APPLICATIONS OLYMPIAD 2015 FINALS

Instructions (READ this before proceeding!)

1. You have **four** hours; allocate your time according to the marks allocated.
2. You may produce the material **in any order.**
3. Make sure you have something to submit for **each** of the sections. Go back to improve documents if time allows.
4. The rules are similar to those for a matric paper and include such items as:
    a. No communication with each other.
    b. No electronic devices such as flash drives, iPods, phones etc.
    c. Do nothing to disturb other participants.
    d. Ask permission to get up and leave your station.
5. You have access to the internet to find documents and help. Beware that this may be a trap that tempts you to use up available time for research rather than production.
6. You have to acknowledge the source of every illustration, document or quotation you use.
7. You may NOT use email facilities or other communication apps during the contest.
8. It is important to **save** every step of your work for later evaluation.
9. Before you hand in, please ensure that you have saved all files in the folders as described on the attached Appendix 3.
10. After the event you may be asked to demonstrate your results to the judges.

1.   SAVING ELECTRICITY

The Aggeneys City Council has asked you to prepare a document to briefly show how electricity can be saved. Mention at least the following:

1. Switching off rather than stand-by
2. Using your fridge and geyser economically
3. Electricity saving devices
4. Alternative lighting

This question requires you to prepare a document named **Saving** including the image **Q1.jpg** that must be available in three forms to show to the judges.

- A printed Word document; a single page flyer (**SavingWord**)
- A smaller electronic version for email that can be read by people who do not have Microsoft Office (**SavingMail**)
- A webpage version that can be opened in a browser and has working hyperlinks (**SavingWeb**).

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2. AKUNAMANDLA

In this question you will be required to create a "waterfall chart" as shown in Appendix 2. To help you, a set of instructions is included on your drive in the Word document called "How to create waterfall chart in Excel". The document is long (9 pages) and you will be marked on how many of the features you include in your chart.

Akunamandla coal depot (somewhere in South Africa) supplies coal to a number of local power stations. The change in coal stock (in 1 000 kgs) each day over a week, is supplied in the Excel file **Akunamandla**.

This question requires you to use the information provided to produce a chart depicting this change in stock per day for a week and save it as **WaterfallChart**.

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3. LOAD SHEDDING

Load shedding is something we are all familiar with. Each time Eskom announces load shedding there is a scramble to discover what time we will be affected. You have to develop an application with which the employees of the Cape Town Call Centre can quickly and easily answer questions from the public. Using your Excel skills you are going to display the time(s) that a particular zone will be "load shedded" given the day of the month and the stage of load shedding.

You have been provided with an Excel workbook **LoadShedding** which contains the load shedding schedule in two formats. The first format is as a table and the second is as a list. You may use either or both formats and provide any way of indicating to a user when they will have load shedding. This is an open ended problem and how you answer it is limited only by your knowledge of Excel.

You may use any features from conditional formatting to VBA code (if you know how). The worksheet called **Input** shows the typical information which is given to you.

Save your work as **Schedule**.

Attached as Appendix 3 is a sheet on which you will write down, for the judges, what features you used and how your results are displayed. Marks will be awarded for completeness of your solution. Highlighting only the correct zone across the whole table will earn low marks. Output which takes into account the stage or stages, the day, if the zone falls within the load shedding time and then presents it in a creative and easily understandable way, will earn high marks.

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4.   BIG DATA

Wikipedia defines Big Data as "*a broad term for data sets so large or complex that traditional data processing applications are inadequate. Challenges include analysis, capture, data curation, search, sharing, storage, transfer, visualization, and information privacy*". As an example when the Square Kilometre Array (SKA) in the Northern Cape becomes operational it will generate as much data in a single day as the rest of the world generates in a year. Analysing all this data will require massive computing power and special techniques.

