



Computer Applications Olympiad

A project of the Institute of IT Professionals South Africa.

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APPLICATIONS OLYMPIAD 2017

FINAL ROUND

Morning Session (09:45 -11:30)

09:45 - 10:15 Session 1a (30 minutes – counts 10 marks)

Instructions (READ these before proceeding!)

1. The Final Round comprises
 - a. A split morning session. Session 1a for 30 minutes counts 10 marks. Short break. Session 1b for one hour does not count for marks. Lunch will follow.
 - b. An afternoon session of five hours. This session counts 90 marks.
2. The rules are similar to those for a Grade 12 examination and include such items as:
 - a. No communication with each other (except where this is allowed in session 1b).
 - 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.

09:45 - 10:15 Session 1a (30 minutes – 10 marks)

This session consists of three image tasks

Google image search was first introduced in July 2001 when many users searched for “Jennifer Lopez’s green dress”. The image search feature has been developed and refined since then. In 2011 Google introduced a reverse image search, where a user could submit an image as a search item. The image which you wanted to search for could be dragged and dropped onto the search bar or searched via a URL or uploaded from a file. While there are other reverse images search engines the Google image search is recommended for this task.

- 1) Use Google’s image search on the image called **Question 1.jpg** to answer the following TWO questions:
 - 1.1) What is the name of the lady in the image? (1)
 - 1.2) What is her title in the government department she is part of? (1)

- 2) Sometimes you may have to manipulate an image before you use it as a search item. The image provided as **Question 2.jpg** is such an example. If you use it, you will not find any matching results (in Google or Bing). This image demonstrates a common feature found in many ‘selfies’ – the image is reversed. Use a photo editor, either online or on the PC, to mirror the image and save the new image as **Question 2 reversed.jpg**. Now search, using the image you saved, and answer the following questions.
 - 2.1) The vehicle in the image is used in a tunnel which links two water sources. What is the name given to the tunnel? (1)
 - 2.2) How long is the tunnel? (1)
 - 2.3) What is the name of the town at the source of the tunnel **AND** the name of the town nearest to outlet of the tunnel? (2)

- 3) The image **Question 3.jpg** shows a young girl, at a window of a restaurant, in a tower overlooking a waterfall. Use the image and any other applications or websites you may feel are needed to answer the following questions.
 - 3.1) What is the name of the tower in which the photo was taken? (1)
 - 3.2) How high is the tower? (1)
 - 3.3) Where is the tower located? Give the name of the city and country. (1)
 - 3.4) What is the name of the closest ‘capital’ city to the tower? Justify your answer. (1)

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10:30 - 11:30 Session 1b (60 minutes – does not count for marks)

Dashboards and other delights – digging deeper in Excel

This Olympiad is not just a competition but also a time to learn. During this session you are going to be looking at some advanced features of Microsoft Excel. You will be provided with some resources (documents, web sites, a video and data files) to get you going. You must look at the items provided but you are welcome to find, and use, other resources as well. After 20 minutes you may also discuss any aspect with a fellow participant, and, or a teacher in the room. You will be required to use something of what you learn during this session in the final challenge in the afternoon session.

You will find the following resources

DOCUMENT: Chart with a Scroll Bar.docx (FILE: Chart-with-a-Scroll-Bar-Example-File.xlsx)

PDF: excel_dashboards_tutorial.pdf
Dashboard-Example_1.pdf (FILE: Dashboard-Example_1.xlsx)

VIDEO: Step by step instructions to make an Excel Dashboard - Excel Dashboards
Tutorial.mp4 (FILE: orders-dashboard.xlsx)

URL: <http://chandoo.org/wp/excel-dashboards/> (Everything is here but you will never get through it all in this session so pick carefully when necessary.)

You may use any other resources you find.

Your task is to find out as much as you can about dashboards in Excel as possible during the session. You will be required to create a dashboard in the afternoon session. Ensure that you have viewed the video and its example as well as worked through the document and its example.

The first 20 minutes of the session you must work on your own. Thereafter you may discuss things with other participants or ask questions.

