# Grade 12 Mathematical Literacy: Question Paper 1

**MARKS: 150** **TIME: 3 hours**

## QUESTION 1

1.1 On a given day, the bank advertises the Rand : Euro exchange rate as 1 : 0,0868.

How many Euros can you buy with R 5 000,00 on this day? (3)

1.2 A house plan is drawn using a 1 : 75 scale

1.2.1 The front door is 2,4 cm tall on the plan. How tall is the door in reality? (3)

1.2.2 The plot of land on which the house is being built is 14 m wide. What is the corresponding length on the plan? (3)

1.3 The conversion table below is used to convert between the shoe sizes of different systems. Refer to this table to answer the questions that follow.

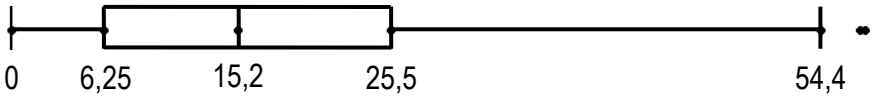
| System | | Sizes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Europe | | 35 | 35½ | 36 | 37 | 37½ | 38 | 38½ | 39 | 40 | 41 | 42 | 43 | 44 |
| Japan | M | 21,5 | 22 | 22,5 | 23 | 23,5 | 24 | 24,5 | 25 | 25,5 | 26 | 26,5 | 27,5 | 28.5 |
| | W | 21 | 21,5 | 22 | 22,5 | 23 | 23,5 | 24 | 24,5 | 25 | 25,5 | 26 | 27 | 28 |
| U.K. | M | 3 | 3½ | 4 | 4½ | 5 | 5½ | 6 | 6½ | 7 | 7½ | 8 | 8½ | 10 |
| | W | 2½ | 3 | 3½ | 4 | 4½ | 5 | 5½ | 6 | 6½ | 7 | 7½ | 8 | 9½ |
| Inches | | 9 | 9⅛ | 9¼ | 9⅜ | 9½ | 9⅝ | 9¾ | 9⅞ | 10 | 10⅛ | 10¼ | 10½ | 10¾ |
| Centimeters | | 22,8 | 23,1 | 23,5 | 23,8 | 24,1 | 24,5 | 24,8 | 25,1 | 25,4 | 25,7 | 26 | 26,7 | 27,3 |

1.3.1 What is the European equivalent of a UK (W) size 5 shoe? (2)

1.3.2 What shoe size would a Japanese man with a size 24 foot ask for in the U.K. (2)

1.3.3 The standard inch : cm conversion rate is 1 : 2,54 cm. According to the table 9⅜ inches = 23,8 cm. Is this correct? Show your working (3)

1.4 The box and whisker plot below represents the batting averages of the 160 cricketers who have batted in T20 matches since 1 January 2009. Answer the questions that are based on the plot.




1.4.1 What is the name given to the two data points with value 57 and 57,33? (2)

1.4.2 How many players have a batting average that is less than 6,25? (2)

1.4.3 What must a batsman's batting average be for him to be in the top quartile? (2)

1.4.4 Jaques Kallis is the South African with the highest batting average. If his average is 48,4, how does he compare with the other batsmen? (2)

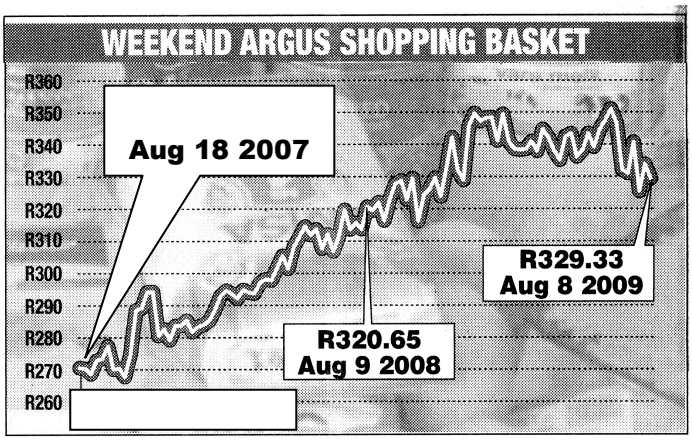
**[24]**

**QUESTION 2**

The graph alongside appeared in a weekend newspaper and describes the price of that newspaper's "shopping basket" over a period of two years.

Study the graph and answer the questions that follow.




2.1 Use the graph to estimate the following (to the nearest R5,00):

2.1.1 What is the **highest** price paid for the shopping basket over the period? (2)

2.1.2 What is the **lowest** price paid for the shopping basket over the period? (2)

2.2 Calculate the percentage change in the cost of the basket from 9 August 2008 to 8 August 2009 (4)

2.3 If the percentage change in the cost of the basket from 18 August 2007 to 9 August 2008 was 18,50, calculate to the nearest rand what the actual cost of the basket was on 18 August 2007. Show your working. (4)

**[12]**

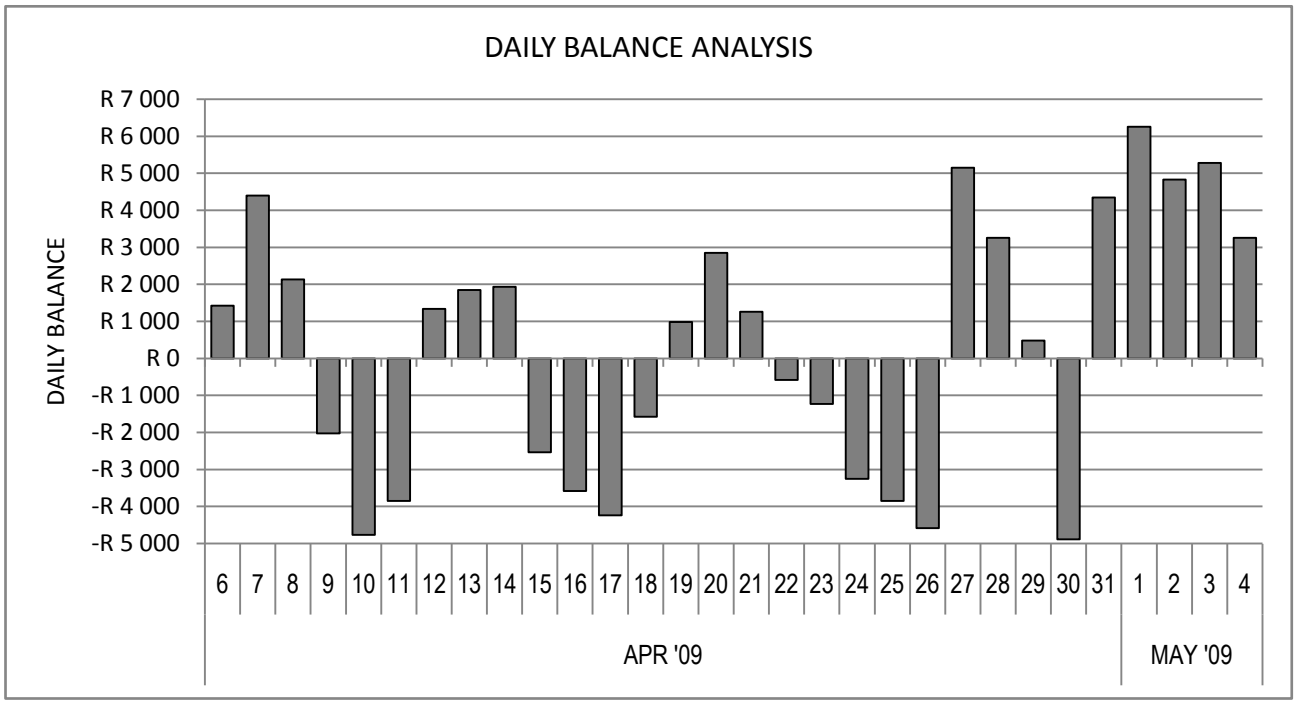
 

## QUESTION 3

Athene runs a small catering business. Her bank provides a monthly bank statement that includes a graph depicting the daily balance in her account. One of these graphs is reproduced below.

Athene has negotiated an overdraft facility of R5 000,00.

Use the graph to answer the questions that follow.




3.1 Determine the following from the graph (all values can be estimated to the nearest R500)

3.1.1 For what period is the graph? (2)

3.1.2 What was the balance in the account on 14 April? (2)

3.1.3 What was the balance in the account on 30 April? (2)

3.1.4 On how many days in the period was the account in overdraft? (2)

3.2 Use the graph to calculate the following as accurately as possible.
You should:

- Estimate all the values that you read from the graph to the nearest R500
- Clearly show all your working

3.2.1 How much money could Athene still withdraw from her account on 18 April? (4)

3.2.2 Describe in overall terms what happened between the following pairs of dates to account for the change in the bank balance:

(a) 8 April to 9 April

(b) 26 April to 27 April (6)

**[18]**

**QUESTION 4**

The table alongside is an extract from a fuller table published in the newspaper by the National Bargaining Council for the Road and Freight Industry (NBCRFI) to advertise the weekly wages of a wide range of employees in the industry.

Parts of the text have been enlarged to make them easier to read.

Extracts from the SARS weekly (PAYE) tax deduction tables for the same period are reproduced below.

Refer to both of these documents to answer the questions that follow.

For the purpose of this question we will assume all workers to be "Under 65" years old.

## Wage Schedule for year 1:
### 01 June 2009 to 28 February 2010

NBCRFI
National Bargaining Council for the Road Freight Industry
*Your Road Freight Partner.*

### Weekly Wages

| Category Code | Class | New Minimum Wage |
|---|---|---|
| 1<br>42<br>3<br>27 | General worker<br>General worker, repair shop<br>Packer/loader, grade I<br>Security guard | R642.87 |
| 5<br>6<br>2<br>22<br>24<br>46 | Motorcycle/motor tricycle driver<br>Light motor vehicle driver<br>Checker, grade I<br>Loader operator, grade II<br>Mobile hoist operator, grade II<br>Packer/loader, grade II | R711.48 |
| 7<br>8<br>44<br>19<br>23<br>47<br>21<br>20<br>26<br>15 | Medium motor vehicle driver (articulated)<br>Medium motor vehicle driver (rigid)<br>Artisan assistant<br>Gantry crane operator, grade I<br>Mobile hoist operator, grade I<br>Checker, grade II<br>Loader operator, grade I<br>Gantry crane operator, grade II<br>Storeman (workshop)<br>Team leader | R876.91 |
| 50 | Vehicle Guard | R1153.94 |
| 10<br>11<br>12<br>13<br>18 | Heavy motor vehicle driver (articulated)<br>Heavy motor vehicle driver (rigid)<br>Extra-heavy motor vehicle driver (articulated)<br>Extra-heavy motor vehicle driver (rigid)<br>Dispatch clerk | R985.53 |
| 14<br>45<br>49 | Ultra-heavy motor vehicle driver<br>Semi-skilled artisan<br>Storeman (warehouse) | R1131.85 |
| 51 | Custodian | R1615.51 |
| 41<br>40<br>39 | Security officer, III<br>Security officer, II<br>Security officer, I..... | R1384.72<br>R1384.72 |

### Provident Fund

**Employee's Deductions**
10% of ordinary weekly wages

Contribution
kly wage contribution

**WEEKLY DEDUCTION TABLES (2010 TAX YEAR)**

| Remuneration | | | Annual Equivalent | Tax | |
|---|---|---|---|---|---|
| | | | | Under 65 | Over 65 |
| R 0 | - | R 1,042 | R 54,132 | R 0 | R 0 |
| R 1,043 | - | R 1,044 | R 54,262 | R 0 | R 0 |
| R 1,045 | - | R 1,046 | R 54,366 | R 1 | R 0 |
| R 1,149 | - | R 1,150 | R 59,774 | R 19 | R 0 |
| R 1,151 | - | R 1,152 | R 59,878 | R 20 | R 0 |
| R 1,153 | - | R 1,154 | R 59,982 | R 20 | R 0 |
| R 1,155 | - | R 1,156 | R 60,086 | R 20 | R 0 |
| R 1,157 | - | R 1,158 | R 60,190 | R 21 | R 0 |
| R 1,601 | - | R 1,604 | R 83,330 | R 101 | R 0 |
| R 1,605 | - | R 1,608 | R 83,538 | R 102 | R 0 |
| R 1,609 | - | R 1,612 | R 83,746 | R 102 | R 0 |
| R 1,613 | - | R 1,616 | R 83,954 | R 103 | R 0 |
| R 1,617 | - | R 1,620 | R 84,162 | R 104 | R 0 |
| R 1,621 | - | R 1,624 | R 84,370 | R 104 | R 1 |
| R 1,625 | - | R 1,628 | R 84,578 | R 105 | R 1 |

4.1 Determine the following from the information provided

4.1.1 For what period are the wages in the table valid? (2)

4.1.2 What, according to SARS, is the annual equivalent remuneration of somebody who earns R 1 155 per week? (2)

4.1.3 How much is the weekly deduction from the ordinary wages of employees for the Provident Fund? (2)

4.2 Use the weekly wage and tax tables to determine the following:

4.2.1 What is the weekly PAYE deduction for a general worker? (2)

4.2.2 What is the weekly PAYE deduction for a custodian? (2)

4.2.3 What is the weekly Provident Fund deduction for a custodian? (2)

4.2.4 Hence, or otherwise show that a custodian "takes home" R1 350,96 after deductions. (4)

4.3 The "New Minimum Wage" value in the table is the wage after an 11% increase. Hence determine:

4.3.1 What did a custodian "take home" before the increase if:

- the weekly PAYE deduction for the original wage (in the previous tax year) was R27,87?
- the provident fund deduction was the same (10% of weekly wages)? (5)

4.3.2 What is the percentage increase in "take home" pay between the original wage and the new wage? (4)

4.3.3 Is the percentage increase in "take home" wages:

- the same as,
- greater than, or
- or less than the

increase of 11% in wages? Give a reason for the observation(s) you have made (4)

**[29]**

## QUESTION 5

A strip map of the road joining Bloemfontein to Port Elizabeth is reproduced alongside.

Us the map to answer the questions that follow.

5.1 Use the strip map to determine the following distances:

5.1.1 Port Elizabeth to Bloemfontein (2)

5.1.2 Cradock to Colesburg (3)

5.2 A family living in Trompsburg travels to Port Elizabeth (a distance of 568 km). If:

- they travel at an average speed of 80 km/h; and
- their car has an average petrol consumption of 12 litres per 100 km,

calculate the following.

5.2.1 The time that it will take them to complete the journey, correct to the nearest 15 minutes. (5)

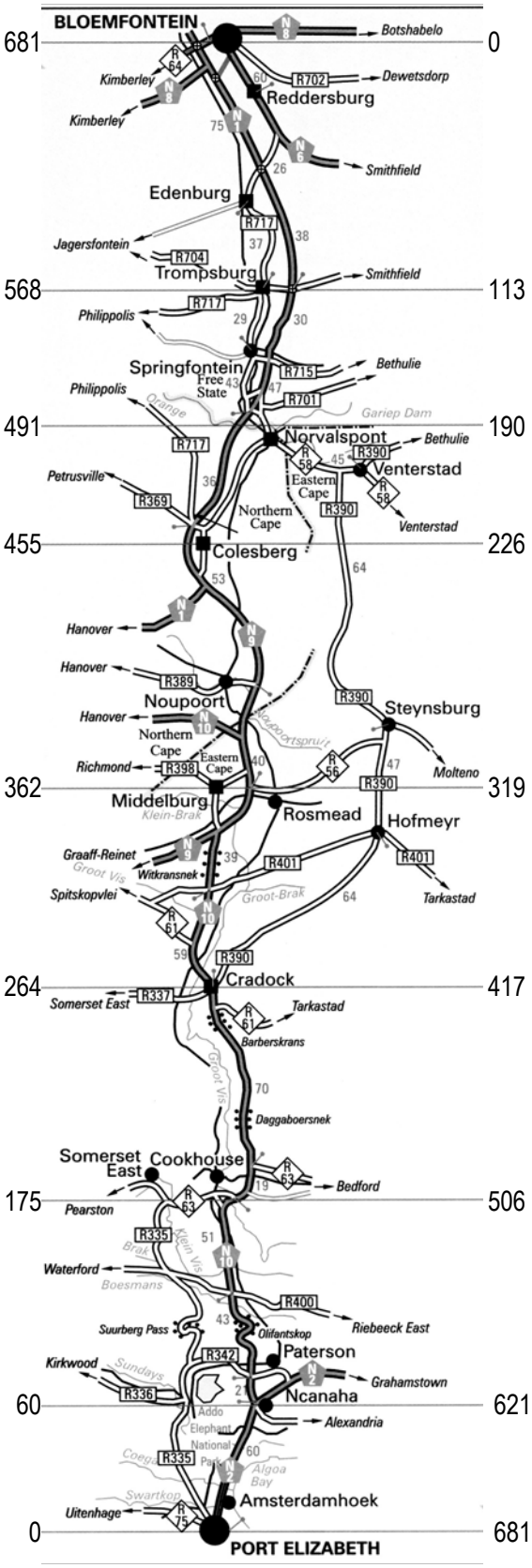
5.2.2 The amount that they will spend on petrol if petrol costs R7,25 per litre. (5)

5.3 If the family wants to stop twice along the journey to stretch and buy cold drinks, determine the following:

5.3.1 Two towns shown on the map that would break the journey in three roughly equal parts. (4)

5.3.2 The approximate times that they would arrive at each town if they depart at 07:00. (6)

**[25]**



## QUESTION 6

Part of one page from a Metrorail timetable is reproduced alongside.

