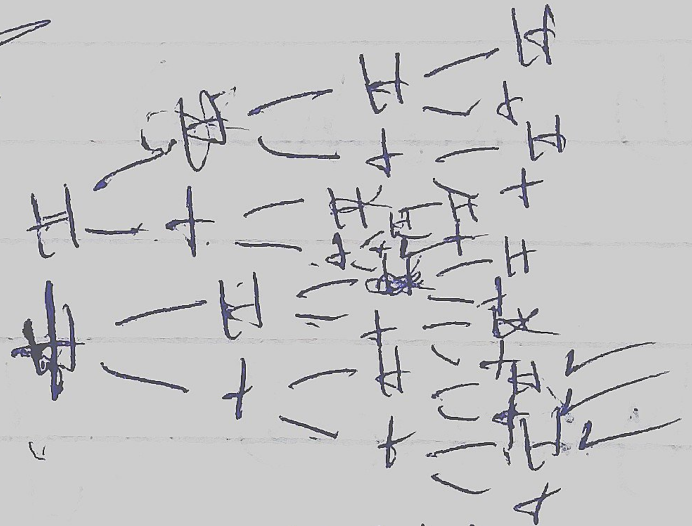
Task 22

Binomial Distribution



for $\underline{4}$ $\longrightarrow$ $N = 6$

~~HHHH~~

HHTT   THTH

TTHH   HTTH

HTHT

THHT

* for 5 flips $\#H = \#T$

N = 0

* for 5 flips $\#H = 1$, $\#T = 4$

H T T T T

T H T T T

T T H T T

T T T H T

T T T T H

$\boxed{5}$ $\boxed{N = 5}$

5 coin flips 2 Heads

H H T T T
H T H T T
H T T H T
H T T T H } 4

$\boxed{N = 10}$

$\underline{H}\ \underline{\ }\ \underline{H}\ \underline{\ }\ \underline{\ }$

$\frac{5 \times 4}{2}$ ↳ over-count
which means there is two probabilities have the same probability

T H H T T
T H T H T
T H T T H } 3

T T H H T
T T H T H } 2

T T T H H } 1

5 coins flips 3 Heads

$\frac{5 \cdot 4 \cdot 3}{3} = \cancel{20}$

$\underline{H}\ \underline{H}\ \underline{H}\ \underline{\ }\ \underline{\ }$

$\Rightarrow \frac{5 \times 4 \times 3}{3 \times 2 \times 1} = 10$ ✓

3 → for the first one, 2 → for second one, 1 → for the third one

$\frac{n!}{k!(n-k)!} = \frac{n(n-1)(n-2)\cancel{(n-k)!}}{k!\cancel{(n-k)!}} =$ ✓

125 Coins 3 Heads

$\frac{125!}{3! \times (125-3)!} = 317750$

$P(H) = 0.5$

flip coin 5 times $\quad P(\#H) = 1$ what is the probability of number of heads exactly once

?

$$\frac{5!}{4! \times 1!} = 5$$

Size of truth table $= 2^5 = 32$

$$P(A) = \frac{5}{32} = \checkmark$$

if we change $P(\# H) = 3$

$$\frac{5!}{3! \times 2!} = 10 \Rightarrow P(A) = \frac{10}{32} = \checkmark$$

if we change

$P(H) = 0.8 \quad P(\# \text{heads}) = 1$

flip coin 3 times

$$\frac{3!}{2! \times 1!} = \boxed{3}$$

HTT $\quad P(A) = 0.8 \times 0.2 \times 0.2 \times 3 = \checkmark$

THT

TTH

$P(H) = 0.8$

flip coin 5 times $\quad P(\# H = 4)$

$$\frac{5!}{1! \times 4!} = \boxed{5}$$

HHHHT

$P(A) = 0.8^4 \times 0.2 \times 5$

$= \boxed{0.4096}$

for $P(\#H = 3)$

$\frac{5!}{2!\,3!} = 10 \Rightarrow 10 \times 0.8^3 \times 0.2^2 =$

flip coin 12 times $\quad P(H) = 0.8$

$P(\#H = 9)$

$\frac{12!}{3!\;9!} = 220 \Rightarrow 220 \times 0.8^9 \times 0.2^3$

Summary:

$\frac{n!}{(n-k)!\,k!}$ } for calc the number of probabilities

+

$p^k (1-p)^{n-k}$ } for calc the probabilities of one diff

$\boxed{\text{binomial Distribution}}$

we can use it to calc any events that have two outcomes.