MATH 017 SECTIONS 006 AND 007
SPRING 2007
QUIZ 4

1. Solution: If the fist child is a boy, the only way in which the family can have three girls and four children is if they have three girls in a row after their boy: BGGG. Since the first child is already assumed to be a boy, the only possibilities under consideration are those sequences starting with B and with either B or G in the following entries; this is the same thing as finding the number of sequences with three entries and B or G in each place. Just as there were 2^3 configurations (truth assignments) for a truth table with three atomic statements, there are 2^3 such sequences (consider replacing F's with B's and T's with G's). Explicitly, these are BBB, BBG, BGB, GBB, BGG, GBG, GGB, GGG; the complete sequences are BBBB, BBBG, BBGB, BGBB, BBGG, BGBG, BGGB, BGGG. Of these, we want exactly one: BGGG. The chances of getting this is $\frac{1}{8}$.

2. Solution: The first marble is blue with chances $\frac{1}{8}$ and the second marble is green with chances $\frac{2}{7}$. The product is $\frac{2}{56} = \frac{1}{28}$.

3. Solution: We seek the chances that someone is under 21 if we know they prefer root beer. There are $25 + 20 + 30 = 75$ people who prefer root beer. Of these, exactly 25 are under 21. Hence the chances of someone who likes root beer being under 21 is $\frac{25}{75} = \frac{1}{3}$.

4. Solution: $P(N|M) = 0.1$, hence the proportion of the size of (the part of) N (that lies) in M is 0.1. The size of M is 0.8, hence the size of (the part of) N (that lies) in M, or more precisely, $N \cap M$ is $0.1 \times 0.8 = 0.08$. Similarly, the proportion of the size of (the part of) N (that lies) in M' is 0.1. The size of M' is 0.2, hence the size of (the part of) N (that lies) in M', or more precisely, $N \cap M'$ is $0.1 \times 0.2 = 0.02$. Since N is exactly the union of $N \cap M$ and $N \cap M'$, the size of N is $0.08 + 0.02 = 0.1$. Hence we know that N' is a set of size $1 - 0.1 = 0.9$. Since the size of $N \cap M$ is $0.1 \times 0.8 = 0.08$, the size of (the part of) N' in M (or just $N' \cap M$) is 0.8 (the size of M) less 0.08 (the size of $N \cap M$), so that is $0.8 - 0.08 = 0.72$. Now the size of $N' \cap M'$ is the size of N' (0.9) less the size of $N' \cap M$ (0.72); that is $0.9 - 0.72 = 0.18$. The set $N' \cap M'$ lies completely inside the set N' and occupies a proportion $\frac{0.18}{0.9} = 0.2$ of N'. Hence $P(M'|N') = 0.2$.