Use this timetable to answer the questions that follow.

| TRAIN NO. | 9516 | 9438 | 9218 | 9440 | 9442 | 9522 | 9444 | 9446 | 9526 |
|---|---|---|---|---|---|---|---|---|---|
| KHAYELITSHA | | 06:48 | | 07:00 | 07:10 | | 07:22 | 07:35 | |
| NONKQUBELA | | 06:51 | | 07:03 | 07:13 | | 07:25 | 07:38 | |
| NOLUNGILE | | 06:54 | | 07:06 | 07:16 | | 07:28 | 07:41 | |
| MANDALAY | | 06:58 | | 07:10 | 07:20 | | 07:32 | 07:45 | |
| | | 06:59 | | 07:11 | 07:21 | | 07:33 | 07:46 | |
| STOCK ROAD | | 07:01 | | 07:13 | 07:23 | | 07:35 | 07:48 | |
| KAPTEINSKLIP | 06:47 | .. | 07:00 | .. | .. | 07:18 | .. | .. | 07:40 |
| MITCHELLS PL. | 06:50 | .. | 07:03 | .. | .. | 07:21 | .. | .. | 07:43 |
| LENTEGEUR | 06:53 | .. | 07:06 | .. | .. | 07:24 | .. | .. | 07:46 |
| | 06:54 | .. | 07:07 | .. | .. | 07:25 | .. | .. | 07:47 |
| PHILIPPI | 06:58 | 07:04 | 07:11 | 07:16 | 07:26 | 07:29 | 07:38 | 07:51 | 07:51 |
| NYANGA | 07:03 | 07:09 | .. | .. | 07:31 | 07:34 | 07:43 | 07:56 | 07:56 |
| HEIDEVELD | 07:07 | 07:13 | 07:17 | 07:24 | 07:35 | 07:38 | 07:47 | 08:00 | 08:00 |
| NETREG | 07:11 | 07:17 | 07:20 | .. | 07:39 | 07:42 | 07:51 | 08:04 | 08:04 |
| BONTHEUWEL | 07:14 | 07:20 | 07:23 | 07:29 | 07:42 | 07:45 | 07:54 | 08:07 | 08:07 |
| | 07:15 | 07:21 | 07:24 | 07:30 | 07:43 | 07:46 | 07:55 | 08:08 | 08:08 |
| LANGA | 07:18 | 07:24 | 07:27 | 07:33 | 07:46 | 07:49 | 07:58 | 08:11 | 08:11 |
| YSTERPLAAT | .. | 07:34 | 07:37 | 07:43 | 07:56 | .. | 08:08 | 08:21 | .. |
| ESPLANADE | .. | 07:39 | 07:42 | 07:48 | 08:01 | .. | 08:13 | 08:26 | .. |
| PINELANDS | 07:23 | .. | .. | .. | .. | 07:54 | .. | .. | 08:16 |
| NDABENI | 07:25 | .. | .. | .. | .. | 07:56 | .. | .. | 08:18 |
| MAITLAND | 07:28 | .. | .. | .. | .. | 07:59 | .. | .. | 08:21 |
| SALT RIVER | 07:33 | .. | .. | .. | .. | 08:04 | .. | .. | 08:26 |
| CAPE TOWN | 07:40 | 07:44 | 07:47 | 07:53 | 08:06 | 08:11 | 08:18 | 08:31 | 08:33 |

6.1 Use the time table to answer the following questions

6.1.1 At what time does train number 9516 pass through Nyanga? (2)

6.1.2 Does train number 9218 stop in Nyanga? (2)

6.1.3 At how many stations does train number 9440 stop when travelling between Kapteinsklip and Cape Town? (2)

6.1.4 How long does the train number 9438 take to travel from Nolungile to Ysterplaat? Show your working. (4)

6.2 Themba takes the train from Lentegeur to Cape Town. He needs to arrive at Cape Town station before 07:50 in order to be at work on time.

6.2.1 List the numbers of all the trains that he can use. (4)

6.2.2 One morning Themba is running very late and misses train number 9522. If he catches the next possible train from Lentegeur, at what time will he arrive at Cape Town station? (4)

**[18]**

## QUESTION 7

The Metropolitan Premier Cup is a soccer tournament hosted by Bay United FC.

In the first round groups of 4 teams play a round robin tournament with the top two teams in each group going through to the second round.

The fixtures and results of the first three games for the teams in Group A are shown alongside.

| Group A | | | | |
|---|---|---|---|---|
| WP United | 4 | - | 0 | Junction Rovers |
| Bay United | 1 | - | 1 | WP United |
| Ajax Cape Town | 5 | - | 0 | Junction Rovers |
| Ajax Cape Town | Still to be played | | | Bay United |
| Ajax Cape Town | Still to be played | | | WP United |
| Bay United | Still to be played | | | Junction Rovers |

7.1 Teams are awarded:

- 3 points for a win;
- 2 points for a draw; and
- 0 points for a loss

Complete the missing information after the first three games in the log table below (you need only write down the values of (a) to (f) in your script):

| Team name | Games played | Games won | Games drawn | Games lost | Goals for | Goals against | Points |
|---|---|---|---|---|---|---|---|
| WP United | 2 | 1 | 1 | 0 | 5 | 1 | (a) |
| Ajax Cape Town | 1 | 1 | 0 | 0 | (b) | 0 | 3 |
| Bay United | (c) | (d) | (e) | (f) | 1 | 1 | 2 |
| Junction Rovers | 2 | 0 | 0 | 2 | 0 | 9 | 0 |

(7)

7.2 By considering the remaining games in the Group answer the following questions:

7.2.1 How many games must Ajax Cape Town still play? (2)

7.2.2 What is the maximum number of points that Junction Rovers can end the group competition with? Explain your answer. (3)

7.3 Consider the game between Ajax Cape Town and Bay United

7.3.1 What are the three possible outcomes of the game? Answer this question by completing the statements below (write done the statements in your script):

(a) Ajax Cape Town **wins** and Bay United ____

(b) Ajax Cape Town **draws** and Bay United ____

(c) Ajax Cape Town _____ and Bay United ____ (4)

7.3.2 For each of the three outcomes above state how many points each team will have on the log after the game. (6)

7.4 In light of your answers in 1.2 and 1.3 discuss the likelihood (probability) of Junction Rovers ending the group tournament in positions 1 or 2. Give reasons for your answer. (4)

**[26]**

# Grade12 Mathematical Literacy: Memorandum Paper 1

1.1 R5 000,00 × 0,0868 = €434 ✔ ✔ ✔ 3

1.2.1 2,4 cm × 75 cm = 180 cm = 1,8 m ✔ ✔ ✔ 3

1.2.2 14 m ÷ 75 m = 0,186 m = 18,6 cm ✔ ✔ ✔ 3

1.3.1 38 ✔ ✔ 2

1.3.2 5½ ✔ ✔ 2

1.3.3 9⅜ inches × 2,54 cm = 23,81 cm ✔ ✔
This is correct. ✔ 3

1.4.1 Outliers ✔ ✔ 2

1.4.2 About 40 players ✔ ✔ 2

1.4.3 > 25,5 ✔ ✔ 2

1.4.4 He is definitely in the top quartile. He is closer to the highest batting averages so he compares favourably with the best batsmen in the world. ✔ ✔ 2

2.1.1 Accept between R350 and R355 ✔ ✔ 2

2.1.2 Accept between R265 and R270 ✔ ✔ 2

2.2 % change $= \frac{\text{R329.33} - \text{R320.65}}{\text{R320.65}} = 2{,}7\%$
✔ ✔ ✔ ✔ 4

2.3 $0{,}185 = \frac{\text{R320.65} - x}{x}$ ✔ ✔
$0{,}185x = \text{R320,65} - x$
$1{,}185x = \text{R320,65}$
$x = \text{R320,65} \div 1{,}185$ ✔
$x = \text{R320,65} \div 1{,}185$
$x = \text{R270,59}$ ✔ 4

3.1.1 6th April, 2009 to 4 May, 2009 ✔ ✔ 2

3.1.2 R2 000 ✔ ✔ 2

3.1.3 –R5 000 ✔ ✔ 2

3.1.4 13 ✔ ✔ 2

3.2.1 R5 000 – R1 500 = R3 500 ✔ ✔ ✔ ✔ 4

3.2.2 (a) Athene withdrew R4 000. This caused her bank balance to go from R2 000 to –R2 000. ✔ ✔ ✔
(b) Athene deposited R9 500. This caused her bank balance to go from –R4 500 to R5 000. ✔ ✔ ✔ 6

4.1.1 2010 Tax year ✔ ✔ 2

4.1.2 R60 086 ✔ ✔ 2

4.1.3 10% ✔ ✔ 2

4.2.1 R0,00 ✔ ✔ 2

4.2.2 R103 ✔ ✔ 2

4.2.3 Weekly deduction = 10% of R1 615,51
Weekly deduction = R161,55 ✔ ✔ 2

4.2.4 Take Home = R1 615,51 − (R103 + R161,55) ✔ ✔ ✔
= R1 350,96 ✔ 4

4.3.1 R1 615,51 = 111% of original wage
Original wage = R1 615,51 ÷ 1,11
= R1 455,41 ✔ ✔
10% of R1 455,41 = R145,54 ✔
Take Home = R1 455,41 − (R27,87 + R145,54) ✔
= R1 282,00 ✔ 5

4.3.2 % change $= \frac{\text{R1 350.96} - \text{R1 282.00}}{\text{R1 282.00}} =$
5,4% ✔ ✔ ✔ ✔ 4

4.3.3 The "take home" percentage increase is less than half of the wage increase of 11%. The reason for this is the increase in the PAYE that the custodian has to pay. Originally he/she paid R27,87 per week which is 1,91% of his/her salary. After the increase he/she pays R103 PAYE per week which is 6,38% of his/her salary. Hence the discrepancy in the "take home" increase and the wage increase. ✔ ✔ ✔ ✔ 4

5.1.1 681 km ✔ ✔ 2

5.1.2 455 km – 264 km = 191 km ✔ ✔ ✔ 3

5.2.1 Time = distance ÷ speed
Time = 568 km ÷ 80 km/hr ✔ ✔
= 7,1 hr ✔ ✔
≈ 7 hr ✔ 5

5.2.2 Ave petrol consumption = 12 l /100 km
568 km ÷ 100 km = 5,68 km ✔
Petrol used = 12 l /100 km × 5,68 km ✔
= 68,16 l ✔
Cost = 68,16 l × R7,25 = R494,16 ✔ ✔ 5

5.3.1 Middleburg and Cookhouse ✔ ✔ ✔ ✔
OR any other reasonable suggestion 4

5.3.2 Dist to Middleburg = 568 km – 362 km
= 206 km ✔
Time taken = 206 km ÷ 80 km/hr ✔
= 2,6 hr = 2 h 36 min. ✔
They will arrive in Middleburg at approximately 09:36 ✔
Dist to Cookhouse = 362 km – 175 km
= 187 km
Time taken = 187 km ÷ 80 km/hr ✔
= 2,3 hr = 2 h 18 min. ✔
They will arrive in Cookhouse at approximately 12:00 or later depending on how long they spent in Middelburg ✔ 6

6.1.1 07:03 ✔ ✔ 2

6.1.2 No ✔ ✔ 2

6.1.3 7 stations ✔ ✔ 2

6.1.4 Train leaves Nolungile at 06:54 ✔
Arrives in Ysterplaat at 07:34 ✔
It takes 40 minutes ✔ ✔ 4

6.2.1 9516 ✔ ✔
9218 ✔ ✔ 4

6.2.2 The next possible train leaves at 07:46 and will arrive in Cape Town at 08:33
✔ ✔ ✔ ✔ 4

7.1 (a) 5 ✔ ✔
(b) 5 ✔
(c) 1 ✔
(d) 0 ✔
(e) 1 ✔
(f) 0 ✔ 7

7.2.1 2 games ✔ ✔

7.2.2 Junction Rovers have only 1 game left to play. If they win then they will get the maximum number of points which will be 3. ✔ ✔ 3

| | | |
|---|---|---|
| | Hence the maximum number of points that they can end the competition with is 3. ✔ | |
| 7.3.1 | (a) Ajax Cape Town **wins** and Bay United loses ✔<br>(b) Ajax Cape Town **draws** and Bay United draws ✔<br>(c) Ajax Cape Town loses and Bay United wins ✔ ✔ ✔ ✔ | |
| 7.3.2 | (a) Ajax Cape Town 6 and Bay United 2 ✔ ✔<br>(b) Ajax Cape Town 5 and Bay United 4 ✔ ✔<br>(c) Ajax Cape Town 3 and Bay United 5 ✔ ✔ | 6 |
| 7.4 | The maximum points that Junction Rovers can end the tournament are 3.<br>WP United already has 5 points which means that Junction Rovers cannot be placed in position 1. ✔<br>In each of the three scenarios in the Ajax Cape Town vs. Bay United game one of the teams ends with more than 3 points which means that Junction Rovers cannot be placed in position 2. ✔ ✔<br>Hence the likelihood of Junction Rovers ending in position 1 or 2 is nil. (impossible) ✔ | 4 |

# Grade 12 Mathematics: Question Paper 1

**MARKS: 150** **TIME: 3 hours**

## QUESTION 1

1.1 Solve for $x$ in the following, correct to two decimal places where necessary.

1.1.1 $2x^2 + 7x = 30$ (4)

1.1.2 $2x(x-2) - 5 = 0$ (4)

