Assignment 1

Instructions

- Deadline: **September 11 (4:00 pm)**
- Format: Hard copy (on paper) only. **Submissions by MIO will not be accepted.**
- Please show all of your work on your submission.
- Notation counts. Poor notation will result in a loss of marks.
- Please leave your answers as exact values. If using decimals, please report your answer to four decimal places.
- You are encouraged to ask your instructor for help, and/or discuss ideas with your classmates. However, you must produce fully explained individual solutions.
- Under no circumstances may you simply copy solutions obtained online or from a classmate.
- In unclear cases, you may be asked to explain your solutions in a Teams meeting, and your work may be refused altogether.

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1. **Shaken. Not Stirred**

   A new study published in the *Medical Journal of Australia* called *"License to Swill"* has found that James Bond has a "severe alcohol use disorder". In *Quantum of Solace*, he downs six vesper martinis on an aeroplane — enough to kill some people. The number of alcoholic beverages consumed by Bond in 45 missions is shown below:

2	5	6	6	7	7	7	8	8	8	9	9	9	9	9
10	10	10	11	11	11	12	12	12	13	13	13	14	14	14
15	15	15	16	16	16	17	17	17	18	18	18	19	19	24

   (a) Organize the data into **seven classes** and make a table showing: class limits, class boundaries, the frequencies, relative frequencies, the less-than cumulative frequencies (LTCF), the LTCF's in decimal, the more-than cumulative frequencies (MTCF), and the MCTF's in decimal.

   (b) What is the probability that Bond consumes at least 14 drinks in on a mission?

   (c) What is the probability that Bond consumes at most 9 drinks or at least 22 drinks on assignment?

   (d) What is the probability that Bond consumes between 10 and 21 drinks (inclusive) on the job?

2. **Mocker Swallowtail Butterflies**

To avoid predation, female mocker swallowtail butterflies can be born in one of at least 14 different guises that all resemble poisonous butterflies. The males all look the same. The wingspans of 42 swallowtail butterflies in millimetres are shown below.

50	58	59	60	65	66	67	67	68	74	74	75	75	77
77	77	78	78	81	83	85	87	88	88	88	88	89	89
89	89	89	89	89	90	90	90	90	91	91	91	92	92

(a) Organize the data into **six classes** and make a table showing: class limits, class boundaries, the frequencies, relative frequencies (in %), the less-than cumulative frequencies (LTCF), the LTCF's in decimal, the more-than cumulative frequencies (MTCF), and the MCTF's in decimal.

(b) How many butterflies in the sample have a wingspan of 74 mm or more?

(c) What is the probability that a randomly selected butterfly has a wingspan at most 65 mm or least 90 mm?

(d) Based on the frequency distribution, which wingspan interval is the least likely for a randomly selected butterfly? Explain your reasoning.

(e) Decide between a bar graph and a histogram. Then sketch a graph of the relative frequencies (in %) for the wingspan data. Label your axes, and comment on the shape of the distribution.

3. **Kea Birds**

In New Zealand, kea birds are so fond of stealing traffic cones that authorities have been forced to set up roadside "gyms" to keep the birds occupied. The number of cones stolen per week by a mischievous flock of kea was recorded over 48 weeks, as shown below:

3	4	5	6	6	7	7	8	8	9	9	9	10	10	10	11
11	11	12	12	12	12	13	13	13	13	13	14	14	14	15	15
15	15	15	15	15	16	16	16	17	17	17	17	17	17	20	20

(a) Organize the data into **six classes** and make a table showing: class limits, class boundaries, the frequencies, relative frequencies, the less-than cumulative frequencies (LTCF), and the more-than cumulative frequencies (MTCF).

(b) What is the probability that the kea flock steals 9 or more cones in a given week?

(c) What is the probability that the kea flock steals at most 14 in a given week?

(d) Which is event is more likely: that a kea flock steals exactly 12 cones in a week, or that a flock of keas steals exactly 17 cones in a week? Justify your answer with some calculations..

4. **Balloons**

Artist Masayoshi Matsumoto has taken balloon modelling to a whole new level. Watch how he makes them here

The number of balloons used to make 45 sculptures are shown below

11	12	14	16	18	20	22	23	26	28	30	32	33	33	34
34	35	35	35	35	35	35	36	36	38	39	39	44	46	48
49	51	53	53	54	54	62	64	66	70	72	74	92	94	95

(a) Organize the data into **seven classes** and make a table showing: class limits, class boundaries, the frequencies, relative frequencies (in decimal), the less-than cumulative frequencies (LTCF), the LTCF's in decimal, the more-than cumulative frequencies (MTCF), and the MCTF's in decimal.

(b) What is the probability that a randomly selected sculpture uses at least 24 and at most 62 balloons?

(c) What is the probability that a randomly selected sculpture does not fall into the the two categories from part (b)?

(d) In the long run, if 500 balloon sculptures are made, how many would you expect to use at least 50 balloons?

(e) Decide between a bar graph and a histogram. Then, sketch a graph of the frequencies for the number of balloon used to make a sculpture. Label your axes, and comment on the shape of the distribution.