



# Spring dinner

## LOWER SECONDARY MATHEMATICS DAY 2021



*The OnderbouwWiskundeDag (OWD) was organized for the first time in 2012. The OWD is a team competition for 3 HAVO/VWO, in which a large, recognizable problem is placed in a central position. The OWD is organized in the tradition of offering 'larger assignments' within mathematics education, as an essential addition to the mathematics curriculum from the book, organized under the heading "Mathematics in Teams." Primary education has De Grote Rekendag. Characteristics of these larger assignments are: the application of mathematical knowledge and skills in complex authentic situations; deploying modeling- and problem-solving skills; working together in groups of three to four students; provide a clear report of the solution process and the final results and so make explicit the mathematics used. The OWD is in line with the renewed program for lower secondary schools resulting from the programmatic changes in the Second Phase HAVO/VWO of 2015. The OWD is organized by the Freudenthal Institute of Utrecht University, with support from the Ministry of Education, Culture and Science. The OWD committee, responsible for assignment and judging, consists of Maartje Belmer (teacher RSG Magister Alvinus, Sneek), Vincent Jonker (Freudenthal Institute, Utrecht University), Dédé de Haan (teacher educator NHLStenden Hogeschool and Freudenthal Institute, Utrecht University) and Monica Wijers (Freudenthal Institute, Utrecht University)*

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## Introduction

Restaurant Octagon is a restaurant in the center of a medium-sized city. Due to Covid-19, the restaurant has been closed for a long time. Temporary staff has been fired and there is only one permanent waiter still employed.

In spring, the restaurant can finally reopen and the owner wants to tackle this in a grand way with a “spring dinner.” There will be a special menu, for a great price, and registrations are already coming in. Of course, all the rules that have been set for the catering industry in connection with Covid-19 must be complied with. As a result, not everyone who has registered can also be admitted to the festive evening.

You are asked to provide a plan for the floor plan of the restaurant. This must be done in such a way that as many of the guests who have registered as possible can actually come. The owner of Restaurant Octagon also wants you to think about a future-proof restaurant that can be used in times of Covid-19 as well as in times without restrictions. She is looking for creative new ideas.

The “Covid-19 rules” that must be met are:

- The maximum number of visitors inside is 30 people per room (including children, excluding staff).
- A group consists of a maximum of 10 people.
- Guests always keep a distance of 1.5 meters from each other (unless they come from 1 household) and have a fixed seat. This rule does not apply to children up to and including 12 years of age.
- A health check is mandatory upon entry.
- Traffic flows must remain well separated.
- You do not need to wear a mask if you are sitting at the fixed seat at the table; if not, you have to wear a mask. This applies to visitors and staff, except for children up to and including 12 years old.
- Restaurants must close at 22:00 h.

## Assignment 1: Seating arrangements

Below, you see a scheme with a number of the groups of people that have registered. A group can be placed at the table in different ways. One possible way in which a group is placed at the table is called a seating arrangement. Make different seating arrangements for each group, in which you comply with the "Covid-19 rules". The tables you can use are 70 cm by 70 cm and 140 cm by 140 cm. You can assume that you have enough tables at your disposal, but of course you will try to use as few tables as possible. Make clear drawings of the devised seating arrangements and justify your choices.

Groups of people	
family	$3a$
couple	$2a$
family w/ friends	$(2a, 2c)+a+a$
family w/ friends	$4a+(a,2c)$
friends	$2a+2a$
friends	$2a+a$
friends	$a+a+a$

Explanation of the above scheme:

- $a$  means adult;  $c$  means "child up to age 12";
- $2a$  means two adults who form one household (also referred to as "couple");  $3a$  means: 3 adults who form one household;
- $(2a, 2c)$  means a family (one household) with 2 adults and 2 children up to the age of 12;
- if it says +, it concerns separate households.  $2a+2a$  are two different households consisting of two adults each;  $(2a, 2c) + a + a$  consists of three households: a family, an adult not belonging to this family and another adult;  $4a + (a, 2c)$  consists of two households.

## Assignment 2: Layout for the spring dinner

Dinner is organized between 17:00 and 22:00 h. Many people have signed up. Below, you can see all reservations for the spring dinner.

Name	Composition	Name	Composition
Datoo	3a	Halang	2a
Gamers	2a	Aaron	2a
Freir	4a+(a,2c)	Sleurink	a+a+a
Hazelhof	2a+2a	Goris	2a+a
Holtrop	2a	Palm	a+a+a
Belmer	2a+a	Maduro	a+a+a+a
de Vries	a+a+a	Moussaoui	2a+2a+2a
Martinez	(2a,2c)+a+a	Weele	3a+a

On the next page and in the appendix, you can see a floor plan of the room, with the dimensions, the doors, toilets, kitchen and bar. You also see the dimensions of the furniture, of which there is enough available.

