

Exercises for Day 20

Exercise 1. Download the Excel spreadsheet named `grade.xlsx` from the course web page. The file contains a grade sheet for a first-year course. The columns are:

Column	Contents
A	Student ID number
B-F	Homework scores
G-H	Mid-Term scores
I	Final Exam score

The last row provides the perfect score for each activity. According to the course policy, the total course grade is computed based on the following formula:

$$\text{Course Grade} = 0.20 * \text{Homework Average} + 0.40 * \text{Mid-Term Average} + 0.4 * \text{Final Exam Score}$$

where “average” represents the arithmetic mean of all reported scores in the respective category.

- Add some summary columns and give them headings:
 - Put the Homework Average *in percent* in column K.
 - Put the average of the mid-term scores *in percent* in column L.
 - Put the Final Exam Score *in percent* in column M.
 - Leave column N blank
 - Put the Course Grade *in percent* in column O.
- Next add some summary rows and give them headings:
 - Add a row for the maximum (in percent) for each of the columns you have created.
 - Add a row for the minimum (in percent) for each of the columns you have created.
 - Add a row for the average (in percent) for each of the columns you have created.
 - Add a row for the median (in percent) for each of the columns you have created.

Print the final spreadsheet out to turn in for this problem.

Exercise 2. Download the Excel spreadsheet named `rocket.xlsx` from the course web page. The data file you have is the thrust measurement from a rocket engine in a static test. It contains two columns of data. The first column lists the time, t , in seconds while the second column lists the thrust, $F(t)$, in **Newton**s. The time data is evenly spaced; the difference between all times is a constant. The duration of the test is 5.00 seconds.

- a) Use Excel to plot the rocket thrust, $F(t)$, in **kiloNewtons**, against the time, t , in seconds. Properly label both axes, and provide a meaningful title to the figure. There should be no legend.

(over)

- b) The rocket's mass flow rate $\frac{dm}{dt}$ is modeled by the equation $\frac{dm}{dt} = 500 \exp(-1.25 t)$ kg/s. We can then calculate the exhaust gas velocity at each time point as follows:

$$V_e = \frac{F(t)}{\left(\frac{dm}{dt}\right)}$$

Create a column containing the values of $\frac{dm}{dt}$. Create a column containing the values of V_e . Find the maximum value of V_e .

- c) To calculate the effectiveness of the engine in the test, its impulse, I , must also be calculated. The impulse is the area under the thrust curve from the start to the end of the test. Implement the trapezoidal rule, using Excel, to compute the impulse, I , as follows:

$$I = \int_{t=0}^{t=5} F(t) dt \approx \sum_{i=1}^{N-1} \left[\frac{F_i + F_{i+1}}{2} \right] \Delta t$$

where N is the number of rows in the data file.

Print out the plot (chart), as well as the first and last pages of the spreadsheet. (That is, tell Excel to print the spreadsheet but choose only the first page and the last page for printing.)