1. Suppose you flip n fair coins What is the probability of getting exactly i heads, for each i. What is the probability of getting at least i heads for each i?

1.1 $P = \binom{n}{i}/2^n$

1.2 $P = \sum_{k=i}^{n}\binom{n}{k}/2^n$

2. What is the probability of an odd sum when you roll three dice.

P=P(all three are odd)+P(1odd+ 2even)=(3*3*3+3*3*3*3)/(6*6*6)=0.5

3. Suppose that each of 9 people are dealt 4 cards. What is the probability that one of the people has 2 or more kings. (I recently lost a poker hand where the only way I could have lost was if someone had 2 or more kings. I had been pretty sure I was going to win).

P = 1- P(every one has 0 or 1 King)

= 1 – P(no king is selected for everyone) + P(1 king is selected for everyone) + P(2 kings are selected, but only 1 max for everyone) + P(3 kings are selected, but only 1 max for everyone) + P(4 kings are selected, but only 1 max for everyone)

$$= 1 - \frac{\binom{48}{36}\times\binom{4}{0}}{\binom{52}{36}} - \frac{\binom{48}{35}\times\binom{4}{1}}{\binom{52}{36}} - \frac{\binom{48}{34}\times\binom{4}{2}}{\binom{52}{36}} \times \frac{\binom{9}{2}\times\binom{4}{1}\times\binom{4}{1}}{\binom{36}{2}} - \frac{\binom{48}{33}\times\binom{4}{3}}{\binom{52}{36}} \times \frac{\binom{9}{2}\times\binom{4}{1}\times\binom{4}{1}\times\binom{4}{1}}{\binom{36}{3}} - \frac{\binom{48}{32}\times\binom{4}{4}}{\binom{52}{36}} \times \frac{\binom{9}{2}\times\binom{4}{1}\times\binom{4}{1}\times\binom{4}{1}\times\binom{4}{1}}{\binom{36}{4}}$$

$$= 0.4933$$

4. Which event is more likely:

(a) drawing an ace and a king, when you draw 2 cards from a 52 card deck.

(b) drawing an ace and a king, when you draw 2 cards from a 13 card deck consisting of only hearts.

Please explain with calculations.

52 card has 4 aces and 4 kings, but 13 card of only hearts has 1 ace and 1 king. So that:

P(a) = (draw ace then draw king + draw king then draw ace) / (total numbers of draw 2 cards from deck)

= (4*4+4*4) / (52*51) = 0.0060

P(b) = (draw ace then draw king + draw king then draw ace) / (total numbers of draw 2 cards from deck)

= (1*1 + 1*1) / (13*12) = 0.0128