Some formulas you may need:

$$P(X = x) =_n C_x p^x q^{n-x} \qquad EV = \mu = np \qquad \sigma^2 = npq \qquad \sigma = \sqrt{npq}$$

1. (2, 2, 3, 1, 2 points) John the gambler loves betting on green in the game of roulette. Suppose John is about to bet on green 10 times in a row. Let X denote the total number of times he wins among the 10 spins.

a) List the 7 things you are supposed to list when dealing with this kind of random variable.

$\boxed{\text{Binomial}}$ $n = 10$ $p = \dfrac{2}{38}$

Success = ball lands on green (win) when spinning the wheel once $q = \dfrac{36}{38}$

Failure = ball does not land on green (lose) when spinning the wheel once

X = Total number of times the ball lands on green (and John wins) among the 10 spins of the wheel.

b) What is the probability that John will win exactly 3 times?

$$P(X=3) =_{10} C_3 \left(\frac{2}{38}\right)^3 \left(\frac{36}{38}\right)^{10-3} = \boxed{0.0120}$$

c) What is the probability that John will win at most 2 times?

$$P(X=0 \text{ or } X=1 \text{ or } X=2) = P(X=0) + P(X=1) + P(X=2)$$

$$=_{10} C_0 \left(\frac{2}{38}\right)^0 \left(\frac{36}{38}\right)^{10-0} +_{10} C_1 \left(\frac{2}{38}\right)^1 \left(\frac{36}{38}\right)^{10-1} +_{10} C_2 \left(\frac{2}{38}\right)^2 \left(\frac{36}{38}\right)^{10-2}$$

$$= 0.5824 \quad + \quad 0.3235 \quad + \quad 0.0809$$

$$= \boxed{0.9868}$$

d) What is the probability that John will win more than 2 times?

$$P\left(\begin{array}{c}\text{win more than}\\ \text{2 times}\end{array}\right) = 1 - P\left(\begin{array}{c}\text{win at most}\\ \text{2 times}\end{array}\right) = 1 - 0.9868 = \boxed{0.0132}$$

$\uparrow$
from part c

e) Find the expected value of the random variable in this problem and explain its meaning.

$$\mu = np = 10\left(\frac{2}{38}\right) = 0.53$$

If John plays roulette and bets on green 10 times and repeats this many times, in each group of 10 spins if he counts how many times he wins and takes the average, the average will be about 0.53 wins.