1

(a) $S = \{(1,1), (1,2), (1,3),$
$(2,1), (2,2), (2,3),$
$(3,1), (3,2), (3,3)\}$

(b)

$E = \{(2,1), (2,2), (2,3)\}$

$F = \{(2,3), (3,2)\}$

$E \cap F = \{(2,3)\}$

$E \cup F = \{(2,1), (2,2), (2,3), (3,2)\}$

$\bar{E} = \{(1,1), (1,2), (1,3), (3,1), (3,2), (3,3)\}$

(c) $P(E) = 3/9 = 1/3$

$P(F) = 2/9$

② (a)

$\binom{5}{3} = \frac{5!}{3!2!} = 10$ ways to pick where 6's go

_ $\underline{6}$ $\underline{6}$ _ $\underline{6}$

$\underline{1}$ $\underline{6}$ $\underline{6}$ $\underline{2}$ $\underline{6}$

$5 \cdot 5 = 25$ ways to fill in rest

Answer $= \frac{10 \cdot 25}{6^5} = \boxed{\frac{250}{7776} \approx 0.032\ldots}$

(b) $|S| = 2^8$

$P(\text{at least 1 head}) = 1 - P(\text{0 heads})$

$= 1 - \frac{1}{2^8} =$

$= \frac{256-1}{256} = \boxed{\frac{255}{256}}$

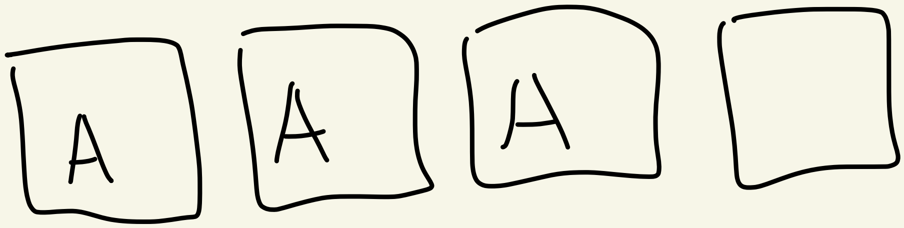
$\approx \boxed{0.996\ldots}$

③ (a)

$$\binom{52}{4} = \frac{52!}{4!\,48!} = \frac{52 \cdot 51 \cdot 50 \cdot 49}{4!} = \boxed{270{,}725}$$

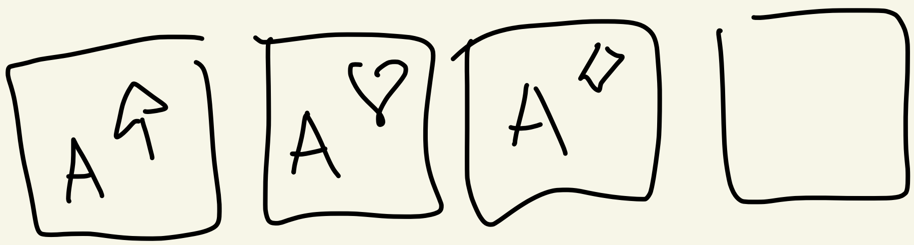
(b)

Pick face value for triplet



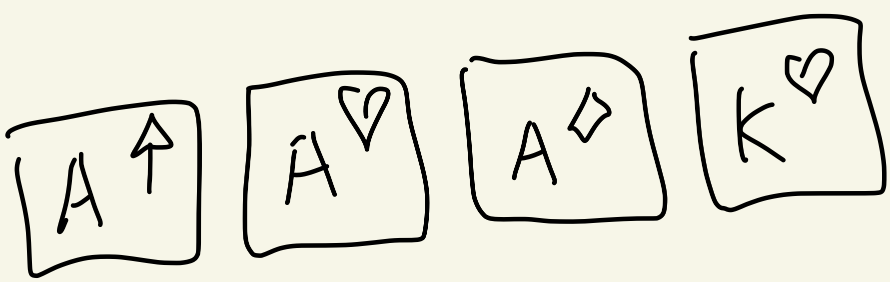
$$\binom{13}{1} = 13$$

Pick three suits



$$\binom{4}{3} = 4$$

Pick last card



$$\binom{48}{1} = 48$$

Answer:

$$\boxed{\frac{13 \cdot 4 \cdot 48}{270{,}725} = \frac{2496}{270{,}725} \approx 0.00922\ldots}$$

