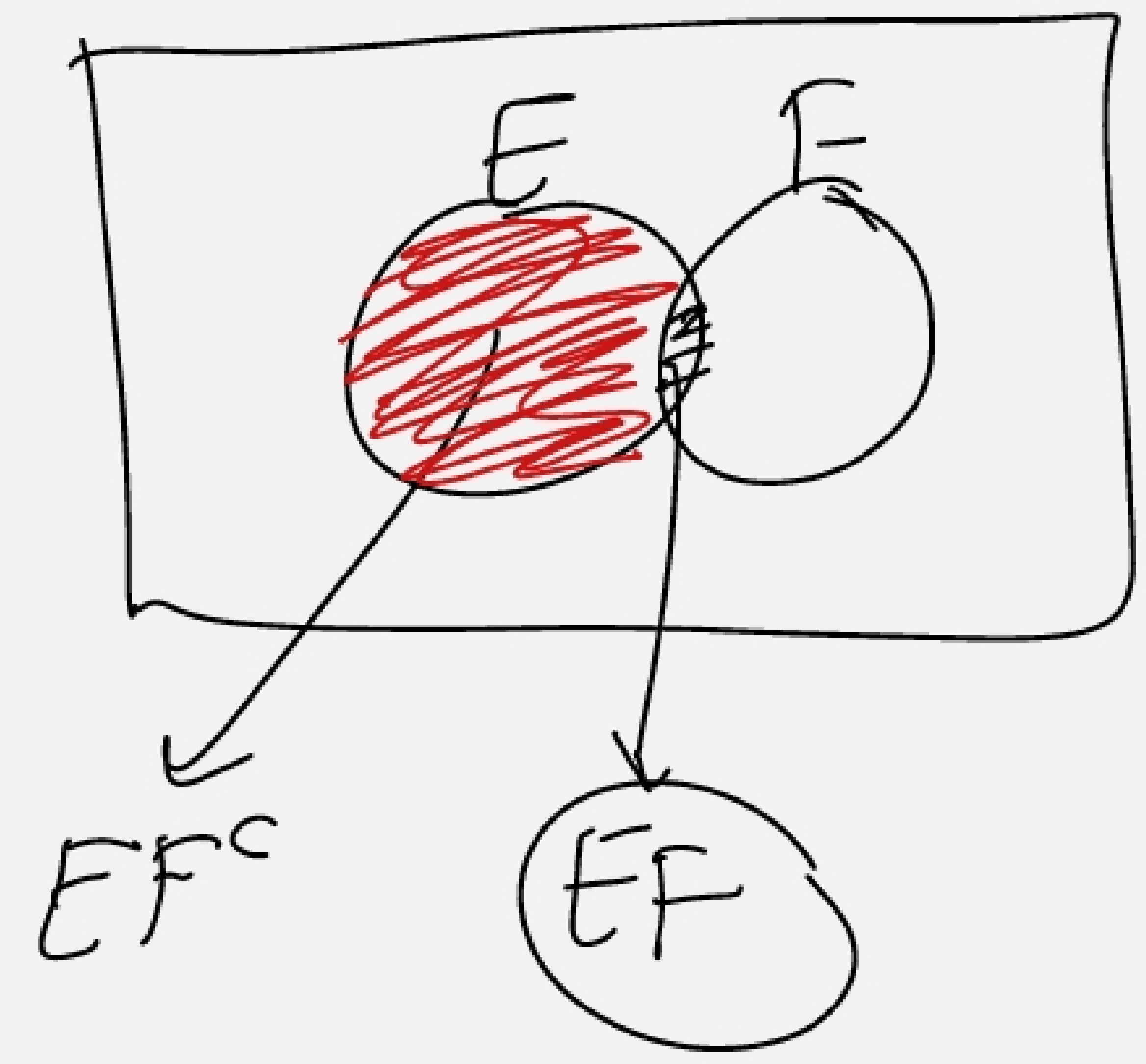
Multiplication rule:

$$P(ABC) = P(A)\,\underbrace{P(B|A)\,P(C|AB)}_{\text{conditions}}$$

Bayes Formula.

$$\boxed{E = EF \cup EF^c}$$



$$P(E) = P(EF \cup EF^c)$$
$$= P(EF) + P(EF^c)$$
$$= P(E)P(F|E) + P(E)P(F^c|E)$$

$$P(F^c) = 1 - P(F)$$

$$P(E) = P(EF^c \cup EF)$$

$$= P(EF^c) + P(EF)$$

$$= \boxed{P(F^c)P(E|F^c)} + P(F)P(E|F) \rightarrow \boxed{(1-P(F))P(E|F^c) + P(F)P(E|F)}$$

$$= \boxed{P(E)P(F^c|E)} + P(E)P(F|E)$$

$$P(E) = (1-P(F))P(E|F^c) + P(F)P(E|F)$$

$P(E)$ is weighted avg. of conditional prob of E given F & E given F^c.

$$y = w_1 y_1 + w_2 y_2$$

Q

D: person has disease

E: test +ve.

$P(D|E)$ = To find

$$P(D|E) = \frac{P(DE)}{P(E)} = \frac{P(E|D)\cdot P(D)}{P(E|D^c)\cdot P(D^c) + P(E|D)\cdot P(D)}$$

Given: $P(E|D^c) = 0.01$

$P(E|D) = 0.95$

$P(D) = 0.005$

Q

spring date late $p = 0.3$ $\longrightarrow$ $P(E|F) = 0.3$

non " " $p = 0.1$ $\longrightarrow$ $P(E|F^c) = 0.1$

E: late to work

F: rain

$p = 0.7$, rain tommorrow $\longrightarrow$ $P(F) = 0.7$

0.76

a) find prob that he is early tomorrow $\longrightarrow$ $P(E^c) = 1 - P(E)$

b) Given that he was early, what's conditional prob that it rained

$P(E|F^c) \cdot P(F^c) + P(E|F)P(F)$

Find $(F|E^c) = \dfrac{P(FE^c)}{P(E^c)}$

b) $P(R|E^c)$

$$P(\text{Rain}|\text{Early}) = \frac{P(\text{Rain } \& \text{ Early})}{P(\text{Early})} = \frac{P(\text{Early}|\text{Rain})\,P(\text{Rain})}{P(\text{Early})} = \frac{0.7 \times 0.7}{0.76}$$

ans from (a)

$$= \frac{49}{76}$$

$$= 0.64$$