

Container logistics – teacher guide

Abstract

For a city it is important to have an efficient system of public transport. If a city grows it may be necessary to reorganize the public transport system and for example set up a completely new bus network. In this assignment students design a plan for a new bus network for a city, based on a set of data and criteria. The system must be efficient and meet the needs of both inhabitants and tourists. Students have to plan the routes, the stops and the timetables, compare different options and think of measure to judge their quality. They test their plans using the data of fictive travelers.



Discipline: Mathematics

Duration: 480 minutes

Target Group: upper secondary school

Age range: 15 - 18

WoW context: Public transport planner

Introduce the context of public transport planning. You may use the pictures, maps and text from the assignment or you can show a video. For example parts of this video on careers in transportation <https://www.youtube.com/watch?v=bVVp0t1hfQI> (which has somewhat wider scope).

Student task

Student design a plan for a new bus network for a city, based on a set of data and criteria and think of measure to judge the quality of the plan.

Extra information

This task was originally designed for the mathematics A-lympiad: a real-world-mathematics-problem-solving competition for teams of students from upper secondary schools. The open assignments are designed by the A-lympiad committee, a committee residing at the Freudenthal Institute of Utrecht University in the Netherlands, that organizes the Mathematics A-lympiad since 1989. The aim is to elicit students to think mathematically, to solve open-ended unfamiliar problems in a creative way, to model, structure and represent problems and solutions, to work collaboratively and to communicate about mathematics. The task is set in a non-mathematical real life (often work related) situation that asks for mathematical modelling and problem solving. The final product is a report fitting the real-life context of the task. These reports are assessed by taking into account:

- The completeness and correctness of the answers for the various parts;
- the representation of calculations and the method used;
- the use of math;
- the argumentation and the justifications of choices and decisions;
- the depth to which the various assignments have been answered;
- originality and creativity in methods and solutions;
- elements like: lay-out, readability, language, illustrations etc..



Lesson plan example:

Because the assignment is originally meant for a competition the role of the teacher can be limited to giving guidance on the planning and the group-processes. In a regular classroom setting the teacher may of course decide to build in opportunities for classroom discussions, reflection or clarification.

15 min Acquaint your students with the WoW context by using the introduction to the assignment (see student worksheet). You may also use other materials such as video's related to the WoW-context or a presentation by a vocational specialist.

15 min Talk to students about the way to work on the assignments. This can also be found on the first page of the assignment.

- First read the full text of the assignment so you will know what you have to do in the seven hours you have for this assignment.
- Divide tasks where possible and consult in your group when needed.
- Keep an eye on the time when you work on the different parts.
- Be sure to have enough time left to draw up the report and prepare for the presentation

420 min Students work for about 7 lessons in teams of 3 or 4 on the tasks in the assignment. You may want to build in some classroom discussions to reflect on the process and discuss issues.

Allow about 5 hours (300 min) for the introductory tasks and final assignment 1-3. These three final assignments should be finished before students start on final assignment 4. For this final assignment 4 students need extra information. This information can be found in appendix 1 of this document. Make a copy and hand it to the students at the appropriate moment.

Allow about 2 hours for final assignment 4 and the design of the presentation.

60 min In a plenary session, students present their results.



Appendix 1

Assignment 4: The travelling time

When traveling with public transportation, there are several websites nowadays to help you out. You enter a departure or arrival time, a starting point and a destination. The computer will generate a schedule. An example of such a schedule is shown below:





Schedule of Journey

From prof leon fuchslaan 24, utrecht

To rijnlaan 139, utrecht

Date thursday, 10 march 2005

Departure: **8:59**
 Arrival: **9:30**
 Travel time: **0:31**
 Transfers: **1**

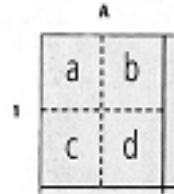
Departure	From	To	Arrival	How
8:59	prof leon fuchslaan utrecht	prof j w dieperinklaan utrecht	9:01	 walk 2 min
9:01	prof j w dieperinklaan utrecht	vredenburg utrecht	9:05	 bus 138
9:14	vredenburg utrecht	maasplein utrecht	9:29	 citybus 1
9:29	maasplein utrecht	rijnlaan utrecht	9:30	 walk 1 min

On the next page are eight descriptions of journeys in Amberhavn.

