

Mid term problem # 7

One pair

possible
hands
dealt = $52C_4$

$$\rightarrow \frac{52!}{4! (52-4)!} = \underline{270,725}$$

Number of combinations

$${}^{13}C_1 \times {}^4C_2 \times {}^{12}C_2 \times {}^4C_1 \times {}^4C_1$$

$$\frac{13!}{1!} \times \frac{4!}{2!(4-2)!} \times \frac{12!}{2!(12-2)!} \times \frac{4}{1!(4-1)!} \times 4$$

$$1! (13-1)! \times 6 \times 6 \times 4 \times 4 = \underline{82,368}$$

$$\frac{82,368}{270,725} = 0.3042496999$$

or
30.42%

two pair

$${}^{13}C_2 \times {}^4C_2 \times {}^4C_2$$

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$$\frac{13!}{2! (13-2)!} \times \frac{4!}{2! (4-2)!} \times 6$$

$$\begin{array}{ccc} \downarrow & & \downarrow \\ 78 & \times & 6 \\ & & \downarrow \\ & & 6 \end{array} = 2808$$

$$\frac{2808}{270,725} = 0.01037214886$$

or

$$1.03\%$$

3 of a kind

$$\begin{array}{ccc} 13 & & 12 \\ C_1 & \times & C_1 \\ \downarrow & & \downarrow \\ 13 & \times & 12 \\ & & \downarrow \\ & & 4 \\ & & \downarrow \\ & & 4 \end{array}$$

$$13 \times \frac{4!}{3!(4-3)!} \times 12 \times 4$$

$$1196$$

$$= 2496$$

$$\frac{2496}{270,725} = \frac{0.009219687875}{\text{or}} 0.92\%$$

4 of a kind

$${}^{13}C_1 \times {}^4C_4$$

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

$$\frac{13}{270,725} = \frac{0.00004801920768}{\text{or}} 0.004801\%$$

or

$$0.004801\%$$

0.0015

