

GRADE 12 MATHEMATICAL LITERACY PAPER 1	
DATE 12 July 2016	TIME 3 Hours
EXAMINER Cluster	MODERATOR Y Fourie

Name:		Maths Teacher:	
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PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of:
 - 10 pages and 5 questions.
 - an INSERT of 3 pages
 - an APPENDIX of 3 pages with 3 diagrams
 Please check that your paper is complete.
2. Answer all the questions.
3. An approved (non-programmable) calculator may be used.
4. All the necessary working details must be clearly shown in order to justify marks.
5. Units of measurement must be included where applicable.
6. Round off appropriately according to context, unless otherwise stated.
7. It is in your own interest to write legibly and to present your work neatly.
8. Maps and diagrams are not necessarily drawn to scale, unless stated otherwise

FOR EXAMINERS USE ONLY:

QUESTION	MARKS ALLOCATED	ACTUAL MARK	SIGNATURE
1	50		
2	31		
3	21		
4	30		
5	18		
TOTAL	150		

QUESTION 1

1.1. On a dairy farm, Mrs Boots (a farmer) has fixed expenses of R16 450,00 per month. Her variable expenses work out to R190,00 per cow per month

1.1.1 Give an example of a fixed expense on a dairy farm (1)

1.1.2 Give an example of a variable expense on a dairy farm (1)

1.2 Each cow produces an average of 17 litres of milk per day and Mrs Boot sells it at R1,20 per litre.

1.2.1 Calculate her income per 30-day month if she only had one cow. (2)

1.2.2 Write an equation to calculate the Income (I) generated per cow (C) in a 30 day month. (3)

1.3 She uses the following equation to calculate her expenses

$$\text{Expenses} = \text{R}16\,450,00 + \text{R}190,00 \times C$$

1.3.1 Complete the table below in the **Insert** provided by determining the values for A to E. (5)

No. Cows	0	1	20	40	C	80	100
Expenses	A	R16 640	R20 250	R24 050	R 28 800	R31 650	D
Income	B	R612	R12 240	R24 480	R39 780	R48 960	E

1.4 Mrs Boots wants to consider selling the milk at R1,00 per litre. She draws up a graph showing her income from milk sold at a rate of R1,00 per litre. This is shown on the set of axes in the **Insert**.

Complete the following on the **Insert**

1.4.1 Supply all the necessary labels that are missing (3)

1.4.2 Draw the graph of her income from milk sold at a rate of R1,20 per litre. (2)

1.4.3 Draw the graph of her expenses. (3)

1.5 Use your graph to answer the following questions:

1.5.1 How many cows should the farmer keep in order to break even, if she sells her milk at R1,00 per litre?

Use the letter '**X**' on your graph to show where you took your reading. (2)

1.5.2 If she sells her milk at R1,20 per litre, determine by what percentage she should reduce the number of cows she has, in order to break-even? (4)

- 1.5.3 How much income will the farmer generate if she has 90 cows and sells her milk at R1,20 / litre? Use the letter 'Y' on your graph to show where you took your reading. (2)
- 1.5.4 How much profit / loss will the farmer generate if she has 90 cows and sells her milk at R1,20 / litre? (3)
- 1.6 Lucy gets a loan of R3 000,00 from a money-lender, which she pays off over 12 months, in equal instalments. The first financial statement that she receives from the money-lender is shown below:

FINANCIAL STATEMENT			
Lucy Ndamase			
Reference number: 02938194			
Date	Transaction	Amount	Balance
20130501	Opening balance		- R3 000,00
20130601	Debit: interest	- R75,00	- R3 075,00
20130601	Administrative fee	- R6,25	-R3 081,25
20130601	Electronic transfer: credit	R300,00	- R2 781,25
20130701	Debit: interest	A	B
20130701	Administrative fee	C	D

- 1.6.1 What do the negative numbers used in this statement indicate? (2)
- 1.6.2 Calculate the administrative fee for the entire year. (2)
- 1.6.3 By which means does Lucy pay off her loan (eg. Debit order, cash etc)? (2)
- 1.6.4 How much interest is charged per month? (1)
- 1.6.5 Show that the monthly interest rate is 2,5%. (3)
- 1.6.6 The same amount of interest is charged every month by the money-lender. What type of interest has the money lender applied to this loan? (1)
- 1.6.7 Calculate the values of A - D in the table. Write the letter and your answer on your answer sheet. (5)
- 1.6.8 The loan is paid off after 12 instalments. However, the last instalment is only R269,24. Calculate the total amount Lucy had to pay back. (3)

[50]

QUESTION 2

Countries worldwide are trying to reduce carbon dioxide emissions. As a result, South Africa is investing in alternate sources of energy. Serious electricity shortages in recent years make it essential to step up the plans for future electricity development.

