MA6004 autumn 2022

THE PROJECT ASSIGNMENT

The purpose of this assignment is to show how you can carry out a modelling process as described in Blum and Ferri (2009) based on a situation of your own choice. The mathematics you use must be within chapters 2-7, 9 of the textbook (Gulliksen et al., 2022). You choose whether you want to start from a situation that involves descriptive modelling or a situation that involves prescriptive (normative) modelling (Niss, 2015). The work with the model will be somewhat different depending on this choice. Another option is to carry out a descriptive modelling process and then reflect on how the situation could be changed to include normative aspects.

In your work with the assignment, you must show how to use digital tools such as GeoGebra, Excel or programming in a programming language (Python is probably the most relevant here).

1. Find a situation that is suitable for modelling with functions, and possibly also with concepts closely related to functions such as differentiation, integration and differential equations. You can get inspiration for choosing situations from the articles by Blum and Ferri (2009) and Niss (2015), but you are otherwise free to choose the situation within the framework of modelling involving the use of functions and related concepts.
2. Describe the situation you choose and what it is in the situation you want to find out, i.e. what questions will answered by using the mathematical model. Explain whether you want to create a descriptive or a prescriptive model. When working with the model, you should particularly emphasise the transition from situation to mathematical model, i.e., steps 2 and 3 in the modelling cycle (Blum & Ferri, 2009, p. 46), the mathematical processing (step 4 in the cycle) and the interpretation of the results (step 5 in the cycle). This means that it is not a requirement that you relate the work with the model to empirical data, but the situation you choose should be such that it is in principle possible to find empirical data.
3. Explain the mathematical model you create based on the situation, step 3 of the modelling cycle (Blum & Ferri, 2009, p. 46).
   1. What assumptions about the situation have you made?
   2. What simplifications of the situation have you made?
   3. Why is the mathematical model you choose a reasonable description of the situation (step 3)?
   4. Show the mathematical treatment of the model and the results you arrive at (step 4). This work will involve the use of digital tools for illustrations and calculations.
4. Perform calculations with the model to arrive at mathematical results and interpret these results in light of the original situation. What is the range of validity of the model?
5. If you have chosen a descriptive model, what investigations can you do to determine if the results you have obtained are reasonable? Explain what the results mean in the original situation (step 5).

The results of the work are presented in a report that should be approximately 2,500 words in length.

Deadlines:

- An outline of the problem/situation must be sent by email to Frode by 3 October.

- An oral presentation of the work will be held sometime between Session 2 and Session 3

- A draft response is submitted no later than 15 November

- The final response is submitted no later than 5 December

References

Blum, W., & Ferri, R. B. (2009). Mathematical modelling: Can it be taught and learnt? *Journal of Mathematical Modelling and Application, 1*(1), 45-58

Gulliksen, T., Hashemi, A. M., & Hole, A. (2022). *Matematikk i praksis* (7th Ed.). Universitetsforlaget.

Niss, M. (2015). Prescriptive modelling – challenges and opportunities. In G. A. Stillman et al. (Eds.), *Mathematical modelling in education research and practice* (pp. 67-79). Springer.