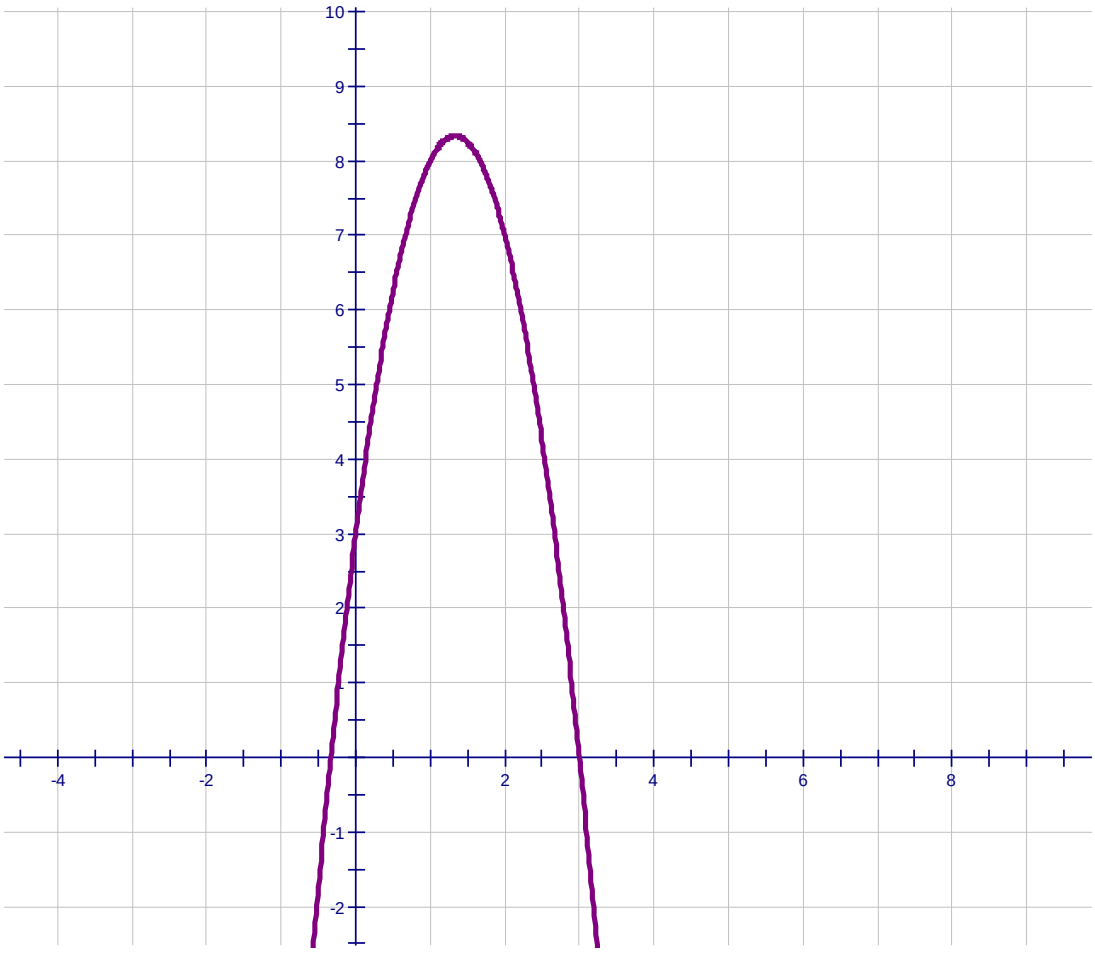
1.1.3 $4x^2 + 5x - 2 < 0$ (4)

1.2

1.2.1 Solve simultaneously for $x$ and $y$ if
$2x + 6 - y = 0$ and $y + 3x^2 = 8x + 3$ (5)

1.2.2 The graph of $y = -3x^2 + 8x + 3$ is shown below. Use this graph and any other sketch to explain your answer in 1.2.1. (3)

**[20]**



**QUESTION 2**

2.1 A woman wishes to borrow R800 000 in start up capital for her business. She is offered an interest rate of 9% per annum, compounded monthly, by All Star Finance. She has worked out that she will be able to afford a monthly repayment of R7 500. Determine how long it will take her to pay back the loan. Give your answer in years. (7)

2.2 A bus company owns vehicles to the value of R1 500 000.

2.2.1 The vehicles are depreciating at a rate of 18% per annum on a reducing balance. Calculate their value after 5 years. (3)

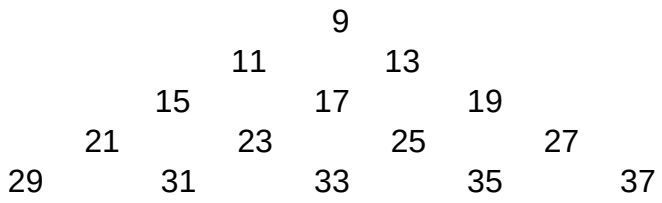
2.2.2 The average rate of inflation over the next five years is expected to be 4,5% per annum and the management expect to sell the old vehicles for their market value in 5 years time. Calculate the value of the sinking fund which will be necessary to buy completely new vehicles after 5 years (4)

2.2.3 What monthly payments will the management of the bus company need to make in order to achieve this target, if they are offered an interest rate of 6% per annum, compounded monthly, on their savings? (5)

**[19]**

**QUESTION 3**

3.1 A pyramid of odd number has been made, starting with the number 9.




Consider the sequence formed by the numbers at the beginning of each row, that is

9 11 15 21 29

3.1.1 Give the name of type of sequence formed. (1)

3.1.2 If the sequence is continued, determine a formula for the nth term. (4)

3.2 Bill and Bob decided to have a competition with their jumping frogs, Sammy and Solly. They recorded the results of the jumps in a table and realized that the results of the jumps formed an arithmetic progression. Jumps are measured in centimeters.

| Frog | Jump 1 | Jump 4 | Jump 20 |
|---|---|---|---|
| Sammy | 2 | 17 | x |
| Solly | y | 59 | 107 |

Determine the values of x and y, showing all working. (6)

**[11]**

**QUESTION 4**

4.1 Anele started working in 2009. His initial annual salary was R85 000. His contract says he will receive an increase of 9% per year.

4.1.1 Calculate his annual salary for 2010 and for 2011. (2)

4.1.2 His company decides that they will only give a maximum of 15 salary increases. What is the maximum annual salary that Anele can ever earn under this system? (4)

4.2 Evaluate $\sum_{k=0}^{3} \frac{2}{5^k}$ (3)

4.3 A mining company is drilling a well to reach water at a depth of 95m below the surface. On the first day of drilling the drill reaches a depth of 20m. The rock becomes progressively harder and the drill is only able to reach ¾ of the depth of the previous day's drilling on each successive day.

4.3.1 How deep is the hole after 10 days of drilling? (3)

4.3.2 When will the company succeed in reaching the water? Justify your answer by calculation. (4)

**[16]**

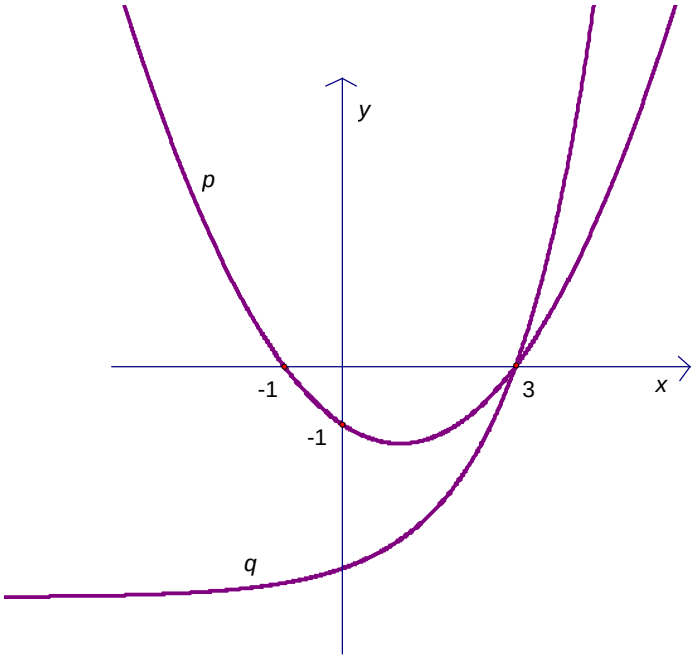
**QUESTION 5**

5.1 The function $f(x) = \frac{-3}{x-1} + 2$ is given.

5.1.1 Draw a neat sketch graph of the function, showing any intercepts with the axes and any asymptotes. (4)

5.1.2 Determine the equations of the axes of symmetry of $f(x)$. (3)

5.2 Two graphs, $p(x)$and $q(x)$, are shown in the diagram below.




$p(x)$ passes through the points (-1 ; 0), (3 ; 0) and (0 ; -1)

5.2.1 Determine the equation of $p(x)$ in the form (5)

$$p(x) = ax^2 + bx + c$$

5.2.2 $q(x)$ passes through (3 ; 0) and has equation (2)

$$q(x) = \frac{1}{2}b^x - 4$$

Show that the value of b is 2.

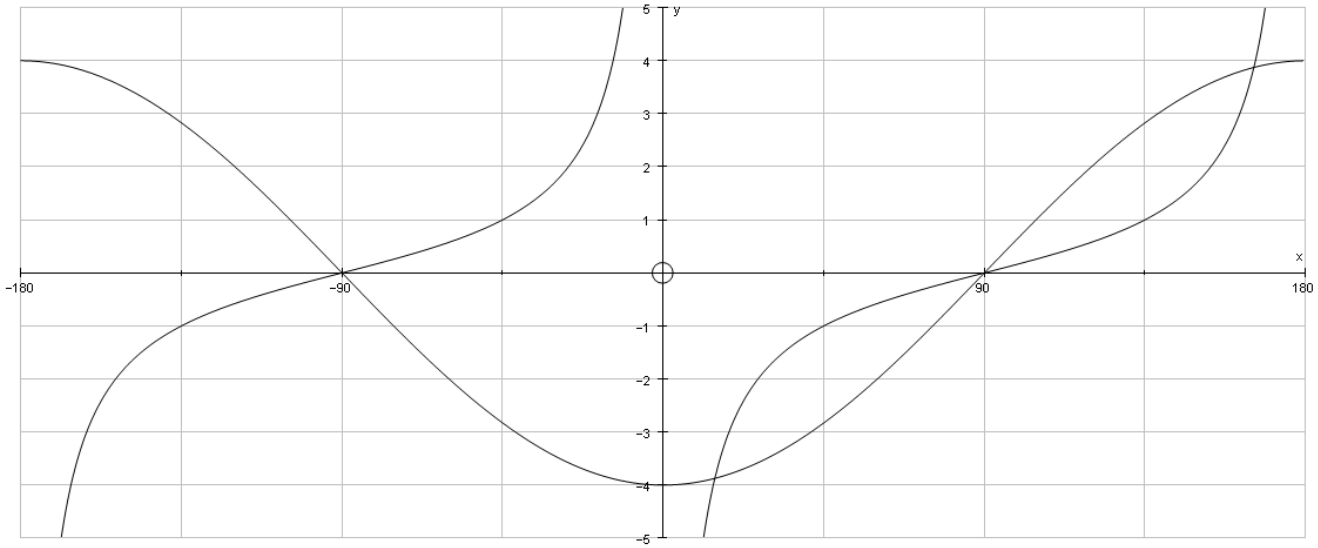
5.2.3 Give the domain and range of $q(x)$. (2)

5.2.4 Determine the equation of $q^{-1}(x)$, the inverse function of $q(x)$. (3)

5.2.5 Give the domain of $q^{-1}(x)$. (1)

5.3

The graphs of $f: y = a\cos x$ and $g: y = \tan(x + 90°)$ are drawn below




5.3.1 Determine the value of a. (1)

5.3.2 Give the equation of the asymptotes of *g* for the domain $-180° \le x \le 180°$ (2)

5.3.3 If the graph of *g* is moved 45º to the left and 2 units up, give the equation of the new graph formed. (2)

**[25]**

**QUESTION 6**

6.1 Find the derivative, from first principles, of $f(x) = \frac{1}{2}x^2$. (5)

6.2 Determine

6.2.1 $f'(x)$ if $f(x) = x^4 + \sqrt{x} - \frac{9}{x}$ (3)

6.2.2 $\frac{dy}{dx}$ if $y = t(t+1)$ and $t = 3x$ (3)

6.3 Researchers have been studying the growth of an alien plant on farm dams. The equation $A(x) = -\frac{1}{2}x^3 + 12x^2$ describes the area covered by the plant after *x* months have passed. The area is measured in square metres.
Determine

6.3.1 how many months the plant will take to cover the maximum area. (4)

6.3.2 at what rate the growth was increasing one month after the study began. (2)

**[17]**

## QUESTION 7

The function $f(x) = x^3 - 4x^2 - 3x + 18$ is given.

7.1 Find the value of $f(3)$. (1)

7.2 Hence or otherwise determine the coordinates of the $x$ intercepts of the graph of the function. (4)

7.3 Determine the coordinates of any turning points of the graph. (5)

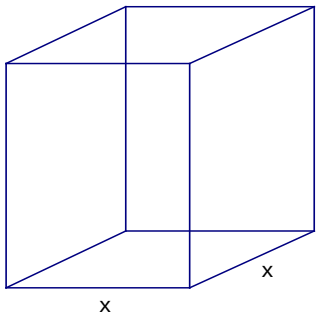
7.4 Draw a clear sketch graph of $f(x)$, showing the intercepts with the axes and any turning points. (4)

7.5 Determine the $x$ coordinate of the point of inflection of the curve. (2)

**[16]**

## QUESTION 8

A manufacturer wants to make an **open** box ( i.e it has **no** lid) with a square base and volume $2{,}5\text{m}^3$. The sides are perpendicular to the base and measure $x$ metres each.




8.1 Determine the height of the box in terms of $x$. (2)

8.2 The manufacturer wants to dip the box in plastic resin to coat the inside and the outside of the box, including the base, with plastic resin. Show that the area to be coated is given by the equation

$$A = 2x^2 + \frac{10}{x}$$

(3)

8.3 Hence determine the value of x that will give the minimum surface area to be coated. (5)

**[10]**

**QUESTION 9**

A retailer wishes to buy a maximum of 20 guitars. He can buy either type A for R1500 each or type B for R3000 each. R45 000 has been set aside for purchasing all the guitars. At least 6 of each type must be purchased.

8.1 If the retailer buys $x$ number of type A guitars and $y$ number of type B guitars, write down four inequalities which describe the above constraints. (4)

8.2 Represent the constraints graphically and clearly indicate the feasible region for the problem. (5)

8.3 If the retailer makes a profit of R400 on each type A guitar and a profit of R1000 on each type B guitar write down an equation for the total profit (P) which will be gained on sales. (1)

8.4 Determine how many of each type of guitar should be sold to achieve the maximum profit. (3)

8.5 If the profit on the type A changes to R500 and the profit on type B remains the same, explain how this will affect the quantity of each type which should be sold to achieve the maximum profit. (3)

**[16]**

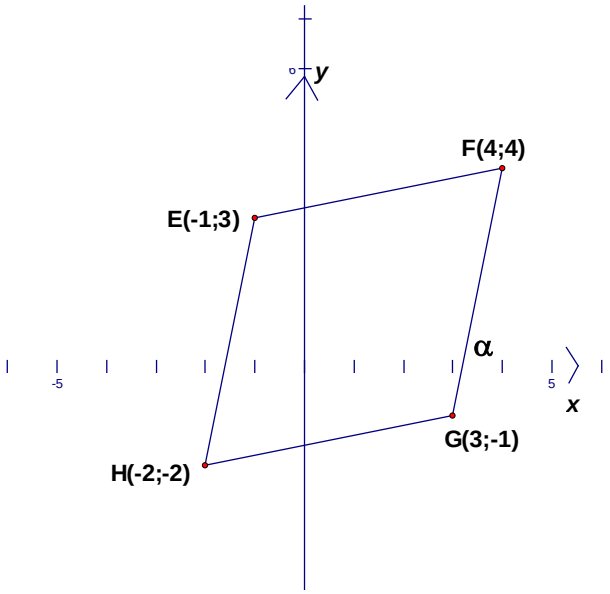
 

# Grade 12 Mathematics: Question Paper 2

**MARKS: 150** **TIME: 3 hours**

## QUESTION 1

In the diagram alongside, quadrilateral EFGH has vertices E(-1; 3), F(4; 4), G(3; -1) and H(-2; -2).




