

Answer on Question #76860 – Math – Statistics and Probability

Question

1. A discrete random variable can be described by the Binomial distribution if it satisfies FOUR (4) conditions. State these conditions.

Solution

The number of experiments n is fixed.

Each experiment is independent.

Each experiment represents one of two outcomes ("success" or "failure").

The probability of "success" p is the same for each outcome.

2. A shoe factory in Umlazi in the district of Durban shows that 30% of customers use a credit card to make payment. On a particular morning, 7 customers purchase shoes from the store. Determine the probability that

Question

a. 3 customers will pay by credit card.

Solution

Using Binomial distribution:

$$p = 0.3, n = 7$$

$$P(x = 3) = C_7^3 p^3 (1 - p)^{7-3} = \frac{7!}{3! 4!} 0.3^3 0.7^4 = 0.2269$$

Question

b. At least one will pay by credit card.

Solution

$$P(x \geq 1) = 1 - P(x = 0) = 1 - \frac{7!}{0! 7!} 0.3^0 0.7^7 = 0.9176$$

3. The time it takes a randomly selected job applicant to perform a certain task is normally distributed with a mean value of 120 seconds and a standard deviation of 20 seconds. Determine the probability that a randomly selected candidate will complete the task

Question

a. between 100 and 130 seconds.

Solution

$$\begin{aligned} P(100 < x < 130) &= P\left(\frac{100 - 120}{20} < z < \frac{130 - 120}{20}\right) = P(-1 < z < 0.5) = \\ &= P(z < 0.5) - P(z < -1) = 0.6915 - 0.1587 = 0.5328 \end{aligned}$$

Question

b. between 75 and 100 seconds.

Solution

$$\begin{aligned} P(75 < x < 100) &= P\left(\frac{75 - 120}{20} < z < \frac{100 - 120}{20}\right) = P(-2.25 < z < -1) = \\ &= P(z < -1) - P(z < -2.25) = 0.1587 - 0.0122 = 0.1465 \end{aligned}$$

Question

c. within 75 seconds.

Solution

$$P(x < 75) = P\left(z < \frac{75 - 120}{20}\right) = P(z < -2.25) = 0.0122$$