

Business Mathematics (BK/IBA) – Quantitative Research Methods I (EBE)
Digital test retake 1 (13/01/2016 11:00-12:30)

Question 1

- a) Open the file “1234567_digitaltest_retake1.docx” that is located on the D-drive.
- b) Type your name, student number, programme (IBA/BK/EBE), etc. at the appropriate places. **(2 points)**
- c) Save the document on the D-drive under the filename in which “1234567” is replaced by your student number (=7 digits, not your VU-net ID!). Thus, the new filename becomes something like “8520981_digitaltest_retake1.docx”.
- d) Leave the document open for inserting the answers to the remaining questions in the indicated places. We recommend you to save your document regularly while doing the next questions.

Question 2

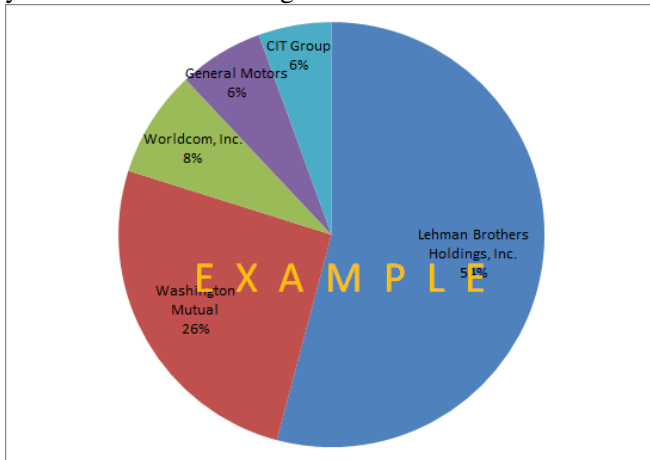
- a) Retype the following formula in a professionally typeset way into the document. You don't need to choose a font similar to the original one, but you should at least use the usual conventions for typing mathematical text, and type the mathematical part exactly as given (for instance, don't replace $\frac{1}{n}$ by $1/n$). **(2 points)**

$$\prod_{k=1}^n \zeta_k = \begin{cases} 0 & \text{if } \zeta_k = 0 \text{ for at least one } k \in [1, n] \\ c \neq 0 & \text{otherwise} \end{cases}$$

- b) Type a formula that corresponds to the following Excel syntax. Use the usual conventions for typing mathematical text. **(1 point)**
“=MMULT(A1:C23;D1:D3)+E1:E23”
- c) Given are the following facts: 1) an office manager orders a certain number of identical office chairs 2) there is a certain price for each chair 3) because the order is large, a certain discount percentage is negotiated. Give a formula for the total cost of this transaction. Introduce and explain symbols where needed, and apply the usual conventions for typing mathematical text. **(1 point)**

Question 3

- Open the file “excel_digitaltest_retake1.xlsx”, and go to the worksheet bankruptcy. This is a data set on the 20 largest bankruptcies in the US. You don’t need to report anything. You don’t need to hand in your Excel file, but it can be convenient to save it regularly.
- Create a new column (E) that represents a new variable derived from the data with total assets. The new column should for each company contain the original Total Asset divided by the Total Asset of Lehman Brothers, so that every case is represented as a fraction of that of the largest bankruptcy. Report the Excel formula used¹ for the first company by pasting it in the Word file. **(1 point)**
- Create another new column (F) that contains the text “huge” if the Total Asset is larger than 40 billion, and “large” if this is not the case. Report the Excel formula used¹ for the first company by typing or pasting it in the Word file. **(1 point)**
- Type a formula that counts how many cells in the column with Total Assets are less than 35 billion. Report the Excel formula used¹, and report the value. **(1 point)**
- Create a pie chart of the assets of the five largest cases. Adjust the settings such that the pie chart looks as close as possible to the example below (but without the word “EXAMPLE”). Paste² the plot in the Word file. You don’t need to choose exactly the same colours as in the example, but you should at least change the colour of some of the slices. **(2 points)**