1.1 Determine the coordinates of M, the midpoint of EG. (2)

1.2 Show that EG and FH bisect each other. (2)

1.3 Show that EFGH is a rhombus. (4)

1.4 Find the equation of line EG. (3)

1.5 Does the point $(\frac{5}{2}; -\frac{3}{4})$ lie on the line EG? Justify your answer. (3)

1.6 Calculate the value of $\alpha$, the angle that the line FG makes with the positive direction of the $x$ axis. (3)

1.7 Determine the area of $\Delta$EGH. (4)

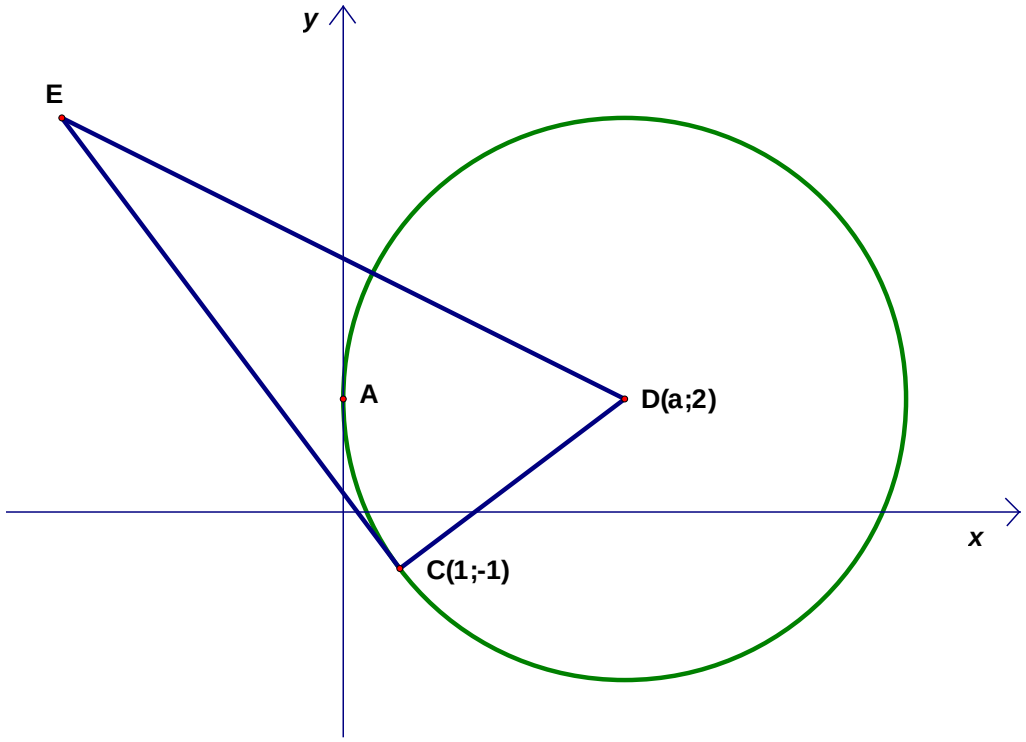
1.8 Determine the coordinates of P, a point in the second quadrant, so that EGHP is a parallelogram. (2)

**[23]**

**QUESTION 2**

In the figure below, EC is a tangent to the circle with centre D($a$; 2). EC is 12 units and ED is 13 units. C is the point (1; -1). The circle touches the $y$ axis at point A.




Determine

2.1 the length of DC (2)

2.2 the value of a. (5)

2.3 the equation of the tangent to the circle at the point C. (4)

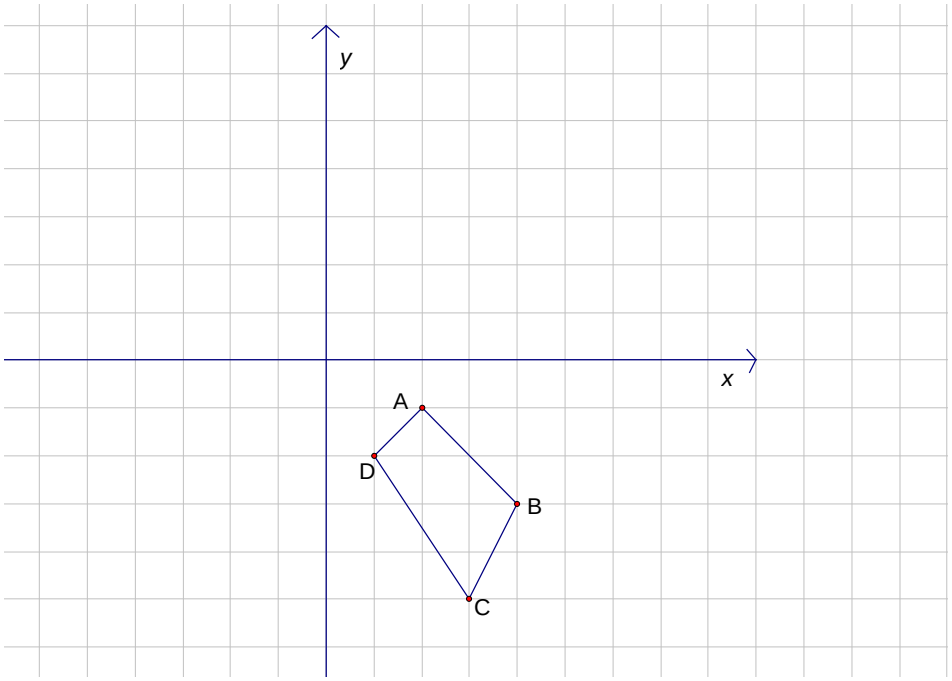
2.4 the coordinates of the point A. (2)

2.5 the equation of the circle with centre C, passing through the point A (5)

**[18]**

**QUESTION 3**

The vertices of a quadrilateral ABCD are shown in the grid. The coordinates are: A(2; -1), B(4; -3), C(3; -5) and D(1; -2).




3.1 Each of the points in the grid below is rotated about the origin in an anti-clockwise direction through an angle of 90°. Sketch and label the vertices of A'B'C'D', the image of ABCD, on the grid. Only give the **coordinates** of point C'. (5)

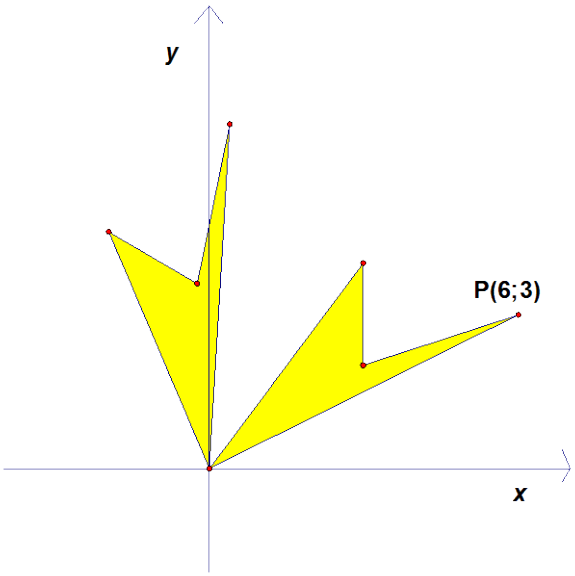
3.2 Each of the points A, B C and D is also reflected in the line $y = -x$. Sketch and label A"B"C"D", the image of ABCD after this transformation. Only show the **coordinates** of point B". (5)

3.3 Consider a general point P($x$; $y$). Write down the image of P($x$; $y$) after it has undergone the following two transformations: a rotation of 180º about the origin, followed by an enlargement of factor $\frac{4}{5}$. (2)

3.4 If the area of quadrilateral ABCD in the sketch is $p$ units², what is its area after undergoing the two transformations described in 3.1.1 (2)

**[14]**

## QUESTION 4



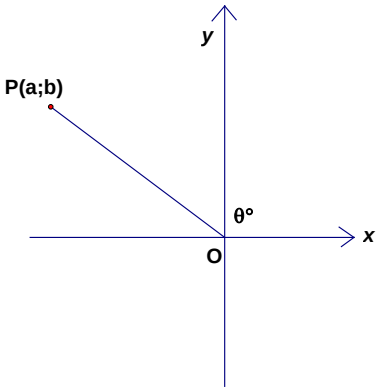

4.1 A quadrilateral is rotated as shown in the sketch. Determine the coordinates of the image of point P(6;3) after a rotation of 60° about the origin. Give your answer in the simplest surd form. (5)

4.2 Instead of the above rotation the original quadrilateral is reflected in $y = x$ and then in the line $y = 0$. Give the coordinates of the final image of P. (2)

**[7]**

## QUESTION 5

5.1 The point P(a;b) is joined to the origin and the line OP makes an angle of $\theta°$ with the $x$ axis.




Find, in terms of a and b

5.1.1 $\tan\theta$ (1)

5.1.2 $\cos(-\theta)$ (4)

5.2 If $\sin 37° = k$, determine, in terms of $k$,

5.2.1 $\cos 53°$ (2)

5.2.2 $\sin(-74°)$ (4)

5.3 Prove, without using a calculator, that

5.3.1 $\dfrac{\sin\alpha\cdot\sin 2\alpha}{\cos\alpha}+\cos 2\alpha=1$ (4)

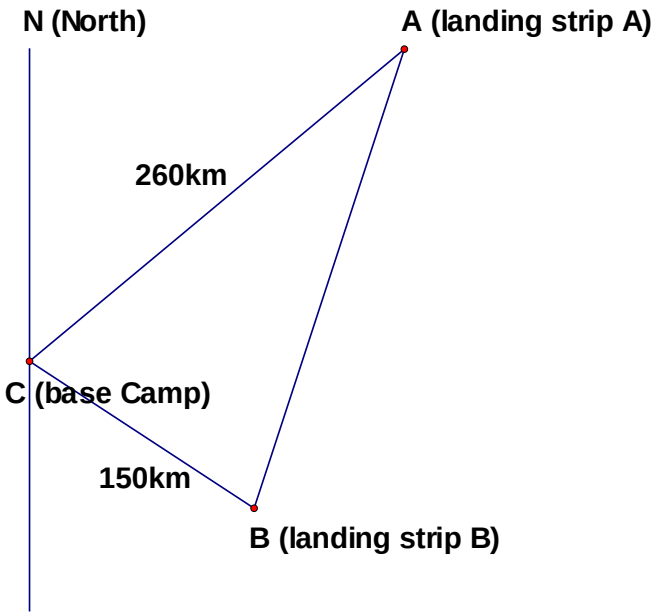
5.3.2 $\dfrac{\sin 234^\circ}{\cos 36^\circ}-\dfrac{\sin(x-90^\circ)\cos(90^\circ-2x)}{\sin(x-360^\circ)}=\cos 2x$ (8)

5.4 Determine the general solution for $3\cos^2 x+5\sin x=3$ (6)

**[29]**

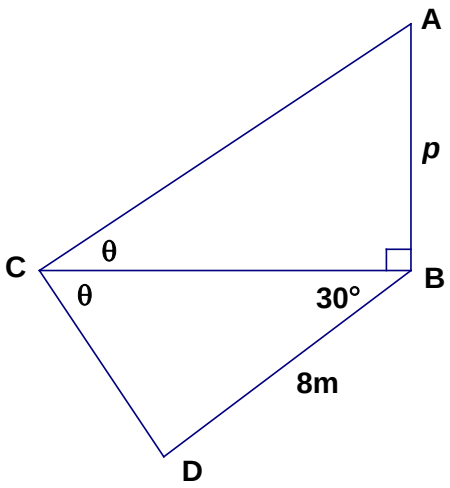
## QUESTION 6

6.1 Bush rangers often use light aircraft to monitor the position of animals in game reserves. The diagram below shows the position of two landing strips the planes use and the base Camp. Landing area A is on a bearing of 50° from the base camp,C, and landing area B is on a bearing of 110° from the base camp. That means $N\hat{C}A=50^\circ$ and $N\hat{C}B=110^\circ$.
The distance from C to A is 260km and from C to B is 150km.




Determine the distance a pilot would have to fly from point A to point B. Answer correct to the nearest kilometer. (5)

6.2 In the diagram shown, B, C and D are three points on the same horizontal plane and AB is a vertical pole of length $p$ metres. The angle of elevation of A from C is $\theta$ and $B\hat{C}D = \theta$. Also $C\hat{B}D = 30°$ and $BD = 8$ metres.




6.2.1 Express $C\hat{D}B$ in terms of $\theta$. (1)

6.2.2 Hence show that $p = \dfrac{8\sin(30° + \theta)}{\cos\theta}$ (6)

**[12]**

**QUESTION 7**

Consider the functions $f(x) = \sin 2x$ and $g(x) = \cos(x - 45^\circ)$ for $x \in [-180^\circ; 180^\circ]$

7.1 Solve for $x$ if $\sin 2x = \cos(x - 45^\circ)$. (8)

7.2 Sketch the graphs of $f$ and $g$ on the same system of axes for $x \in [-180^\circ; 180^\circ]$. (6)

7.3 Determine for which values of $x \in [-180^\circ; 90^\circ]$ is

7.3.1 $g(x) \leq f(x)$ (3)

7.3.2 $\dfrac{f(x)}{g(x)}$ undefined? (2)

**[19]**

**QUESTION 8**

8.1 A potato packing company does a survey to determine if a consistent number of potatoes are being packed in each 10kg bag that they sell. A sample of 15 bags was taken and the number of potatoes in each was counted. The results are in the table below.

| Bag Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of potatoes | 60 | 75 | 50 | 60 | 66 | 65 | 65 | 45 | 70 | 72 | 66 | 80 | 64 | 70 | 71 |

Determine

8.1.1 the mean number of potatoes per bag. (3)

8.1.2 the standard deviation of the data. (2)

8.1.3 how many bags from this group would be rejected if the company only sells bags within one standard deviation of the mean. (3)

8.2 A survey was done of the number of patients attending out-patient clinics in a certain province over the course of one month. Ten clinics were selected from around the province for this survey. The results are given in the table below, rounded to the nearest 100 patients.

| Clinic | Number of patients per month |
|---|---|
| A | 12 600 |
| B | 16 800 |
| C | 15 400 |
| D | 19 600 |
| E | 16 500 |
| F | 15 300 |
| G | 18 600 |
| H | 11 000 |
| I | 14 200 |
| J | 14 500 |

8.2.1 Determine the five-number summary for the data. (5)

8.2.2 Draw a box and whisker plot from your answer to 8.2.1 (3)

8.2.3 Determine the maximum and minimum number of patients per day who attended these clinics, if the clinics were open for 28 days per month. (2)

**[18]**

**QUESTION 9**

The matric results of the 245 pupils at a certain school were recorded as follows:

| **Marks** | **Frequency** | **Cumulative frequency** |
|---|---|---|
| $20 \leq x \leq 29$ | 4 | 4 |
| $30 \leq x \leq 39$ | 12 | |
| $40 \leq x \leq 49$ | 30 | |
| $50 \leq x \leq 59$ | 82 | |
| $60 \leq x \leq 69$ | 55 | |
| $70 \leq x \leq 79$ | 35 | |
| $80 \leq x \leq 89$ | 24 | |
| $90 \leq x \leq 100$ | 3 | |

9.1 Complete the cumulative frequency table. (2)

9.2 Draw an ogive to illustrate the data, using a suitable scale on the axes. (4)

9.3 Use your ogive to determine the approximate median value. Show on your graph where you obtained your answer. (2)

9.4 Why is it not possible to obtain the exact mean or median of this data? (2)

**[10]**

# Grade 12 Mathematics: Memorandum Paper 1

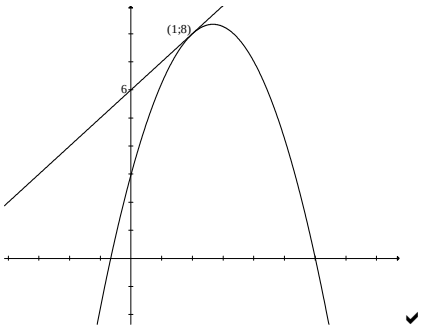
1.1.1 $2x^2 + 7x = 30$
$2x^2 + 7x - 30 = 0$ ✔
$(2x - 5)(x + 6) = 0$ ✔
$\therefore x = \frac{2}{5}$ or $x = -6$ ✔ ✔ (4)

1.1.2 $2x(x - 2) - 5 = 0$
$2x^2 - 4x - 5 = 0$ ✔
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$
$$x = \frac{4 \pm \sqrt{(-4)^2 - 4 \times (2)(-5)}}{2 \times 2}$$ ✔
$$\therefore x = \frac{4 + \sqrt{56}}{4} \text{ or } x = \frac{4 - \sqrt{56}}{4}$$ ✔ ✔
Or $x = 2{,}87$ or $x = -0{,}87$ (4)

1.1.3 $4x^2 + 5x - 2 < 0$
$(4x - 1)(x + 2) < 0$ ✔ ✔
$x < ¼$ or $x > -2$ ✔ ✔ (4)

1.2.1 $2x + 6 - y = 0$
$2x + 6 = y$
$y + 3x^2 = 8x + 3$
$y = -3x^2 + 8x + 3$ ✔
$\therefore 2x + 6 = -3x^2 + 8x + 3$ ✔
$3x^2 - 6x + 3 = 0$
$x^2 - 2x + 1 = 0$
$(x - 1)^2 = 0$ ✔
$\therefore x = 1$ ✔
$\therefore y = 2x + 6 = 8$ ✔ (5)

