STAT/MA 41600
In-Class Problem Set #3: August 31, 2015
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Problem Set 3 Answers

1a. The probability is $(.45 + .42)^5 = (.87)^5 = 0.4984$.
1b. Let each person sampled be a trial. Treat the selection of a female as a good result, selection of a male as a bad result, and selection of a child as neutral. Then the probability that the first adult we interview is a female is $\frac{.45}{.45+.42} = 0.5172$.

2a. On a given roll, the probability that a value is 7 or less is 21/36. So the probability that we get two results of 8 or higher, followed by a result of 7 or less, is $(15/36)^2(21/36) = 0.1013$.
2b. The probability that 1 or 2 rolls is sufficient is $\frac{21}{36} + (\frac{15}{36})(\frac{21}{36}) = 119/144 = 0.8264$. So the probability of the complementary event, i.e., the probability that 3 or more rolls are needed, is $1 - 119/144 = 25/144 = 0.1736$.
2c. We let the sum of the dice be a trial. Then a good trial is exactly a 7, a bad trial is a value (strictly) less than 7, and a neutral trial is (strictly) more than 7. (Notice that we stop when a good or bad trial occurs, i.e., when a roll of 7 or less occurs.) Then the probability of a good trial is 6/36 and the probability of a bad trial is 15/36. So the desired probability is $\frac{6/36}{6/36+15/36} = 6/21 = 2/7 = 0.2857$.

3. We consider the chosen genre as a trial. A good trial is rock. A bad trial is country, pop, or R&B. A neutral trial is any other genre. Hence, we stop when we get a good or bad trial. So the probability that the person prefers rock is $\frac{.29}{.29+.11+.15+.17} = 0.4028$.

4a. We let each of the simultaneous (triples of) rolls of the three dice count as a trial. A good trial has a sum of 5 and the green and blue dice have the same values. A bad trial has a sum of 5 but the green and blue dice do not have the same values. A neutral trial does not have a sum of 5. So a good trial has probability $P(\{(1,1,3),(2,2,1)\}) = 2/96$, and a bad trial has probability $P(\{(1,3,1),(3,1,1),(2,1,2),(1,2,2)\}) = 4/96$. So the desired probability is $\frac{2/96}{2/96+4/96} = 2/6 = 1/3$.
4b. The solution is exactly the same, even if the dice do not have colors. If you are worried about distinguishing the two 4-sided dice, just put one into your left hand and one into your right hand, and everything proceeds as above.