Test your schedule for your bus network by designing time schedules, like the one shown above, for each journey.

Present the total travelling time of all eight journeys on your poster; attach the eight travelling schedules to your report for the city council.

In the descriptions the following location system will be used to specify location within the larger squares on the map:



Journeys

Korteweg family

The Korteweg family lives in Rue Constant Martha 5 (G2c). They want to go to the movies on Monday night with their kids. The movie starts at 21.15 h in Filmview Theatre, Place Klebert 3 (C3c). The movie lasts for two hours. Design a schedule for the way back from the movies to the home of the Korteweg family and calculate their travel time.

Mr. Van Roosmalen

Mr. Van Roosmalen works at the European Broadcasting Company (E2). On Tuesday he expects a foreign guest. This guest will arrive at 11:45 at the railway-station (B3). Mr. van Roosmalen collects his guest there. At 12.30 a conference meeting starts at the European Broadcast Company, that both Mr. van Roosmalen and his guest have to attend. Make a schedule for Mr. van Roosmalen from the time of departure at the European Broadcast Company until his return there and calculate his travel-time.

Pieter Geels

Pieter Geels is a student of mathematics, he lives in Elave. Every Wednesday he has an Algebra class, by prof. Bourbaki at 09:15, in lecture-room B of the Mathematical Institute. This Institute is located at the Rue de Rome 7 (E4). Make a schedule for Pieter Geels' journey to the Mathematical Institute and calculate his travel time.

Mevrouw Lenders

Mrs. Lenders lives at the Rue d' Oslo 5bis (F4a). On Wednesday she has a dental appointment at 11:25. The dental practice is located at Rue de Nideck 17(B5a). Make a schedule for Mrs. Lenders' journey from her house to the dental practice and calculate her travel time.

Mrs. Arendson

Mrs. Arendson's mother (aged 85, walking disability) has an appointment at the University Hospital on Thursday at 9.45. Mrs. Arendson collects her mother at her home and takes her to the Hospital. Mrs. Arendson lives at the Rue de Phalsbourg 1 (C2d). Her mother lives at the Rue Berlioz (F3c). Make a schedule for Mrs. Arendson's journey. Calculate the travel time of Mrs. Arendson from her

own house, to her mother's house and from there to the Hospital. Include walking time and transfer time.

Mr. Wekema

Mr. Edema lives at the Rue de Narcisses (E1c) and works as a doorman at the European Broadcast in Building B at the Avenue du Président Robert Schumann (E2b). At Friday his shift starts at 15:00 and ends at 23:00. Make a schedule for his journey to and from his job. Calculate his travel time to and from his job.

Claire Orange

Claire Orange plans to visit her sister Nadine on Saturday around 11 a.m. Nadine lives at Rue du St. Quentin (F3bd). Clair lives at the Rue du Jardin (E2a). Make a schedule for Claire Orange's journey from her house to her sisters house and calculate her travel time.

Janet Kapowsky

Janet Kapowsky is a tourist. She stays at the Youth Hostel at the Rue du Fosse 7 (C2c). She leaves on Sunday at 10:05 after a late breakfast, to visit the City Centre. First she wants to go to the old City Centre (see nr. 3). She has a late lunch at the Quay de la Petite France (B4b). After that she walks around for a while. Just before 15:30 she decides to take a bus to Pont St. Etienne (D3c). Then she walks to the Cathedral (nr. 2) . After visiting the Cathedral she returns by bus to the Youth Hostel. She has an appointment there with a friend at 18:00. Make a schedule for each separate bus journey and calculate the travel time. Also calculate how much time Janet has to visit the Cathedral.



