MATHEMATICAL LITERACY: PAPER II
Time: 3 hours

## PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of:

- A question paper of 14 pages
- Five questions
- Appendix A with 4 Annexures
- An Answer Sheet of 1 page

Please check that your question paper is complete.
2. Answer all the questions.
3. It is strongly suggested that all working details be shown.
4. Round off appropriately according to the context unless stated otherwise.
5. Approved non-programmable calculators may be used in all questions.
6. It is in your own interest to write legibly and present your work neatly.
7. Maps and diagrams are not necessarily drawn to scale, unless otherwise stated.
8. Please start each of the five questions on a new page.

## QUESTION 1



Electronic Toll Collection (ETC), otherwise known as e-Tolls, allows for tolls to be collected without vehicles having to stop or slow down, i.e. there are no physical toll booths and no cash toll transactions that take place along a road or highway.

Overhead 'gantries' charge people by electronically identifying the number plates of vehicles that drive under them or by means of an e-tag. Each time a vehicle passes, a toll is charged. The cost is determined by the kilometre distance represented by the gantry.

Toll is deducted from a user's registered e-toll account associated with the vehicle and the user will be able to travel without any disruption. As part of the verification process images will be taken of the front and rear number plates as well as the top of the vehicle. The gantry equipment also measures the vehicle in order to classify it.

E-tags are small electronic discs that drivers will purchase and install
 in their cars. The discs will have money loaded onto them and will be linked to your account as a debit order or to your credit card. The option will be available to load money onto the e-tag in advance or to have money automatically debited from your account whenever the card is running low.

The tolls are supposed to pay for the R20 billion highway upgrade programme that has recently been completed.
[Source: Adapted from <tollfreegp.co.za>]
Refer to ANNEXURE 1 in order to answer the following questions:
1.1 Each gantry has been given the name of a bird. Determine the number of gantries shown on this map.
1.2 If a driver was travelling from the 'Sunbird' gantry towards the 'Flamingo' gantry, in which general direction would she be travelling?
1.3 Determine the scale of this map if the actual distance between the Buccleuch interchange (close to Gantry 8) and the Brakfontein interchange (just after Gantry 5) is 21 km . Round off your map measurement to the nearest centimetre.

1.4 John lives in Sandton and works in Centurion. He is a registered e-Toll user with an e-tag and drives his car along the N1 from Sandton to Centurion. He joins the N1 at the William Nichol interchange (just after Gantry 11) and leaves the N1 at the Botha interchange (just before Gantry 3).

1.4.1 Calculate the total amount that John will have to pay in e-Tolls for a single trip to work.
1.4.2 John travels this trip from the William Nichol interchange to the Botha interchange and back again every day for work. John's trip back home costs him R11,61 in e-Tolls.

The calendar below shows John's work schedule for the month of December 2014. He will work:

- 8 a.m. to 5 p.m. Monday to Friday
- $\quad 9$ a.m. to 1 p.m. on Saturdays
- He will not work on Sundays or public holidays

| Mon | Tues | Wed | Thurs | Fri | Sat | Sun |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 |  |  |  |  |
|  |  |  |  |  |  |  |



Show that John's total e-Toll fees for the month of December will exceed R400.
1.5 Calculate John's daily saving on e-Tolls by being a registered e-Toll user with an e-tag.

Refer to ANNEXURE 2 and your ANSWER SHEET in order to answer the following question:
1.6 ANNEXURE 2 is a copy of a Transaction Report that John received last year. The separate ANSWER SHEET shows a simplified e-Tolls map.

Cleary indicate on the Answer Sheet the route that John travelled on the 04/12/2014, from 08:59:20 to 09:14:51.
1.7 The following is an extract from a Tax Invoice that John received along with the Transaction Report with some information missing.

| VPC Account ID | 1058044 | VPC Tax Invoice Ref No | 804605 |
| :--- | :--- | :--- | :--- |
| Vehicle Licence Plate Number |  | Customer VAT No | N/A |
| Invoice Date | $2013 / 12 / 23$ | Identification | Period |
| E-mail | N/A | RSA ID document |  |

Dear John
Your e-toll VPC Tax Invoice is a consolidation of all your VPC transaction fees including VAT for the specified period. Please refer to the Payment Terms specified below for any possibe discounts.

| Description | VAT Rate | VAT Amount | Amount |
| :--- | :--- | :--- | :--- |
| 10 GORT* Toll Transactions from 2013/12/04 to 2013/12/12 | $14 \%$ | $\ldots \ldots . . . . . . . . . . . . . . ~$ | $\ldots . . . . . . . . . . . . . . . . ~$ |
|  | Total Amount |  |  |

## Payment Terms:

- The discount amount payable (incl VAT) before expiry date R 53.38
- The date on which the discount expires 2014/01/22

Please contact e-toll Customer services for an up-to-date settlement amount.