One of the alternate energy sources is wind energy, generated by wind turbines.

2.1 Study **Figure 1.1** and **Figure 1.2** and answer the questions that follow:

- 2.1.1 Determine the height of the hub (2)
- 2.1.2 Determine the minimum height, above the concrete foundation, of the tip of the blade when the blades are turning. (2)
- 2.1.3 Determine the length of one blade. (2)
- 2.1.4 Calculate the circumference of the sweep area of the blades using your answer from Question 2.1.3. (3)
- 2.1.5 Calculate the area the blades sweep as they turn, using the following formula. (2)

$$\text{Area} = \pi \times (\text{radius})^2$$

- 2.2 At a specific point in time the tips of the turning blades are moving at a speed of 360 km/h. Determine the speed in m/s? (4)
- 2.3 The Reinforced Concrete Foundation is made from a square concrete slab having a side measuring 22,5m and depth of 1,5m
- 2.3.1 Write the length of the slab in relation to the depth of the slab, as a simplified ratio. (2)
- 2.3.2 Calculate the area of the bottom side of the foundation. (2)
- 2.3.3 Show that the volume of the foundation is $759,375\text{m}^3$ (2)

$$\text{Volume} = \text{area of the base} \times \text{depth}$$

- 2.3.4 Determine the capacity of the foundation, in litres, using the volume of $759,375\text{m}^3$ from Question 2.3.3. (3)

$$1 \text{ cm}^3 = 1 \text{ ml}$$

- 2.4 The foundation (volume $759,375\text{m}^3$) is made from concrete which is a combination of cement, water, sand and gravel mixed in the ratio 1 : 2 : 3 .

The mixture below makes approximately one cubic metre (m^3) of concrete.

Material needed	By volume
Cement	1bag = $0,03 \text{ m}^3$
Water	24 litres
Sand	$0,06 \text{ m}^3$
Gravel	$0,09 \text{ m}^3$

- 2.4.1 How many bags of cement are needed to make the correct amount of concrete to build the foundation? (2)
- 2.4.2 If the mass of one bag of cement is 110 pounds, calculate what it is in kilograms (to the nearest kg) if 2,22 pounds = 1 kg. (3)
- 2.4.3 Calculate the total kilograms of cement that would be needed to build this concrete foundation. (2)

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QUESTION 3

East London is a city in the Eastern Cape. Its harbour is the country's only river port which is situated at the mouth of the Buffalo River running into the Indian Ocean. The double-decker bridge, on the R72, joins the banks of the Buffalo River. Use the map of a section of East London given in **Figure 2.1** of the Appendix, to answer the questions that follow.

- 3.1 What is the name of the double-decker bridge? (2)
- 3.2 Name the streets that form part of the R72. (2)
- 3.3 Write the scale of this map in the form 1 : _____? (3)
- 3.4 What is the width of the C.W. Malan Turning Basin at the point where the banks are 'parallel' to each other?
- 3.4.1 in centimetres on the map? (2)
- 3.4.2 in metres in reality (2)
- 3.5 Passenger liners and cargo ships regularly enter and leave this port. What is the shortest width of the entrance to the port. Give your answer in metres. (2)
- 3.6 Mr Green and his family are visiting relatives in East London and spend the day at the Marine Park (D2) on the northern part of the Esplanade. Mr Green is stung by a bee and needs to get to the East London Private Hospital (B1) because he has had an allergic reaction. Write a set of directions including street names and compass directions to help Mrs Green find the quickest way to the hospital using main roads only. (6)
- 3.7 Which two intersecting roads can be found at $33^{\circ} 01' 00''$ S and $27^{\circ} 55' 00''$ E? (2)

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QUESTION 4

The table below shows the energy consumption of households from countries divided into two sub-Saharan African regions:

- Western and central sub-Saharan African countries
- Southern sub-Saharan African countries

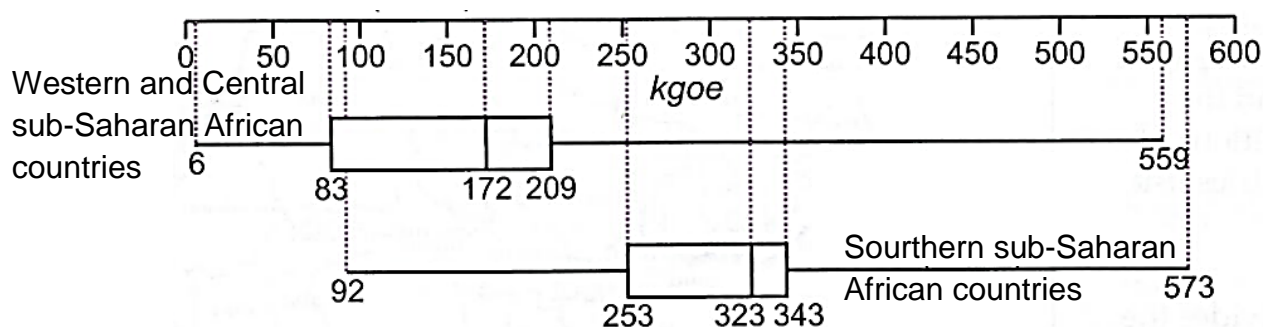
Note: **kgoe** stands for “kilograms of oil equivalent”.