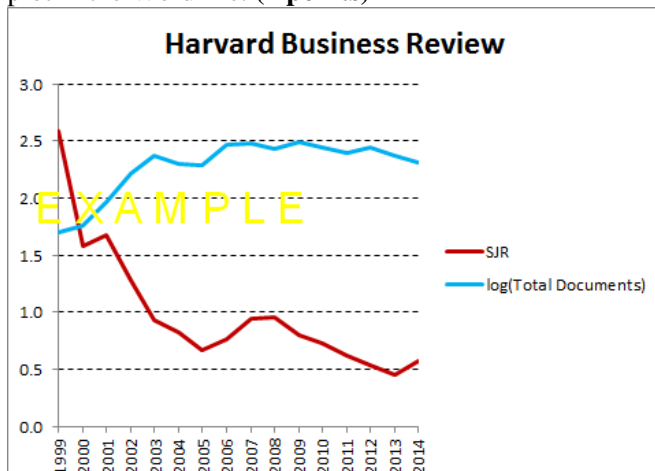


¹ Excel formulas should be reported in plain Excel syntax, e.g., “=SQR(A1)”.

² Use Paste as picture to ensure that the result will not be changed if you change or delete the data.

Question 4

- a) Move to worksheet HBR. This is a data set on the performance of the famous scholarly journal Harvard Business Review in different years. You don't need to report anything.
- b) The number of documents seems to have increased while the reputation of the journal, measured as the SJR (the so-called SCImago Journal Rank) indicator is going down. Make a plot of the logarithm (base 10) of the number of documents and the SJR against time. The result should as close as possible³ look like the example below (but without the word "EXAMPLE"). Paste² the plot in the Word file. (2 points)



- c) Row 13 contains the "Cited docs" for each year. We want to create a new row (16) that contains the "cumulative cited docs", up to the year of interest. See the example below.

15	% International Collaboration	0.00	0.00	0.00	1.22	14.10	12.09	10.40	12.04
16	cumulative cited docs	84	184	284	388	525	718	986	1250
17	Journal	Harvard Business Review							

We can do this by typing in cell B16 the formula " $=B13$ ". In formula C16 we type another formula, not " $=B13+B14$ ", but a more clever one that we can copy to cells D16 to Q16. What formula do we type in C16? Report the Excel formula used¹. (1 point)

³ For those who are colour-blind: the SJR line is red and the other line is blue.

Question 5

- a) Use Excel's matrix functions to solve the following system of linear equations:

$$\begin{cases} y - x = 1 - z \\ z = 2w - 4 \\ 4 + 2x - 3y = 0 \\ w + x = 2y - 2z - 2 \end{cases}$$

- Make a screenshot⁴ of the result. Take care to make the screenshot in such a way that all information (matrices/vectors, intermediate matrices/vectors) is visible, but no more. Paste it in the Word file. **(2 points)**
- b) Given is the function $f(x, y) = e^{x-y} + xy$ and the constraint $x^2 + 3y^2 \leq 120$. Use the solver⁵ to find the maximum. Make a screenshot⁴ of the settings of the Solver, and paste it in the Word file. Also state the formula in the cell of f , and the value of f at the maximum point. **(2 points)**
- c) Make a graph of the function $g(x) = \left(-\frac{1}{2} + \frac{\ln(15+x)}{\sqrt{x+1}}\right)^2$ with domain $[1,16]$ using steps of size $\Delta x = 0.003$. The plot may be a quick-and-dirty plot, but the scales of x and y should be such that the shape of g is clearly visible and the x and y values should be visible besides the axes. Paste² the plot in the Word file. **(2 points)**

Ready?

Save your Word file, and **check location** (D-drive) **and name** (similar to 8520981_digitaltest_retake1.docx).

Next **start the icon "Tentamen inleveren"** on the desktop, log on with your VUnet ID and **upload your Word document**.

Make sure you have signed the attendance list.

⁴ Use [alt][PrintScreen] to send a screenshot of the active window to the clipboard.

⁵ Make sure the Solver add-in is active. If not, use Excel Options - Add-Ins to activate the Solver.