Answer on Question #51040 – Math – Statistics and Probability

3. Aquinas students were asked how many pizzas they have eaten in the last 10 days. Let the random variable X be the number of pizzas a student has eaten in the last 10 days. Picking a student at random, we have the following probabilities:

Number of Pizzas (# of Pizzas)	0	1	2	3	4 or more
P(x)	0.10	0.17	0.41	0.18	0.14

Find P(X>2)

4. Aquinas students were asked how many pizzas they have eaten in the last 10 days. Let the random variable X be the number of pizzas a student has eaten in the last 10 days. Picking a student at random, we have the following probabilities:

Number of Pizzas (# of Pizzas)	0	1	2	3	4 or more
P(X)	0.10	0.17	0.41	0.18	0.14

Find P(X<2)

5. A screw manufacturer makes specialized tiny screws that are 15mm long. The manufacturing process does not make every screw exactly 15mm long. Suppose we know that the lengths of the screws have population mean 15mm and population standard deviation 0.04mm.
To test for quality control, 100 screws are to be measured. What is the distribution of

Solution

3.

Number of Pizzas (# of Pizzas)	0	1	2	3	4 or more
P(x)	0.10	0.17	0.41	0.18	0.14

$P(X>2) = P(X=3)+P(X=4 \text{ or more}) = 0.18 + 0.14 = 0.32$

4.

Number of Pizzas (# of Pizzas)	0	1	2	3	4 or more
P(x)	0.10	0.17	0.41	0.18	0.14

P(X<2) =P(X=0)+P(X=1)= 0.10 + 0.17 = 0.27.

Because P(X>2) is evaluated in problem 3, another method is the following:

P(X<2)=1-P(X=2)-P(X>2)=1-0.41-0.32=1-0.73=0.27.

5.

Unfortunately, the statement of question is not complete. Nevertheless, this problem deals with normally distributed variables with mean $E(X_i) = 15$ mm and standard deviation

$sd(X_i) = 0.04$, where X_i is the length of *i*th screw.

Let $Y = X_1 + X_2 + \cdots + X_{100}$.

Distribution of random variable Y should be found in this question.

Assume that the lengths of screws are independent identical normally distributed random variables.

It is known that the sum of normally distributed random variables will be normally distributed, namely, Y is normally distributed with mean $E(Y) = 100E(X_i) = 100 \cdot 15 = 1500$ mm and

standard deviation $sd(Y) = \sqrt{\sum_{i=1}^{100} sd^2(X_i) + 2\sum_{i<j} r_{ij} sd(X_i) sd(X_j)}$ when X_i and X_j are dependent random variables (r_{ij} is Pearson's correlation coefficient between variables X_i and X_j) or $sd(Y) = \sqrt{\sum_{i=1}^{100} sd^2(X_i)}$ when X_i and X_j are independent random variables. Thus, $sd(Y) = \sqrt{\sum_{i=1}^{100} sd^2(X_i)} = \sqrt{100 \cdot 0.04^2} = 0.04 \cdot 10 = 0.4$ mm.

Finally the sum of screws lengths is normally distributed with mean of 1500 mm and standard deviation of 0.4 mm.