4: A poker hand consists of 5 cards drawn at random from a deck of 52 cards having 13 denominations and 4 suits. Compute the probability of drawing a "full house" hand. A "full house" hand consists of three cards from one denomination and two cards from a different denomination, e.g., three eights and two jacks. Derive an expression for this probability but do not simplify or evaluate it.

$$P(\text{"full house"}) = \frac{13 \cdot 12 \cdot \binom{4}{3}\binom{4}{2}}{\binom{52}{5}} \quad \left.\begin{matrix}\\ \\ \\ \end{matrix}\right\} 1$$

$$= \frac{{}_{13}P_2 \; {}_4C_3 \; {}_4C_2}{{}_{52}C_5}$$

5: A group of friends take a road trip together. They travel in 4 cars. Each car will stop for gas only once during the trip. There are 7 gas stations along the route. Derive - but do not simplify - an expression for the probability that two or more cars stop at the same gas station.

$$P(\text{"2 or more"}) = 1 - P(\text{"no 2 cars at same station"})$$

$$= 1 - \frac{7 \cdot 6 \cdot 5 \cdot 4}{7^4} \quad \left.\begin{matrix}\\ \\ \end{matrix}\right\} 2$$

1