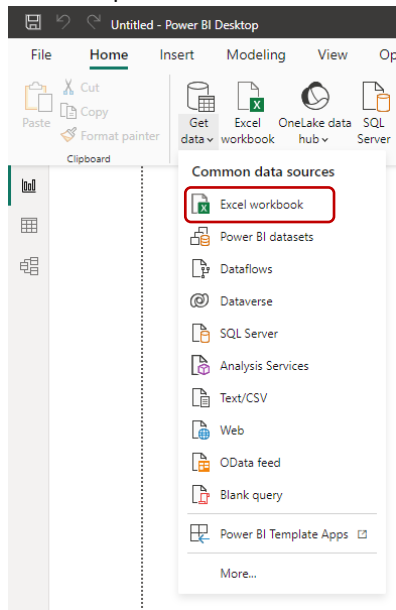


POWER BI DESKTOP

Practical work

1 Import and organize data

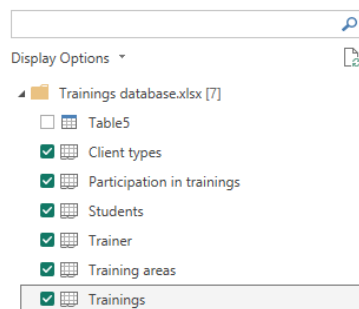
1.1 Import the initial data from an Excel file called: Trainings database.xlsx



1.2 Check tables:

- Client Types
- Participation in trainings
- Students
- Trainer
- Training areas
- Trainings

Navigator



Trainings

ID	Training name	Price per hour (class)	Price per hour (online)
1	Excel		30
2	Word		27
3	Power BI		36
4	Outlook		24
5	Annual Report Preparation		30
6	Investments		33
7	Accounting		30
8	Payroll Calculation		27
9	Estonian Language		18
10	Russian Language		18
11	English Language		18
12	German Language		18
13	Finnish Language		18
14	Adobe Photoshop		36
15	Sales Training		24
16	Budgeting System		24
17	Computer Networks		45
18	Human Resources Management		27
19	Strategy Seminar		18
20	Project Management		27
21	MS Project		36

Load

Transform Data

Cancel

- 1.3 Click **Transform Data** to open Power Query Editor
- 1.4 The table "Client types" contains information about client types (private, business and government) – OK, no need to edit
- 1.5 The table "Trainer" contains information about lecturers – OK
- 1.6 The table "Trainings" contains information about the name of the trainings and the hourly rate - As the prices in the "Training names" table are in two separate columns, this table must be changed:
 - 1.6.1 In the table "Trainings", mark the columns [Price per hour (class)] and [Price per hour (online)] and give the order **Transform/Unpivot Columns**
 - 1.6.2 Add a new column: if the row in the table refers to classroom training, enter "class " in this row, if it refers to e-learning, enter "online" -> **Add Column/Conditional column**

Add Conditional Column

Add a conditional column that is computed from the other columns or values.

New column name

Training type

	Column Name	Operator	Value	Output
If	Attribute	contains	ABC 123 class	Then ABC 123 class

Add Clause

Else

ABC 123 online

OK

Cancel

- 1.6.3 Remove [Attribute] column – select column and click **Home/Remove Column**
- 1.6.4 Rename [Value] column name – double click on column header and insert new name "Hourly rate"
- 1.7 The table "Training areas" contains the names of the training areas (Computer skills; Economy; Language; Management) – OK, all in order
- 1.8 Table "Students" – In the [Payer's Name] column, private persons are missing the name of the payer
 - 1.8.1 Add a new column with the **Add Column/Conditional Column** function, so that if the payer's name cell is empty, take the value from the [Student's Name] column, otherwise from the [Payer's Name] column.

Add Conditional Column

Add a conditional column that is computed from the other columns or values.

New column name

Payer

	Column Name	Operator	Value	Output
If	Payer's Name	equals	ABC 123 null	Then Student name

Add Clause

Else

Payer's Name

OK

Cancel

- 1.8.2 Delete the old [Payer's Name] column from the table -select column and click **Home/Remove Column**

1.9 In the "Participation in trainings" table, each row in the table shows the participation of one student in one training.

1.9.1 Add a new conditional column "Training type": if [Location] is unspecified, then "online" otherwise "class" -> **Add Column/Conditional Column**

✕

Add Conditional Column

Add a conditional column that is computed from the other columns or values.

New column name

	Column Name	Operator	Value ①	Output ②
If	Location	equals	ABC 123 null	Then ABC 123 online ...

Add Clause

Else ③


1.9.2 Bring the hourly price from the table "Trainings" for each training row (take into account whether it is classroom or e-learning)

- Click order Home/Merge Queries
- Select "Trainings" as the bottom table and select the columns [Training ID] and [Training type] in the upper table, select the columns [ID] and [Training type] in the lower table Click **OK**.


✕

Merge

Select a table and matching columns to create a merged table.

Participation in trainings 

e	Training ID ①	Location	Trainer ID	Number of days	Hours per day	Participant ID	Training type ②
.2021	11	Pärnu	6	10	3	37	class
.2021	11	Pärnu	6	10	3	50	class
.2021	11	Pärnu	6	10	3	51	class
.2021	11	Pärnu	6	10	3	8	class

Trainings 

ID ①	Training name	Training area ID	Hourly rate	Training type ②
1	Excel	1	30	class
1	Excel	1	24	online
2	Word	1	27	class
2	Word	1	24	online
3	Power BI	1	36	class

Join Kind

☐ Use fuzzy matching to perform the merge

► Fuzzy matching options

✓ The selection matches 892 of 892 rows from the first table.

- Unpack the table with the button after the column header:

123 Hours per day	123 Participant ID	ABC 123 Training type	Trainings
3	37	class	Table
3	50	class	Table
3	51	class	Table
3	8	class	Table
3	77	class	Table
3	101	class	Table
3	121	class	Table
8	8	class	Table
8	20	class	Table
8	39	class	Table
8	47	class	Table
8	48	class	Table
8	58	class	Table
8	62	class	Table
8	50	class	Table
8	66	class	Table
8	75	class	Table
8	83	class	Table
8	124	class	Table
6	4	class	Table
6	14	class	Table
6	18	class	Table
6	26	class	Table
6	27	class	Table
6	54	class	Table
6	57	class	Table

PROPERTIES
Name
Participation in trainings
All Properties

APPLIED STEPS
Source
Navigation
Promoted Headers
Changed Type
Added Conditional Column
Merged Queries

- Select only [Hourly rate] in the fields and click OK

ABC 123 Training type
Trainings

Search Columns to Expand

☒ Expand
☐ Aggregate

☒ (Select All Columns)
☐ ID
☐ Training name
☐ Training area ID
☒ Hourly rate
☐ Training type

☒ Use original column name as prefix

OK
Cancel

- Set the [Trainings.Hourly rate] column name: "Training Hourly Price" ->double click in column header to rename column

1.10 Adding calculation columns to the "Participation in trainings" table

- 1.10.1 Add a new calculation column called "Training cost", the formula is
[Number of days] x [Hours per day] x [Training hourly price] -> **Add Column/Custom Column**

Custom Column

Add a column that is computed from the other columns.

