Homework #3

The SAT Reasoning Test is a standardized test for college admissions in the United States. SAT consists of three major sections : Critical Reading, Mathematics, and Writing. Each section receives a score on the scale of 200-800.
In the table below are shown the SAT Maths scores for 173 students.

368	440	447	457	472	485	501	520	537	551	575	650
370	441	448	459	474	486	501	521	538	551	575	654
375	441	449	459	474	487	502	524	540	553	583	660
382	442	449	460	474	489	505	525	540	554	585	670
393	442	450	464	476	490	506	526	542	557	585	700
403	444	450	466	476	490	506	526	542	557	589	736
404	444	450	467	477	492	507	528	543	559	590	740
408	444	450	468	479	495	509	529	544	560	590	750
410	445	450	468	479	495	510	529	545	560	590	
413	445	451	470	480	495	512	530	547	560	592	
428	445	452	470	480	496	513	531	547	564	596	
430	445	456	470	480	496	513	532	548	570	616	
439	446	456	470	480	499	514	533	549	570	621	
440	446	457	471	482	499	515	533	549	571	642	
440	446	457	472	485	500	515	536	550	574	644	

In this exercise, we will discover a method to find an approximate value of the median and quartiles when the data is grouped in intervals.

Preliminary question Explain why the median is the 87th value in this ordered data. Deduce its value. Compute, in the same way, the exact values of the quartiles of these data.

1. Group the data in intervals of width 25, starting at 343.5. Show the results in a frequency table (with the absolute frequencies).
2. Represent the data as a histogram.
3. (a) Add a new row or column in the table of question 1 where you'll show the cumulative absolute frequencies.
   (b) How many students had a score between 593.5 and 618.5 ?
   (c) How many students had a score less than 593.5 ?
4. (a) In what interval is the median ? This interval will be called I_{Med} in the following questions
   (b) What do you think of the middle of this interval as an approximate value of the median ?
   (c) How many students had a score in the interval I_{Med} ?
   (d) We've seen in the preliminary that the median is the 87th value of the data. Deduce from the previous questions the exact rank of the median in the interval I_{Med}.

(e) Assuming that the values are equally space inside the interval, we can deduce that an approximative value of the median is given by the formula :

$$Med \approx 493.5 + \frac{5}{23} \times 25.$$

Explain every element of this formula and use it to compute the approximate value.

(f) What do you think of this new value as an approximate value of the median ?

5. Use the same method to find approximate values of the first and third quartiles from the grouped data.