Afternoon Session (Five hours - 12:30-17:30)

This session counts for 90 marks

Instructions (READ these before proceeding!)

- 1, The Afternoon Session lasts for five hours and counts for 90 marks. The marks for Session 1a will be added to obtain a total out of 100.
 3. The rules are similar to those for a Grade 12 examination 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.
 - e. Allocate your time according to the marks allocated making sure you leave enough time to complete the report.
 4. You may produce the material **in any order**.
 5. Make sure you have something to submit for **each** of the sections. Go back to improve documents if time allows.
 6. You have access to the Internet to find documents and help. **Beware as this may be a trap that tempts you to use up available time for research rather than production.**
 7. You have to acknowledge the source of every illustration, document or quotation you use.
 8. You may NOT use e-mail facilities or other communication apps during the contest.
 9. It is important to **save** every step of your work for later evaluation.
 10. Before you hand in, please ensure that you have saved all files in the folders. Check also that all the files open correctly.
 11. After the event you may be asked to demonstrate your results to the judges.
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Question 1	Report (Word)	25 marks
Question 2	Household water use (Excel)	20 marks
Question 3	City of Cape Town dams (Excel Dashboard)	20 marks
Question 4	Database	25 marks

NB: You should leave enough time after you have attempted questions 2, 3 and 4 to write the report for question 1.

Question 1 Word processing (25 marks)

Create a summary report in MS Word about the water situation in the City of Cape Town in the past and up to 2027, concluding with recommendations for household usage in 2027. The report should be more of an executive summary than giving detail. The **recommendations** may be included in the text of the report or in PowerPoint.

- 1a) The report must include relevant information such as graphs, tables, maps, etc. Use some of the data that you processed in questions 2, 3 and 4. There should be more than one type of output from Excel and/or Access. It should include an appropriate Dashboard giving access to data on dams in different locations and at different dates.

The report should indicate how much water is available and what the City's population is likely to be in 10 years' time up to 2027. The report should conclude with recommendations for daily household water usage.

The suggested length of the body of the report is 5 pages (12 point, 1½ spacing).

The report should conclude with a recommendation regarding household usage based on data for water availability and population for ten years' time up to the end of 2027.

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- 1b) The report must look good with suitable fonts, formatting, white spaces, balance, headers and footers, etc.

Technically the report should include word processing features such a cover page, table of contents, table of figures, table of tables, text boxes with quotes from the text, live linked graphs, cross references, etc.

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QUESTION 1 TOTAL < 25 >

Question 2 – Spreadsheet (20 marks)

The local council has heard of your expertise with spreadsheets and asked that you help with some calculations. You have been provided with a spreadsheet called **Question 2.xlsx**.

It contains a worksheet which shows the water meter readings for a number of households for the past three months. All water meter readings are in litres. Columns H & I contain the reading and date on which the reading was taken at the start of a 3-month period. Columns J, K, N, O, R & S have the readings and the dates on which the readings were taken for the months of April, May and June.

- 2.1) Use the sheet called 'Main Data' and complete, for each of the 3 months, the columns with headings 'Difference' and 'Ave Daily'. (3)

The 'Difference' is the current month's reading less the previous' month's reading. This is the number of litres consumed by the household in the month. The 'Ave Daily' value is the difference divided by the number of days between the readings. This value must be rounded to the nearest whole number.

F	G	H	I	J	K	L	M	N	O	P	Q
		Start		April				May			
Salutation	Occupants	Date	Reading	Date	Reading	Difference	Ave Daily	Date	Reading	Difference	Ave Daily
Mr B Banderker	4	28/03/2017	63255	29/04/2017	74089	10834	339	30/05/2017	84381	10292	332
Mr R R Blake	5	27/03/2017	68962	29/04/2017	88185	19223	583	28/05/2017	106447	18262	630
Mrs L Boggendoel	4	31/03/2017	73989	28/04/2017	81139	7150	255	30/05/2017	89147	8008	250
Mr M Y Boroto	4	28/03/2017	12972	27/04/2017	28119	15147	505	28/05/2017	44023	15904	513
Mrs M Brookside	5	28/03/2017	40648	28/04/2017	68150	27502	887	29/05/2017	91527	23377	754
Mr C Chambers	3	28/03/2017	50697	27/04/2017	59483	8786	293	30/05/2017	67830	8347	253