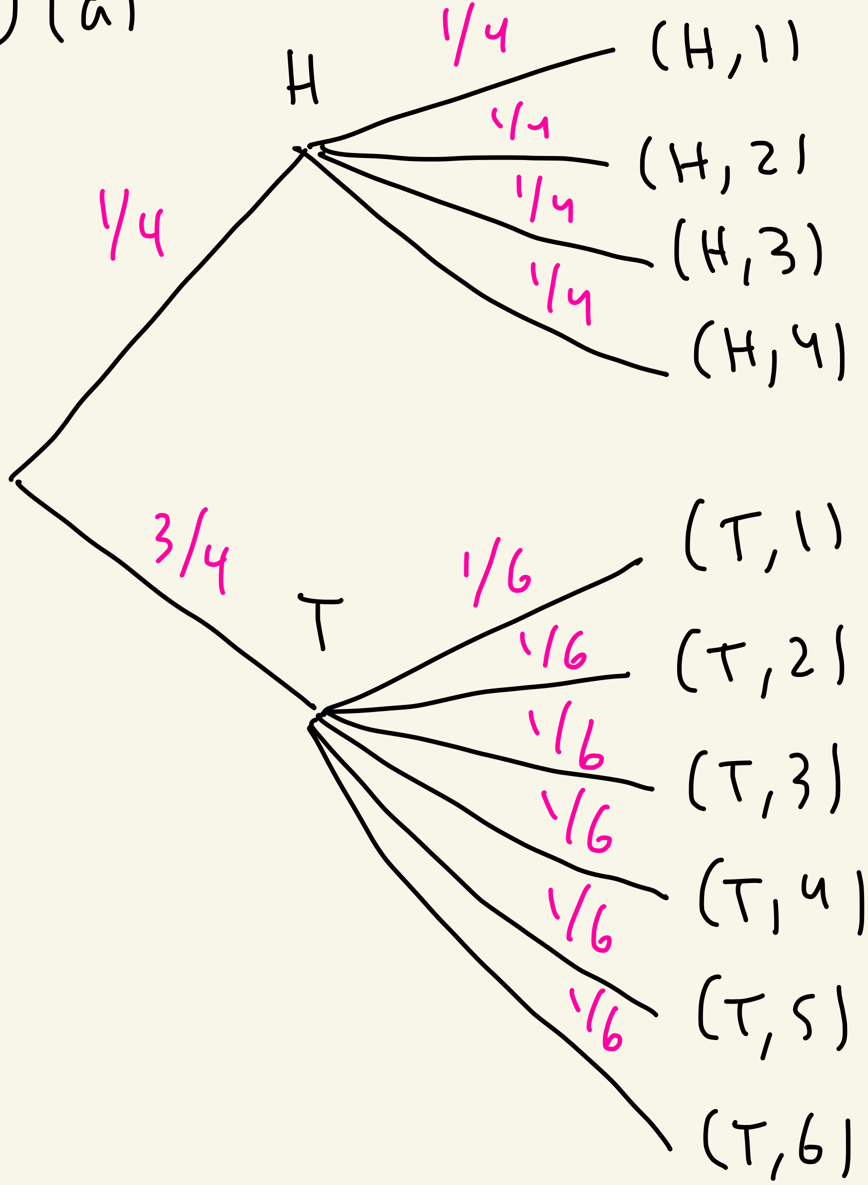
④

(a) $\binom{8}{2} = \dfrac{8!}{2!\,6!} = \dfrac{8\cdot 7}{2} = 28$

(b) $\dfrac{\binom{2}{1}\binom{6}{1}}{28} = \dfrac{12}{28} = \dfrac{3}{7} \approx 0.42857\ldots$

(b) $\dfrac{\binom{6}{2}}{28} = \dfrac{15}{28} \approx 0.5357\ldots$

(5) (a)



(b)

$$\frac{1}{4}\cdot\frac{1}{4}+\frac{3}{4}\cdot\frac{1}{6}=\frac{1}{16}+\frac{3}{24}=\frac{1}{16}+\frac{1}{8}$$

$$=\frac{1+2}{16}=\boxed{\frac{3}{16}}$$

$$\approx \boxed{0.1875}$$

⑥ $|S| = \binom{52}{1} = 52$

$|E| = 13$ ← $E = \{A♡, 2♡, 3♡, 4♡, 5♡, 6♡, 7♡, 8♡, 9♡, 10♡, J♡, Q♡, K♡\}$

$|F| = 4$ ← $F = \{K♡, K♢, K♠, K♣\}$

$|E \cap F| = 1$ ← $E \cap F = \{K♡\}$

$$P(F|E) = \frac{P(F \cap E)}{P(E)} = \frac{1/52}{13/52} = 1/32$$

$$\approx 0.03125$$