Conditional probability

the chance of an event to occur Given that some prior event already happened

biased coin

h ⇒ 70%

t ⇒ 30%

P(t) = 0.3

unbiased

toss a coin

S = {h, t}

P(h) = 1/2 = 0.5

P(t) = 1/2 = 0.5

Ch 3

Def ⇒ When some partial information regarding an experiment is given,

Conditional prob comes in picture

$p = 1/36$ (2 dice rolled)

Given that 1st is a 3, what's prob that sum is 8

info.

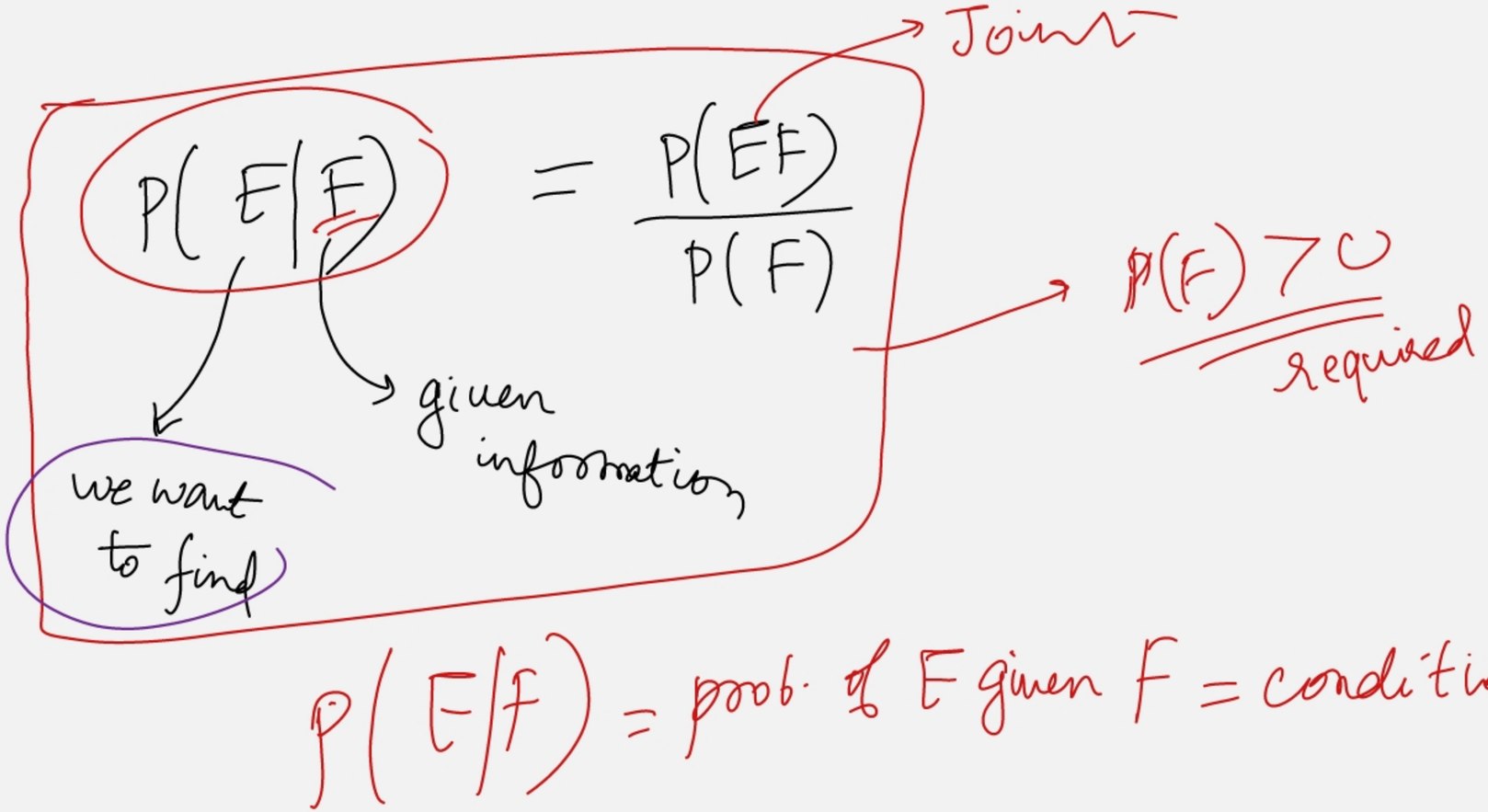
SS = {(1,1) (1,2) . .
(2,1) (2,2) . .
(3,1), (3,2)
(4,1), (4,2)
(5,1) (5,2) . . .
(6,1)

New SS'
= {(3,1) (3,2) (3,3) (3,4) (3,5), (3,6)}

event E

$$P(E) = \frac{\#\text{times } E \text{ occurs}}{\text{sample space}} = \frac{E}{SS}$$

$$= \frac{\text{8 as sum.}}{\text{reduced sample space}} = \frac{E}{SS'} = \frac{1}{6}$$



$P(E|F)$ = prob. of E given F = conditional prob.

$p = 80\%$ for left or right

40% left

40% right

Events L: key in left ✓

R: key in right ✓

$$P(R \mid L^c) = \frac{P(RL^c)}{P(L^c)}$$

$$= \frac{P(R)}{1 - P(L)} = \frac{0.4}{0.6}$$

$$= 2/3$$

$P(A \cap B) = P(A)\,P(B) \Rightarrow$ product $= P(AB)$

$P(A \cup B) = P(A) + P(B) \Rightarrow$ sum.

$P(RL^c)$ — R and L^c — right & left^c — right.

Q) Coin flipped twice. find conditional prob. that both land on heads given a) 1st land on Heads and b) atleast one lands on heads.

Sol:

A = both heads

B = 1st Head

C = atleast 1 Head

(h,h)

(h,t)

(h,h)

(h,t) (t,h), (h,h)

a) $P(A|B) = \frac{P(AB)}{P(B)} = \frac{P\{(h,h)\}}{P\{(h,h),(h,t)\}} = \frac{1/4}{2/4} = \frac{1}{2}$

b) $P(A|C) = \frac{P(AC)}{P(C)} = \frac{P\{h,h\}}{P\{(h,h),(h,t),(t,h)\}} = \frac{1/4}{3/4}$

$= \frac{1}{3}$

$$P(\text{A given B}) = \frac{P(\text{A and B occur together})}{P(\text{B occuring})}$$

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