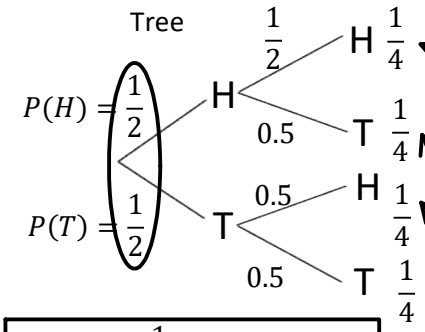
P12 - 2.3 - Tree/Venn/Table Probability

Flip a Coin $let\ H = Heads$, $let\ T = Tails$ $P(H) = \frac{1}{2}$ $P(T) = \frac{1}{2}$ $P(H) + P(T) = \frac{1}{2} + \frac{1}{2} = 1$

Bernoulli Trials - Success/Failure

Flip a Coin Twice

Tree



Multiplication (Branches)

$P(HH) = P(H) \times P(H) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

Addition (Leaves)

$P(H \cap T) = \frac{1}{4} + \frac{1}{4} = \frac{1}{2}$ $P(TT) = \frac{1}{4}$

$\cap : AND$

Table

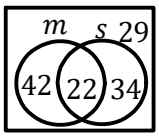
	H	T
H	HH	HT
T	TH	TT

$p(H|H) = \frac{1}{2}$; $Independent$

$given: |$

$p(H \geq 1) = p(H,H) + p(H,T) + p(T,H) = \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3}{4}$

$p(H \geq 1) = 1 - p(0H) = 1 - \frac{1}{4} = \frac{3}{4}$



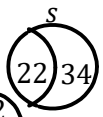
$let\ m = takes\ Math$
$let\ s = takes\ Science$

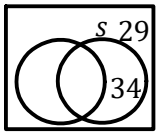
$p(m \cap s) = \frac{22}{127}$ $p(m \cap \bar{s}) = \frac{42}{127}$ $p(\bar{m} \cap \bar{s}) = \frac{29}{127}$

$p(m) = \frac{42 + 22}{126} = \frac{64}{127}$

$p(\bar{m}) = 1 - \frac{64}{127} = \frac{63}{127}$

$p(s) = \frac{22 + 34}{127} = \frac{56}{127}$





$p(m|s) = \frac{22}{22 + 34} = \frac{22}{56}$

$p(\bar{m}) = \frac{34 + 29}{127} = \frac{63}{127}$

$p(s|\bar{m}) = \frac{34}{34 + 29} = \frac{34}{63}$

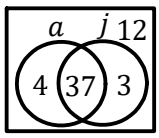
$p(m \cup s) = p(m) + p(s) - p(m \cap s)$

$p(m \cup j) = \frac{64}{127} + \frac{56}{127} - \frac{22}{127}$

$p(m \cup j) = \frac{98}{127}$

	> 18	< 18	$Total$
$Has\ a\ Job$	37	3	40
$Has\ no\ Job$	4	12	16
$Total$	41	15	56

$let\ a = above\ 18$
$let\ b = below\ 18$
$let\ j = has\ a\ Job\ (j)$



Not as intuitive as a Table

$p(a) = \frac{41}{56}$ $p(\bar{a}) = 1 - \frac{41}{56} = \frac{15}{56}$

$Total$	41	15	56

$p(b) = \frac{15}{56}$ $p(\bar{b}) = 1 - \frac{15}{56} = \frac{41}{56}$

$Note : p(a) = p(\bar{b})$

$p(j) = \frac{40}{56}$

$p(\bar{j}) = 1 - \frac{40}{56} = \frac{16}{56}$

$Total$
40
16
56

$p(a \cap j) = \frac{37}{56}$ $p(a \cap \bar{j}) = \frac{4}{56}$

$p(a|j) = \frac{37}{40}$

$Has\ a\ Job$	37	3	40

$p(a \cup j) = p(a) + p(j) - p(a \cap j)$

$p(a \cup j) = \frac{41}{56} + \frac{40}{56} - \frac{37}{56}$

$p(a \cup j) = \frac{44}{56}$

$p(a|j) = \frac{p(a \cap j)}{p(j)}$

$p(a|j) = \frac{\frac{37}{56}}{\frac{40}{56}}$

$p(a|j) = \frac{37}{56} \times \frac{56}{40}$

$p(a|j) = \frac{37}{40}$

$p(j|a) = \frac{37}{41}$

> 18
37
4
41