-Dom Arishi
-Exercise 3

① X = the electricity power fail in a remote village
meaning = $\mu$ 20 = 3 failures every 20 weeks
∴ the ave num of failures per week = $\mu$ 3 ÷ 20 = $\boxed{0.15}$

failure per week;

$$P(X=x) = \frac{(e^{-\mu})(\mu^x)}{x!} \quad , \quad e = 2.718$$

ⓐ P(there will be no failure during a particular week)

$$= P(X=0) = \frac{(e^{-0.15})(0.15^0)}{0!} = \boxed{0.8607}$$

ⓑ P(there will be exactly 2 failures during a particular week) = $P(X=2) = (e^{-0.15})(0.15^2)/2! = \boxed{0.0097}$

ⓒ P(there will be at most 2 failure during a particular week)
$= P(X\le 2) = P(X=0) + P(X=1) + P(X=2)$
$= (e^{-0.15})(15^0)/0! + (e^{-0.15})(15^1)/1! + (e^{-0.15})(15^2)/2!$

$= \boxed{0.9995}$

②
ⓐ 1h ⟶ 6 Shooting stars
2h ⟶ 6×2 = 12 ⟹ $\lambda = 12$

$$p(X) = \frac{\lambda^x e^{-\lambda}}{X!} = \frac{12^x e^{-12}}{X!}$$

$p(\text{at least one}) = p(X \ge 1)$
$= 1 - p(X=0)$
$= 1 - \frac{12^0 e^{-12}}{0!}$

$= 1 - e^{-12}$
$= 1 - 0.0000061$
∴ The prob = 0.999994

at most 2 $= P(X \le 2)$

$$= P(X=0) + (X=1) + P(X=2)$$

$$= \frac{12^0 e^{-12}}{0!} + \frac{12^1 e^{-12}}{1!} + \frac{12^2 e^{-12}}{2!}$$

$$= e^{-12} + 12e^{-12} + 72e^{-12} = 85e^{-12} = \boxed{0.00052}$$

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$\boxed{2.2}$

① total $(50+40) = 90$ Representatives out we have not choosing 7 out of 90 of which exactly 3 must be democrates

$\therefore$ the Prob $= \frac{{}^{40}C_3 \cdot {}^{50}C_{(7-3)}}{{}^{90}C_7}$

$$= \frac{(9880)(230300)}{7471375560} = \boxed{0.3045}$$

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② $P(\text{exactly 3 desserts}) = \frac{\binom{20}{2} \times \binom{10}{3}}{\binom{30}{3}}$

$$= \frac{190 \times 120}{142506} = \boxed{0.1600}$$

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$\boxed{3.2}$

| ① what x denotes | Distribution of X |
|---|---|
| | $X \sim$ Bernoulli (0.07) |
| | $X \sim$ Binomial (100, 0.07) |
| | $X \sim$ Pascal (1, 0.07) |
| | $X \sim$ Pascal (4, 0.07 |

(2) $P$ = Prob of frinend is living in his (Emile) neighborhood
$= 0.3$

$n = 34$
$X$ = his member of friends is living in 5-mile, in his neiborhood
$\therefore X \sim Bin(34, 0.3)$, $P(X=K) = {}^{n}C_{K}\, p^{K}(1-p)^{n-K}$

$\therefore = P(X=10) = {}^{34}C_{10}\, p^{10}(1-p)^{34-10}$

$= \frac{34!}{10!\,24!} p^{10}(1-p)^{24}$

$\boxed{= 0.1483}$

(b)

$P(X=K) = P(1-P)^{K}$
$= P(X=5) = P(1-P)^{5} = (0.3)(0.7)^{5} = \boxed{0.0504}$

(c) $n = 7$ $\quad r = 2$ students

$X \sim$ Negative binomial distribution $n = 8$, $r = 2$
$P(X=n) = {}^{n-1}C_{r-1}\, P^{r}(1-P)^{n-r}$

here $P(X=78) = {}^{7}C_{1}\, P^{2}(1-P)^{5}$
$= 76 \times P^{2}(1-P)^{5} = \boxed{0.0467}$

Prob that Godal + hectre asked 7 students in his class before he first the first two students who lives in his neibohood $= 0.0467$

③ $= P(X \geq 2)$

$= X \sim$ binomial $(20, 0,40)$

$\therefore P(X \geq 2)$

$= 1 - P(X < 2)$

$= 1 - (P(X=0) + P(X=1))$

$= 1 - (0,60)^{20} - 20 \times (0,40)(0,60)^{19}$

$= 1 - 0,0003 - 0,0004 = \boxed{0,9993}$

ⓑ $= b.q + q.b$ (when $q$ = Prob of failure)

$= 0,40 \times 0,60 + 0,60 \times 0,40 = \boxed{0,48}$

ⓒ $X \sim$ Binomial $(5, 0,40)$

So, $P(X = 3)$

$= \binom{5}{3} (0,40)^3 (0,60)^2 = \boxed{0,230}$

ⓓ $= b \times b \times b$

$= 0,40 \times 0,40 \times 0,40 = \boxed{0,064}$