Ex. 82 page 91

p(a vehicle passes) = 0.70

a) P(all the next 3 vehicles pass)

V_1 passes, V_2 passes, V_3 passes.

P(all 3 pass) $= 0.7 \times 0.7 \times 0.7$
$= \underline{0.343}$

Event B

b) P(at least 1 of the next 3 fails)

V_1 can fail, V_2 can fail V_3 can fail

$V_1 V_2$ can fail, $V_1 V_3$ can fail...

$P(B) = 1 - P(B')$

B' = all 3 vehicles pass.

$P(B') = 0.343$

$P(B) = 1 - 0.343 = 0.657$

c) P(exactly 1 passes) = ?

either 1st or 2nd or 3rd passes &

the remaining 2 fails.

$\underline{(V_1)}_p (V_2)_f (V_3)_f$ or $(V_1)_f (V_2)_p (V_3)_f$

or $(V_1)_f (V_2)_f (V_3)_p$

$$P(\text{exactly 1 passes}) = (0.7)(0.3)(0.3) + (0.3)(0.7)(0.3) + (0.3)(0.3)(0.7)$$

$$= 0.189$$

d) $\underbrace{P(\text{none passes})}_{(0.3)(0.3)(0.3)} + P(\text{exactly 1 passes})$

$(0.3)(0.3)(0.3) + 0.189 = 0.216$

e) $$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{P(A)}{P(B)}$$

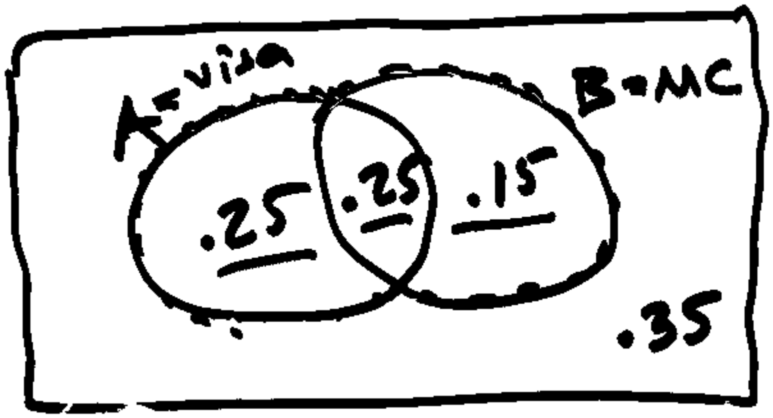
$$P\left(\text{all 3 pass} \middle| \begin{array}{l}\text{at least}\\ \text{1 passes}\end{array}\right) = \frac{0.343}{\underbrace{0.973}_{P(B)}} = 0.353$$

$P(B) = P(\text{at least 1 passes})$

$= 1 - P(\text{all fail})$

$= 1 - (0.3)^3 = 0.973$

Ex. 47 page 83

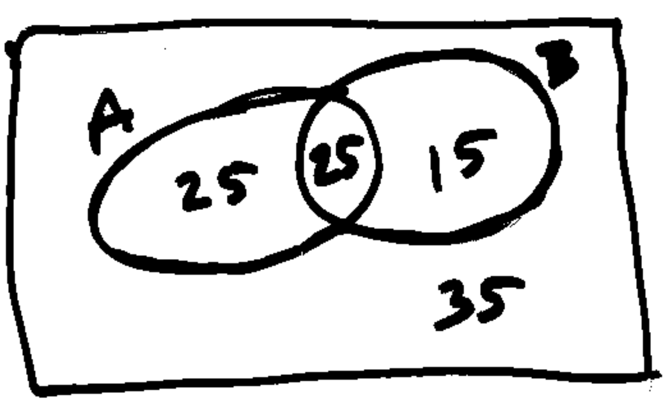


Graphical way.

e) $\dfrac{.25+.25}{.65} = .7692$ OR $P(A \mid A \cup B)$

$$P(A \mid A \cup B) = \frac{P(A \cap (A \cup B))}{P(A \cup B)}$$

$$= \frac{P(A)}{0.65} = \frac{0.5}{0.65} = .7692$$



# of students = 100

Number of students with at least one card = 65 $\dfrac{50}{65} = .7692$

Poisson Distb Example.