[^0]1.7.1 Calculate the amount excluding VAT.
1.7.2 Hence, calculate the actual VAT amount.

## QUESTION 2

2.1 Logan and Thabo are going overseas after they matriculate. They will be flying from Durban to London via Dubai.

Logan and Thabo's flight itinerary is shown below:

| Flight | Depart/ Arrive | Time | Airport | Terminal | Duration/ Stops | Class/ Aircraft | Booking Status |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & \text { EK } \\ & 776 \end{aligned}$ | Depart Sat <br> 13 Dec 2014 | 18:45 | King Shaka International Airport (DUR) |  | 08 hr 40 | Economy <br> Boeing | Confirmed |
|  | Arrive Sun <br> 14 Dec 2014 | 05:25 | Dubai International Airport (DXB) | 3 | 0 Stops | $\begin{aligned} & 777- \\ & 300 \mathrm{ER} \end{aligned}$ | Confirmed |
| $\rightarrow$ ィィConnection |  |  |  |  |  |  |  |
| $\begin{aligned} & \text { EK } \\ & 001 \end{aligned}$ | $\begin{aligned} & \text { Sun } 14 \text { Dec } \\ & 2014 \end{aligned}$ | 07:45 | Dubai International Airport (DXB) | 3 | 07 hr 50 min 0 stops | Economy Airbus A380-800 | Confirmed |
|  | $\begin{array}{\|l} \text { Sun } 14 \text { Dec } \\ 2014 \end{array}$ | 11:35 | London Heathrow Airport (LHR) | 3 |  |  |  |

- All times given are in local times, i.e. the time it will be in that country.
2.1.1 Calculate, in hours and minutes, the waiting period at Dubai International Airport.
2.1.2 Logan works out that they will spend a total of 15 hr 30 min on an aeroplane if they board 30 minutes before each flight takes off. Thabo, however, says that they will in fact spend more than $15,5 \mathrm{hrs}$ on an aeroplane. Show, with calculation, who is correct.
2.1.3 The boys will need to phone their parents when they arrive in Dubai to let them know they are safe. The local time, i.e. the time in Dubai will be 05:25. Calculate what the time will be in Durban then.
2.1.4 Calculate the total time it will take Logan and Thabo to get to London, from the time the aircraft departs Durban to the time it lands in London.
2.2 Logan saved R25 000 for the holiday.
2.2.1 When going to exchange his savings into British pounds, Logan is made aware of the fact that the bank charges their clients for converting money. The fees charged are $1,85 \%$ (with a minimum fee of R70,00) of the amount to be converted. Calculate the fees Logan will have to pay the bank when converting his R25 000 into British pounds.
2.2.2 How many British pounds will Logan get if the fees are to be paid from the R25 000 and the given exchange rate is 1 British Pound $=$ R18,3325? The bank will not pay out coins, so you need to determine the amount of pounds Logan will get taking into account that the smallest note is 5 pounds.
2.3 Thabo's parents invested some money for him on 1 January of his Grade 8 year. They deposited R450 every month into a savings account which offered a fixed interest rate of $3,25 \%$ p.a., compounded daily based on 365 days per year of the investment.

Calculate the daily interest rate as a decimal rounded to 6 places.
2.4 Thabo's father is 52 years old. His annual taxable income is R410 000. With the use of the tax table given below, show that he pays more than R80 000 in tax per year.

| Statutory Rates (Individuals) |  |
| :--- | :--- |
| Taxable Income (R) | Rates of tax (R) |
| $0-174550$ | $18 \%$ of each R1 |
| $174551-272700$ | $31419+25 \%$ of amount above 174550 |
| $272701-377450$ | $55957+30 \%$ of amount above 272700 |
| $377451-528000$ | $87382+35 \%$ of amount above 377450 |
| $528001-673100$ | $140074+38 \%$ of amount above 528000 |
| 673101 and above | $195212+40 \%$ of amount above 673100 |


| Statutory Rates (Individuals) |  |
| :--- | :--- |
| Primary Rebate | R12 728 |
| Secondary rebate (for person 65 years and older) | R 7 110 |
| Tertiary rebate (for person 75 years and older) | R 2 367 |

