CA660 Statistical Data Analysis (2019_2020)
Review Exercises + Probability Basis
[Note: Some of the exercises are FYI only,
i.e. they are not covered or examinable in 2019]

1. Des Jarlan's et al. (1991) examined failure to maintain AIDS risk reduction in a study of intravenous drug user's in New York. Findings were as follows

No. of Sexual	**Risk Reduction Status**			
Partners /month	**None**	**Not Maintained**	**Maintained**	**Total**
0	20	17	43	80
1	37	45	95	177
>1	20	54	67	141
Total	77	116	205	398

On selecting a subject at random, what is the probability

(i) He/she did not initiate risk reduction
(ii) Given he/she had more than one sexual partner, that he/she maintained risk reduction
(iii) That he/she had no sexual partners and did not maintain risk reduction
(iv) He/she had one sexual partner or initiated no risk reduction

2. The probability that a person, selected at random from a given population, exhibits classical symptoms of a certain disease =0.2. The probability that a person, selected at random etc., has this disease =0.23. The probability that a person, selected at random etc., has the symptoms and has the disease =0.18. If a person, selected at random from the population, does not have the symptoms, what is the probability that he/she has the disease?

3. In a certain population, 10% of persons are given a credit rating B. A random sample of 25 is drawn, find the probability that

(i) No more than 5 are CRB
(ii) At least 6 are CRB
(iii) Between 6 and 9 inclusive are CRB.
(iv) Some 2,3 or 4 are CRB

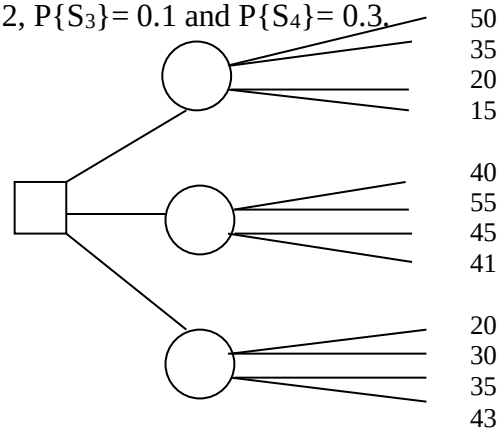
4. In accident surveys, a large number of secondary roads are sampled in a given region and the number of fatal accidents in each sample is counted. The average number of accidents leading to fatalities in a sample is found to be 2. If these counts are assumed to follow a Poisson, find the probability that

(i) A sample will contain ≤ 1 fatal accident
(ii) .. .. exactly 3 fatal accidents
(iii) .. .. ≥ 5 fatal accidents

5. In a certain population, 13 new cases of oesophagal cancer are diagnosed on average each year. If we assume that the incidence of oesophagal cancer follows a Poisson, find the probability in a given year that the number of newly diagnosed cases of o.c.

(i) Equals 10 (iii) ≤ 12 (v) ≤ 7
(ii) ≥ 8 (iv) between 9 and 15 inclusive

6. [FYI, not covered/examinable in 2019] Complete the following decision tree and determine the decision based on the max expected payoff. Let $P\{S_1\}= 0.4$, $P\{S_2\}= 0.2$, $P\{S_3\}= 0.1$ and $P\{S_4\}= 0.3$.



Branches are labelled S_1 to S_4 from top to bottom in each case

7. Worldwide production of Japanese car industry in 1989 was as follows, (in thousands of vehicles worldwide).

Manufacturer	**Thousands of Vehicles Worldwide**
Toyota	4,448
Nissan	3,009
Honda	1,861
Mitsubishi	1,560
Mazda	1,270
Suzuki	868
Daihatsu	664
Fuji(H)	563
Isuzu	559

(i) Are classifications mutually exclusive?
(ii) If a Japanese vehicle is selected at random, what is the probability that it is neither a Toyota, a Nissan, or a Honda?
(iii) Suppose two vehicles are selected at random from this worldwide production. What is the probability that both are Toyotas or both Nissans?
(iv) For the two vehicles in (iii), what is the probability that at least one is a Toyota?

8. [FYI, not covered/examinable in 2019] Referring to the example in the lecture on introducing a new computer tablet to the market, the closeness of the expected payoff figures means that the management want to perform a sensitivity analysis before making a decision. The following sets of probabilities are to be used. How sensitive, (from your analysis), are decisions based, respectively, on *minimax* and *maximum expected payoff* strategies?

$P\{S_1\}$	$P\{S_2\}$	$P\{S_3\}$	$P\{S_4\}$
0.1	0.5	0.2	0.2
0.1	0.5	0.1	0.3
0.1	0.5	0.3	0.1
0.1	0.5	0.2	0.2
0.2	0.5	0.2	0.1