Homework #2 solutions: MA 204

1.8 $\Omega = \{G, BG, BBG, BBBG, BBBBG, BBBBBG\}$

Let X be the random variable. Possible examples of X are (i) the number of children until the couple has a girl or (ii) the number of boys the couple have

1 screenshot.png

1.20 A Venn diagram is sufficient to show work here

(a) P(neither A nor B) = $P(A^cB^c) = 0.20$

(b) P(AB) = 0.20

(c) P(one of two events occurs and not the other) = P(A^cB) + P(AB^c) = 0.2+0.4 = 0.6

1.22 A Venn diagram is sufficient to show work here

$$
\begin{aligned}
P(AUB) = P(A) + P(A^cB) &= 0.6 \text{ (given)} && (1)\\
P(AUB^c) = P(A) + P(A^cB^c) &= 0.8 \text{ (given)} && (2)\\
P(A) + P(A^cB) + P(A^cB^c) &= 1.0 \text{ (probabilities sum to 1)} && (3)\\
2P(A) + P(A^cB) + P(A^cB^c) &= 1.4 \text{ (by adding (1) and (2)))} && (4)\\
P(A) &= 0.4 \text{ (subtracting (4) minus (3))} && (5)
\end{aligned}
$$

1.32 Appendix D comes in handy here

$$\sum_{n=0}^{\infty} \frac{x^n}{n!} = e^x$$

$$\sum_{k=0}^{\infty} \frac{3^k}{k!} = e^3$$

$$c(\sum_{k=0}^{\infty} \frac{3^k}{k!}) = c(e^3) = 1 \Rightarrow c = \frac{1}{e^3}$$

Figure 1: 1.20 - 1.32

1.47 Answers will vary. I will check that simulations are unique from the ones done in class and for results to match the probabilities estimated by hand