Answer on Question #76755 – Math – Statistics and Probability

Question

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;

4.2.1 3 customers will pay by credit card. (4 marks)

4.2.2 At least one will pay by credit card. (4 marks)

Solution

This is binomial distribution with

$$p = 0.3, n = 7.$$

1.

$$P(x = 3) = \frac{7!}{3!\,4!}(0.3)^3(0.7)^4 = 0.2268945$$

2.

$$P(x \geq 1) = 1 - P(x = 0) = 1 - \frac{7!}{0!\,7!}(0.3)^0(0.7)^7 = 1 - (0.7)^7 = 0.9176457$$

Question

4.3 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;

4.3.1 between 100 and 130 seconds. (3 marks)

4.3.2 between 75 and 100 seconds. (3 marks)

4.3.3 within 75 seconds. (2 marks)

Solution

1.

$$P(100 < x < 130) = P\left(\frac{100 - 120}{20} < z < \frac{130 - 120}{20}\right) = P(-1 < z < 0.5) = P(z < 0.5) - P(z < -1)$$

From z table

$$P(z < 0.5) = 0.6915; P(z < -1) = 0.1587$$

Thus,

$$P(100 < x < 130) = 0.6915 - 0.1587 = 0.5328$$

2.

$$P(75 < x < 100) = P\left(\frac{75-120}{20} < z < \frac{100-120}{20}\right) = P(-2.25 < z < -1) = P(z < -1) - P(z < -2.25)$$

From z table

$$P(z < -2.25) = 0.0122; P(z < -1) = 0.1587$$

Thus,

$$P(75 < x < 100) = 0.1587 - 0.0122 = 0.1465$$

3.

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

From z table

$$P(z < -2.25) = 0.0122$$

Thus,

$$P(x < 75) = 0.0122$$