

1) How many ten-bit strings begin with 1100?

$$2^6$$

2) How many 5-card poker hands contain a four of a kind?

(A four of a kind is all 4 cards of one rank, and one card of a different rank)

$$\binom{13}{1} \binom{4}{4} \binom{12}{1} \binom{4}{1} = 13 \cdot 12 \cdot 4$$

3) How many nonnegative integer solutions does the equation below have?

$$x_1 + x_2 + x_3 + x_4 + x_5 = 38$$

$$\binom{38 + 4}{4} = \binom{42}{4}$$