New column name

Training cost

Custom column formula ⓘ

= [Number of days]*[Hours per day]*[Training Hourly Price]

Available columns

training ID
Location
Trainer ID
Number of days
Hours per day
Participant ID
Training type
Training Hourly Price

<< Insert

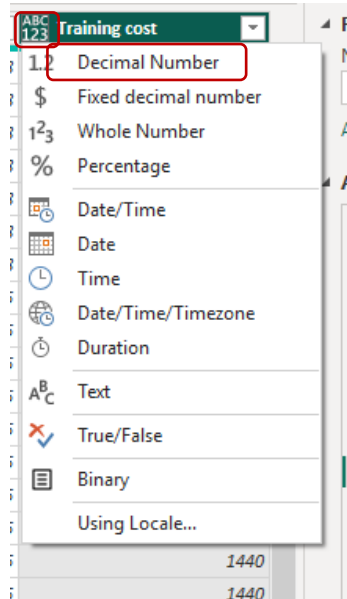
[Learn about Power Query formulas](#)

✓ No syntax errors have been detected.

OK

Cancel

- 1.10.2 Set the format of the [Training Cost] column to Decimal value



- 1.10.3 Add the calculation column "Hours in training" with the operation Number of days x Number of hours per day and set the format to a Whole number

Custom Column

Add a column that is computed from the other columns.

New column name
Hours in training

Custom column formula ⓘ
= [Number of days]*[Hours per day]

Available columns
Date
Training ID
Location
Trainer ID
Number of days
Hours per day
Participant ID

<< Insert

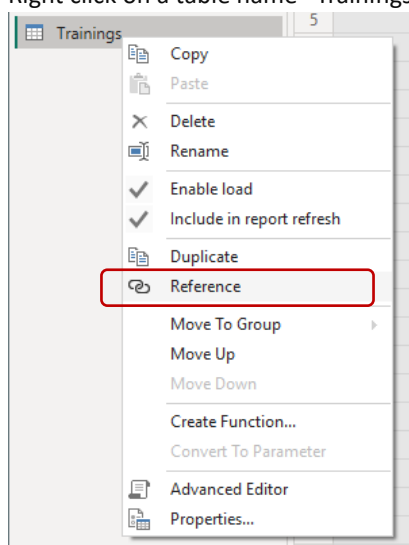
Learn about Power Query formulas

✓ No syntax errors have been detected.

OK Cancel

- 1.11 Since the training ID is not unique in the table (the e-learning and classroom training share the same training ID), we need to create a new table from the „Trainings table“ and remove duplicates from the new table.“

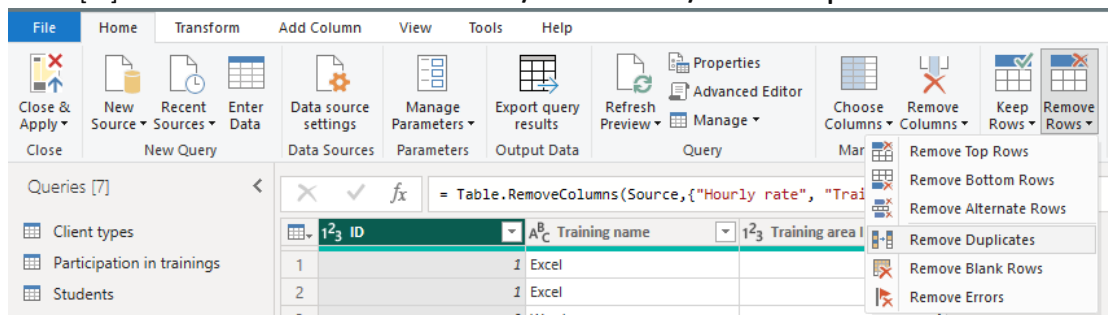
- 1.11.1 Right click on a table name “Trainings” and select command **Reference**



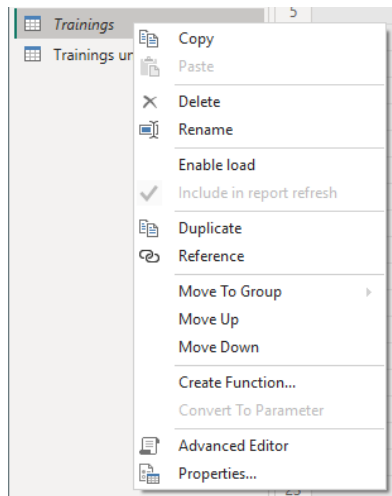
- 1.11.2 Rename new table's name to “Trainings unique” ->Double click to change name

- 1.11.3 Remove columns [Hourly rate] and [Training type]

- 1.11.4 Select [ID] column and choose command **Home/Remove Rows/Remove Duplicates**



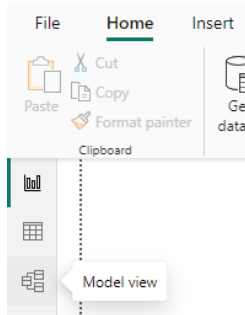
- 1.11.5 We don't need old "Trainings" table in Data model ->right click on table name and remove tick from "Enable load"