You have been supplied with a file called **household_power_consumption.txt** that is over 120 MB in size. It contains masses of data (over 2 million lines/records). Each line/record comprises the following fields:

1. **Date**: date in format dd/mm/yyyy
2. **Time**: time in format hh:mm:ss
3. **Global_active_power**: household global minute-averaged active power (in kilowatt)
4. **Global_reactive_power**: household global minute-averaged reactive power (in kilowatt)
5. **Voltage**: minute-averaged voltage (in volt)
6. **Global_intensity**: household global minute-averaged current intensity (in ampere)
7. **Sub_metering_1**: energy sub-metering No. 1 (in watt-hour of active energy). It corresponds to the kitchen, containing mainly a dishwasher, an oven and a microwave (hot plates are not electric but gas powered).
8. **Sub_metering_2**: energy sub-metering No. 2 (in watt-hour of active energy). It corresponds to the laundry room, containing a washing-machine, a tumble-drier, a refrigerator and a light.
9. **Sub_metering_3**: energy sub-metering No. 3 (in watt-hour of active energy). It corresponds to an electric water-heater and an air-conditioner.

As so often happens data such as this contains blank fields which are meaningless when the data has to be analysed. Before the data can be analysed it needs to be "cleaned". Cleaning data is "*the process of detecting and correcting (or removing) corrupt or inaccurate records from a record set*".

This question requires you to

1. import the data into a database table;
2. "clean" the data by deleting ALL the records where there are fields containing Null values. Use whichever method you prefer to delete the records.
3. using the "cleaned data" create an appropriately titled summary report (called **rptJune2010Summary**) for the period 1 June 2010 to 30 June 2010 that shows
   a. the minimum, maximum and average voltage for each day in June 2010; and
   b. the minimum, maximum and average voltage for the month
4. export the data you used in the above summary report to a spreadsheet (called **June2010Summary**) and then draw a suitably labelled appropriate chart of these values.

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5.   MUNICIPAL ELECTRICITY ACCOUNTS

The Khâi-Ma Municipality covers a number of small towns around Pofadder in the Northern Cape. One of these towns is Aggeneys, a small mining community. On a monthly basis the Khâi-Ma Municipality issues electricity accounts to all home-owners in the towns it manages.

You have been supplied with the following files:

- **dbAggeneys.accdb**: this is a multi-table database containing the two linked tables, viz.
  - o **tblCustomers**: a table containing the details of some of the people who own property in Aggeneys and to whom monthly electricity accounts are sent
  - o **tblReadings**: a table containing the readings on the meter that registers electricity usage at each home
- **JuneReadings.txt**: this is a text file containing the readings that James, Aggeneys's meter-reader, took on 30 June 2015
- **ElectricityAccount.dotx**: a template of the electricity account sent to home-owners

You should note the following:

- Where James is unable to read the meter the reading is registered as 0 and a comment is made as to why the meter could not be read or any other pertinent fact that the municipality needs to take note of.
- One of the fields in the **tblCustomers** table contains a field called **custDailyAverage** which holds a value for the daily average usage of electricity for that property. In instances where the meter cannot be read this value should be used when calculating the amount owing.
- Pay careful attention to the examples that have been given to you as they contain valuable information.

This question requires you to accomplish the following:

1. Append the data contained in the **JuneReadings.txt** file to the appropriate table in the database.
2. Using whatever method you prefer, produce an electricity account that will be sent to each of the account holders in the database at the beginning of July. You may use the **ElectricityAccount** template provided. Examples of three such accounts are provided for your information. Save ALL the accounts in a file called **June2015Accounts**.

   For the purposes of the calculations the following tariffs apply:
   - The first 100 kWh of electricity are free
   - Cost per kWh up to and including 450 kWh: R1.447
   - Cost per kWh between 450 kWh and 600 kWh: R1.759
   - Cost per kWh more than 600 kWh: R2.139

   The following messages should be printed on the relevant account:
   - Users of less than 450 kWh per month get a message: "*The Khâi-Ma Municipality appreciates your sparing use of electricity.*"
   - Users of over 1 000 kWh per month get a message: "*Excessive use of electricity may result in your supply being interrupted.*"

3. Update the **custDailyAverage** field in the **tblCustomers** to take into account the new June reading. Use the weighted average of 5 times the **custDailyAverage** value and the daily average that you used when creating the monthly account.
4. Create and print the following suitably titled reports:
    a. the list of names and postal addresses of all the persons who own a home in Aggeneys but who have a postal address that is not in Aggeneys. (*Non-resident*)
    b. the list of names, street addresses and comments made by James, the meter-reader, of all the houses where a reading was not able to be taken in June. (*No June Reading*)

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Appendix 1:   File List
Appendix 2:   Sample Waterfall Chart for Q2
Appendix 3:   Features List for Q3