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Probability & Statistics B

(1) Sample space (Ω) = S

Defect = D

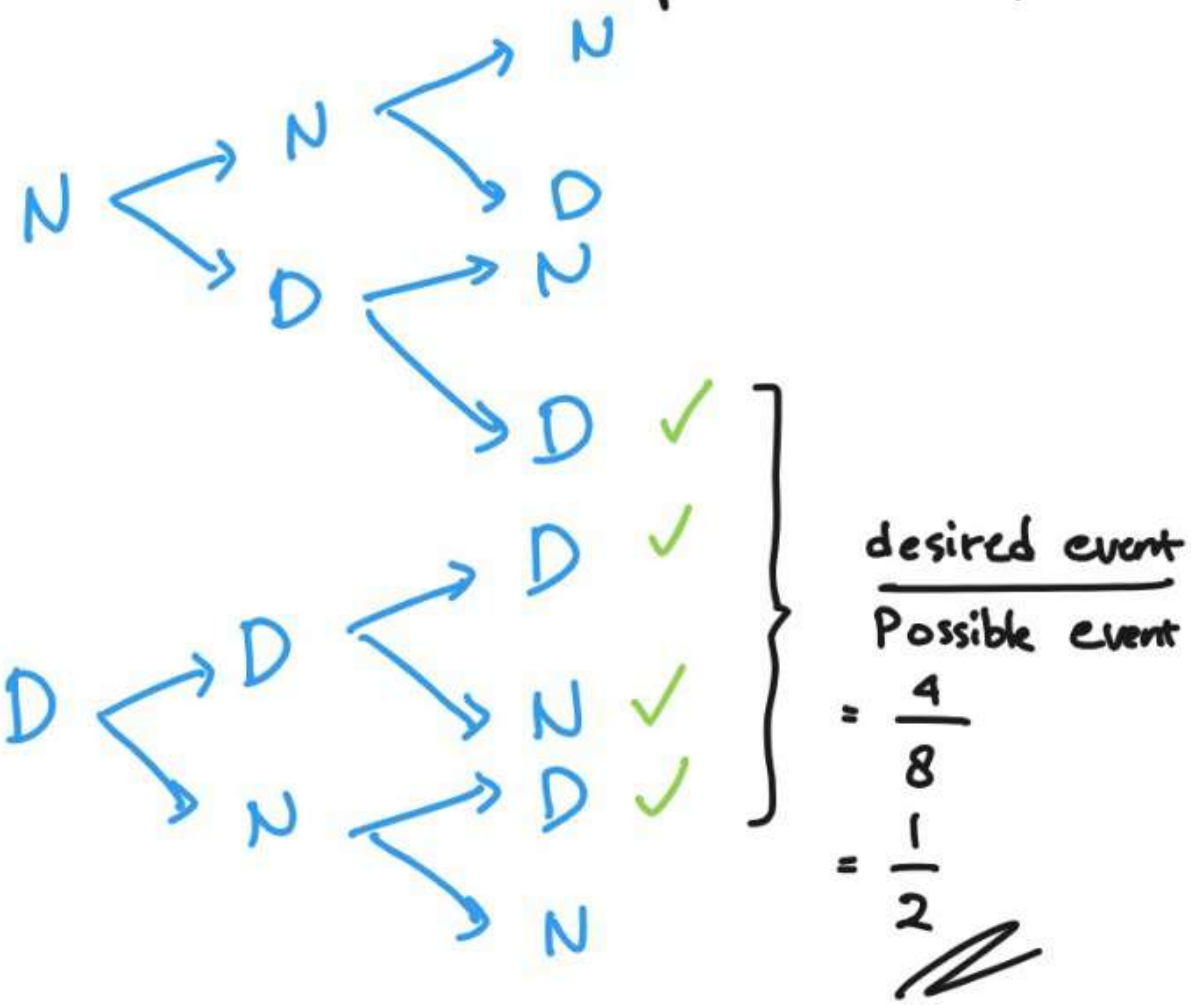
Normal = N

a. List of elements of a sample space

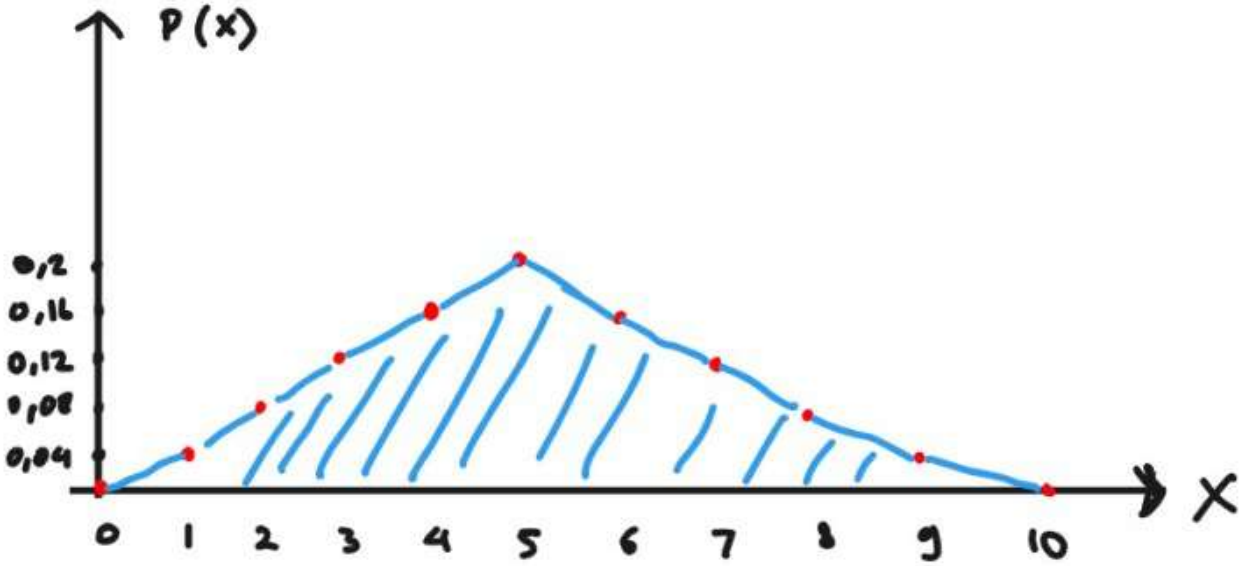
$S \Rightarrow P(s) = 2$

$S = \{D, N\}$

b. at least 2 component Defects



(2) a.