- 1.12 Load tables into the Data Model with **Home/Close & Apply** command

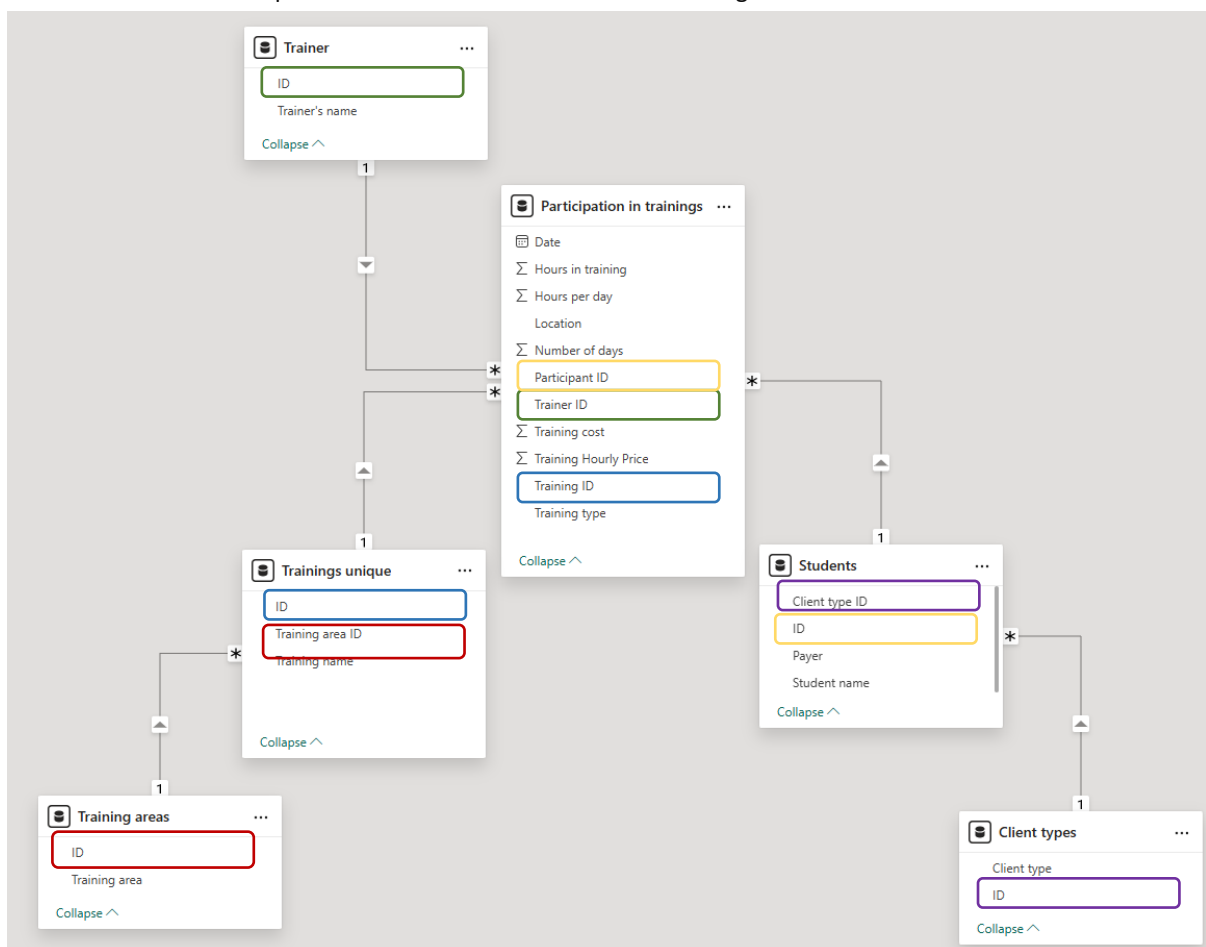
2 Data model

2.1 Open model view



2.2 Remove all automatically added relationships between tables ->right click on relationship's line and delete

2.3 Create relationships between the tables as shown in the image:

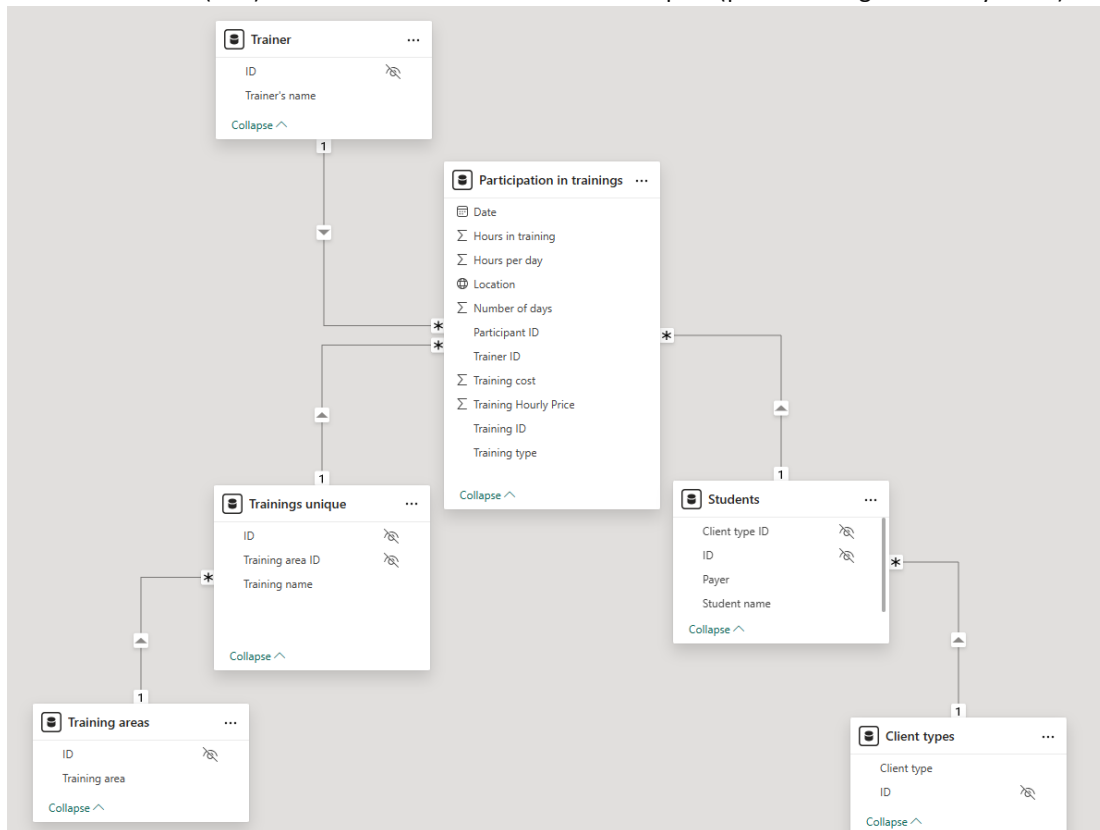


Joins between tables.

Table	Spacing	Connection	Spacing	Table
Trainer	ID	1-->--*	Trainer ID	Participation in training
Training areas	ID	1-->--*	Training area ID	Trainings unique
Trainings unique	ID	1-->--*	Training ID	Participation in training
Client Types	ID	1-->--*	Customer type ID	Students
Students	ID	1-->--*	Participant ID	Participation in training

3 Setting up the model

3.1 Hide fields (ID-s) that do not need to be used in the report (prohibitor sign on the eye icon)



3.2 Set a design format for columns

Open the table view and select the table (panel on right side) and column you want to format

File	Home	Help	External tools	Table tools	Column tools
Name	Kuupäev	Format	14.03.2001 (dd.mm...)	Summarization	Don't summarize
Data type	Date			Data category	Uncategorized
Structure	Formatting	Properties	Sort by column	Data groups	Manage relationships
			Sort	Groups	Relationships
					Calculations

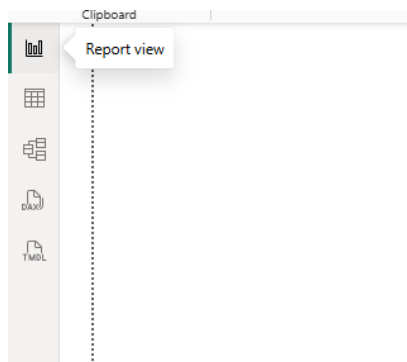
Toimunud koolituse ID	Kuupäev	Koolituse ID	Asukoht	Lektor ID	Päevade arv	Tundide arv päevas	Tundide arv koolitusel
15.08.2023_7_8	15.08.2023	7	Võru	8	3	4	12
14.09.2021_15_3	14.09.2021	15	Võru	3	2	4	8
28.11.2022_6_3	28.11.2022	6	Võru	3	1	8	8
12.07.2022_6_3	12.07.2022	6	Valga	3	1	8	8
04.03.2021_15_7	04.03.2021	15	Valga	7	2	4	8
17.01.2023_3_3	17.01.2023	3	Tartu	3	3	6	18
26.12.2022_21_2	26.12.2022	21	Tartu	2	2	8	16
18.12.2022_10_5	18.12.2022	10	Tartu	5	10	3	30
05.10.2021_4_1	05.10.2021	4	Tartu	1	1	5	5
15.12.2022_8_2	15.12.2022	8	Tartu	2	1	6	6
25.07.2022_5_4	25.07.2022	5	Tartu	4	1	6	6

