## Mathematical Statistics Problem Set 1 Descriptive Statistics

1. A group of 20 amateurs took part in a 20 km street race. The results obtained (in minutes) were:

$$
111,131,132,135,139,141,148,149,149,152,153,157,158,175,176,181,184,186,190,190 .
$$

Illustrate the race times by means of a histogram of
(a) bins of width equal to 10 , starting from 110 ;
(b) bins of width equal to 10 , starting from 105 ;
(c) 4 bins of equal width.

Discuss the differences.
2. The series:

$$
2,2,2,2,2.5,2.5,2.5,3,3,3,3,3,3,3,3.5,3.5,3.5,3.5,4,4,4,4,4.5,5,5
$$

describes the exam grades of a group of Mathematical Statistics students.
(a) Plot the bar chart for student grades
(b) Find the mean and median of the sample. Interpret the values of the statistics.
3. An analysis of the earnings of a group of engineers yielded the following results

| earnings (in thousands of \$) | Empirical CDF |
| :--- | :---: |
| 2.4 | 0 |
| 2.8 | 0.1 |
| 3.4 | 0.19 |
| 3.8 | 0.32 |
| 4.2 | 0.5 |
| 4.6 | 0.75 |
| 5.0 | 0.9 |
| 5.4 | 0.96 |
| 5.8 | 1 |

Visualize the distribution of earnings by means of a histogram. Calculate the mean, median, mode and interpret the results.
4. The amounts of monthly income taxes paid by workers of a certain factory amounted to (in EUR): 126.31140 .09346 .7286 .14106 .00139 .7243 .2979 .0268 .35152 .8075 .3917 .3554 .00114 .0767 .0895 .34 71.8038 .77156 .73204 .03189 .3859 .3817 .6975 .4338 .57153 .46253 .9227 .6995 .20174 .1030 .21104 .75 90.97139 .12291 .1373 .4912 .83248 .51183 .4348 .3310 .34174 .5958 .8033 .7518 .3293 .0873 .3520 .18 79.65268 .71117 .4974 .0797 .64225 .97106 .4660 .99145 .1972 .1027 .6134 .75201 .31125 .7269 .42
 $104.6436 .3478 .94213 .5815 .32180 .15184 .83107 .7977 .17174 .7532 .49176 .6852 .06 \quad 68.78107 .16$ 32.93141 .07124 .24155 .422 .4820 .7514 .08
(a) Calculate the mean and the median value of monthly income taxes for this group of workers.
(b) Construct three grouped frequency tables for this data with class intervals of length: 30, 50 and 70 . For each of these groupings, calculate the mean and the median based on the grouped interval data. Discuss the differences and compare with the values calculated for raw data.

