Answer on Question #45891 – Math – Statistics and Probability

Problem.

A shipment of 8 similar microcomputers to a retail outlet contains 3 that are defective. If a school makes a random purchase of 2 of these computers, find the probability distribution for the number of defectives? Also, find its mean and standard deviation.

Solution:

There are $8-3=5$ working microcomputers. There are $\binom{8}{2}=28$ ways to select 2 computers.

There are $\binom{3}{0}\binom{5}{2}=10$ ways to select 0 defective computers and 2 working computers.

The probability to select 0 defective computers is

$$P=\frac{10}{28}\approx 0.3571.$$

There are $\binom{3}{1}\binom{5}{1}=15$ ways to select 1 defective computers and 1 working computers.

The probability to select 1 defective computers is

$$P=\frac{15}{28}\approx 0.5357.$$

There are $\binom{3}{2}\binom{5}{0}=3$ ways to select 2 defective computers and 0 working computers.

The probability to select 1 defective computers is

$$P=\frac{3}{28}\approx 0.1071.$$

The numbers of defective microcomputers	0	1	2
Probability	$\frac{10}{28}$	$\frac{15}{28}$	$\frac{3}{28}$
(The numbers of defective microcomputers)^2	0	1	4

$$\text{Mean}=0\cdot\frac{10}{28}+1\cdot\frac{15}{28}+2\cdot\frac{3}{28}=\frac{21}{28}=0.75.$$

$$\text{Mean of the squares}=0\cdot\frac{10}{28}+1\cdot\frac{15}{28}+4\cdot\frac{3}{28}=\frac{27}{28}\approx 0.9642.$$

$$\text{Standard deviation}=\sqrt{\text{Mean of the squares}-\text{Mean}^2}=\sqrt{3/14}\approx 0.4629.$$

Answer:

The numbers of defective microcomputers	0	1	2
Probability	$\frac{10}{28}$	$\frac{15}{28}$	$\frac{3}{28}$

$\text{Mean}=0.75$, $\text{Standard deviation}=\sqrt{3/14}\approx 0.4629.$