1.2.2




✔

(1; 8) is the point of contact between the straight line $y = 2x + 6$ and the parabola $y = -3x^2 + 8x + 3$. There is one point of contact.
$\Rightarrow$ line is a tangent to the curve. ✔ ✔ (3)

2.1
$$P = \frac{x\left[1 - (1+i)^{-n}\right]}{i}$$ ✔
$$800\,000 = \frac{7500\left[1 - \left(1 + \frac{\frac{9}{100}}{12}\right)^{-n}\right]}{\frac{9}{\frac{100}{12}}}$$ ✔ ✔
$$800\,000 = \frac{7500\left[1 - \left(1 + \frac{3}{400}\right)^{-n}\right]}{\frac{3}{400}}$$
$800\,000 \times \frac{3}{400} \div 7\,500 = 1 - (\frac{403}{400})^{-n}$
$\frac{20}{25} = 1 - (\frac{403}{400})^{-n}$ ✔
$(\frac{403}{400})^{-n} = \frac{5}{25} = \frac{1}{5}$
$$-n = \left(\frac{\log\frac{1}{5}}{\log\frac{403}{400}}\right)$$ ✔
$-n = -215{,}4$ months ✔
$\therefore$ It will take 17,95 years to pay back the loan. ✔
(Simplifications at various stages are not necessary.) (7)

2.2.1 $A = P(1 - i)^n$ ✔
$A = 1\,500\,000(1 - \frac{18}{100})^5$ ✔
$A = 556\,109{,}76$ ✔
$\therefore$ It is worth R556 109,76. (3)

2.2.2 $A = P(1 - i)^n$ ✔
$A = 1\,500\,000(1 + \frac{4.5}{100})^5$ ✔
$A = 1\,869\,272{,}91$ ✔
$\therefore$ Sinking fund required is
R1 869 272,91 – R556 109,76
= R1 313 163,15 ✔ (4)

2.2.3
$$F = \frac{x\left[(1+i)^2 - 1\right]}{i}$$ ✔
$$1313163{,}15 = \frac{x\left[\left(1 + \frac{\frac{6}{100}}{12}\right)^5 - 1\right]}{\frac{6}{\frac{100}{12}}}$$ ✔ ✔
$$\frac{1313163{,}15 \times 6 \div 100 \div 12}{\left[\left(1 + \frac{\frac{6}{100}}{12}\right)^5 - 1\right]} = x$$ ✔
$260\,019{,}40 = x$ ✔
$\therefore$ They will need to pay R260 019,40 per month. (5)

3.1.1 Quadratic sequence ✔ (1)

3.1.2

| $T_0$ | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ |
|---|---|---|---|---|---|
| 9 | 9 | 11 | 15 | 21 | 29 |
| | 0 | 2 | 4 | 6 | 8 |
| | | 2 | 2 | 2 | 2 | |

Second difference = 2
$\therefore 2a = 2$
$a = 1$ ✔
By inspection $T_0 = 9$
$\therefore c = 9$ ✔
$\therefore T_n = n^2 + bn + 9$
$T_1 = 1^2 + b + 9 = 9$
$\therefore b = -1$ ✔
$\therefore T_n = n^2 - n + 9$ ✔
(or equivalent method) (4)

3.2 Sammy:
$a = 2 \quad T_4 = a + 3d$ ✔
$= 2 + 3d = 17$
$3d = 15$
$d = 5$ ✔
$\therefore T_{20} = a + 19d$
$= 2 + 19 \times 5$
$= 97$
$\therefore x = 97$ ✔
Solly:
$T_4 = a + 3d = 59$
$T_{20} = a + 19d = 107$ ✔
$16d = 48$
$d = 3$ ✔
$\therefore T_4 = a + 3d = 59$
$a + 9 = 59$
$a = 50$ ✔
$\therefore y = 50$ (6)

4.1.1 2010
109% of 85 000 = R92 650 ✔
109% of 92 650 = R100 988,50 ✔ (2)

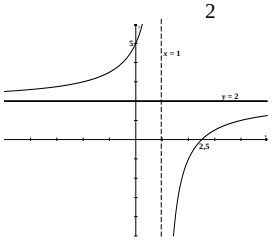
4.1.2 GP with $a = 85\,000$
$r = 109\% = 1{,}09$ ✔
$T_n = ar^{n-1}$ ✔
$T_{15} = 85\,000(1{,}09)^{15}$ ✔
$= R309\,611{,}01$ ✔ (4)

4.2
$$\sum_{k=0}^{3} x = \frac{2}{5^k}$$
$$= 2 + \frac{2}{5} + \frac{2}{25} + \frac{2}{125}$$ ✔ ✔
$$= \frac{312}{125}\ (2{,}496)$$ ✔ (3)

4.3.1 GP with $a = 20$
$r = \frac{3}{4}$
$$S_n = \frac{a\left[1 - r^n\right]}{1 - r}$$ ✔
$$S_n = \frac{20\left[1 - \left(\frac{3}{4}\right)^{10}\right]}{1 - \frac{3}{4}}$$ ✔
$= 75{,}49$ ✔
$\therefore$ Depth is 75,49 m. (3)

4.3.2
$$S_\infty = \frac{a}{1 - r}$$ ✔
$$= \frac{20}{1 - \frac{3}{4}}$$ ✔
$= 80$
$s_\infty = 80$ m ✔
$\therefore$ Company will never reach the water. ✔ (4)

5.1.1
$f(x) = \frac{-3}{x-1} + 2$
asymptotes at $x = 1$; $y = 2$
$y$-intercept: $x = 0 \ \therefore \ f(0) = \frac{-3}{0-1} + 2 = 5$
$x$-intercept: $y = 0 \ \therefore \ 0 = \frac{-3}{x-1} + 2$
$\frac{3}{x-1} = 2$
$3 = 2x - 2$
$5 = 2x$
$\frac{5}{2} = x$




✔ ✔ ✔ ✔ (4)

5.1.2 Axes of symmetry:
$y = x + c$ and $y = -x + c$
Pass through (1; 2) ✔
$\therefore 2 = 1 + c \qquad 2 = -1 + c$
$1 = c \qquad 3 = c$
$\therefore y = x + 1$ and $y = -x + 3$ ✔ ✔ (3)

5.2.1 $y = a(x - x_1)(x - x_2)$ ✔
$y = a(x + 1)(x - 3)$ ✔
Substitute (0; –1):
$-1 = a(0 + 1)(0 - 3)$ ✔
$-1 = -3a$
$\frac{1}{3} = a$ ✔
$\therefore p(x) = \frac{1}{3}(x + 1)(x - 3)$
$= \frac{1}{3}(x^2 - 2x - 3)$
$= \frac{1}{3}x^2 - \frac{2}{3}x - 1$ ✔ (5)

5.2.2 $q(x) = \frac{1}{2}b^x - 4$
Substitute (3; 0):
$0 = \frac{1}{2}b^3 - 4$ ✔

$4 = \frac{1}{2}b^3$
$8 = b^3$ ✔
$2 = b$ (2)

5.2.3 Domain: $x \in \Re$ ✔
Range: $y \in \Re$ ; $y > -4$ ✔ (2)

5.2.4 $q(x) = y = \frac{1}{2}.2^x - 4$
$q^{-1}(x)$: $x = \frac{1}{2}.2^y - 4$ ✔
$2x = 2^y - 8$
$2x + 8 = 2^y$ ✔
$\therefore y = \log_2(2x + 8)$ ✔
$q^{-1}(x) = \log_2(2x + 8)$ (3)

5.2.5 Domain of $q^{-1}(x)$ = Range of $q(x)$
$= x \in \Re$ ; $x > -4$ ✔ (1)

5.3.1 $a = -4$ ✔ (1)

5.3.2 $x = 180°$; $x = -180°$ ✔
$x = 0°$ ✔ (2)

5.3.3 $y = \tan(x + 90° + 45°) + 2$ ✔
$y = \tan(x + 135°) + 2$ ✔
or $y = \tan(x - 45°) + 2$
by inspection/reduction (2)

6.1 $f(x) = \frac{1}{2}x^2$

$$f'(x) = \lim_{h\to 0}\frac{f(x+h) - f(x)}{h}$$

$$\therefore f'(x) = \lim_{h\to 0}\frac{\frac{1}{2}(x+h)^2 - \frac{1}{2}x^2}{h}$$ ✔

$$\therefore f'(x) = \lim_{h\to 0}\frac{\frac{1}{2}x^2 + xh + \frac{1}{2}h^2 - \frac{1}{2}x^2}{h}$$ ✔

$$\therefore f'(x) = \lim_{h\to 0}\frac{h(x + \frac{1}{2}h)}{h}$$ ✔

$$\therefore f'(x) = \lim_{h\to 0} x + \frac{1}{2}h$$ ✔

$f(x) = x$ ✔ (5)

6.2.1 $f(x) = x^4 + \sqrt{x} - \frac{9}{x}$

$f(x) = x^4 + x^{\frac{1}{2}} - x^{-1}$ ✔

$\therefore f'(x) = 4x^3 + \frac{1}{2}x^{-\frac{1}{2}} - 9x^{-2}$

✔ ✔ (3)

6.2.2 $y = t(t + 1)$
$y = 3x(3x + 1)$ ✔
$y = 9x^2 + 3x$ ✔
$\therefore \frac{dy}{dx} = 18x + 3$ ✔ (3)

6.3.1 $A(x) = -\frac{1}{2}x^3 + 12x^2$
$A'(x) = -\frac{3}{2}x^2 + 24x$ ✔
$\therefore 0 = -\frac{3}{2}x^2 + 24x$ ✔ (4)

$0 = x^2 - 16x$ ✔
$0 = x(x - 16)$
$x = 0$ or $x = 16$

$\therefore$ Maximum area will be covered after 16 months. ✔

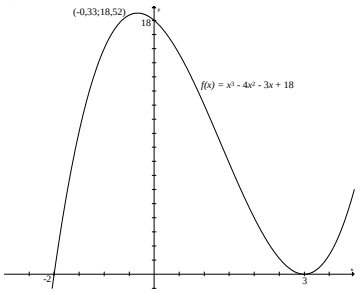
6.3.2 $A'(x) = -\frac{3}{2}x^2 + 24x$
$A'(1) = -\frac{3}{2}(1)^2 + 24(1)$ ✔
$= 22\frac{1}{2}$ ✔

$\therefore$ The rate of growth was $22\frac{1}{2}$ m$^2$/ month one month after the study had begun. (2)

7.1 $f(x) = x^3 - 4x^2 - 3x + 18$
$f(3) = 27 - (4 \times 9) - (3 \times 3) + 18 = 0$ ✔ (1)

7.2 $0 = x^3 - 4x^2 - 3x + 18$
$0 = (x - 3)(x^2 - x - 6)$ ✔
$0 = (x - 3)(x - 3)(x + 2)$ ✔
$\therefore x$-intercepts at $x = 3$ and $x = 2$. ✔ ✔ (4)

7.3 $f'(x) = 3x^2 - 8x - 3 = 0$ for turning points ✔
$\therefore (3x + 1)(x - 3) = 0$
$x = -\frac{1}{3}$ and $x = 3$ ✔ ✔
$\therefore f(x) = (-\frac{1}{3})^3 - 4(-\frac{1}{3})^2 - 3(-\frac{1}{3}) + 18$
$= \frac{500}{27}$ $(= 18{,}52)$ ✔
$f(3) = 0$
$\therefore$ Turning points at $(-\frac{1}{3}; \frac{500}{27})$ and $(3; 0)$. ✔ (5)

7.4 

✔ ✔ for each of the points (4)

7.5 $f''(x) = 6x - 8 = 0$ ✔
for point of inflection.
$\therefore x = \frac{8}{6} = \frac{4}{3}$ ✔ (2)

8.1 $V$ = Area of base × Height
$2{,}5 = x^2h$ ✔
$\frac{2.5}{x^2} = h$ ✔ (2)

8.2 Area $= 2x^2 + 4xh$ ✔
$= 2x^2 + 4x \times \frac{2.5}{x^2}$ ✔
$= 2x^2 + \frac{10}{x}$ ✔ (3)

8.3 Area $= 2x^2 + 10x^{-1}$ ✔
Area $= 4x - 10x^{-2}$ ✔
$4x - \frac{10}{x^2} = 0$ (for minimum) ✔

$4x^3 - 10 = 0$

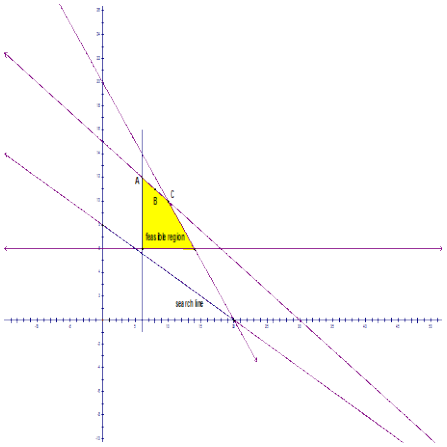
$x^3 = \frac{10}{4}$

$x = \sqrt[3]{\frac{5}{2}}$ ✔

$x = 1{,}36$ ✔ (5)

9.1 $x$ = no. of guitars of type A
$y$ = no. of guitars of type B
$x + y \leq 20$ ✔
$1\,500x + 3\,000y \leq 45\,000$ ✔
$x \geq 6$ ✔
$y \geq 6$ ✔ (4)

9.2




✔ ✔ ✔ ✔ ✔ (5)

9.3 $P = 400x + 1\,000y$ ✔ (1)

9.4 $-400x + P = 1\,000y$

$-\frac{400}{1\,000}x + \frac{P}{1\,000} = y$

$-\frac{2}{5}x + \frac{P}{1\,000} = y$ ✔

$\therefore$ Use search line of slope $-\frac{2}{5}$ … see sketch. ✔

$\therefore$ Maximum profit for
$x = 6$ and $y = 12$ at point A. ✔ (3)

9.5 New profit equation:
$P = 500x + 1\,000y$

$-\frac{500}{1\,000}x + \frac{P}{1\,000} = y$

$-\frac{1}{5}x + \frac{P}{1\,000} = y$ ✔

This line is parallel to one of the borders of the feasible region. Therefore maximum profit occurs at any whole-number point on this line. ✔

i.e. A(6; 12)
B(8; 11)
C(10; 10) ✔

(3)

# Grade 12 Mathematics: Memorandum Paper 2

**1.1**

$M = \left(\frac{-1+3}{2}; \frac{3+(-1)}{2}\right)$ ✔

$M = (1; 1)$ ✔ (2)

**1.2**

Midpoint $FH = \left(\frac{4+(-2)}{2}; \frac{4+(-2)}{2}\right)$ ✔

$= (1; 1)$ ✔

$\therefore$ midpoint FH = midpoint EG

$\therefore$ lines bisect each other. (2)

**1.3**

$m_{EG} = \frac{3-(-1)}{-1-3} = \frac{4}{-4} = -1$ ✔

$m_{FH} = \frac{4-(-2)}{4-(-2)} = \frac{6}{6} = 1$ ✔

$\therefore\ m_{EG} \times m_{FH} = -1$

$\Rightarrow$ EG $\perp$ FH ✔

$\therefore$ using 1.2, diagonals of EFGH bisect at 90° ✔

$\therefore$ EFGH is a rhombus.

OR

$length_{EH} = \sqrt{(-1-(-2))^2 + (3-(-2))^2}$

$= \sqrt{1+25}$

$= \sqrt{26}$

✔

$length_{EF} = \sqrt{(-1-4)^2 + (3-4)^2}$

$= \sqrt{25+1}$ ✔

$= \sqrt{26}$

$\therefore$ using 1.2, EFGH is a parallelogram (diagonals bisect) ✔

But EH = EF ✔

$\therefore$ EFGH is a rhombus. (4)

**1.4**

$m_{EG} = -1$ from above ✔

$\therefore\ y = -x + c$ Substitute (–1; 3): ✔

$3 = -(-1) + c$

$2 = c$

$\therefore\ y = -x + 2$ ✔ (3)

**1.5**

$y = -x + 2$ Let $x = \frac{5}{2}$.