- 2.2) The local council has set a goal for water consumption of 100 litres per person per day. Create a table on the sheet called 'Table' which will determine how many households achieved this target for each of the 3 months. The number of occupants in each household is given in column G. The results in the table should be dynamic, i.e. if data is changed the table will update accordingly. You should also make the goal a dynamic value as the council may change this value at any time. You may use any additional columns on the 'Main Data' sheet for any intermediate calculations which you may feel are necessary. Do not delete or hide these columns. (5)

	Households who achieved goal		
	April	May	June
Number	139	143	138
%	36%	37%	36%

- 2.3) The council would like you to calculate how much to charge each household for the water consumed in June. There are two parts to calculating the cost of the water consumed, viz. a basic cost and a possible discount. (8)
- a. For the basic cost if the monthly consumption is less than 8000 litres it will cost 0,9 cents per litre. Anyone who uses above 8000 litres will pay 1,4 cents per litres. Use the consumption you calculated in column T (Difference for from May to June) and

store the basic cost for the water used (in column V or beyond) on the 'Main Data' sheet using the heading **Basic Cost**.

- b. For the discount the council has decided to reward consumers with discounts based on 2 criteria. The first is if the household consumption has decreased each month for the past 3 months. For example, the household in the first line (Banderker) achieved this but not the household in the 2nd line (Blake). Secondly if the household used less than the goal of 100 litres per person per day another discount was given. Again the 'Banderker' household achieved it while the 'Bake' household did not. The percentage discount available is shown in the table below.

Discount on basic cost if...	100 litre goal achieved	
	yes	no
Decrease each month for 3 months	yes	no
yes	10%	5%
no	5%	0%

This means that a house hold that used less water each month for 3 months AND used less than 100 litres per person per day in June gets a 10% discount on the basic cost. So 5% is given for the 3-month decrease and an additional 5% for achieving the daily goal. Store the discount percentage in a column on the 'Main Data' sheet using the heading **Discount %**.

- c. Calculate the final cost and store the result in a column with the heading **Final Cost**.

2.4) POPULATION ESTIMATE

Cape Town Population Statistics: Actual for 2011 and 2016, estimated for 2017 and 2023

Year	Population	Source
1996	2 563 095	Stats SA
2001	2 893 249	Stats SA
2011	3 740 026	Stats SA
2016	4 004 793	Community survey, Stats SA
2017	4 014 765	Estimate, City of Cape Town, GIS
2023	4 232 273	Estimate, City of Cape Town, GIS

Develop a graph of the population based on the above supplied statistics. On the graph show a probable TREND for the next ten years up to the year 2027.

(4)

QUESTION 2 TOTAL < 20 >

Question 3 – Spreadsheet Dashboard (20 marks)

Use the file called **Question 3.xlsx** and create a dashboard that shows various aspects of the data. The file shows the state of each of the six main water supply dams for Cape Town over a period of 5 years. The storage capacity for each dam is given in MI (millions of litres).

Your dashboard should include, but is not limited to

- a. a table containing conditional formatting,
 - b. a chart with a scroll bar,
 - c. a pivot table chart, and
 - d. pivot table slicers.
-
- Your dashboard must include a chart which shows the % total supplied (column F) by each dam over the 5-year period. The user must be able to select an individual dam or the grand total supplied.
 - Ensure that anything you include in your dashboard is well-labelled, useful and easily understood by a user.
 - You may make copies of all or parts of the data as needed.

Marks will be allocated as follows – content 10 marks and presentation 10 marks.

QUESTION 3 TOTAL < 20 >

Question 4 – Database questions (7 questions for 25 marks)

The Access database **CapeTownDams** that you have been provided contains data on the 14 major dams that supply water to the City of Cape Town. Note that the database contains two linked tables, viz. *tblDamDetails* and *tblDamReadings*.

