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Theory

Q1 (i) Given Random Variable in the question are:-

X : Event that the person has travelled
Y : Event that the person has caught Corona
Z : Event that the person has caught a disease other than Corona
A : ~~Mild~~ Severe that a person has caught
B : An ~~an~~ event that the person has died

a. $P(X \cap (Y \cup Z)) = 0.0825$

b. $P(A = \text{Severe} \cap X \mid X) = 0.22$
$P(A = \text{mild} \cap X / X) = 0.15$

c. $P(Z \mid X) = 0.485$

d. $P(Z \mid X \cap Z) = 0.24$

e. $P(\text{Severe} \cap X \cap \neg X) = 0.025$

f. $P(\text{Severe} / \neg X) = 0.457$

g. $P(B \cap X) = 0.059$

h. $P(A_{\text{Severe}}) = 0.1$

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(i) $P(Y) = P(Y \cap X) + P(Y \cap \neg X)$
$= 0.5$

(ii) Yes all these create valid probability ~~do~~ distribution as these:-

~~all~~

a. All are non-negative
b. If we calculate sum of all probability it will be 1.
~~c. Now Now~~

(iii) To calculate

Q2.

a. Yes we should switch. For choosing the door there's a $\frac{1}{3}$ probability if the key ~~key~~ is ~~kept~~ behind it.

Now if person ~~sees~~ reveals a door with a life lost. Now the probability of the key is kept behind the other door is unopened is

$$P(\text{Unopened door}) = 1 - P(\text{door opened})$$

$$= 1 - \frac{1}{3} = \frac{2}{3}$$

b. Now ~~for in~~ also for in this scenario to get the maximum the chances of winning again it will be

$$P(\text{Unopened door}) = 1 - P(\text{Door open})$$

$$= 1 - \frac{1}{3} = \frac{2}{3}$$

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c. Probability to win the Key is

~~P(…) If the probability of lo…~~

Now luckily the man open the door by mistake and one is key is behind the door. So, thus probability of winning will be if the lost is $\frac{1}{2}$. Thus

$$P(\text{Winning}) = 1 - P(\text{Loss})$$
$$= 1 - \frac{1}{2} = \frac{1}{2}$$

d. Probability of winning key if a person revealed the doors by mistakenly is $\frac{1}{2}$

Now probability if the man revealed door will lose life is 0.

Thus,

Conditional expectation:

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$E[\text{Key} / \text{Switch}] = \frac{1}{2} \times$ Value of Key

Now for Sticking

Probability of key if man reveals reveals the door with life loss = 0

Probability if man revealed the door with loss life $\frac{1}{3}$

Thus Conditional expectation

$E[\text{Key} / \cancel{\text{Stick}}\ \text{Stick}] = \frac{1}{3} \times$ value of key

Now comparing both of these

We get
$E[\text{Key} / \text{Switch}] > E[\text{Key} / \text{Stick}]$