3.2.1 "Participation in trainings" table

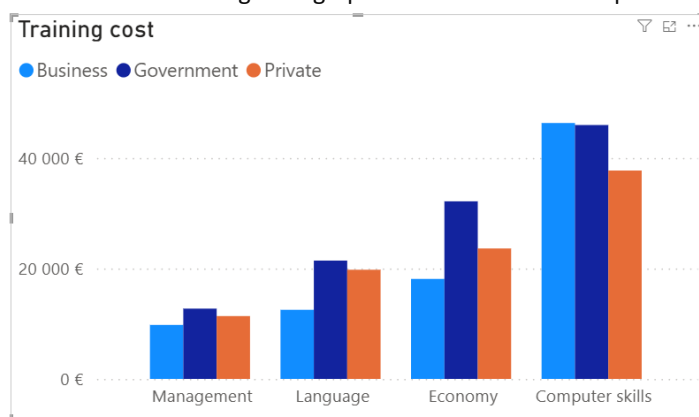
- [Training cost] field to currency format and zero decimal places (Ex: 2 350 €)
- [Location] field assign data category: City
- [Date] field to Short Date

4 Creating a report, page 1 ("Trainings")

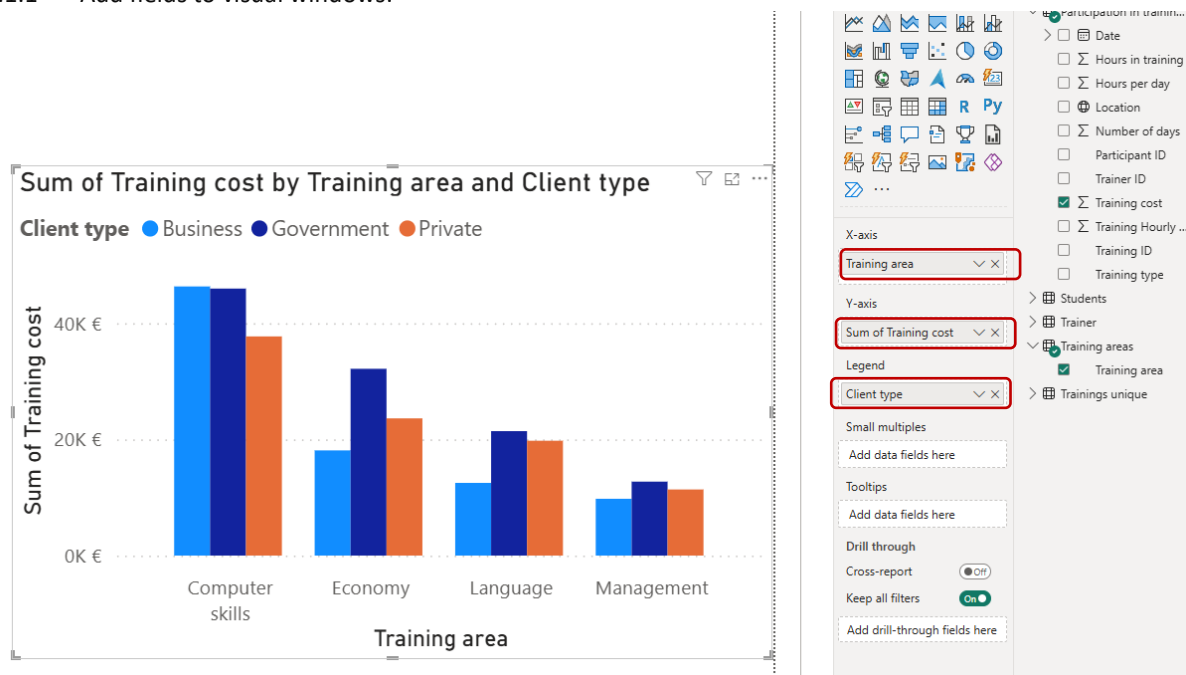
Open Report view



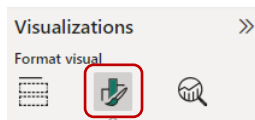
4.1 Add a clustered column chart to the report: the turnover of trainings by customer types and training areas and design the graph as shown in the example:



4.1.1 Add fields to visual windows:

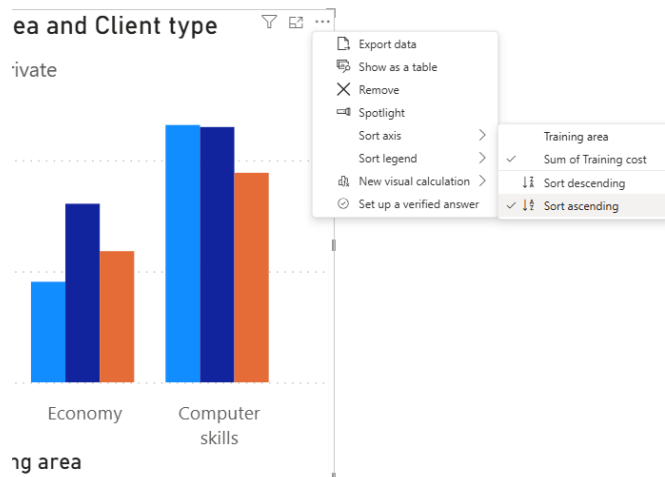


4.1.2 Use the formatting panel to edit:

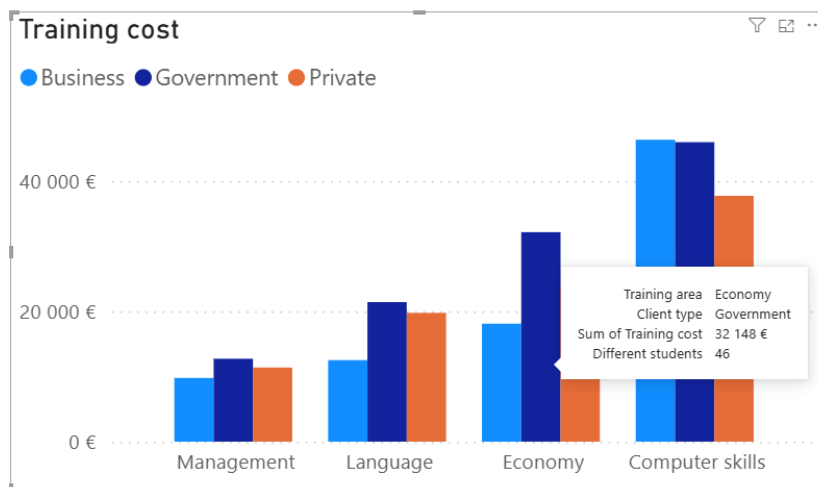


- Graph title, text, and position
- Remove vertical axis title and display scale values without turning into thousand
- Remove the title of the legend