$y = -\frac{5}{2} + 2$ ✔

$y = -\frac{1}{2}$ ✔

$\therefore \left(\frac{5}{2}; \frac{-3}{4}\right)$ does not lie on the line. ✔ (3)

**1.6**

$m_{FH} = \frac{4-(-1)}{4-3} = \frac{5}{1} = 5$ ✔

$\therefore \tan\alpha = 5$

$A = \tan^{-1}(5)$ ✔

$= 78{,}69°$ ✔ (3)

**1.7**

$length_{EG} = \sqrt{(3-(-1))^2 + (-1-3)^2}$ ✔

$= \sqrt{32}$

$length_{HM} = \sqrt{(1-(-2))^2 + (1-(-2))^2}$ ✔

$= \sqrt{18}$

$\therefore$ area $\Delta EGH = \frac{1}{2}\sqrt{18} \times \sqrt{32}$ ✔

$= 5{,}05$ units$^2$ ✔ (4)

**1.8**

G $\rightarrow$ H back 5 down 1

$\therefore$ E $\rightarrow$ P is the same ✔

$\therefore$ P(–6; 2) ✔

(or equivalent) (2)

**2.1**

$\Delta EDC$ is right angled at C (tangent, radius)

$ED^2 = EC^2 + DC^2$ ✔

$13^2 = 12^2 + DC^2$

$25 = DC^2$

$5 = DC$ ✔ (2)

**2.2**

$DC^2 = (a-1)^2 + (2-(-1))^2$ ✔

$25 = a^2 - 2a + 1 + 9$ ✔

$0 = a^2 - 2a - 15$ ✔

$a = -3$; $a = 5$ ✔

By inspection, for this sketch $a = 5$. ✔ (5)

**2.3**

$m_{DC} = \frac{2-(-1)}{5-1} = \frac{3}{4}$ ✔

$m_{tangent} = \frac{-4}{3}$ ✔

$y = \frac{-4}{3}x + c$ Substitute (1; –1):

$-1 = \frac{-4}{3}x + c$ ✔

$\frac{1}{3} = c$ ✔

$y = \frac{-4}{3}x + \frac{1}{3}$ (4)

**2.4**

$y$-axis is tangent to circle at A.

$\therefore$ AD is horizontal $\therefore$ A(0; 2) ✔ ✔

(inspection) (2)

**2.5**

$(x-a)^2 + (y-b)^2 = c^2$ ✔

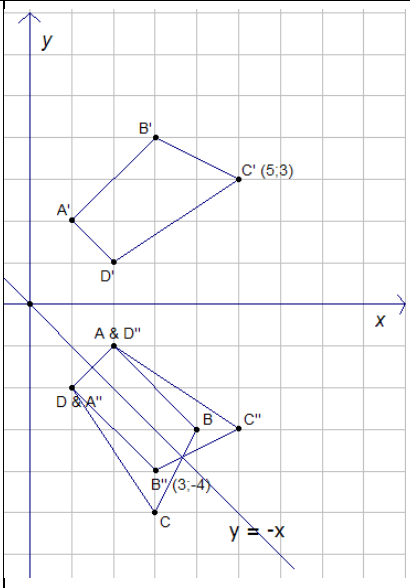
Substitute (1; –1) and (0; 2):

$(0-1)^2 + (2-(-1))^2 = c^2$ ✔ ✔

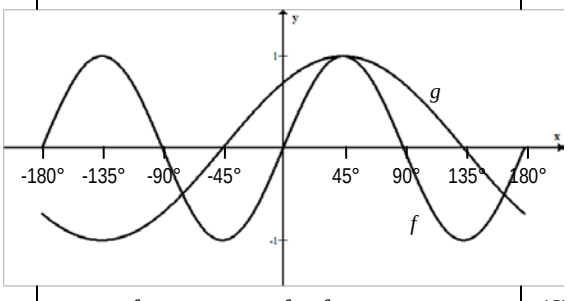
$10 = c^2$ ✔

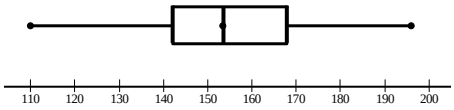
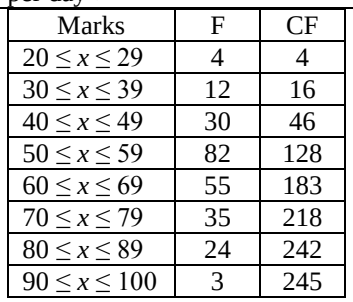
$(x-1)^2 + (y+1)^2 = 10$ ✔ (5)

**3.1 and 3.2**

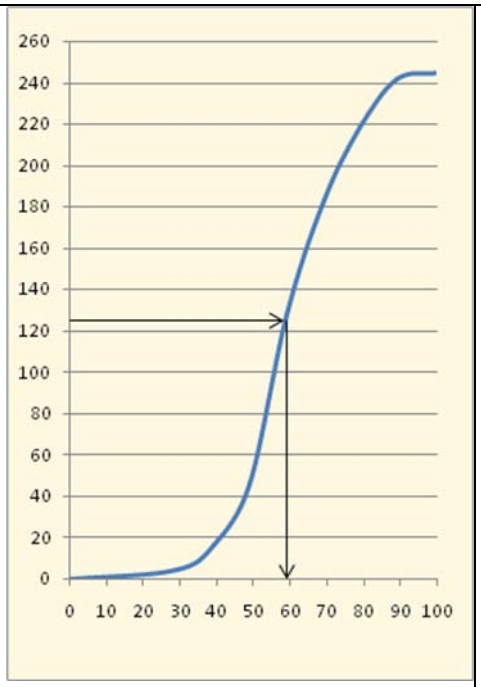



(10)

| | | |
|---|---|---|
| 3.3 | P($x$; $y$)<br>→ P′($-x$; $-y$)<br>→ final image $(-\frac{4}{5}x; -\frac{4}{5}y)$ ✔ ✔ | (2) |
| 3.4 | Linear factor $\frac{4}{5}$<br>$\Rightarrow$ area factor $\frac{16}{25}$ ✔<br>$\therefore$ area $= \frac{16}{25}p$ units$^2$ ✔ | (2) |
| 4.1 | $(x\cos\theta - y\sin\theta;\ x\sin\theta + y\cos\theta)$ ✔<br>$= (6\cos 60° - 3\sin 60°;\ 6\sin 60° + 3\cos 60°)$<br>✔ ✔<br>$= \left(\frac{6-3\sqrt{3}}{2}; \frac{3+6\sqrt{3}}{2}\right)$ ✔ ✔<br>OR<br>$= \left(3 - \frac{3\sqrt{3}}{2}; 3\sqrt{3} + \frac{3}{2}\right)$ | (5) |
| 4.2 | (6; 3) → (3; 6) → (3; –6) ✔ ✔ | (2) |
| 5.1.1 | $\tan\theta = \frac{y}{x} = \frac{a}{b}$ ✔ | (1) |
| 5.1.2 | $\cos(-\theta) = \cos\theta = \frac{x}{r}$ ✔ ✔<br>$r = \sqrt{a^2+b^2}$ (Pythagoras) ✔<br>$\therefore\ \cos(-\theta) = \frac{a}{\sqrt{a^2+b^2}}$ ✔ | (4) |
| 5.2.1 | $\cos 53°$<br>$= \sin(90° - 53°)$<br>$= \sin 37°$ ✔<br>$= k$ ✔ | (2) |
| 5.2.2 | $\sin(-74°)$<br>$= -\sin 74°$<br>$= -2\sin 37°\cos 37°$ ✔ ✔<br>$= -2k\sqrt{1-k^2}$ ✔ | (4) |
| 5.3.1 | LHS<br>$= \frac{\sin\alpha\sin 2\alpha}{\cos\alpha} + \cos 2\alpha$ ✔<br>$= \frac{\sin\alpha 2\sin\alpha\cos\alpha}{\cos\alpha} + 1 - 2\sin^2\alpha$ ✔ ✔<br>$= 1$ ✔<br>= RHS | (4) |
| 5.3.2 | LHS<br>$= \frac{\sin 234°}{\cos 36°} - \frac{\sin(x-90°)\cos(90°-2x)}{\sin(x-360°)}$<br>$= \frac{-\sin 54°}{\cos 36°} - \frac{(-\cos x)\sin 2x}{\sin x}$ ✔ ✔ ✔ ✔<br>$= \frac{-\sin 54°}{\sin 54°} - \frac{\cos x.2\sin x\cos x}{\sin x}$ ✔ ✔<br>$= -1 + 2\cos^2 x$ ✔<br>$= \cos 2x$<br>= RHS | (8) |
| 5.4 | $3\cos^2 x + 5\sin x = 3$<br>$3(1 - \sin^2 x) + 5\sin x = 3$ ✔<br>$3 - 3\sin^2 x + 5\sin x = 3$<br>$0 = 3\sin^2 x - 5\sin x$<br>$0 = \sin x(3\sin x - 5)$ ✔ | (6) |
| | $\sin x = 0$ or $\sin x = \frac{5}{3}$ ✔ ✔<br>$\therefore x = 0° + n180°$ or $x$ is undefined ✔ ✔<br>$(n \in Z)$ | |
| 6.1 | $A\hat{C}B = 110° - 50°$<br>$= 60°$ ✔<br>$\therefore AB^2 = 150^2 + 260^2 - (2.150.260)\cos 60°$<br>✔<br>$AB^2 = 51\ 100$ ✔<br>$\therefore AB = 226{,}05$ ✔<br>AB = 226 km ✔ | (5) |
| 6.2.1 | $C\hat{D}B = 180° - (\theta + 30°)$ ✔ | (1) |
| 6.2.2 | In ΔABC:<br>$\tan\theta = \frac{p}{CB}$<br>$CB\tan\theta = p$ ……(i) ✔<br>In ΔCBD:<br>$\frac{CB}{\sin[180° - (\theta + 30°)]} = \frac{8}{\sin\theta}$ ✔<br>$\frac{CB}{\sin(\theta + 30°)} = \frac{8}{\sin\theta}$ ✔<br>$CB = \frac{8\sin(\theta + 30°)}{\sin\theta}$ ……(ii) ✔<br>Combining (i) and (ii):<br>$p = \frac{8\sin(\theta + 30°)}{\sin\theta}.\tan\theta$<br>$p = \frac{8\sin(\theta + 30°)}{\sin\theta}.\frac{\sin\theta}{\cos\theta}$ ✔<br>$p = \frac{8\sin(\theta + 30°)}{\cos\theta}$ ✔ | (6) |
| 7.1 | $\sin 2x = \cos(x - 45°)$<br>$\sin 2x = \sin[90° - (x - 45°)]$<br>$\sin 2x = \sin(135° - x)$ ✔<br>$\therefore 2x = 135° - x + n360°$ $(n \in Z)$ ✔<br>$3x = 135° + n360°$<br>$x = 45° + n120°$ ✔<br>or<br>$2x = 180° - (135° - x) + n360°$ $(n \in Z)$ ✔<br>$2x = 45° + x + n360°$<br>$x = 45° + n360°$ ✔<br>$\therefore$ for $x \in [-180°; 180°]$<br>$x = 45°; 165°; -75°$ ✔ ✔ ✔ | (8) |
| 7.2 |  <br>✔ ✔ ✔ for $g$ ✔ ✔ ✔ for $f$ | (6) |
| 7.3.1 | $g(x) \leq f(x)$ for $[-180°; 90°]$<br>$\Rightarrow -180° \leq x \leq -75°$ ✔ ✔ ✔ | (3) |
| 7.3.2 | $\frac{f(x)}{g(x)}$ undefined $\Rightarrow$ $g(x) = 0$ ✔<br>$\therefore x = -45°$ only for $[-180°; 90°]$ ✔ | (2) |
| 8.1.1 | $\bar{x} = 65{,}27$ ✔ ✔ ✔ | (3) |

| | | |
|---|---|---|
| | Using stats mode on calculator or manually | |
| 8.1.2 | $SD = 8{,}71$ ✔ ✔ | (2) |
| 8.1.3 | Upper boundary<br>$= 65{,}27 + 8{,}71$<br>$= 73{,}98$ ✔<br>Lower boundary<br>$= 65{,}27 - 8{,}71$<br>$= 56{,}56$ ✔<br>∴ reject 50; 45; 80<br>i.e. 3 bags would be rejected ✔ | (3) |
| 8.2.1 | Ordered list<br>11 000<br>12 600<br>14 200 $Q_1 = 14\,200$<br>14 500<br>15 300<br>Median = 15 350<br>15 400<br>16 500<br>16 800 $Q_3 = 16\,800$<br>18 600<br>19 600<br>∴ Minimum = 11 000 ✔<br>Lower quartile = 14 200 ✔<br>Median = 15 350 ✔<br>Upper quartile = 16 800 ✔<br>Maximum = 19 600 ✔ | (5) |
| 8.2.2 | Scale in 100s<br>  <br><br>✔ ✔ ✔ ✔ | (3) |
| 8.2.3 | Maximum per day = $\frac{19\,600}{28} = 700$ patients per day ✔<br>Minimum per day = $\frac{11000}{28} = 392$ patients per day ✔ | (2) |
| 9.1 |  <br>✔ ✔ | (2) |

| Marks | F | CF |
|---|---|---|
| $20 \leq x \leq 29$ | 4 | 4 |
| $30 \leq x \leq 39$ | 12 | 16 |
| $40 \leq x \leq 49$ | 30 | 46 |
| $50 \leq x \leq 59$ | 82 | 128 |
| $60 \leq x \leq 69$ | 55 | 183 |
| $70 \leq x \leq 79$ | 35 | 218 |
| $80 \leq x \leq 89$ | 24 | 242 |
| $90 \leq x \leq 100$ | 3 | 245 |

| | | |
|---|---|---|
| 9.2 |  <br><br>✔ ✔ ✔ ✔ | (4) |
| 9.3 | Median at $\frac{245 + 1}{2} = 123$<br>Median approximately 59 ✔ ✔ | (2) |
| 9.4 | Data is grouped, so original raw data is lost.<br>∴ mean or median will be approximate.<br>✔ ✔ | (2) |

# Grade 12 Mathematical Literacy: Question Paper 1

**MARKS: 150** **TIME: 3 hours**

## QUESTION 1

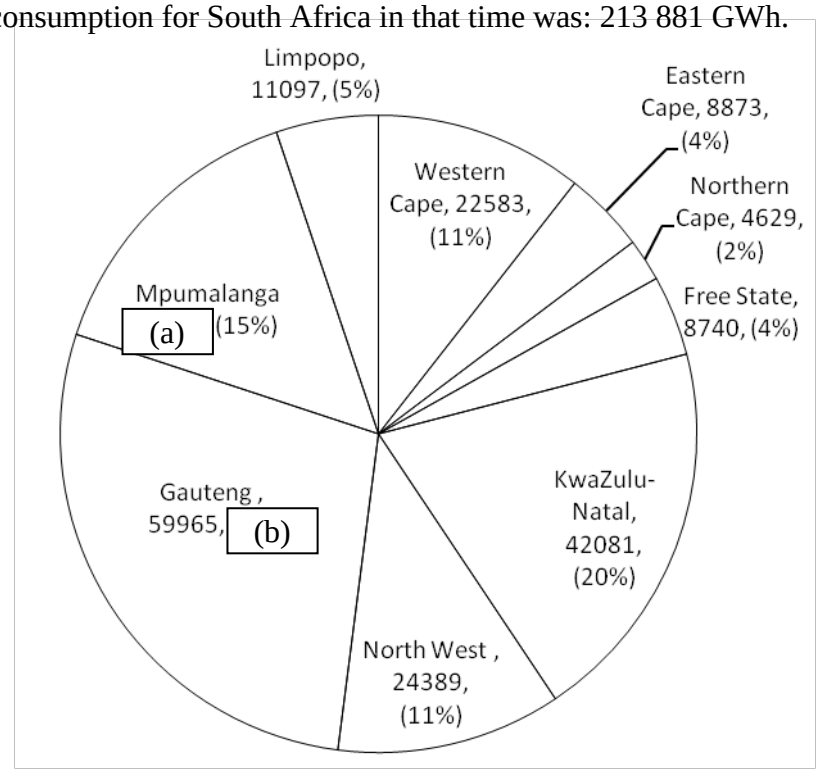
1.1 Eskom will increase the price of electricity by:
24,8% in 2010, 25,8% in 2011, and 25,9% in 2012.
At the start of 2010 the average standard price was 41,57c per kWh.