Energy consumed per household in selected sub-Saharan African countries			
Western and central sub-Saharan African countries	Household energy use per person (kgoe)	Southern sub-Saharan African countries	Household energy use per person (kgoe)
Ethiopia	6	Namibia	92
Senegal	77	Congo	119
Eritrea	83	Kenya	253
Sudan	144	Angola	307
Cote d'Ivoire	152	Botswana	307
Benin	172	South Africa	323
Togo	185	Zambia	324
Ghana	193	Tanzania, United Rep	341
Congo, Dem Rep	209	Mozambique	343
Cameroon	279	Zimbabwe	456
Nigeria	559	Gabon	573

4.1 Looking at household energy use per person in **Southern** sub-Saharan African countries:

- 4.1.1 What is the mode for this set of data? (2)
- 4.1.2 Calculate the mean use per household. (4)
- 4.1.3 You embark on a business trip to visit, at random, each country in this list once. Determine the probability that you would visit a country that uses more than 300 kgoe? (2)
- 4.1.4 What is the probability that you will visit Madagascar? (2)
- 4.1.5 Your first visit was South Africa, which you will *not visit again on this trip*. Determine the probability that you visit Angola next, on your trip? (2)

- 4.2 Study the box-and-whisker plots for the two sub-Saharan regions below and answer the questions that follow:



- 4.2.1 What would you use the dotted lines for, on these box-and-whisker plots? (2)
- 4.2.2 Why are the box-and-whisker plots for the two regions shown on the same grid? (2)
- 4.2.3 Fill in the missing values from the table below in the **Insert** provided, to show the summarised data for the Southern area (5)

	Western and central sub-Saharan African countries	Southern sub-Saharan African countries
Minimum value	6	
First quartile (Q ₁)	83	
Median	172	
Third quartile (Q ₃)	209	
Maximum value	559	

- 4.2.4 For the household energy use for **Western and Central** sub-Saharan African countries calculate:
- the range (2)
 - the inter-quartile range (IQR) (2)
- 4.2.5 For the household energy use for **Southern** sub-Saharan African countries:
- which specific countries (from the previous list) fall in the top 25% of household energy use? (2)
 - which percentage of countries use more than 253 kgoe? (1)
- 4.2.6 Study the data of the two sets of African regions. Which country appears to be an outlier and state its value. (2)

QUESTION 5

A wind turbine uses wind to make electricity. The wind turns the blades, which spin a shaft, which connects to a generator and makes electricity. The electricity is sent through transmission and distribution lines to a substation, then on to homes, businesses and schools.

The table below summaries the stats of the Ceres Project put together to build a number of turbines in the area.

Summary data, Ceres Project

Number of Turbines	MW each	Total MW	Construction date	Latitude	Longitude
197	3.4	670	Second half of 2016	S 34.61°	E 137.74°
Additional data on Ceres Project					
Owner/operator			Suzlon		
Project cost			Aus\$1.3 billion		
Capacity factor			More than 38% expected		
Annual generation			About 2000 GWh/yr expected		
Annual CO₂ emissions			About two million tones		
Equivalent number of rooftop solar systems			About 500 000 (assuming an average of 2.5kW each)		

- 5.1 In which month would the construction of this project start? (2)
- 5.2 What will the cost of the project be, in South African Rand if the exchange rate is Aus\$1 : R11,107476? (2)
- 5.3 How much electricity will Ceres generate in one month? Provide your answer correct to 2 decimal places. (3)
- 5.4 As of 2015, about 41,6% of the population of South Africa are without jobs, which is a serious social issue. The energy sector itself has the potential to employ large numbers of people. South Africa has a population of 52,98 million people.
- 5.4.1 Write the population figure using digits only (1)
- 5.4.2 Write the population figure from Question 5.3.1 in words. (2)
- 5.4.3 Write the population figure from Question 5.3.1 in scientific notation. (2)

5.5 Draw a suitable graph on the axes provided in the **Insert** to display the following information:

(6)

Additional power creates new jobs		
Power source	Additional power generated in 2020 (in gWh)	Resulting new jobs created
Coal	18000	14000
Wind	21000	24000
Biomass	15000	2000
Solar	5000	10600
Landfill	2500	2000

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[TOTAL 150]
END OF EXAMINATION