The Excel workbook **Cape Town Dams** that you have also been provided contains a number of different sheets, one for each of the dams supplying water to Cape Town. Each sheet contains the *Height* and *Volume* of water readings for nearly every day from late September 1997 through to 28 June 2017.

NOTE: Study these sets of data very carefully as you will be required to use them to answer the questions that follow. Pay particular attention to the following:

- The daily readings are comprised of the code for a specific dam and the date on which the reading was taken. So BR42914 will be the set of readings taken at the Berg River dam on 28 June 2017.
- The date is not displayed in the normally accepted format, say 5 July 2017 or 2017/07/05, but is displayed in the manner in which Microsoft stores date data. So 28 June 2017 will be stored as 42914.
- The *tblDamDetails* contains some information on each of the dams, including whether the dam is considered to be a major supply dam or a minor supply dam.

NB: the judges will need to know how you arrived at your answers so make notes for yourself and also save any queries/reports that you may have created in getting to the answer using a suitable name. Give these queries/reports appropriate names to make them easier to remember and more importantly find.

NBB: Make a backup copy of the database just in case you make a mistake and need to revert to the original version given to you.

NBBB: in the manipulation of the data you may use whatever application you think is best for the task you are required to do. So for example, you might want to export the results of a query that you created in Access so that you can use the graphic or pivot table functionality included in Excel.

Tasks:

1. When 100% full what is the total capacity of all of the dams that supply water to Cape Town?
(1)
2. What was the volume of water in the Berg River dam on 16 June 2010?
(2)
3. What was the total volume of water in all of the minor dams supplying water to Cape Town on 1 September 2009?
(3)

4. What was the average volume of water in each of the 8 minor dams supplying water to Cape Town for the month of January 2017?
- (3)
5. The database does not contain data for the Theewaterskloof Dam, the largest supply dam for Cape Town. The workbook that you have been provided includes the data for Theewaterskloof in one of the sheets. You must include this data in the database before proceeding. But before you do that, you need to check that the data in the Theewaterskloof sheet is “clean”. You should do this by:
- Removing all the rows that do not contain any data in the “Height” and “Volume” columns
 - Remove any duplicate data. As there could well be duplicates in the columns headed “Code”, “Height” and “Volume” you should only check the “Readings” column for duplicate entries.
 - Once the data is clean you need to add it to the appropriate table in the **CapeTownDams** database.
- (3)
6. For the last few months the City of Cape Town has been providing comparative details that show the water that is available in all of the dams (see the example below). Your task is to construct a similar table - but only for the 6 major dams - using the data that you have available. With the exception of the data in the column “Previous Week” all the other data must be for 1 September (the first day of spring) for 2013, 2012, 2011, 2010 and 2009.

MAJOR DAMS	STORAGE						
	CAPACITY	%	%	%	%	%	%
	Megalitres	26 June 2017	Previous Week	2016	2015	2014	2013
BERG RIVER	130 010	36,6	34,2	38,7	60,7	100,5	96,3
STEENBRAS LOWER	33 517	30,1	28,8	36,9	55,9	73,5	74,8
STEENBRAS UPPER	31 767	60,5	58,8	67,1	51,3	101,1	88,1
THEEWATERSKLOOF	480 188	18,9	17,3	33,8	55,4	99,1	83,0
VOËLVLEI	164 095	18,5	18,0	27,5	40,1	81,9	70,1
WEMMERSHOEK	58 644	37,3	36,6	50,1	53,4	90,4	89,7
TOTAL STORED	898 221	219 731	207 063	321 098	477 030	850 480	744 586
% STORAGE		24,5	23,1	35,7	53,1	94,7	82,9

NB: In the table above all figures are for 26 June for each year except for those in the column headed “Previous Week”, which gives the figures for the previous week in 2017, i.e. 19 June 2017.

- (6)
7. Climatologists tell us that wet and dry spells occur in a cyclical pattern. Cape Town experienced a similar very dry spell a few years ago. Using the data that you have available determine which month in which year had the lowest average total volume of water available in all the dams supplying Cape Town.

(7)

QUESTION 4 TOTAL < 25 >