#1

There are 42 bunnies in a mystical forest. We can stick our hand into an equally mystical hat to grab a single bunny. This piece of headwear causes bunny selection to follow a uniform distribution. One bunny has a highly sought-after golden fur. Selecting this prized bunny has a probability of 1/42, but failing to do so will cause the other bunnies to eat your hand.

Due to ethics, we will use 300 plastic hands to test how often a hand is eaten

#2

$$\frac{1}{81} + \frac{8}{81} + \frac{16}{81} + \frac{24}{81} + \frac{32}{81} = 1$$

Since all probabilities add to 1, this table is complete. Since $0 \le w \le n$,

$n = 4$.

$$P(W=w) = \binom{4}{w} p^w (1-p)^{4-w}$$

$$\binom{4}{0} p^0 (1-p)^4 = \frac{1}{81}$$

$$(1-p)^4 = \frac{1}{81}$$

$$1 - p = \frac{1}{3} \longrightarrow p = \frac{2}{3}$$

#3

a, (c-g) Rmd b) $n = 60$ $p = 0.3$

#4

a) Multinomial because there more than two possible outcomes.

$n = 20$ $p_A = 0.3$ $p_B = 0.45$ $p_d = 0.25$

b) $\frac{20!}{7!4!9!} \cdot 0.3^7 \cdot 0.45^4 \cdot 0.25^9$

c) A: $20 \cdot 0.3 = 6$ B: $20 \cdot 0.45 = 9$

d) A: $20 \cdot 0.3 \cdot 0.7 = 4.2$ B: $20 \cdot 0.45 \cdot 0.55 = 4.95$

e) $Corr(A,B) = -\sqrt{\frac{0.3 \cdot 0.45}{0.7 \cdot 0.55}} = -0.5922$

There is a moderate negative relationship between A's wins and B's wins. It's negative bc if one wins, the other has less opportunities to win.