9/8/15

5 flower's 5 flower pots

3 B, 2 R

If the Blue and red indistrict $\frac{3!}{3!2!} = 10$

$$P(RBRBB) = \frac{1 \cdot 1}{|\Omega|} = \frac{2 \cdot 3 \cdot 1 \cdot 2 \cdot 1}{5!} = \frac{3!\,2!}{5!} = \frac{1}{10}$$

other way $= \frac{\quad}{\quad} = \frac{1}{10}$

$|A| = n$

$2^A = \{B : B \subseteq A\}$ $|2^A| =$ $2^{|A|} = 2^n$.

$$2^A = \{B : B \subseteq A, |B| = 0\} \cup \{B : B \subseteq A, |B| = 1\} \cup \cdots \cup \{B : B \subseteq A, |B| = n\}$$

$$= \bigcup_{i=0}^{n} \{B : B \subseteq A, |B| = i\}$$

(It cant share any element because all set size different)

$|A_1 \cup A_2| = |A_1| + |A_2|$ if A_1, A_2 mao...

$$|2^A| = \sum_{i=0}^{n} |\{B \; B \subseteq A, |B| = i\}| = \boxed{\sum_{i=0}^{n} \binom{n}{i} = 2^n}$$

$(a+b)^2 = a^2 + 2ab + b^2$

$(a+b)^3 = (a+b)(a+b)(a+b) = a^3 + 3a^2b + 3ab^2 + b^3$

$2 \cdot 2 \cdot 2 = 8$

$(a+b)^4 = (a+b)(a+b)(a+b)(a+b) = \binom{4}{4} a^4 b^0 + \binom{4}{3} a^3 b + \binom{4}{2} a^2 b^2$

$+ \binom{4}{1} a^1 b^3 + \binom{4}{0} a^0 b^4$

$$\boxed{(a+b)^n = \sum_{i=0}^{n} \binom{n}{i} a^i b^{n-i} = \sum_{i=0}^{n} \binom{n}{i} a^{n-i} b^i}$$

Binomial theorem.

- $(1+x)^n = \sum_{i=0}^{n} \binom{n}{i} 1^{n-i} x^i = \sum_{i=0}^{n} \binom{n}{i} x^i = 1 + \sum_{i=1}^{n-1} \binom{n}{i} x^i + x^n$

- $(1+x)(1+x)^{n-1} = (1+x) \sum_{i=0}^{n-1} \binom{n-1}{i} x^i = \sum_{i=0}^{n-1} \binom{n-1}{i} x^i + 1$

(e.1) $i = i+1$ $\quad \sum_{i=1}^{n} \binom{n-1}{i-1} x^i$

$i = j-1$

$= 1 + \sum_{i=1}^{n-1} \binom{n-1}{i} x^i + \sum_{i=1}^{n-1} \binom{n-1}{i-1} x^i + x^n$

$= \sum_{i=1}^{n-1} \binom{n}{i} x^i = \sum_{i=1}^{n-1} \left(\binom{n-1}{i} + \binom{n-1}{i-1} \right) x^i$

$\Rightarrow \boxed{\binom{n}{i} = \binom{n-1}{i} + \binom{n-1}{i-1}}$

$\binom{0}{0}$

$\binom{1}{0} \quad \binom{1}{1}$

$\binom{2}{0} \quad \binom{2}{1} \quad \binom{2}{2}$

$\binom{3}{0} \quad \binom{3}{1} \quad \binom{3}{2} \quad \binom{3}{3}$

1

1 1 Pascal's law

1 2 1

1 3 3 1

1 4 6 4 1

5 cards of 52 order does not matter How many?

$\binom{52}{5}$

$$P(\text{Royal flash}) = \frac{\binom{4}{1}\binom{1}{1}}{\binom{52}{5}} \quad \binom{52}{5} = 2598960$$

10, J, R, K, A

same suits

$$P(\text{Straights flash}) = \frac{\binom{4}{1}\binom{10}{1}}{\binom{52}{5}}$$

All same suit

A 2 3 4 5

2 3 4 5 6

⋮

10 J Q K A

H

C

D

S

A. 2 3 4 5.

2 3 4 5 6

⋮

6 7 8 9 10

7 8 9 10 J

8 9 10 J R

9 10 J R K

~~10 J R K A~~

$$P(4\text{ of a kind}) = \frac{\underbrace{\binom{13}{1}\binom{4}{4}}_{4\text{ of a kind}}\underbrace{\binom{12}{1}\binom{4}{1}}_{\text{odd card leftover.}}}{\binom{52}{5}}$$

2222 K D

AAAA 2 3 ⋮ 4

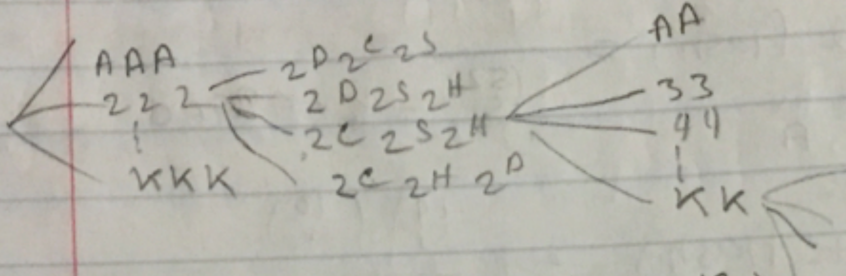
2222

⋮

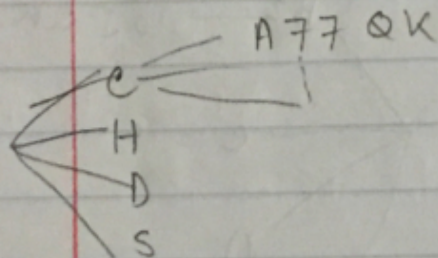
KKKK

$$P(\text{fullhouse}) = \frac{\overbrace{\binom{13}{1}\binom{4}{3}}\binom{12}{1}\binom{4}{2}}{\binom{52}{5}}$$

