1. Solved using Binomial model.

5% - computer parts produced are defective

16 parts contain:

a) $P(A) = P(X=3) = C_{16}^{3} \cdot (0{,}05)^{3} \cdot (0{,}95)^{13}$

b) $P(B) = P(X > 3) = 1 - P(X \leq 3)$

c) $P(C) = P(X \geq 1) = 1 - P(X=0) = 1 - (0{,}95)^{16}$

this is just a greedy solution

d) $P(D) = P(X<3) = P(X=0) + P(X=1) + P(X=2)$

this is how we should solve it at the exam

2. Trials = "occupy a seat"

Outcome = "seats for press" or "seats not for press".

200 seats, 10 seats for press, sampling done without replacement

hypergeometric distribution

$N = 200, \quad n = 150, \quad n_1 = 10$

Probability that in 150 objects, 10 objects have the characteristic and 140 do not have the characteristic

$$P(K=10) = \frac{C_{10}^{10} \cdot C_{140}^{150}}{C_{200}^{150}}$$

3. 10 laptops

7 good , 5 laptops bought

3 defect

a) Hypergeometrical model

$$P(A) = P(K=2) = \frac{C_3^2 \cdot C_7^3}{C_{10}^5}$$

b) $$P(K=2 \mid K\geq 2) = \frac{P(K=2 \cap K\geq 2)}{P(K\geq 2)} = \frac{P(K=2)}{P(K\geq 2)} =$$

$$= \frac{P(K=2)}{P(K=2)+P(K=3)}$$

4. trial: "run a test"

outcomes: " test finds an error" or " test does not find an error"

Success: "test finds an error"

probability of success is different in every trial

Poisson Model:

$n=5$ $P_1 = 0,1$ $P_2 = 0,2$ $P_3 = 0,3$ $P_4 = 0,4$ $P_5 = 0,5$

Polynomial: $P(X) = (0,1 \cdot X + 0,9)(0,2X+0,8)\cdot(0,3X+0,8)\cdot$

$(0,4X+0,6)\cdot(0,5X\cdot 0,5)$

a) $P(K \geq 1) = 1 - P(K=0) = 1 - (\text{coefficient of } x^0)$

$= 1 - 0{,}9 \cdot 0{,}8 \cdot 0{,}7 \cdot 0{,}6 \cdot 0{,}5$

b) $P(K > 2) = 1 - P(K \leq 2) = 1 - P(K=0) + P(K=1) + P(K=2)$

c) $P(K=5) = 0{,}1 \cdot 0{,}2 \cdot 0{,}3 \cdot 0{,}4 \cdot 0{,}5$

5) Trial; "user closes Windows"

outcomes: user is closing - bad

- good

success: user closes good

we do not know how many trials

Geometric Model

$p = 0{,}9$

$P(A) = P(X=2) = 0{,}9 \cdot (0{,}1)^2 = 0{,}009$

6) Trial: "Engineer tests a computer"

outcome: "PC good" or "PC bad"

Success: "PC is bad"

a) Binomial model:

$n = 20 \qquad p = 0{,}05$

$P(K=3) = C_{20}^{3} \cdot (0{,}05)^{3} \cdot (0{,}95)^{17}$

b) We don't have a number of trials

the experiment is repeated until something happens (we find the second bad computer)

So we are interested in the rank of our success.

B = "the second success in 5 or more trials" = "the second success after 3 or more failures"

$\overline{B}$ = the second success after 2 or less failures"

$\overline{B}$ follows Pascal (Negative Binomial) Model

$n = 2 \qquad p = 0{,}05 \quad , \quad K \in \{0,1,2\}$

$P(\overline{B}) = P_2(K \leq 2) = P(K=0) + P(K=1) + P(K=2) =$

$= \sum_{K=0}^{2} C_{K+1}^{1} (0{,}05)^{2} \cdot (0{,}95)^{K} \qquad P(B) = 1 - P(\overline{B})$