1) P(no student answering more twice)

$$\frac{\frac{15!}{7!}}{15^8} \Rightarrow \frac{259459200}{2562890625} = 0.1012 = 10.12\%.$$

2) Digits(unique)

$$\frac{\text{unique combos}}{\text{total combos}} = \frac{5.4.7.6.5}{10^5} = \frac{4200}{100000} = 0.042$$

3) A = at least 2 dice ≥ 4

B = all 3 dice show

A_1 = only 2 dice showing ≥ 4

A_2 = all 3 dice showing ≥ 4

$$\Rightarrow P(A) = P(A_1) + P(A_2) = \binom{3}{2}\left(\frac{1}{2}\right)^2\left(\frac{1}{2}\right)^1 + \binom{3}{3}\left(\frac{1}{2}\right)^3\left(\frac{1}{2}\right)^0$$

$$= \frac{1}{2}$$

$$P(B) = \frac{6}{6} \times \frac{1}{6} \times \frac{1}{6} = \frac{1}{36} \qquad P(A \cap B) = \frac{3}{6} \times \frac{1}{6} \times \frac{1}{6} = \frac{1}{72}$$

$$P(A) \cdot P(B) = \frac{1}{2} \cdot \frac{1}{36} = \frac{1}{72}$$

$P(A) \cdot P(B) = P(A \cap B)$ independent

1) geometric distribution

$$P(f) = \binom{4}{1} \cdot \binom{13}{5} = \frac{4!}{3!} \cdot \frac{13!}{5!\,8!}$$

$$= 4.1287 = 5148 \text{ hands}$$

$$P(h) = \binom{52}{5} = \frac{52!}{5!\,47!} = 2598960 \text{ hands}$$

$$P = \frac{5148}{2598960} = 0.00198$$

$$E[X] = \frac{1}{p} = 505 \text{ hands}$$

2) ~~team winning~~

$P(w)$ = winning team

$$P(s) = 0.75 \qquad P(s') = 0.25$$

[when $P(s)$ is Stacy played]
s' = didnt play

$$P(s|w) = \frac{P(w|s) \cdot P(s)}{P(w|s) \cdot P(s) + P(w|s') \cdot P(s')}$$

Binomial distribution ⇒

$$P(w|s) = \binom{5}{4}(0.70)^4(0.30)^1 = 0.36015$$

$$P(w|s') = 0.15625$$

$$\Rightarrow \frac{0.36015 \times 0.75}{0.36015 \times 0.75 + 0.25 \times 0.15625} \Rightarrow 0.87$$

∴ there is a 87% chance