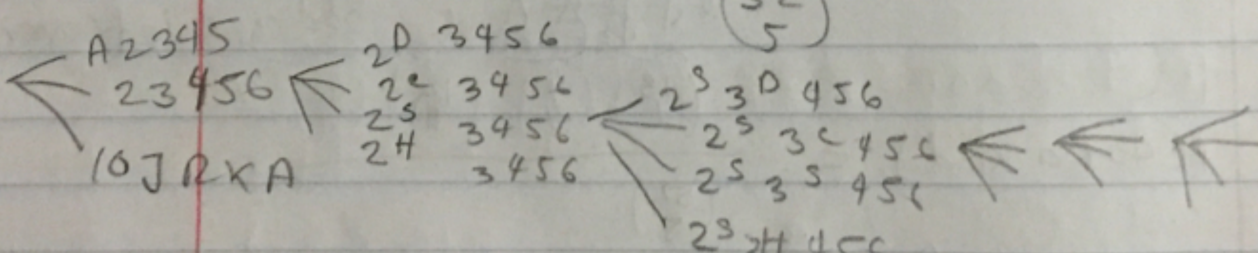
QQQ77



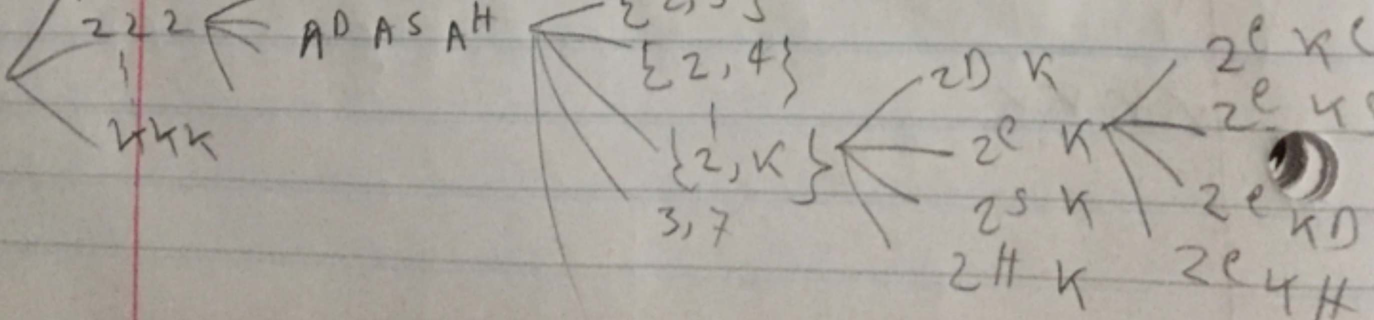
$$P(\text{flaush}) = \frac{\binom{4}{1}\binom{13}{5}}{\binom{52}{5}}$$



$$P(\text{Straight}) = \frac{\binom{10}{1}\binom{4}{1}^5}{\binom{52}{5}}$$



10101039 $$P(\text{trips}) = \frac{\binom{13}{1}\binom{4}{3}\binom{12}{2}\binom{4}{1}^2}{\binom{52}{5}}$$



$$P(2\,\text{pair}) = \frac{\binom{13}{2}\binom{4}{2}^2\binom{11}{1}\binom{4}{1}}{\binom{52}{5}}$$

77KK4

AA22

AAKK

22, 33

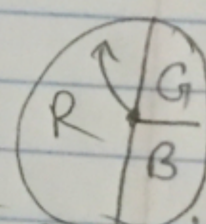
22KK

33KK

* $$P(\text{no Pair}) = \frac{\binom{13}{5}\binom{4}{1}^5 - \text{flash} - \text{Straigts}}{\binom{52}{5}}$$

$$\Omega = \{H, T\}$$

$$P(\{H\}) = \frac{|\{H\}|}{|\Omega|} = \frac{1}{2}$$



$$P(A) = \frac{|A|}{|\Omega|}$$

$$P(\{R\}) = \frac{|\{R\}|}{|\Omega|} = \frac{1}{3}$$

$|\Omega|$ $\Omega = \{R, G, B\}$

All outcomes equally likely.

$$\forall \varepsilon \in \Omega \quad P(\{\varepsilon\}) = \frac{1}{|\Omega|}$$

$\Omega = \{\text{sunny, Cloudy, drs}\}$

$P(\{\sim 3\}) \neq \frac{1}{3}$

$$\mathbb{1}_{\omega \in A} := \begin{cases} 1 & \omega \in A \\ 0 & \text{othewise} \end{cases}$$ indicator function

proposition of the event A occurs

$$P(A) := \lim_{n \to \infty} \sum_{i=1}^{n} \frac{\mathbb{1}_{\omega_i \in A}}{n}$$

long Run frequancy (lrf)