CYBER 759 Assignment 2
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1.

$P(H) = P(T) = 0.5$.

$P(H2 \cap H4) = P(H2) \times P(H4)$

$= 0.5 \times 0.5$

$= 0.25$

2.

Total number of balls = 2 + 3 + 4 = 9

Probability that the first ball is red and the second is green:

$P(R1 \cap G2) = (4/9) \times (3/8) = (12/72)$

Probability that the first ball is green and the second is red:

$P(G1 \cap R2) = (3/9) \times (4/8) = (12/72)$

Summing both probabilities: (12/72) + (12/72) = (24/72) = (1/3)

3.

Scenarios where there are at least 2 tails(T):

a) TTT: $0.4 \times 0.4 \times 0.4 = 0.064$

b) TTH: $0.4 \times 0.4 \times 0.6 = 0.096$

c) THT: $0.4 \times 0.6 \times 0.4 = 0.096$

d) HTT: $0.6 \times 0.4 \times 0.4 = 0.096$

Summing all the probabilities:

0.064 + 0.096 + 0.096 + 0.096 = 0.352

4.

The probability of not winning for any single ticket is (995/1000) = 0.995.

For 4 tickets to all not be winners:

$0.995^4 = 0.9801$

Using the complementary rule, the probability that he wins with at least one ticket:

$1 - 0.9801 = 0.0199$

5.

Let G be the event that a student is a girl and L be the event that a student has long hair.

$$P(G|L) = \frac{P(L|G)xP(G)}{P(L)}$$

$P(L|G) = 0.7\ (given)$

$P(G) = 0.6\ (given)$

$P(L)$

$P(L) = P(L|G)\ x\ P(G) + P(L|B)x\ P(B)$

$P(L) = 0.7\ x\ 0.6\ x\ 0.1\ x\ 0.4$

$P(L) = 0.42 + 0.04$

$P(L) = 0.46$

Plug in:

$$P(G|L) = \frac{0.7\ x\ 0.6}{0.46}$$

$P(G|L) = 0.913$

Thus, given that a student has long hair, there's roughly 91.3% chance they're a girl when chosen randomly from this class of students.