

2 pair

$$\text{sample size} = |52 \cdot 51 \cdot 50 \cdot 49| = |6,497,400|$$

$${}_{13}C_1 \times {}_4C_2 + {}_{13}C_1 + {}_4C_2$$

$$\left( \frac{13!}{1!12!} \times \frac{4!}{2!2!} \right)^2$$

$$\left( \frac{1014}{2652} \right)^2$$

$$\frac{1014^2}{2652^2} \times 100 = \boxed{14.6\% \text{ of getting 2 pairs}}$$

3 of a kind

$$\text{sample size: } |52 \cdot 51 \cdot 50| = |132,600|$$

$${}_{13}C_1 \binom{13}{1} \frac{13!}{1!(13-1)!} \times {}_4C_3 \binom{4}{3} \frac{4!}{3!1!}$$

$$\frac{13 \cdot \cancel{12} \cdot \cancel{11}}{1 \cdot \cancel{12} \cdot \cancel{11}} \times \frac{4 \cdot \cancel{3} \cdot \cancel{2} \cdot 1}{3 \cdot \cancel{2} \cdot \cancel{1} \cdot 1}$$

$$13 \times 4 =$$

52 ways to get 3 of a kind

$$\frac{52}{132,600} \times 100 =$$

0.0392%

Four of a kind:

$$\text{sample size: } |52 \cdot 51 \cdot 50 \cdot 49| = |6,497,400|$$

$${}_{13}C_1 \times {}_4C_4$$

$$\binom{13}{1} \frac{13!}{1!(13-1)!} \times \binom{4}{4} \frac{4!}{4!}$$

13 x 1 = 13 ways to get four of a kind

$$\frac{13}{6,497,400} \times 100 =$$

0.00020008%  
of getting  
"four of a kind"