## QUESTION 3

Mrs Pillay gave birth to twins, a boy and a girl. She monitored their weight over the first 6 months which she summarised as follows:

|  | Baby Boy | Baby Girl |
| :--- | :---: | :---: |
|  | Weight (kg) |  |
| Birth | 3,3 | 3,2 |
| Month 1 | 4,4 | 4,1 |
| Month 2 | 5,4 | 5 |
| Month 3 | 6,4 | 5,8 |
| Month 4 | 7 | 6,4 |
| Month 5 | 7,5 | 6,9 |
| Month 6 | 7,9 | 7,3 |

3.1 By making use of the table above and the growth chart shown on ANNEXURE 3 determine which descriptions correctly represent the twins' growth over the 6 months. Write down the corresponding number followed by TRUE or FALSE. If FALSE, correct the statement.
3.1.1 The baby girl lay on the $10^{\text {th }}$ percentile when she was born.
3.1.2 When the baby boy was 3 months old, only $10 \%$ of other baby boys were heavier than he was.
3.1.3 At the time the twins were 6 months old, they both lay close to the $50^{\text {th }}$ percentile.
3.1.4 At 4 months, both babies were developing at the same rate as the average growth rate.
3.1.5 The baby boy's mass increased by a little more than $139 \%$ in the first six months of his life.
3.2 Mrs Pillay was interested in finding out more about the birth of twins. She came across the following table on the Internet.

Table: Multiple pregnancy rate, per pregnancy

|  | Year of treatment | 2008 | 2009 | $\begin{gathered} 2010 \\ \text { (Jan to Jun) } \end{gathered}$ |
| :---: | :---: | :---: | :---: | :---: |
| $\underset{\sim}{\mathbb{O}}$ | 18 to 34 | 31.2\% | 27.6\% | 23.9\% |
|  | 35-37 | 25.0\% | 23.5\% | 22.6\% |
|  | All ages | 26.7\% | 24.4\% | 22.0\% |

Refer to the table in order to answer the questions that follow.
3.2.1 Determine the probability, as a fraction, for all ages giving birth to twins in 2010.
3.2.2 If a woman is 29 years old, determine what the percentage probability would have been in 2009 of her not giving birth to twins.
3.2.3 Write the probability of a 30 year old giving birth to twins in 2010 as a ratio in simplest form.
3.3 Mr Pillay realises that he will now need a bigger geyser to accommodate his bigger family. They previously had a geyser with a capacity of $100 \ell$ and now have a geyser with a capcaity of $200 \ell$.

The following statistics accompany the new geyser.

| MODEL | ELECTRIC LOADING | OPERATIONAL PRESSURE | DIAMETER $\times$ LENGTH |
| :---: | :---: | :---: | :---: |
| 50 Lt | 2 kW | 100 kPa or 200 kPa | $450 \times 610 \mathrm{~mm}$ |
| 100 Lt | 2 kW | $100 \mathrm{kPa}, 200 \mathrm{kPa}$ or 400 kPa | $550 \times 840 \mathrm{~mm}$ |
| 150 Lt | 3 kW | $100 \mathrm{kPa}, 200 \mathrm{kPa}$ or 400 kPa | $550 \times 1150 \mathrm{~mm}$ |
| 200 Lt | 3 kW | $100 \mathrm{kPa}, 200 \mathrm{kPa}$ or 400 kPa | $550 \times 1470 \mathrm{~mm}$ |
| 250 Lt | 4 kW | 100 kPa or 200 kPa | $550 \times 1875 \mathrm{~mm}$ |

Unfortunately, the new geyser has led to a few arguments between Mr and Mrs Pillay.

Mr Pillay is convinced that because the new geyser has twice the volume of the old geyser, the actual surface area of the new geyser will also be double that of the old.