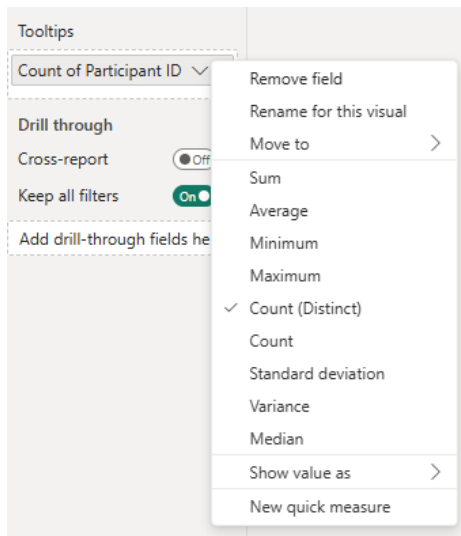
4.1.3 Sort training areas in ascending order (A->Z)



4.1.4 Add to the Tooltip in the graph: how many different students participated in the selected trainings:

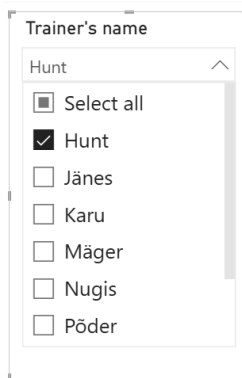


Add 'Participation in trainings'[Participant ID] to the Tooltips window and set the calculation function to Count (Distinct)

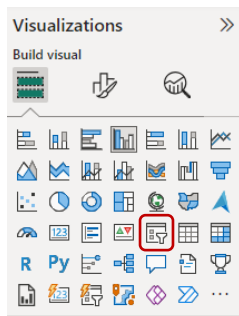


In the Tooltips window, right-click on [Count of Participant ID] and select ***Rename for this visual***, rename: Different students

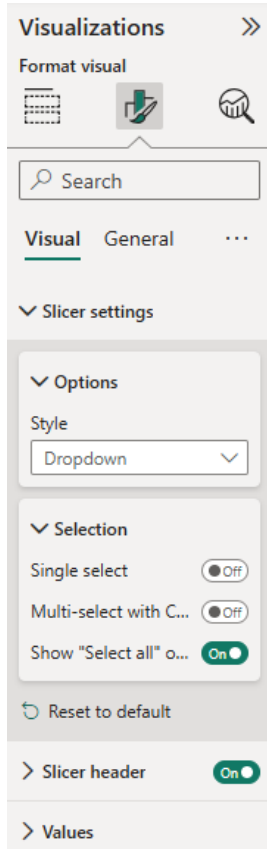
- 4.2 Add the option to filter the trainer with a drop-down menu to the report and set it so that you can select multiple lecturers and you don't have to hold down the CTRL key to select multiple lecturers. Add the search box and the "Select all" option to the filter list as well.



- 4.2.1 Add 'Trainer' to the Slicer report and 'Trainer' to the Values window[Trainer name]



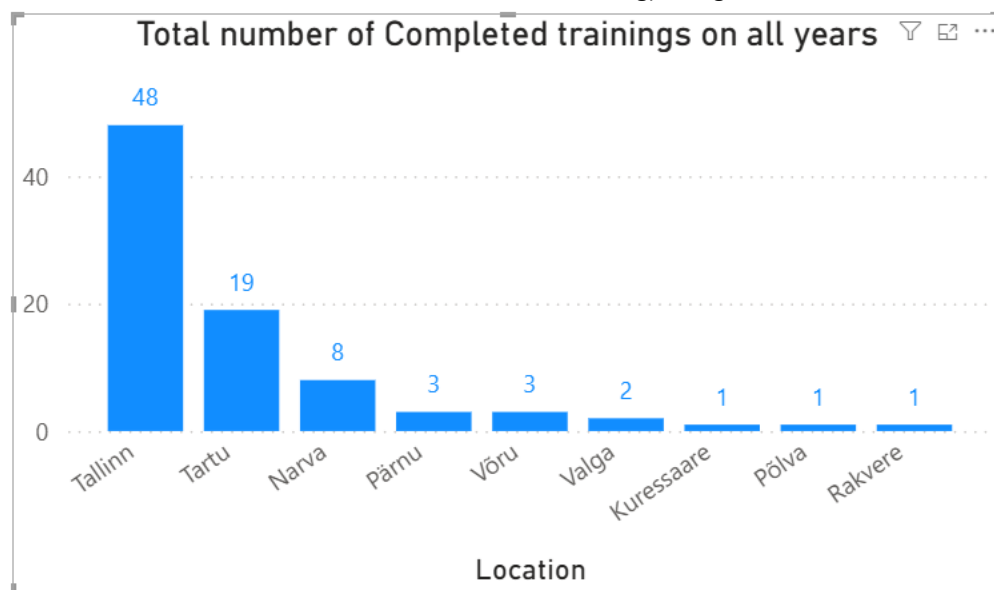
4.2.2 To set the filter, use the options in the Format panel



4.2.3 Choose all trainers except Jänes. How many different business students attended the language training courses? (correct answer: 25)

4.2.4 What was the turnover of the trainer Karu's economy training for private clients? (correct answer: 6 354€)

4.3 Add a bar graph to the report, where you can see the number of trainings by city (exclude trainings where there is no location, i.e. it was online learning), design it as shown in the example:



- 4.3.1 We need to Add a new column (Completed training ID) to “Participation in trainings” table to count past trainings:

Open Power Query Editor ->**Home/Transform Data**

Select “Participation in trainings” table

Select columns [Date], [Training ID] and [Trainer ID]

Add new column->**Add Column/Merge Columns**

Insert separator “_” and column name “Completed training ID”

Merge Columns

Choose how to merge the selected columns.

