Homework #8

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Q7.

Part A: 6.1.5

b.

$$\frac{\binom{13}{1}\binom{4}{3}\binom{12}{2}\binom{4}{1}\binom{4}{1}}{\binom{52}{5}}$$

c.

$$\frac{\binom{4}{1}\binom{13}{5}}{\binom{52}{5}}$$

d.

$$\frac{\binom{4}{2}\binom{13}{1}\binom{12}{3}4^3}{\binom{52}{5}}$$

Part B: 6.2.4

a.

$$1 - \frac{\binom{39}{5}}{\binom{52}{5}}$$

b.

$$1 - \frac{\binom{13}{5}4^5}{\binom{52}{5}}$$

c.

$$\frac{2\binom{13}{1}\binom{39}{4} - \binom{13}{1}^2\binom{26}{3}}{\binom{52}{5}}$$

d.

$$1 - \frac{\binom{26}{5}}{\binom{52}{5}}$$

Q8.

Part A: 6.3.2

a.

$P(A) = \frac{1}{7}$
$P(B) = \frac{1}{2}$
$P(C) = \frac{5!}{7!} = \frac{1}{42}$

b.

$P(A|C) = \frac{1}{10}$

c.

$P(B|C) = \frac{1}{2}$

d.

$P(A|B) = \frac{1}{7}$

e.

First isn't independent, second and third are independent.

Part B: 6.3.6

b.

$(\frac{1}{3})^5(\frac{2}{3})^5$

c.

$(\frac{1}{3})(\frac{2}{3})^9$

Part C: 6.4.2

a.

Use Bayes' theorem and plug in the numbers into formula to get $\approx 40.4\%$.

Q9.

Part A: 6.5.2

a.

$\{0, 1, 2, 3, 4\}$

b.

We need to get the distribution over the random variable A. $(0, C(48,5)/C(52,5)), (1, 4{*}C(48,5)/C(52,5)), (2, C(4,2)C(48,3)/C(52,5)), C(48,2)/C(52,5)), (4, 48/C(52,5))$

Part A: 6.6.1

a.

We use formula $p(M = r)$ and get expected probability of $(0 * 3/45 + 21/45 + (2 * 21/45))/3 = 1$

Part A: 6.6.4

a.

$E[X] = (1 + 4 + 9 + 16 + 25 + 36)/6 \approx 15.1666667$

b.

$E[Y] = 3/8 + 4(3/8) + 9(1/8) = 3$

Part A: 6.7.4

a.

This one can be same as the hat trick problem and essentially is linear as well, boiling down to $10 * \frac{1}{10} = 1$ expected correct coat.

Q10.

Part A: 6.8.1

a.

18.5%

b.

26.4%

c.

1

d.

39.5% and 1, the expected values are the same but probabilities differ.

Part B: 6.8.3

b.

If there are more than 4 heads, we get the wrong conclusion, thus we subtract that probability and results in 35.04%.