Problem Statement 1: [50 marks]

The marks awarded for an assignment set for a Year 8 class of 20 students were as follows:

6 7 5 7 7 8 7 6 9 7 4 10 6 8 8 9 5 6 4 8

Mean =: $\bar{X} = \frac{1}{20} \sum X_i = \frac{1}{20} (6 + 7 + 5 + 7 + 7 + \cdots + 8) = \frac{137}{20} = 6.85$

Median is given by the number in the middle of the ordered data set.

In this case there are two in the middle and will average the two numbers i.e.

4 4 5 5 6 6 6 6 7 7 7 7 7 8 8 8 8 9 9 10

Median $= \frac{1}{2}(7 + 7) = 7$

Mode is the number which has the highest frequency

Mode $=\ 7$

Problem Statement 2: [50 marks]

The number of calls from motorists per day for roadside service was recorded for a particular month: 28, 122, 217, 130, 120, 86, 80, 90, 140, 120, 70, 40, 145, 113, 90, 68, 174, 194, 170, 100, 75, 104, 97, 75, 123, 100, 75, 104, 97, 75, 123, 100, 89, 120, 109

Calculate the mean, median, mode and standard deviation for the problem statements 1 & 2.

Mean =: $\bar{X} = \frac{1}{35} \sum X_i = \frac{1}{35} (28 + 122 + 217 + \cdots + 109) = 109.85$

Median is given by the number in the middle of the ordered data set below

28 40 68 70 75 75 75 75 80 86 89 90 90 97 97 100 100 **100** 104 104 109 113 120 120 120 122 123 123 130 140 145 170 174 194 217

Median = 100

Mode is the number which has the highest frequency

Mode $=\ 75$

Problem Statement 3: [100 marks]

The number of times I go to the gym in weekdays, are given below along with its associated probability:

x = 0, 1, 2, 3, 4, 5 and f(x) = 0.09, 0.15, 0.40, 0.25, 0.10, 0.01 Calculate the mean no. of workouts in a week. Also evaluate the variance involved in it.

Mean is given by:

$$E[X] = \sum X_i f(X) =\ 0(0.09) + 1(0.15) + 2(0.40) + 3(0.25) + 4(0.10) + 5(0.01)$$

$$= 0 + 0.15 + 0.80 + 0.75 + 0.40 + 0.05$$

$$= 2.15$$

Problem Statement 4: [100 marks]

Let the continuous random variable D denote the diameter of the hole drilled in an aluminium sheet. The target diameter to be achieved is 12.5mm. Random disturbances in the process often result in inaccuracy. Historical data shows that the distribution of D can be modelled by the PDF $f(d) = 20e^{-20(d-12.5)}, d \geq 12.5$. If a part with diameter > 12.6 mm needs to be scrapped, what is the proportion of those parts? What is the CDF when the diameter is of 11 mm? What is the conclusion of this experiment?

The variable of interest D is not included in the PROBABILITY DENSITY FUNCTION