1

(1 1 1)	(2 1 1)	(3 1 1)
(1 1 2)	(2 1 2)	(3 1 2)
(1 1 3)	(2 1 3)	(3 1 3)
(1 2 1)	(2 2 1)	(3 2 1)
(1 2 2)	(2 2 2)	(3 2 2)
(1 2 3)	(2 2 3)	(3 2 3)
(1 3 1)	(2 3 1)	(3 3 1)
(1 3 2)	(2 3 2)	(3 3 2)
(1 3 3)	(2 3 3)	(3 3 3)

1	2	3
0	1	2
-1	0	1
2	3	4
1	2	3
0	1	2
3	4	5
2	3	4
1	2	3

a.

$P(X==1) = \frac{6}{27}$

$P(X==2) = \frac{7}{27}$

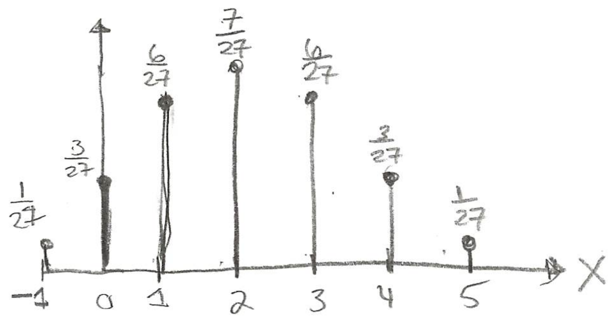
$P(X==3) = \frac{6}{27}$

$P(X=4) = \frac{3}{27}$

$P(X==5) = \frac{1}{27}$

$P(X==0) = \frac{3}{27}$

$P(X==-1) = \frac{1}{27}$



7+3

b

$$\boxed{E[X] = (-1)\left(\frac{1}{27}\right) + (0)\left(\frac{3}{27}\right) + (1)\left(\frac{6}{27}\right) + (2)\left(\frac{7}{27}\right) + (3)\left(\frac{6}{27}\right) + (4)\left(\frac{3}{27}\right) + (5)\left(\frac{1}{27}\right) = 2.00}$$

$$\boxed{Var(X) = \frac{1}{27}(-1-2)^2 + \frac{3}{27}(0-2)^2 + \frac{6}{27}(1-2)^2 + \frac{7}{27}(2-2)^2 + \frac{6}{27}(3-2)^2 + \frac{3}{27}(4-2)^2 + \frac{1}{27}(5-2)^2 = 2.00}$$

c

$P(|X| \geq 0) = 1$

$P(|X| \geq 1) = \frac{24}{27}$

$P(|X| \geq 2) = \frac{17}{27}$

$P(|X| \geq 3) = \frac{10}{27}$

$P(|X| \geq 4) = \frac{4}{27}$

$P(|X| \geq 5) = \frac{1}{27}$

$P(|X| \geq K) = 1$ for $K < 0$

$P(|X| \geq K) = 0$ for $K > 5$

② CDF of Geometric RV

$\sum_{K=1}^{N} p(1-p)^{K-1}$ $K = \{1, \ldots\}$ can succeed on 1

$p \sum_{K=1}^{N} (1-p)^{K-1}$

$p \left(\frac{1-(1-p)^N}{1-(1-p)} \right)$

$p \left(\frac{1-(1-p)^N}{p} \right)$

$1-(1-p)^N$

$1-(1-p)^N \geq .99$

$.01 \geq (1-p)^N$

$.01 \geq \left(\frac{3}{4}\right)^N$

$N \geq 17$) so 170 seconds before expire time

(3)

$$\boxed{\sum_{j=1}^{\infty} P(X \geq j) = \sum_{j=1}^{\infty} \sum_{k=j}^{\infty} P(X=k) = \sum_{k=1}^{\infty} \sum_{j=1}^{k} P(X=k) = \sum_{k=1}^{\infty} k\,P(X=k) = \mathbb{E}[X]}$$

as the double sum was over all different integer pairs (j,k) s.t. $1 \leq j \leq k < \infty$

(4). $P(E \text{ w/ year}) = p$

profit if A occurs

$$\begin{array}{cc} p & (1-p) \\ X-A & X \end{array}$$

profit

profit of 10% of A

$$\mathbb{E}[\text{profit}] = \frac{A}{10} = p(X-A) + (1-p)X$$

$$= pX - pA + X - pX$$

$$\frac{A}{10} = X - pA$$

$$X = pA + \frac{A}{10}$$

$$\boxed{X = A(p + 0.1)}$$

(5)

$$\sum_{k=0}^{3} \frac{\binom{4}{k}\binom{16}{3-k}}{\binom{20}{3}} \cdot k$$

$$= \frac{560}{1140} \cdot 0 + \frac{486}{1140} \cdot 1 + \frac{96}{1140} \cdot 2 + \frac{4}{1140} \cdot 3$$

$$\boxed{\mathbb{E}\left[\begin{smallmatrix}\text{defects in}\\ \text{sample}\end{smallmatrix}\right] = 0.600}$$

The problem follows a hypergeometric distribution, so use this info ...