b. expected value → $E[X]$

→ $E[x] = \sum x\,(P(x))$

$$= 0.0 + 1 \cdot \frac{4}{100} + 2 \cdot \frac{8}{100} + 3 \cdot \frac{12}{100}$$

$$+ 4 \cdot \frac{16}{100} + 5 \cdot \frac{20}{100} + 6 \cdot \frac{16}{100}$$

$$+ 7 \cdot \frac{12}{100} + 8 \cdot \frac{8}{100} + 9 \cdot \frac{4}{100} +$$

$$10.0$$

$$E[x] = 5$$

Variance → $Var(x)$

$$Var(x) = E[x^2] - E[x]^2$$

$$= E[x^2] - 5^2$$

$$= 29 - 25 \Rightarrow Var(x) = 4$$

$$E[x^2] = 1^2 \cdot \frac{4}{100} + 2^2 \cdot \frac{8}{100} + 3^2 \cdot \frac{12}{100} + 4^2 \cdot \frac{16}{100} + 5^2 \cdot \frac{20}{100} +$$

$$6^2 \cdot \frac{16}{100} + 7^2 \cdot \frac{12}{100} + 8^2 \cdot \frac{8}{100} + 9^2 \cdot \frac{4}{100} + 10^2 \cdot 0$$

$$= 29$$

Standard Deviation

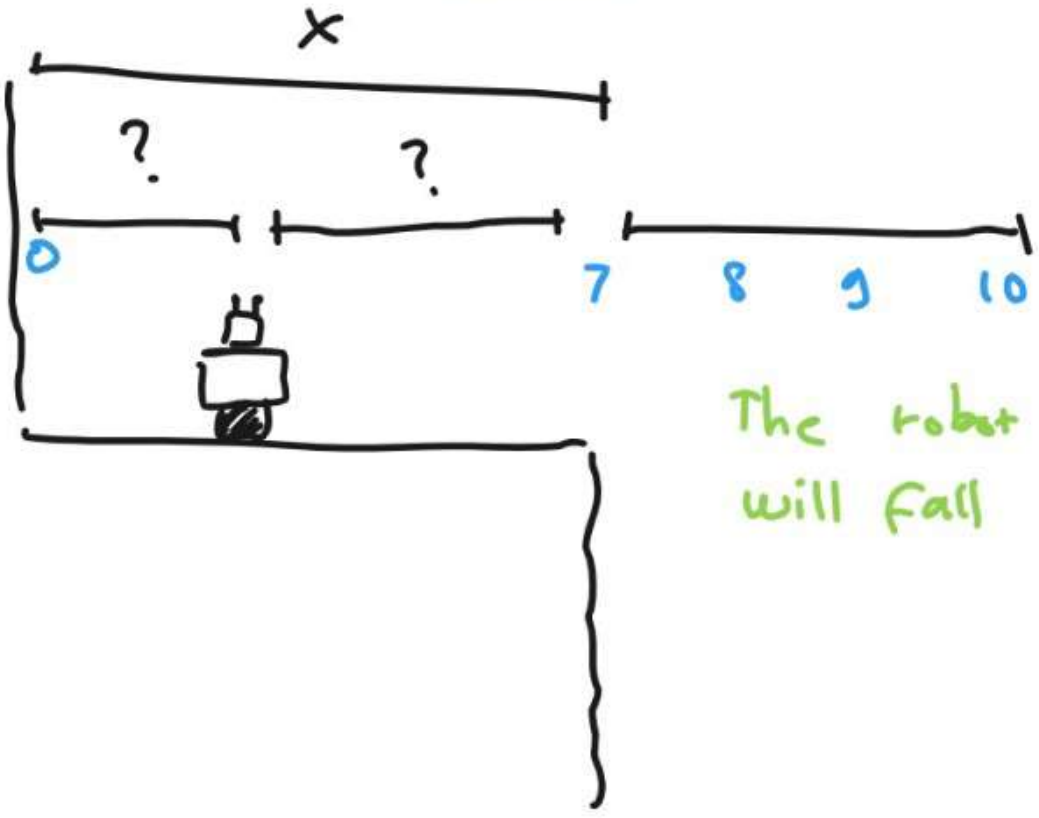
$$SD = \sqrt{Var(X)}$$

$$= \sqrt{4}$$

$$= 2$$

c. Probability the robot doesn't fall off cliff.

in the beginning, we know the distance between the wall and the cliff is 7 meter. So, the safe limit that the robot doesn't fall is when $x \leq 7$



So then, we want to know the probability that the robot doesn't fall off the cliff is :

$$P(x)_{total} = \sum_{x=0}^{7} P(x)$$

$$= \overset{0}{0{,}0} + \overset{1}{0{,}04} + \overset{2}{0{,}08} + \overset{3}{0{,}12} + \overset{4}{0{,}16} + \overset{5}{0{,}20} + \overset{6}{0{,}16} + \overset{7}{0{,}12}$$

$$= 0{,}88$$

So then, the probability that the robot doesn't fall off the cliff is 0,88