With the use of the formula below, show whether Mr Pillay is correct.


$$
\begin{array}{r}
\text { Surface Area }=(2 \times \pi \times r \times l)+\left(\pi \times r^{2} \times 2\right) \\
\text { Where } \begin{aligned}
r & =\text { radius } \\
l & =\text { length } \\
\pi & =3,14
\end{aligned}
\end{array}
$$

3.4 Mr Pillay is now confused. He decides to calculate the volume of each geyser to make sure he is not being deceived.

Volume $=\pi \times$ radius $^{2} \times$ height
OLD $100 \ell$ GEYSER:
$\pi \times(550 \mathrm{~mm})^{2} \times 840 \mathrm{~mm}$
$=798278693,3 \mathrm{~mm}^{3}$
$=79827869,33 \mathrm{~cm}^{3}$
$\approx 79828$ l
Mr Pillay has made two errors whilst calculating the volume of the old $100 \ell$ geyser.

List the two errors and correct them.
3.5 Calculate the volume of the new $200 \ell$ geyser to the nearest litre.
3.6 Based on the volume, should Mr Pillay be happy with his new geyser? Give a reason for your answer.

## QUESTION 4

Rhino poaching has gained a lot of media attention over the past few years.
The following graphs appeared in a report issued by South Africa's Department of Environmental Affairs:

South Africa's rhino poaching statistics (2010-2013)


## GRAPH 1

## GRAPH 2

4.1 What would the ideal ratio be for Graph 1? Explain your answer.
4.2 Which year was the most successful year for poacher arrests? Justify your answer.
4.3 Calculate the mean number of rhinos killed per day over the 4 years shown.
4.4 4.4.1 By using Graph 2 and the table below, calculate the total number of rhinos that were killed over the 4 years.

| YEAR | NUMBER OF DAYS <br> IN THE YEAR |
| :---: | :---: |
| 2013 | 365 |
| 2012 | 366 |
| 2011 | 365 |
| 2010 | 365 |

4.4.2 A rhino costs on average $\$ 150000$. With the knowledge that $\$ 1=\mathrm{R} 10,61$, calculate the value of the rhinos killed from 2010 to 2013. Round off your answer to the nearest million rand.

Another graph appeared in the same media report:

## GRAPH 3

One of the world's flashiest luxury items isn't made of gold or sold by Hermès. It
adorns the snouts of rhinoceroses. That explains why poachers killed 946 of them in South Africa so far in 2013, 42\% more than in 2012.

Number of rhinos poached in South Africa (2010-Dec 2013)

4.5 Calculate the range of rhinos killed in the past 4 years based on the figures shown in Graph 3.
4.6 Why do you think a smaller range would be preferable in the above graph?

Another company chose to represent the sad situation around rhino poaching differently.

## GRAPH 4


4.7 Would it be correct to assume from the above graph that no rhinos were poached during 2012? Justify your answer.
4.8 Estimate what the projected rhino population will be in the year 2021.
4.9 Give a possible reason for the decline in the projected number of rhinos poached between 2023 and 2024.
4.10 According to this projection, how many years from now do we have until rhinos are completely extinct?

## QUESTION 5

Hannah is very excited because her parents have agreed to help her buy a car. They will pay the monthly repayments but she will be responsible for the petrol and insurance costs.

The picture below shows the car she will be buying.

## 2014 FIESTA FORD 1.6 TREND 4DR POWERSHIFT



## The cost of the car is R215 600,00.

5.1 When buying a car, the customer signs a Hire Purchase agreement with the car dealership. The interest rate that her parents are given is $12,5 \%$ and they intend to pay the car off over 60 months.

Hannah feels proud because she understands the concept of hire purchase and how simple interest works.

Without the use of a formula, calculate the cost of the car including interest and hence their monthly repayments. Show all working.
5.2 Hannah investigates quotes from different insurance companies to find the most affordable insurance premium. ANNEXURE 4 shows a summary of the quotes she received from the different insurance companies.
5.2.1 Calculate the percentage difference between the highest quote and lowest quote.
5.2.2 Hannah cannot decide which one to choose. Which company would you advise Hannah to choose and why?
5.3 Hannah is curious about the different amounts which the companies (shown on ANNEXURE 4) charge for excess. She summarises the data in a Box and Whisker Plot.

5.3.1 State which letter represents the Upper Quartile.
5.3.2 State which letter represents the Median, and what its value is.
5.3.3 Lines C and D lie very close to each other. By referring to the context, explain what this means.
5.4 Hannah budgets R980 for her monthly petrol costs. If she chooses $\mathbf{1}^{\text {st }}$ for women as her preferred insurance company, calculate the total monthly costs for her car, including the monthly payment to the bank.


[^0]:    * Note that John will only receive a discount on the total amount payable if he pays before the specified date.