1.1.1 Show that the price after the 2010 increase will be 51,88c per kWh. (2)

1.1.2 Calculate the price after both the 2011 and 2012 increases. (4)

1.1.3 Calculate the total percentage change in the price from the start of 2010 to the end of 2012 (3)

1.2 The graph below shows the consumption of electricity (in Giga Watt hours (GWh)) as well as the percentage of national consumption by province for 2009.
The total consumption for South Africa in that time was: 213 881 GWh.

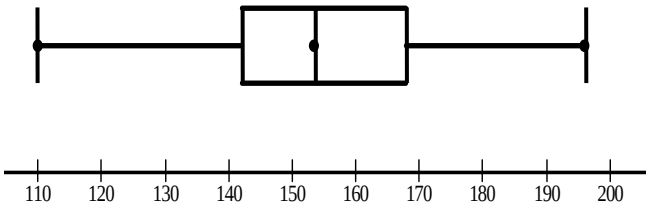



1.2.1 How many GWh of electricity did North West consume in 2009? (2)

1.2.2 What percentage of the total country's consumption did Free State account for in 2009? (2)

1.2.3 Calculate the missing values (a) and (b). (6)

1.3




1.3.1 Estimate the median score for the data summarised by the box and whisker plot. (2)

1.3.2 If the box and whisker plot represents 200 scores estimate how many scores are in the range 110 to 168. (3)

**[24]**

**QUESTION 2**

Maxine has written a booklet on the history of her school.

She has a quotation from the printers which reads as follows:

- Fixed costs (irrespective of number of copies printed): R 5 000,00
- Cost per 100 booklets printed: R 1 000,00

Based on market research Maxine believes that the booklet will sell if she charges R23,00 per booklet.

2.1 Use this information to complete the following table (remember to redraw the table in your answer book):

| Number of booklets | 100 | 300 | 500 | 700 |
|---|---|---|---|---|
| Printing costs | | | | |
| Effective cost per booklet | | | | |

(12)

2.2 Use the graph paper provided to:

2.2.1 Draw a graph that compares the number of booklets printed with the effective cost per booklet. (6)

2.2.2 Use the graph you have drawn to estimate (to the nearest 100) the number of books that Maxine should print in order to break even.

(a) Write down the value that you estimate.

(b) Mark the point that you used to determine your estimate clearly on the graph. (6)

2.3 Show, by calculation, that the number of booklets that Maxine will have to sell if she wants to make R 5 000,00 profit is 800 (rounded to the nearest 100). (5)

2.4 Use your answer for 2.3 to determine the amount of money that Maxine will have to invest in the project in order to have a hope of making R 5 000,00 profit. (3)

**[32]**

**QUESTION 3**

Maxine (referred to in Question 2) has decided to print 800 booklets and needs to take out a loan to finance the project.

Maxine has R 5 000,00 of her own money to invest.

Her uncle has agreed to loan her the additional R 8 000 that she needs on the following terms:

- Interest will be calculated on the outstanding balance at the end of each month.
- The interest rate to be used will be 2% per month.

Maxine sells the booklets for R23,00 each.

3.1 Use this information to complete the statement of the loan up to the end of March 2010 (you need only complete the missing values in the loan statement found in Annexure A):

| Date | Transaction | Debit | Credit | Balance |
|---|---|---|---|---|
| | Opening balance | -- | -- | R 5 000,00 |
| 01 Feb 2010 | Payment of printing invoice | -R 13 000,00 | -- | -R 8 000,00 |
| 20 Feb 2010 | Sales of 50 booklets | | | |
| 28 Feb 2010 | Interest on loan account | | | |
| 25 Mar 2010 | Sales of 150 booklets | | | |
| 31 Mar 2010 | Interest on loan account | | | |
| 28 Apr 2010 | | | | |
| 30 Apr 2010 | | | | |

(12)

3.2 How many booklets must she sell in April if she wants to settle the loan before the end of April? (3)

3.3 How many more booklets must Maxine sell before she breaks even? (4)

**[19]**

## QUESTION 4

In his budget address on 17 February 2010 Minister Gordhan announced the following tax rates for the tax year ending 28 February 2011:

| TAXABLE INCOME | | RATES OF TAX | | |
|---|---|---|---|---|
| R0 - R140 000 | | | +18% of each R1 | |
| R140 001 - R221 000 | | R25 200 | +25% of the amount over | R140 000 |
| R221 001 - R305 000 | | R45 450 | +30% of the amount over | R221 000 |
| R305 001 - R431 000 | | R70 650 | +35% of the amount over | R305 000 |
| R431 001 - R552 000 | | R114 750 | +38% of the amount over | R431 000 |
| R552 000 and above | | R160 730 | +40% of the amount over | R552 000 |

- Rebates:
  - Primary rebate ……..R8 280
  - Additional rebate for persons 65 years or older ……..R4 680
- Tax threshold:
  - Persons under 65 years……R46 000
  - Persons 65 years or older ……R74 000

4.1 Answer the following questions based on the information provided:

4.1.1 What is the tax threshold for a person under 65 years of age? (2)

4.1.2 What is the rebate for a person who is 72 years old? (2)

4.2 Show by calculation that the total tax payable by a 21-year-old person who earns R 95 000 taxable income per annum is R 8 820. (5)

4.3 Consider a 35-year-old person who earns R 350 000 taxable income per annum.

4.3.1 Calculate the total tax payable by the person. (5)

4.3.2 Hence, calculate the effective tax rate for this person. (3)

**[17]**

**QUESTION 5**

Malaria is a preventable infection that can be fatal if left untreated.

People travelling to countries where malaria is endemic are advised to take preventative medicine.

Malarone is one type of malaria medicine. The dosage instructions for Malarone are as follows:

- Treatment with Malarone should be started 1 day before entering a malaria-endemic area and continued daily during the stay and for 7 days after return.
- Adults: One Malarone tablet (adult strength) per day.
- Children: The dosage for children is based on body weight:
  - 11 kg – 20 kg: 1 pediatric tablet daily
  - 21 kg – 30 kg: 2 pediatric tablets daily
  - 31 kg – 40 kg: 3 pediatric tablets daily
  - > 40kg: 1 adult strength tablet daily.

5.1 Answer the following questions based on the information provided:

5.1.1 How many days before the visit should medication be started? (2)

5.1.2 For how many days after the visit should medication be continued? (2)

5.1.3. How many pediatric tablets should a child that weighs 25 kg take daily? (2)

5.2 An adult is going on a 10-day trip to a country where malaria is endemic. Show that the adult will need a total of 18 tablets. (4)

5.3 A family consisting of 2 adults and 2 children (weighing 18 kg and 36 kg respectively) is going on an 8-day trip to a country where malaria is endemic.

5.3.1 Calculate the total number of adult tablets needed. (5)

5.3.2 Calculate the total number of pediatric tablets needed. (6)

5.3.3 If the adult tables cost R12,00 each and the pediatric tablets cost R8,00 each calculate the total cost of the medication for the family for their trip. (3)

**[24]**

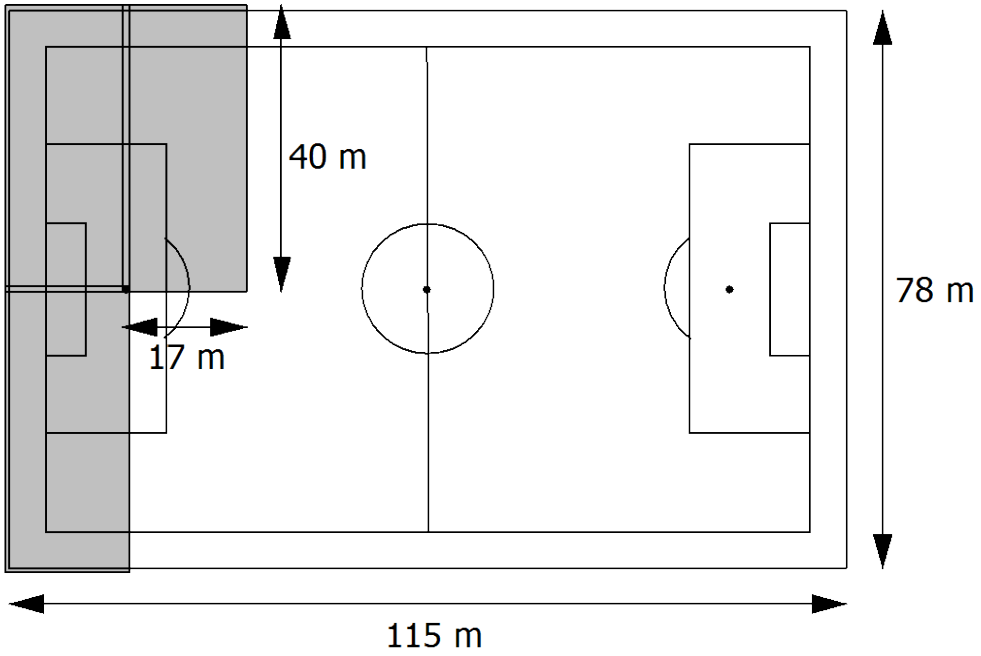
**QUESTION 6**

The soccer pitch and surroundings of the World Cup stadium to be used in the opening ceremony is 115 m long and 78 m wide.

In order to protect the pitch from damage during the opening ceremony it will have to be covered with a large sheet of plastic.

The plastic sheeting that will be used to make the cover is sold in rolls that measure 40 m × 17 m.

The sheets are joined together so that they overlap by 1 m.




6.1 Show that joining two rolls of the plastic along the short ends will create a sheet that is 79 m × 17 m which is long enough to cover the pitch and surroundings from one side line to the other. (5)

6.2 Calculate how many such strips are needed to cover the length of the pitch. Be sure to show your working. (6)

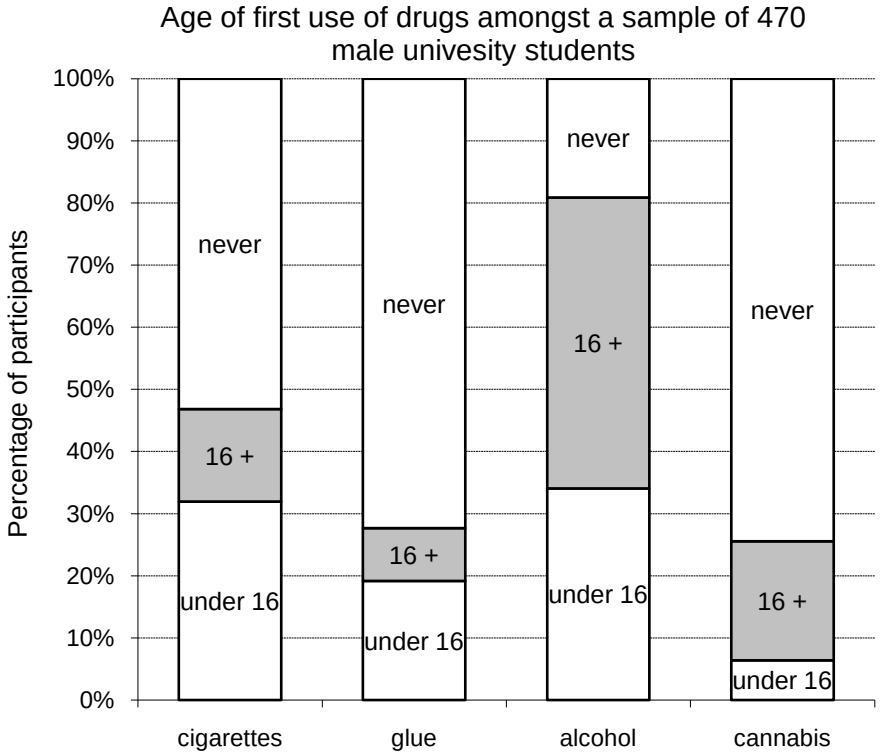
6.3 Based on the calculations above show that 16 rolls of plastic will be needed. (2)

6.4 By calculating the actual the area to be covered and the actual area of the plastic bought determine the percentage of extra plastic purchased. (6)

**[19]**

## QUESTION 7

470 male university students participated in a survey asking them at what age they started using different substances. The results of the survey are summarised in the graph below.




7.1 Answer the following questions based on the graph:

7.1.1 What substances were the respondents asked about? (2)

7.1.2 What percentage of the respondents had started using cigarettes under the age of 16? (2)

7.1.3 What percentage of the respondents had never used cannabis? (2)

7.2 Calculate (to the nearest 10) the number of respondents who started using alcohol after they were 16 years old. (5)

7.3 Is it possible to say from the graph that there were respondents who had never used any of the substances in their life? Justify your answer. (4)

**[15]**

# Grade 12 Mathematical Literacy: Question Paper 2

**MARKS: 150** **TIME: 3 hours**

## QUESTION 1

The costs of tickets for the 2010 FIFA World Cup were listed in both US Dollars and South African Rand (source: www.fifa.com). The table below shows some of the values:

| | Prices in US Dollars (US $) | | | | Prices in South African Rand (ZAR) including the applicable VAT | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Matches | Cat. 1 | Cat. 2 | Cat. 3 | Wheelchair | Cat. 1 | Cat. 2 | Cat. 3 | Cat. 4** | Wheelchair |
| Opening Match (No 1) | 450 | 300 | 200 | 70 | 3 150 | 2 100 | 1 400 | 490 | 490 |
| Group Matches (No 2 to 48) | (a) | 120 | 80 | 20 | 1 120 | 840 | 560 | 140 | 140 |
| Round of 16 (No 49 to 56) | 200 | 150 | 100 | 50 | 1 400 | 1 050 | 700 | 350 | 350 |
| Quarter-finals (No 57 to 60) | 300 | 200 | 150 | 75 | 2 100 | 1 400 | 1 050 | 525 | 525 |
| Semi-finals (No 61 & 62) | 600 | 400 | 250 | 100 | 4 200 | 2 800 | (b) | 700 | 700 |
| 3rd/4th Place Match (No 63) | 300 | 200 | 150 | 75 | 2 100 | 1 400 | 1 050 | 525 | 525 |
| The Final (No 64) | 900 | 600 | 400 | 150 | 6 300 | 4 200 | 2 800 | 1 050 | 1 050 |

**Cat. 4 is reserved for South African residents and will be sold exclusively in ZAR.

1.1 Determine the following from the table:

1.1.1 How many US $ does a Cat. 1 ticket for the opening match cost? (2)

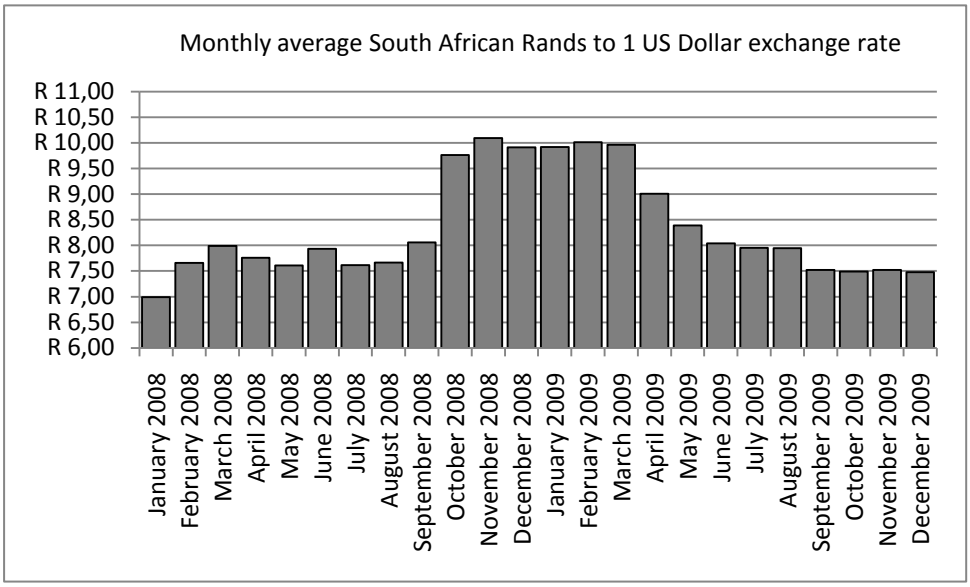
1.1.2 How many ZAR does a Cat. 3 ticket for a quarterfinal match cost? (2)

1.1.3 Which is the most expensive ticket and how much does it cost (in US $)? (3)

1.1.4 Which is the least expensive ticket that a South African can buy and how much does it cost (in ZAR)? (3)

1.2 Exchange rates

The actual monthly average Rand to 1 US $ exchange rate for the period January 2008 to December 2009 (source: www.x-rates.com) is represented by the graph below.