Avg. # of accidents = 5/day

b) P(having at most 4 accidents the next day)

X = the # of accidents during the next day

$P(X \leq 4) = P(X=0) + P(X=1) + \dots + P(X=4)$

$= p(0;5) + p(1;5) + p(2;5) + \dots + p(4;5)$

$$p(x;\lambda) = \frac{\lambda^x}{x!} \cdot e^{-\lambda}$$

$$= \frac{5^0}{0!} \cdot e^{-5} + \frac{5^1}{1!} \cdot e^{-5} + \frac{5^2}{2!} e^{-5} + \dots + \frac{5^4}{4!} e^{-5}$$

$= 0.44049\ldots$

c) P(X is an odd number)

$x = 1, 3, 5, 7, \dots$

$P(X \text{ is odd}) = p(1;5) + p(3;5) + \dots$

Poisson dist. with time interval >1 L7

a) $P(Y=11)$ Y is the # of accidents during the next 3 days.

$t = 3$ days $\lambda = 5$ accidents/day

$p(y;\lambda t) = p(11;(5)(3)) = p(11;15)$

$p(11;15) = \frac{(\lambda t)^y}{y!} \cdot e^{-(\lambda t)} = \frac{(15)^{11}}{11!} \cdot e^{-15}$

$= 0.0662874$

b) P(at least 11 accidents in the next 3 days)

$= 1 - P$(at most 10 accidents in the next 3 days)

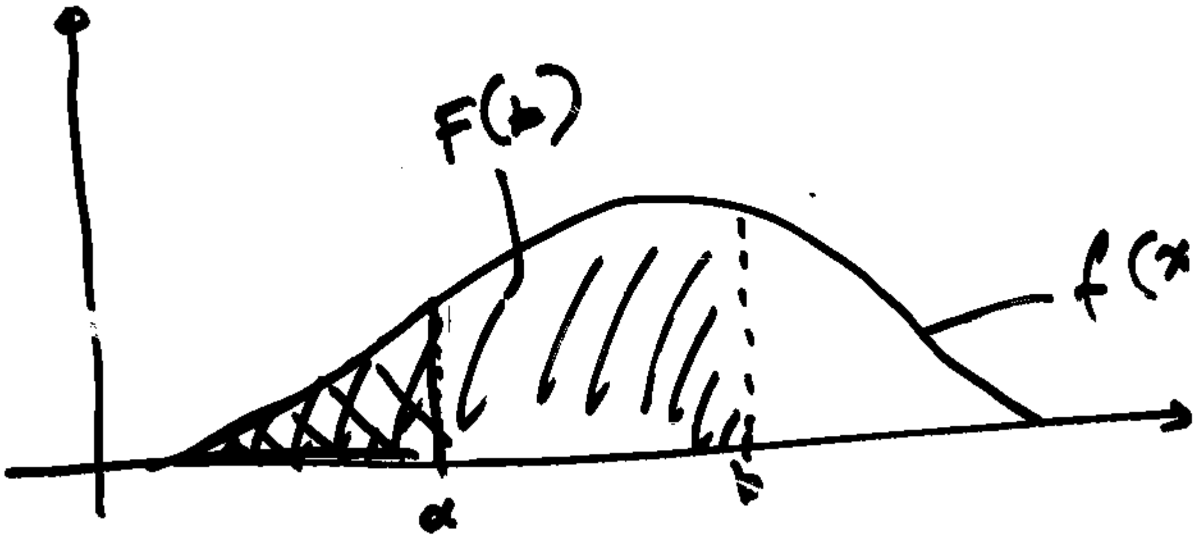
$= 1 - \underbrace{[p(0;15) + p(1;15) + p(2;15) + \cdots + p(10;15)]}_{0.11846412}$

P(at least 11 accidents in the next 3 days) $= 1 - 0.11846412 = 0.88153\ldots$

c) P(at most 18 accidents in the next 4 days) $= \sum_{i=0}^{18} p(i;20)$

$\lambda t = (5)(4) = 20$ $= 0.381421949$

Calculating probabilities using $F(X)$



$F(b)$ = shaded area + crossed area

$F(a)$ = crossed area

$$p(a \leq X \leq b) = F(b) - F(a)$$
$$= \text{shaded area.}$$