

c) Expected accepted rods = (1 - 0.0455) × 10000 = 9545 rods

## Exponential Distribution

### Lifetime of Light Bulbs

a) P(X > 1200) = e^(-1200/1000) = 0.3012 ≈ 0.3010

b) P(X < 500) = 1 - e^(-500/1000) = 0.3935 ≈ 0.3935

c) Median lifetime = ln(2) × 1000 = 693.15 hours

### Customer Arrival Time

a) P(X < 2) = 1 - e^(-2/3) = 0.4866 ≈ 0.4866

b) P(X > 5) = e^(-5/3) = 0.1889 ≈ 0.1889

c) Time by which 75% have arrived = -3 ln(0.25) = 4.16 minutes

### Machine Repair Time

a) P(X < 20) = 1 - e^(-20/30) = 0.4866 ≈ 0.4866

b) P(X > 45) = e^(-45/30) = 0.2231 ≈ 0.2231

c) 90% of repairs completed by t = -30 ln(0.1) = 69.08 minutes