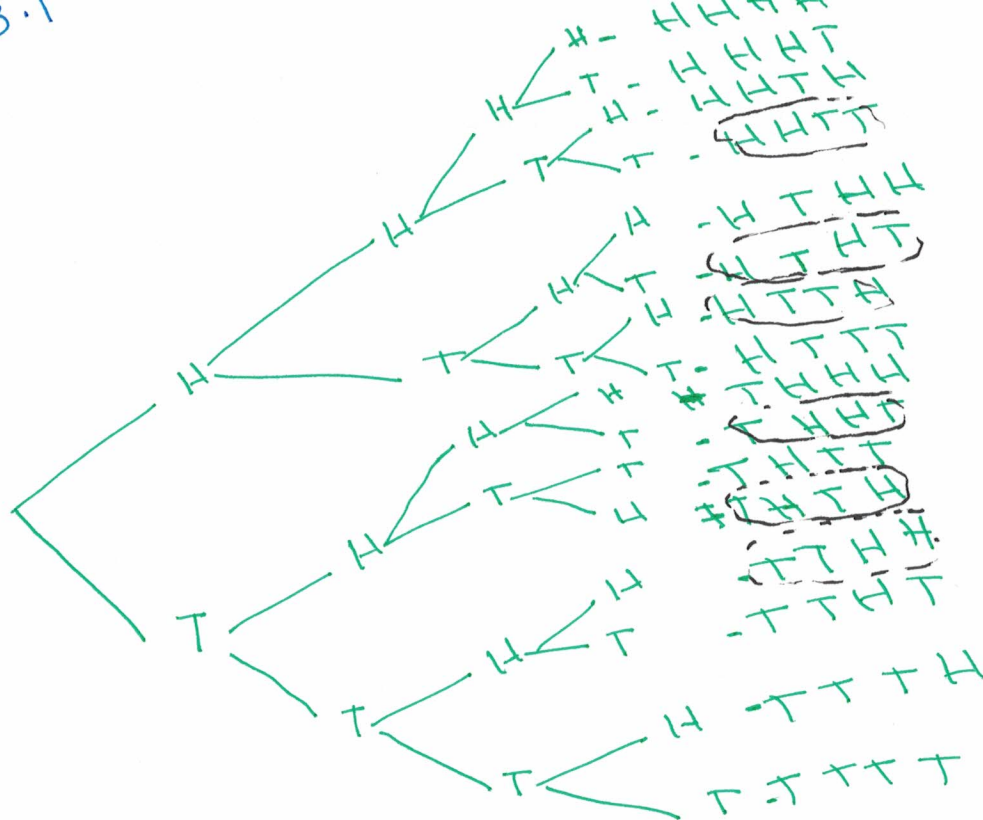


3.1

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$$S = \{ HHHH, HHHT, HHTH, HHTT, HT HH, HT HT, HT TH, HT TT, T H HH, T H HT, T H TH, T H TT, T T HH, T T HT, T T TH, T T TT \}$$

The probability of getting exactly two heads = $\frac{6}{16}$

I will make a table to prove $P(k) = \binom{n}{k} (1-p)^{n-k} p^k$

In this table I will write the probability of getting [0 heads, 1 head, 2 heads, 3 heads, 4 heads]

Table 1): Find probability of # heads from T diagram

# heads exactly	# of combination	probability
0	1	$\frac{1}{16}$
1	4	$\frac{4}{16}$
2	6	$\frac{6}{16}$
3	4	$\frac{4}{16}$
4	1	$\frac{1}{16}$

from the table the probability of 0 head in 4 tossing time = $\frac{1}{16}$. we assume $k=0$, $N=4$, θ is the prob. and we will apply these terms in $P(k) = \binom{N}{k} (1-\theta)^{N-k} \theta^k$

$$\begin{aligned}
 P(k=0, N=4, \theta) &= P(\text{tails}) P(\text{tails}) P(\text{tails}) P(\text{tails}) \\
 &= P(\text{tails})^4 = \binom{4}{0} (1-\theta)^4 \theta^0 \\
 &= (1-\theta)^{(n-k)} \quad \text{as we approach}
 \end{aligned}$$

Let do this experiment for one head

$$\underline{3.1} \quad p(k=1 | N=4, \theta) = p(\text{heads}) p(\text{tail}) p(\text{tails}) p(\text{tails}) \text{ (combination)} \\ = 4 (\theta) (1-\theta)^{N-k} = 4 \theta (1-\theta)^3$$

Let do this for $k=2$ for exactly 2 head

$$p(k=2 | N=4, \theta) = p(\text{heads}) p(\text{heads}) p(\text{tail}) p(\text{tail}) \text{ (combination)} \\ = 6 \theta^2 (1-\theta)^{N-k} = 6 \theta^2 (1-\theta)^2$$

as we can see from the above experiments

$$p(k) = \underbrace{\binom{N}{k}}_{\substack{\text{number} \\ \text{of combination}}} (1-\theta)^{N-k} \theta^k$$

θ^k → probability of tossing head rise to the number of head
 $(1-\theta)^{N-k}$ → probability of tossing tails to the rise to the number of tail

More specifically, this is the number of ways of getting k heads in N tosses.

\therefore probability of two heads: $\underbrace{6}_{\text{combination}} \theta^2 \underbrace{(1-\theta)^2}_{\substack{\text{probability of} \\ N-k \text{ tails}}}$

θ^2 → probability of k heads
 $(1-\theta)^2$ → probability of $N-k$ tails