Separator

--Custom--

-

New column name (optional)

Completed training ID

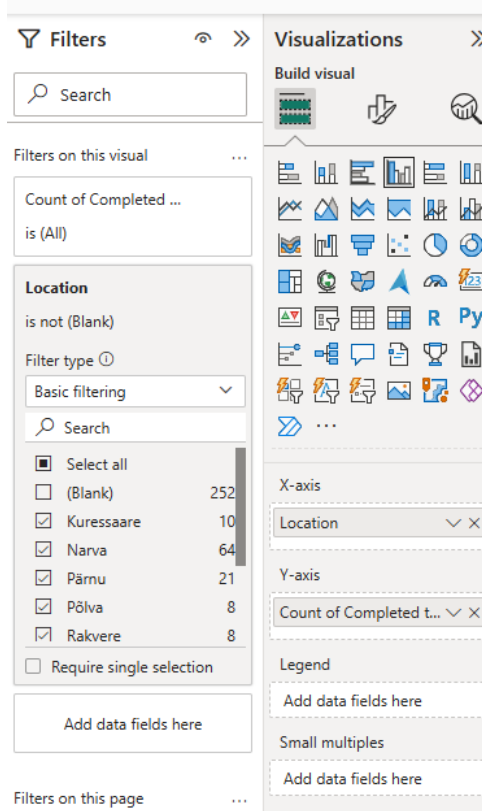
OK

Cancel

Close Power Query Editor and load new data to Data model ->**Home/Close&Apply**

- 4.3.2 The graph uses the 'Participation in training'[Location] and 'Participation in training' [Completed trainings ID] fields, choose COUNT DISTINCT function

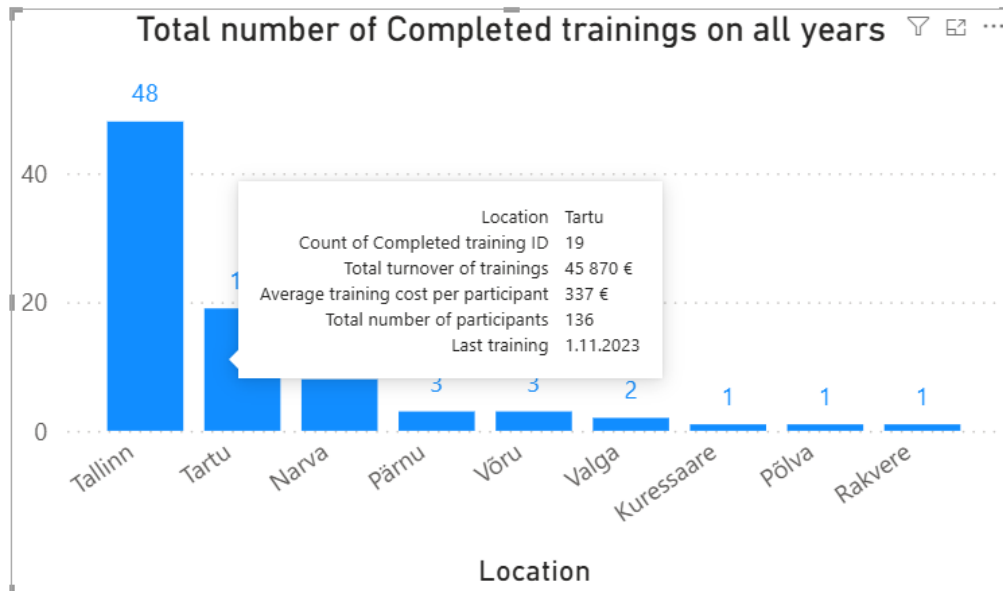
- 4.3.3 Open the filter panel and in the [Location] field, select the values (these are e-learning trainings without a location)



- 4.3.4 Design the chart as shown in the sample using the Format panel

4.3.5 Add calculations to the Tooltip:

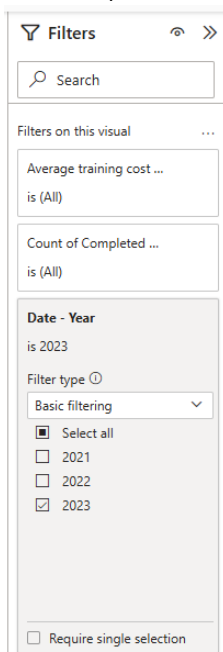
- Total turnover of trainings
- Average training cost per participant
- Total number of participants in the trainings
- When was the last training in this city



4.3.6 Make a similar chart (number of trainings in cities), but only show data from year 2023 trainings.

Colour North Estonia blue, South Estonia purple and West Estonia orange.

Use filter pane to select only year 2023. Colour select column by column in Format pane.





Colour select column by column in Format pane Columns subsection.

4.4 Add the option to filter years and months to the report

- Change title text and colour
- Change the buttons for folding and unpacking + and –

Year and Month

☐ 2021

☐ 2022

☐ January

☐ February

☐ March

☐ April

☐ May

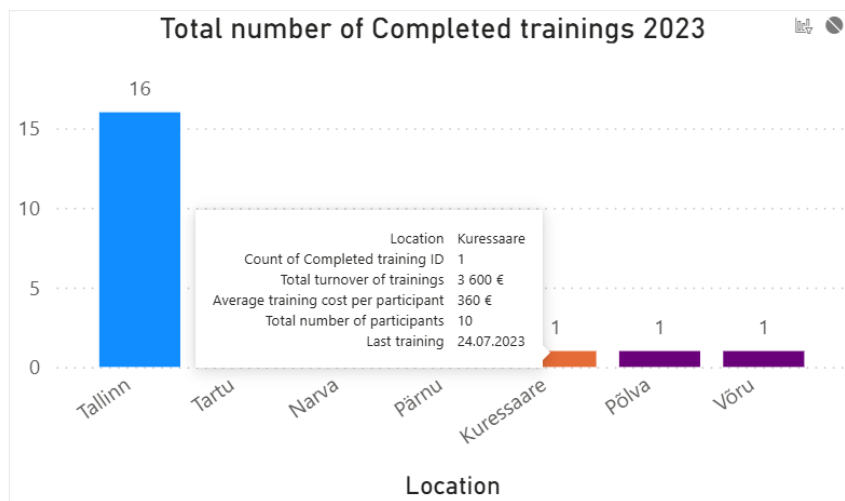
☐ June

☐ July

4.4.1 Use the filter to select only the courses for autumn 2022 (Sept-Nov).

- How many trainings took place in Tallinn?
(correct answer: 6)
- How many computer skills trainings were in Tallinn (2022 sept-nov)?
(correct answer: 4)

- 4.4.2 Set the report so that the date filter does not affect the graph "Total number of Completed trainings 2023"
 Activate Year and month slicer
 Turn on interactivity buttons-> **Format/Edit interactions** and select None from upper right corner of the graph



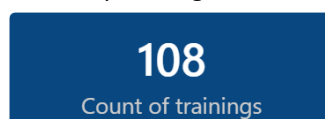
- 4.4.3 Set the report so that clicking on the graph "Total number of trainings in all years" does not affect the graph "Total number of Completed trainings 2023"
- 4.4.4 Set the report so that clicking on the "Training cost" graph filters the data in the "Total number of Completed trainings on all years" graph (instead of highlighting the data))
- 4.5 Add the option to filter the cost of the training to the report



- 4.6 Use the filters in the report and see:
- In which year, 2022 or 2023, were there more trainings in Tallinn with a price of €500 or more per participant?
 (correct answer: 2023 & 7 vs 4)
 - What about in Tartu?
 (correct answer: 2022 & 3 vs 2)
- 4.7 Add Card visuals to the report that would show the overall results and design as shown in the example:
- 4.7.1 the total turnover of the trainings



