Important Notes:

This document has 3 pages.

Part 1 and Part 2 of this exam are completely independent. Be careful to allocate your time accordingly.

Part 1 - Database (6 points – Arable Land sheet in the workbook)

This worksheet contains World Bank data on Arable Land in various countries:

- *Country Code*: ISO code (3 letters),
- *Country* : Country name,
- *Geographical Area*,
- *Arable Land in 1961* (square kilometer surface),
- *Arable Land in 2009* (square kilometer surface),
- *Total surface 1961*: country total surface (km^2),
- *Total surface 2009*: country total surface (km^2),
- *Arable Land % 1961: p*ercentage of arable land (Arable land 1961 / country total surface 1961).
- *Arable Land % 2009: p*ercentage of arable land (Arable land 2009 / country total surface 2009).

Q1. Database Functions

Please answer these questions using database functions.

1) What is the average percentage of arable land in North America in 2009? (**1pt**)
2) How many African or Asian countries have a percentage of arable land less than 2% in 2009? (**1pt**)
3) How many African countries have more than doubled the surface of arable land between 1961 and 2009? Answer the question and then extract these results using advanced filter.**(2pt)**

Q2. Pivot Tables

1) Create a Pivot Table showing the surface of arable land in 1961 and 2009 by geographical area, sorted in descending order by 2009 value. Graph the results. (**1pt**)
2) Create a Pivot Table showing the Total surface and the Percentage of Arable land for South-American countries in 2009. Sort your results in descending order of Total surface. (**1pt**) The 'Grand Total' line should indicate the *sum* of total surface and the *average* percentage of arable land.

Part 2: Building a model (14 points) - Cleaning sheet

Model (use the "Cleaning" worksheet) – 14 points

A family is looking for a cleaning lady to do all its cleaning and ironing. The cleaning should take approximatively 120 minutes (2 hours) per week, and around 15 pieces of clothing have also to be ironed each week. Those numbers may however vary. The mother put an ad in the local newspaper and she met 3 candidates.

Each candidate proposes a different hourly rate. The candidates were asked about the time it takes them to iron one piece of clothing and about their cleaning speed (a cleaning speed coefficient of 0.9 means that the candidate estimates that she needs only 90% of the 'normal' time to do the job – she is a fast cleaner, a cleaning speed coefficient of 1.1 means that she is a 'slow' cleaner and needs 110% of the 'normal' time).

Candidate	Hourly Rate	Time to iron one piece (mn)	Cleaning speed coef.
1	11€	9.5	1.1
2	12.5€	8	1
3	14€	7.5	0.9

Your job is to help the mother choose among these 3 candidates and define the working time.
The number of clothes to be ironed and the 'normal' cleaning time have been randomly generated (don't change the values). For this first version of the model, **you decide to hire Candidate 3 for a working time duration of 240 minutes (4 hours) per week**.

Question 1 (1 point). Allow the user to select the candidate number and dynamically return the hourly rate, the time to iron one piece, and the cleaning speed coefficient for the selected candidate. Default the candidate choice to Candidate 3.

Question 2 (4 points). The cleaning lady begins by cleaning the house. Calculate the remaining time after cleaning, the number of clothes she irons during this time, the number of clothes she does not have time to iron and the time not used when she leaves. Calculate average values at the end of the table.

Week	# of clothes to be ironed	Normal cleaning time	Remaining time after cleaning	# of ironed clothes	# of remaining clothes (no time to iron)	Time not used
1	15	124	128,4	15	0	15,9
2	17	106	144,6	17	0	17,1
3	17	140	114	15	2	1,5
4	19	128	124,8	16	3	4,8
5	21	93	156,3	20	1	6,3
…	…	…	…	…	…	
30	21	139				
Average	16,57	122,07	130,14	14,97	1,60	17,89

Note: Remaining not-ironed clothes are ***not kept for the next week*** but immediately sent to the dry cleaner (cost €3 per piece).

Explanation:

Week 1
The cleaning lady should have spent 124 minutes cleaning, but she is fast (speed coefficient 0.9) so it takes her only 124x0.9 = 111.6mn to clean; the remaining time equals 240-111.6=128.4mn. It takes her 7.5mn to iron one piece so she has time to iron 128.4/7.5=17.12 pieces (count only the integer part 17). There are only 15 pieces to iron, so she leaves 15.9mn in advance after finishing her work (that's the 'time not used').

Week 3
The house was very dirty (estimated cleaning time 140mn). She spends 140x0.9mn cleaning and has 114mn left to iron. During that time, she manages to iron 114/7.5=15 pieces of clothing out of 17. She has not enough time to iron another piece so she leaves 1.5mn in advance without finishing. The mother sends the remaining pieces to the dry cleaner and pays 3€ per remaining piece.

Question 3 – conditional formatting (2 points). Using conditional formats, highlight in yellow the cells that show when the cleaning lady could not iron all the clothes.

Question 4 (2 points). Calculate the average cost per week (cleaning lady salary + average dry cleaner cost).

Question 5 (3 points). Using a data table, calculate the **average cost per week** for the three candidates and for 4 different working time durations (210mn, 240mn, 270mn and 300mn). What would be the best solution? (Using conditional formats, highlight the best solution for each candidate)

Question 6 (2 points). Using a line chart, graph the results of the data table. Working time duration should appear on the graph.