

Probability

$$6. \times 10^4 \times 10^{-6}$$

$$10^2 \cdot 1421 \cdot 10^{-6}$$

1.

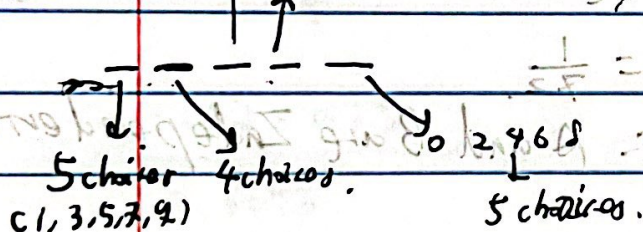
$$\# \text{ total} = 15^8 \text{ (every Q has 15 choice)}$$

$$\# \text{ no one answer more than one q.} = 15 \times 14 \times 13 \times 12 \times 11 \times 10 \times 9 \times 8$$

$$P = \frac{\# \text{ no one answer more than one q.}}{\# \text{ total}} = \frac{15 \times 14 \times 13 \times 12 \times 11 \times 10 \times 9 \times 8}{15^8}$$

$$= \frac{259200}{2562890625} \approx 0.1012$$

2. $(1, 2, 3, 4, 5, 6, 7, 8, 9, 10)$; # Interested Number



$$= 5 \times 4 \times 3 \times 2 \times 1$$

$$= 120$$

$$\# \text{ total} = 99999 - 0 + 1 = 100000 = 10^5$$

$$\# \text{ total combinations} = \frac{10!}{5!5!}$$

$$\# \text{ no 5 interest} = \frac{10!}{5!5!} \times \frac{5!}{5!} = \frac{10!}{5!5!}$$

$$= \frac{10!}{5!5!} = 252$$

$$= \frac{252}{10^5} = 0.00252$$

$$P = \binom{8}{5} (0.00252)^5 (1 - 0.00252)^{8-5}$$

$$= \frac{8 \times 7 \times 6 \times 5 \times 4}{5 \times 4 \times 3 \times 2 \times 1} \times (0.00252)^5 \times (0.99748)^3 = 0.0000064347 \approx 6.4347 \times 10^{-6}$$

3.

$$P(A) =$$

$$\# \text{ total} = 6^3 = 216.$$

$$\# \text{ A event} = 3 \times 3 \times 6 \times 3 = 162$$

$$\# \text{ 2 dice show } \geq 4$$

$$+ \# \text{ 3 dice show } \geq 4 = C_3^2 \times 3 \times 3 \times 3 + 3 \times 3 \times 3$$

$$= \frac{3 \times 2}{2} \times 27 + 27 = 3 \times 27 + 27 = 108$$

$$\# \text{ B event} = 6. \quad \therefore P(A) = \frac{\#A}{\# \text{ total}} = \frac{108}{216} = \frac{1}{2}$$

$$P(B) = \frac{\#B}{\# \text{ total}} = \frac{6}{216} = \frac{1}{36} \quad P(A) \cdot P(B) = \frac{1}{2} \cdot \frac{1}{36} = \frac{1}{72}$$

$$P(A \cap B) = \#A \cap B = 3 \quad (\{4, 4, 4\}, \{5, 5, 5\}, \{6, 6, 6\})$$

$$P(A \cap B) = \frac{\#A \cap B}{\# \text{ total}} = \frac{3}{216} = \frac{1}{72}$$

$$\therefore P(A) \cdot P(B) = P(A \cap B) \quad \therefore A \text{ and } B \text{ are Independent.}$$

4.

For each deck, 4 suits, each 13 cards.

$$\# \text{ combination of 5 cards} = C_{52}^5 = \frac{52 \times 51 \times 50 \times 49 \times 48}{5!}$$

$$= 2598960$$

$$\# \text{ flush} = 4 \cdot C_{13}^5 = 4 \times \frac{13 \times 12 \times 11 \times 10 \times 9}{5!}$$

$$= 4 \times 1287 = 5148$$

$$\therefore P(\text{get a flush in one deck}) = \frac{5148}{2598960} \approx 0.0020$$

$$E(\text{hands}) = \frac{1}{0.0020} = 500$$

111

 $3 \times 3 \times 3$

$$\begin{array}{l} \leftarrow 1 \rightarrow 81 \\ \leftarrow 2 \rightarrow 81 \\ \leftarrow 3 \rightarrow 27 \end{array}$$

5.

$$P(\text{win} | \text{super}) = 0.7. \quad P(\text{win} | \text{non-super}) = 0.5.$$

$$P(\text{super}) = 0.75$$

$$P(\text{win 4 in 5} | \text{super})$$

$$= C_5^4 \cdot 0.7^4 \cdot 0.3^1 \approx 0.3602.$$

$$P(\text{win 4 in 5} | \text{non-super}) = C_5^4 \cdot 0.5^4 \cdot 0.5^1$$

$$\approx 0.1563$$

$$P(\text{win 4 in 5}) = P(\text{win 4 in 5} | \text{super}) \cdot P(\text{super})$$

$$+ P(\text{win 4 in 5} | \text{non-super}) \cdot P(\text{non-super})$$

$$= 0.3602 \times 0.75 + 0.1563 (1 - 0.75) \approx 0.3092$$

$$P(\text{super} | \text{win 4 in 5}) = \frac{P(\text{win 4 in 5} | \text{super}) \cdot P(\text{super})}{P(\text{win 4 in 5})}$$

$$= \frac{0.3602 \times 0.75}{0.3092} \approx \cancel{0.8737} \quad 0.8737.$$