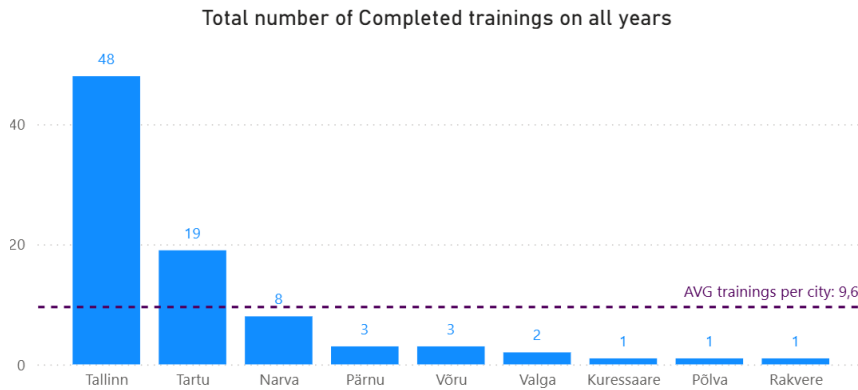
- 4.7.2 how many trainings there were in total



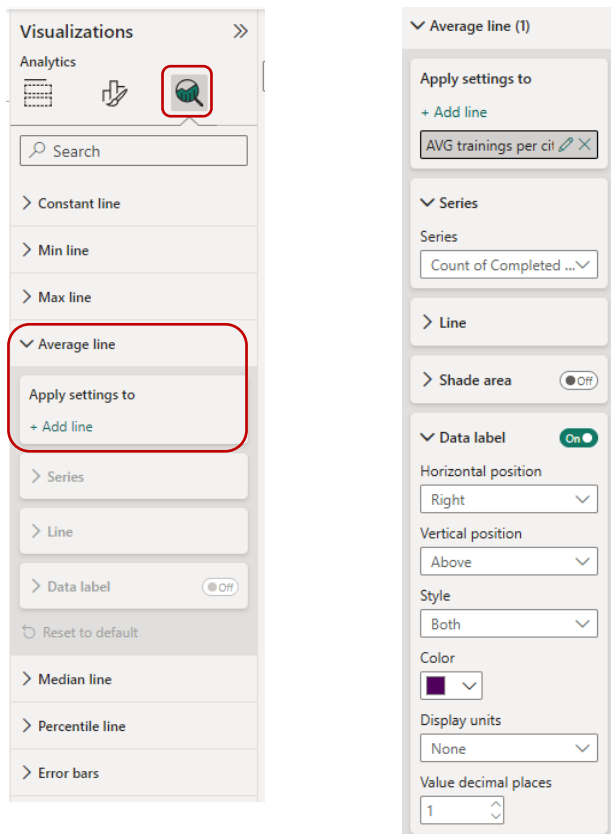
- 4.8 Use the filters in the report and find the answer:
- How many trainings did trainers with the letter R in their names have?
 (correct answer: 65)

- What was the total turnover of private clients in 2022 in those trainings where the cost of the training for the student is 1000 € or less?
(correct answer: 21,582)

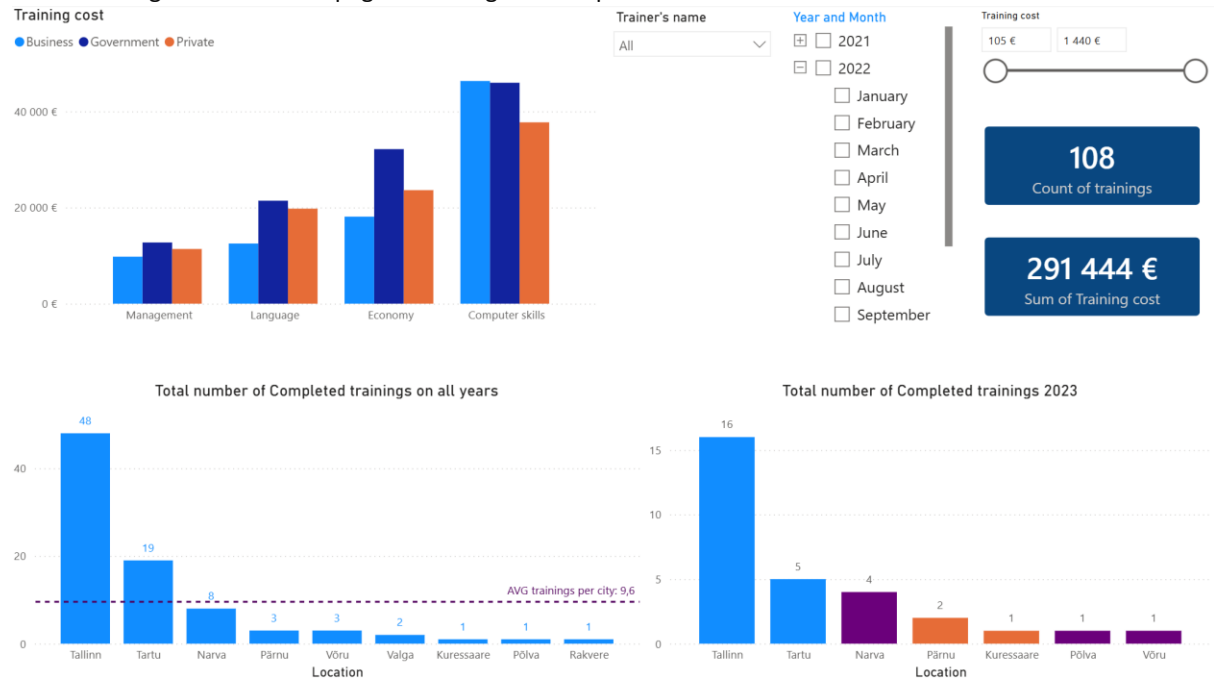
4.9 Add a line to the graph "Total number of completed trainings on all years" that shows the average number of trainings in cities (i.e. the total number of trainings divided by the number of cities), design it as shown in the example:



To add average line, use the Analytics panel:



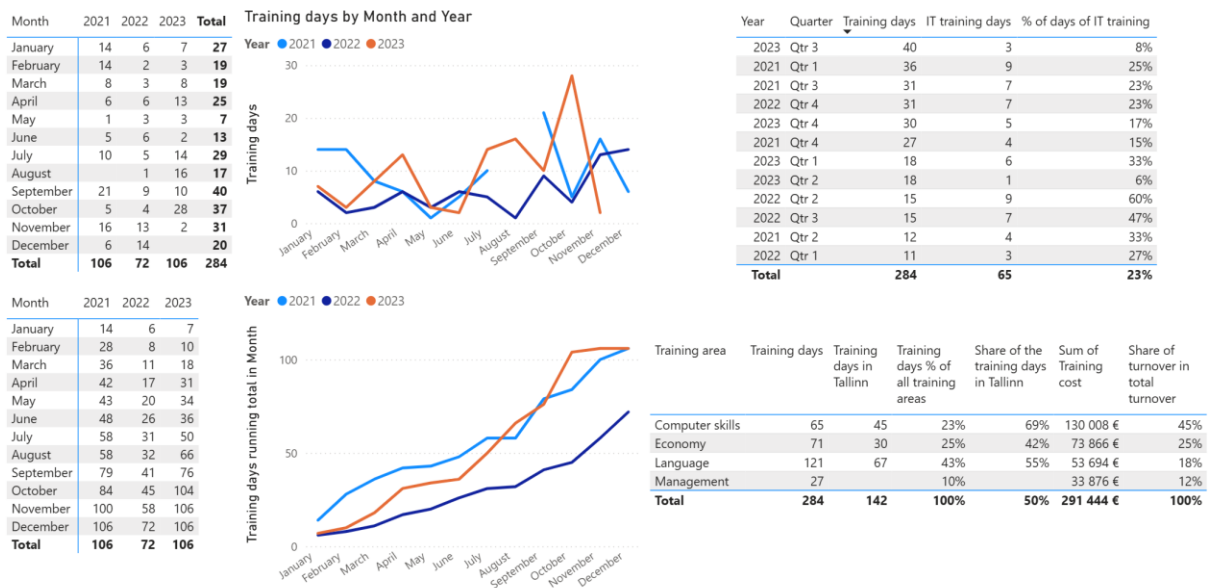
4.10 Arrange visuals on the page according to a sample



5 For Advanced students!

Creating a report, page "Training days"

Add measures to the data model and use the resulting calculations in the visuals of the report page:



5.1 Add a new measure "Number of training days" (adds up the training days) and use it in the line graph:

Home/New measure

Training days = SUMX(SUMMARIZE('Participation in trainings', 'Participation in trainings'[Completed training ID], "Days", MAX('Participation in trainings'[Number of days])), [Days])

Commented formula:

Training days =

// Iterate (row by row) over a table and return a single scalar by summing the [Days] column

SUMX(

// Build a virtual table grouped by Completed training ID (each row is one training)

SUMMARIZE(

'Participation in trainings', //Source table

'Participation in trainings'[Completed training ID], // Grouping column

"Days", //Name of the new calculated column in the summary table

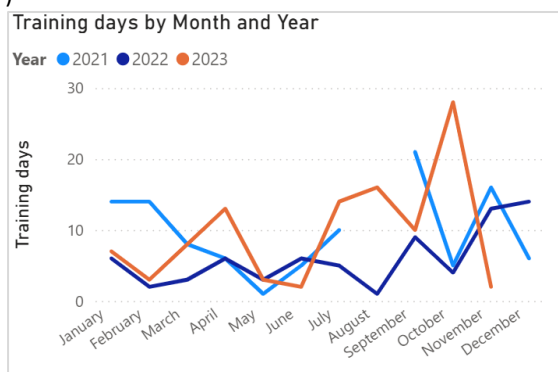
MAX('Participation in trainings'[Number of days]) //Expression: for each training ID, take the value from one row (ex: max of Number of days)

),

//For each row of the summarized table, return [Days] and sum it up

[Days]

)



5.2 To make it easier to manage metrics - add a new table to the data model (without content) and name it "_calculations". Move the "Training days" metric to the "_calculations" table (**Measure tools/Home table**). In the future, add all new metrics to the "_calculations" table.

5.3 Right-click on the table "_calculations" and select New measure from the drop-down menu
In the following exercises, you will need these metrics (try to do the calculations yourself in the following points and if you don't succeed, come back to this point and look at the formula):

Training days in Tallinn = `CALCULATE([Training days], 'Participation in trainings'[Location]="Tallinn")`

Share of the training days in Tallinn = `[Training days in Tallinn]/[Training days]`

Training days % of all training areas = `[Training days]/CALCULATE([Training days], ALL('Training areas'[Training area]))`

Number of IT training days = `CALCULATE([Number of training days], Training areas[Training field]="Computer and IT")`

% of days of IT training = `[IT training days]/[Training days]`

Share of training cost in total cost=

`SUM('Participation in trainings'[Training cost])`
/
`CALCULATE(`
 `SUM('Participation in trainings'[Training cost]),`
 `ALL('Training areas'[Training area])`
`)`

5.4 Add a new metric using the **New Quick Measure** Running Total **order**. Calculate the cumulative sum of training days (the calculation starts at the beginning of the year and at the turn of the year, the result is reset and started to be added again)

Quick measure

Copilot can help Get measure suggestions in DAX query view. [Try it now](#)

Select a calculation to create a measure.

Running total

Calculate the running total over a measure in a specific field. [Learn more](#)

Base value

Training days

Field

Date - Month

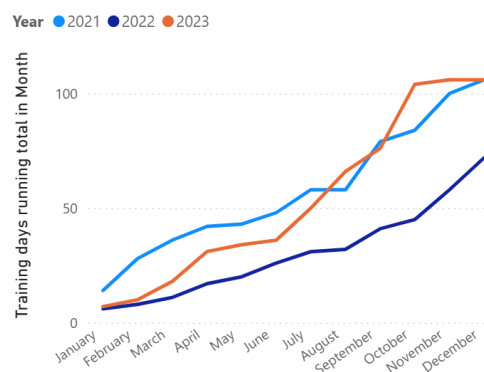
Direction

Ascending

Use this metric in a table and a line graph.

Training days YTD

Month	2021	2022	2023
January	14	6	7
February	28	8	10
March	36	11	18
April	42	17	31
May	43	20	34
June	48	26	36
July	58	31	50
August	58	32	66
September	79	41	76
October	84	45	104
November	100	58	106
December	106	72	106
Total	106	72	106



5.5 Add new metrics "Training days in Tallinn " and " Share of the training days in Tallinn " and use them in the table visual:

Training area	Training days	Training days in Tallinn	Training days % of all training areas	Share of the training days in Tallinn	Sum of Training cost	Share of turnover in total turnover
Computer skills	65	45	23%	69%	130 008 €	45%
Economy	71	30	25%	42%	73 866 €	25%
Language	121	67	43%	55%	53 694 €	18%
Management	27		10%		33 876 €	12%
Total	284	142	100%	50%	291 444 €	100%

5.6 Add a new metric " Training days % of all training areas ", change the format of the metric to a percentage and add to the table

5.7 Add "Sum of Training cost" to the same table, calculate a new metric " Share of training cost in total cost" (change the format of the metric to a percentage) and add to the table:

5.8 Add new metrics " IT training days" (these are trainings that belong to the training area "Computer skills") and "% of days off IT training". Use these metrics in the new table:

Year	Quarter	Training days	IT training days	% of days of IT training
2023	Qtr 3	40	3	8%
2021	Qtr 1	36	9	25%
2021	Qtr 3	31	7	23%
2022	Qtr 4	31	7	23%
2023	Qtr 4	30	5	17%
2021	Qtr 4	27	4	15%
2023	Qtr 1	18	6	33%
2023	Qtr 2	18	1	6%
2022	Qtr 2	15	9	60%
2022	Qtr 3	15	7	47%
2021	Qtr 2	12	4	33%
2022	Qtr 1	11	3	27%
Total		284	65	23%