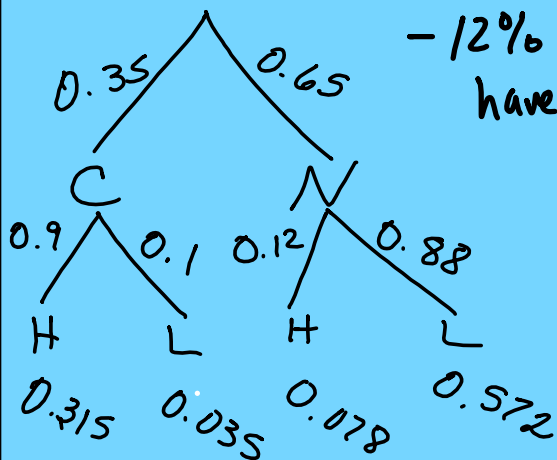# CONDITIONAL PROBABILITY

52% of upperclassmen are juniors.
Of those juniors, 65% are male.
45% of seniors are female.

1) Conditional Prob.
2) Expected Value

If a male is selected, what is the prob he is a junior?

Covid epidemic — 35% of students have C-19
Of those with C-19, 90% have high temp
— 12% of those with other illnesses
have a high temp.

P(NL) = 0.572

P(H) = CH OR NH
       0.315 + 0.078
     = 0.393

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

If a student has low/normal
Temp, what is the prob.
he/she has the C-19?

Conditional — has a Known
fact

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

find   given   Know

$P(C|L_{if}) = \dfrac{P(CL)}{P(L)}$

$\doteq \dfrac{0.035}{0.035 + 0572}$

$= 0.0577$

EXPECTED VALUE (FAIR GAME THEORY)

Dice Game

Roll 1,2,3 Win $10
Roll   4,5   Lose $30
Roll   6   Win $25

Event	1,2,3	4,5	6
Prob	$\frac{3}{6} = \frac{1}{2}$	$\frac{2}{6} = \frac{1}{3}$	$\frac{1}{6}$
Gain/Loss	-9	+31	-24

Pay $1 to play

From the owner's perspective

Expected Value = (Prob)(Gain/Loss)

$$E.V. = \left(\frac{1}{2}\right)(-9) + \left(\frac{1}{3}\right)(31) + \left(\frac{1}{6}\right)(-24)$$

$$= \$1.83/game$$

$1400 Collision Ins

$500 deductible

Car is worth $10,000.

From perspective
of the insured
person:

Total Car	> $5000	$1000	No Accid.
Prob.			
0.05	0.02	0.03	0.9
10000 −500 −1400	5000 −500 −1400	1000 −500 −1400	−1400
8100	3100	−900	

Gain / Loss

$(0.05)(8100) + (0.02)(3100) + (0.03)(-900) +$
$(0.9)(-1400)$

$= -820$ per yr.

E.V. = (2240)(0.02) + (1240)(0.03) + (240)(0.05) + (0.9)(-160) = -$50

Policy owner is losing $50 per payment period. (Company gains $50 per payment period.)