COMP2610/COMP6261 – Information Theory

Tutorial 1: Elementary Probability

Week 1, Semester 2, 2021

1. A spinner is divided into 5 equal sections, with sections labelled 1, 2, 3, 4 and 5. Compute the probability of:

a) spinning a 4 on the spinner. 1/5

b) spinning an even number on the spinner. 2/5

c) Spinning a prime number on the spinner. 3/5

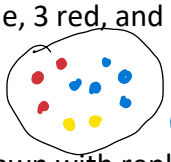
2. Let us assume that ACT number plates have three letters followed by three numbers (e.g., YOA077). What will be the probability that a randomly chosen number plate will have an ACT with the number ending in a 7 (ACT##7)? $\frac{1}{26}\times\frac{1}{26}\times\frac{1}{26}\times\frac{1}{26}=\frac{1}{26^4}=\frac{1}{1679616}$ $\left(\frac{1}{26}\right)^3\times\frac{1}{10}$

3. ACT Govt. plan to enforce speed limits during the morning rush hour on four different routes into the city. The traps on routes A, B, C, and D are operated 40% , 30%, 20%, and 30% of the time, respectively. Arya always speeds to work, and she has probability 0.2, 0.1, 0.5, and 0.2 of using those routes. Compute the probability of:

a) Arya getting a ticket on any one morning. $0.4\times0.2+0.3\times0.1+0.2\times0.5+0.3\times0.2=0.27$

b) Arya will go five mornings without the tickets. $(1-0.27)^5=0.73^5\approx0.2073$ $1-0.27=0.73$

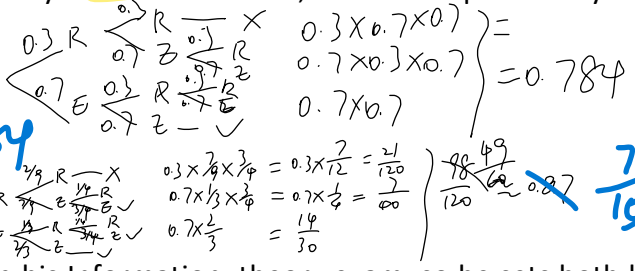
4. In an urn there are 5 blue, 3 red, and 2 yellow marbles. If you draw 3 marbles, what is the probability that less than 2 will be red if:



Red: 0.3

Else: 0.7

a) the marbles are drawn with replacement. 0.784



b) the marbles are drawn without replacement. 0.817

5. Nick will miss an important Cricket match while taking his Information theory exam, so he sets both his VCRs to record it. The first VCR has 70% chances to successfully record the match and the second VCR has 60% chances to successfully record the match . What is the probability that he gets home after the exam and finds? (Note: Here we assume that events A and B are independent, so with P(A) = 0.7 and P(B) = 0.6 and their set complements A^c and B^c occurring with probabilities 0.3 and 0.4 respectively).

a) No copies of the Cricket match? $0.3\times0.4=0.12$

b) One copy of the Cricket match? $0.7\times0.4+0.3\times0.6=0.28+0.18=0.46$

c) Two copies of the Cricket match? $0.7\times0.6=0.42$