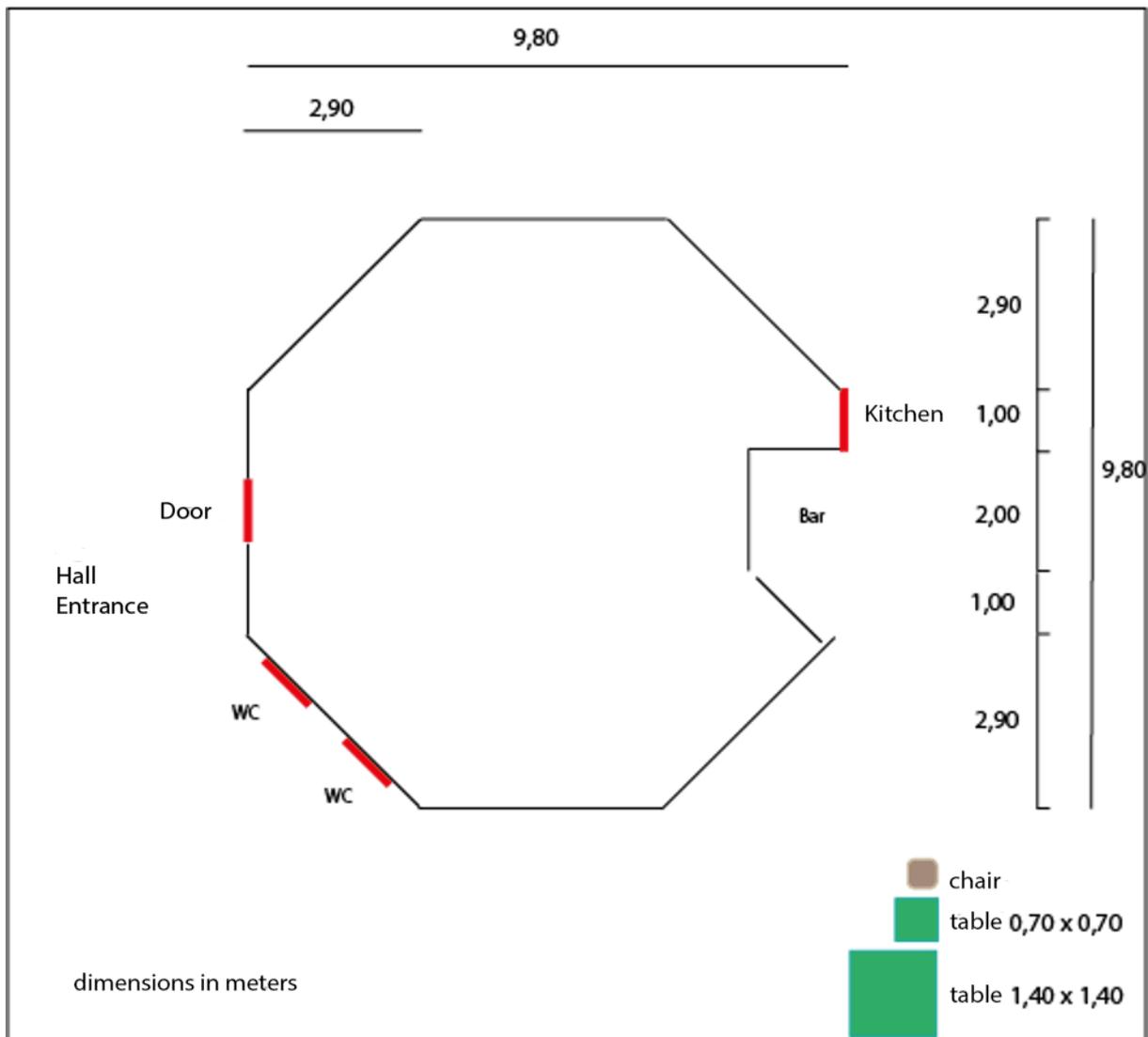
It's up to you to organize the spring dinner!

You can see that not everyone can come at the same time – that does not fit into the restaurant, and you would not comply with the rules then. So, you will have to make a plan how to organize the spring dinner in such a way that as many people as possible can come and eat. Keep the following restrictions in mind:

- you must comply with the Covid-19 rules;
- you want to cancel as few people as possible;
- dinner is organized between 17:00 and 22:00 h;
- it must be clear to every group of people at what time they are welcome to arrive;
- an average of two hours to have dinner is needed for every group of people;
- you need time and space to move tables;
- people also need time and space to arrive and depart.

Make one or more floor plans of the layout of the tables in the restaurant, which makes it clear how and where which groups are seated, and also clarify what time and what time the groups are in the restaurant. Also show that the layout(s) comply with the Covid-19 rules.

Explain your choices!



In the appendix:

Hal = hall  
 Ingang = entrance

WC = toilet  
 Keuken = kitchen

### **Assignment 3: Adjustment of the restaurant**

The restaurant owner is looking forward to a time when the Covid-19 rules are no longer in force. She would like to adapt her restaurant, so that the restaurant can open both in times of Covid-19 and in normal times, and will attract many customers. She asks you to come up with a plan for this.

Use your creativity to rearrange the restaurant. For example, you can think of other tables or a small renovation, but maybe you have many more ideas!

You are free to choose how you present your idea, but your teacher must be able to submit the idea to participate in the Lower Secondary Mathematics Day competition.

Have fun and good luck!

APPENDIX