1.2.1 What was the average ZAR to 1 US $ exchange rate for April 2009? (2)
1.2.2 In which month was the average ZAR to 1 US $ exchange rate lowest? (2)
1.2.3 In which month was the average ZAR to 1 US $ exchange rate highest? (2)
1.2.4 What is the Rand to US $ exchange rate that has been used by FIFA in developing the ticket cost table at the start of the question? Show how you determined your answer. (4)
1.2.5 Use the exchange rate that you have determined in 1.2.4 to calculate the values of (a) and (b) in the table. (4)

1.3 By comparing the actual exchange rate for the period January 2008 to December 2009 and the exchange rate used by FIFA in determining the ticket prices, discuss whether or not South Africans have been advantaged or disadvantaged. Remember to justify your answer as fully as possible. (6)

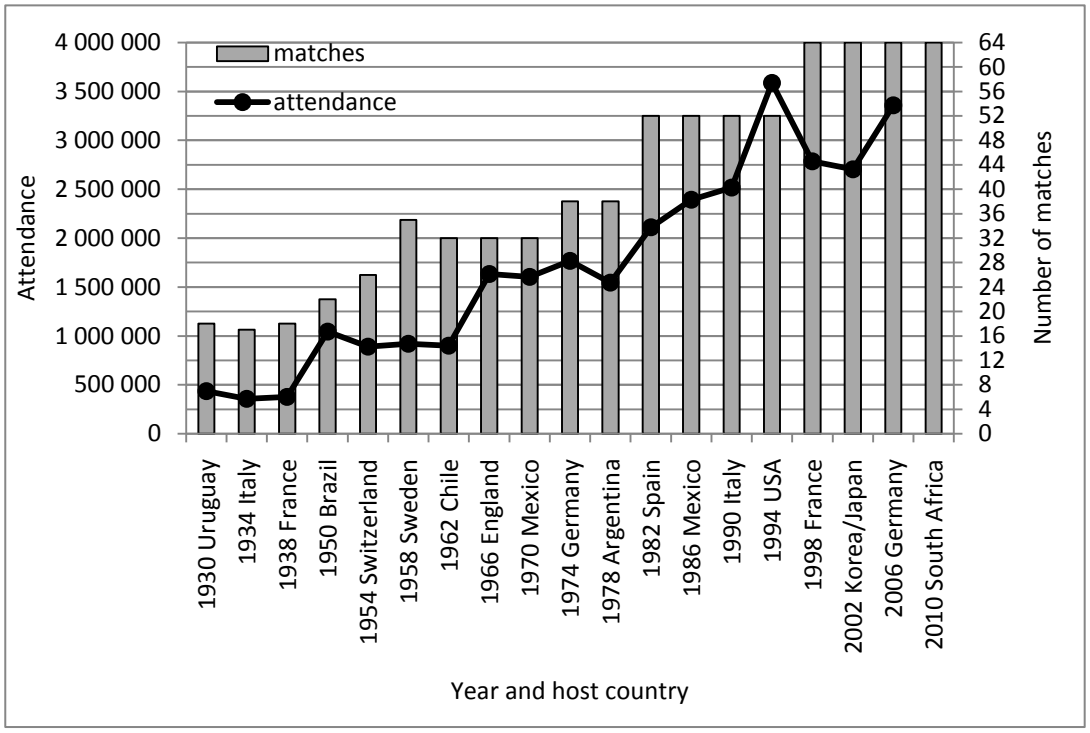
**[30]**

## QUESTION 2

One of the challenges of planning for the World Cup is estimating the number of spectators that will attend the tournament.

The graph below shows the actual number of tickets sold (attendance) for each of the World Cup tournaments since the 1930 tournament in Uruguay.

The graph also shows the number of matches that were played in each tournament.




2.1 Determine the following from the graph:
2.1.1 How many World Cup tournaments have there been before the 2010 tournament in South Africa? (2)

2.1.2 Which country hosted the tournament in 1982? (2)
2.1.3 How many matches were there in the 1962 tournament in Chile? (2)
2.1.4 Approximately how many tickets were sold during the 1990 tournament in Italy? (2)
2.1.5 Estimate the average number of tickets (attendance) per match during the 2002 tournament in Korea/Japan? (4)

2.2 Match attendance

2.2.1 What impression does the line graph create regarding ticket sales (attendance) at the World Cup? Explain how you have determined your answer. (4)
2.2.2 Describe what has happened to the number of matches in each tournament over the history of the tournament. (4)
2.2.3 Estimate the average match attendance for each of the following tournaments:
(a) 1950 Brazil
(b) 1966 England
(c) 1994 USA
(d) 2006 Germany. (8)
2.2.4 Discuss the trend in average match attendance. (2)
2.2.5 Estimating the actual number of tickets to be sold per tournament as well as the number of tickets to be sold per match is important for planning purposes.
Discuss the importance of each of these figures by suggesting different people who would be interested in each of the different values. (4)

**[34]**

## QUESTION 3

Abadom, a Nigerian fan, is planning to follow his team through the group matches. Nigeria has been drawn in Group B. The table below gives the match fixtures for Group B.

| Date - Time | Venue | Match | | |
|---|---|---|---|---|
| 12/06 16:00 | Johannesburg - JEP | Argentina | vs. | Nigeria |
| 12/06 13:30 | Nelson Mandela Bay Port Elizabeth | Korea Republic | vs. | Greece |
| 17/06 16:00 | Mangaung Bloemfontein | Greece | vs. | Nigeria |
| 17/06 13:30 | Johannesburg - JSC | Argentina | vs. | Korea Republic |
| 22/06 20:30 | Durban | Nigeria | vs. | Korea Republic |
| 22/06 20:30 | Polokwane | Greece | vs. | Argentina |

| JUNE 2010 | | | | | | |
|---|---|---|---|---|---|---|
| Mon | Tue | Wed | Thu | 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 | | | | |

3.1 Determine the following from the information provided:

3.1.1 In which city does Nigeria play its first match? (2)
3.1.2 On what date and at what time does Nigeria play its second match? (2)
3.1.3 Who is Nigeria's opponent in the third match? (2)
3.1.4 On what day of the week does Nigeria play against Greece? (2)
3.1.5 Make a list of the cities that Abadom must travel to and the order in which he must visit them in order to follow his team. (4)

Abadom has decided to travel from one city to the next by train. He has the following information about the trains that he might use.

| Town | Dep | Dep | Town | Dep | Dep | Town | Dep | Dep | Town | Dep | Dep |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Johannesburg – East London | | | Johannesburg – Port Elizabeth | | | Johannesburg – Bloemfontein | | | Durban – Cape Town | | |
| Daily except Wed. and Sun. | | | Daily expect Tue. and Sat. | | | Wed.; Fri.; and Sun. | | | DBN-CPT: Wed. CPT-DBN: Mon | | |
| Train number: | 74205 | 47206 | Train number: | 73011 | 37012 | Train number: | 75036 | 57035 | Train number: | 16001 | 61002 |
| Johannesburg | 14:20 | 10:50 | Johannesburg | 13:15 | 11:35 | Johannesburg | 19:40 | 08:10 | Durban | 18:30 | 08:00 |
| Germiston | 14:52 | 10:27 | Germiston | 13:48 | 11:12 | Krugersdorp | 20:23 | 05:17 | Pietermaritzburg | 21:00 | 05:55 |
| Vereeniging | 16:02 | 09:29 | Vereeniging | 14:58 | 10:10 | Randfontein | 20:41 | 05:00 | Ladysmith | 01:00 | 02:05 |
| Sasolburg | 16:33 | 09:29 | Sasolburg | 15:29 | 09:42 | Oberholzer | 21:24 | 04:10 | Harrismith | 03:53 | 23:45 |
| Kroonstad | 18:35 | 07:12 | Kroonstad | 17:30 | 07:54 | Potchefstroom | 22:28 | 03:02 | Bethlehem | 05:40 | 21:45 |
| Henneman | 19:13 | 06:20 | Henneman | 18:08 | 07:02 | Klerksdorp | 23:28 | 02:10 | Kroonstad | 08:20 | 19:07 |
| Virginia | 19:32 | 06:00 | Virginia | 18:26 | 06:42 | Bloemhof | 01:42 | 23:39 | Henneman | 09:00 | 18:03 |
| Brandfort | 20:33 | 04:57 | Brandfort | 19:28 | 05:39 | Christiana | 02:32 | 22:51 | Virginia | 09:20 | 17:45 |
| Bloemfontein | 21:36 | 04:08 | Bloemfontein | 20:30 | 04:50 | Warrenton | 03:06 | 22:17 | Brandfort | 10:26 | 16:45 |
| Springfontein | 00:43 | 00:40 | Springfontein | 23:15 | 01:10 | Kimberley | 04:50 | 21:15 | Bloemfontein | 11:45 | 16:00 |
| Bethulie | 01:30 | 23:23 | Colesburg | 01:20 | 23:19 | Bloemfontein | 07:45 | 18:00 | Kimberley | 15:15 | 12:45 |
| Burgersdorp | 03:05 | 21:56 | Noupoort | 02:35 | 22:29 | | | | Oranjerivier | 17:32 | 10:05 |
| Molteno | 04:08 | 20:42 | Rosemead | 03:28 | 21:17 | Johannesburg – Durban | | | De Aar | 19:40 | 08:40 |
| Queenstown | 06:10 | 19:00 | Cradock | 04:44 | 19:32 | Daily except Tue. and Sat. | | | Hutchinson | 21:41 | 06:20 |
| Cathcart | 07:20 | 17:24 | Cookhouse | 05:57 | 18:23 | Train number: | 76009 | 67010 | Beaufort West | 23:50 | 04:30 |
| Stutterheim | 08:34 | 16:12 | Alicedale | 07:23 | 16:47 | Johannesburg | 18:30 | 07:44 | Prince Albert Road | 01:29 | 02:15 |
| Berlin | 09:34 | 15:02 | Port Elizabeth | 09:15 | 15:00 | Germiston | 19:03 | 07:23 | Laingsburg | 02:57 | 00:50 |
| East London | 10:20 | 14:15 | | | | Standerton | 21:20 | 05:10 | Touwsrivier | 04:17 | 23:30 |
| | | | | | | Newcastle | 23:30 | 02:40 | Worcester | 05:45 | 22:15 |
| | | | | | | Ladysmith | 01:31 | 00:42 | Wellington | 07:18 | 20:20 |
| | | | | | | Pietermaritzburg | 04:58 | 21:36 | Huguenot | 07:32 | 20:04 |
| | | | | | | Durban | 07:10 | 19:15 | Bellville | 08:17 | 19:20 |
| | | | | | | | | | Cape Town | 08:45 | 18:50 |

NOTES:
- The left-hand column shows the departure times from each station on the journey described in the title (e.g. Johannesburg – East London). This must be read from top to bottom.
- The right-hand column shows the departure times from each station on the opposite journey (i.e. East London to Johannesburg for the Johannesburg – East London route). This column must be read from the bottom up.
- The last (highlighted) time in each column is the arrival time at the final destination.

3.2 Answer the following questions based on the train timetable for train number 61002 (Cape Town to Durban):

3.2.1 On what day of the week does the train leave Cape Town? (2)

3.2.2 At what time of day does the train leave Cape Town? (2)

3.2.3 At what time and on what day of the week does the train reach Bloemfontein? (2)

3.2.4 At what time and on what day of the week does the train reach Durban? (2)

3.2.5 Discuss, with reasons, whether or not Abadom can use this train to get from Bloemfontein to Durban to watch the Durban match. (6)

3.3 Determine an itinerary for a journey using the trains that Abadom can use to get from JHB to Bloemfontein to Durban and back to Johannesburg again. Your solution must meet the following criteria:

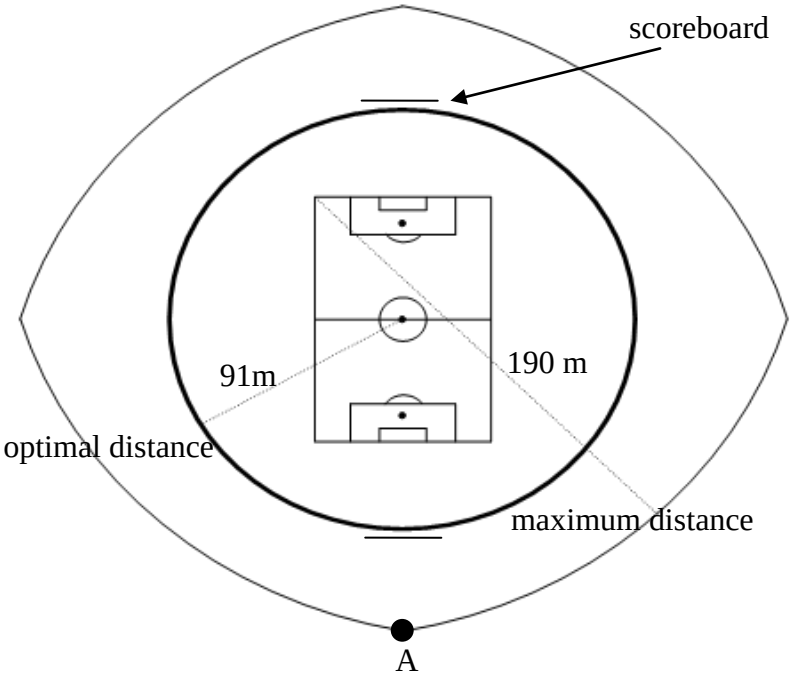
- Abadom cannot leave a town until well after the match is over.
- Abadom must arrive in each town with time to spare before the match starts.
- Your solution must provide:
  - Train numbers
  - Dates and times of departure from each city
  - Dates and times of arrival in each city. (15)

**[41]**

**QUESTION 4**

In order to host the FIFA world cup a host nation needs to have or must build appropriate stadiums. FIFA provides very clear guidelines regarding the dimensions and design of such stadiums.




The diagram above comes from the FIFA guidelines for stadium design. The diagram shows both the ideal distance for spectators from the centre of the field and the maximum distance that any spectator should sit from the furthest corner of the field.

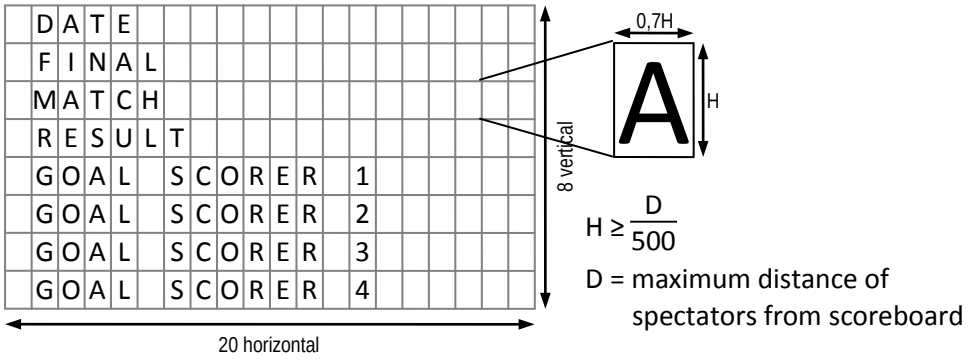
4.1 Determine the following from the diagram:

4.1.1 What, according to FIFA, is the optimal distance for a spectator to sit from the center point of the field? (2)

4.1.2 What, according to FIFA, is the maximum distance that a spectator should sit from the furthest corner of the field? (2)

4.2 The diagram above has been drawn according to scale. Using your ruler and the dimensions provided on the diagram estimate, to the nearest 10 m, the distance that a spectator at point A will sit from the scoreboard on the opposite side of the field. (8)




4.3 FIFA has developed the diagram and formula above to help tournament hosts with the development of scoreboards.
Assume that in a particular stadium the maximum distance of a spectator from the scoreboard is 220m.
Use the formula provided by FIFA to calculate the minimum dimensions of:

4.3.1 H in metres. (4)

4.3.2 The scoreboard in metres. (4)

**[20]**

## QUESTION 5

It is human nature to want to make predictions and it is no less so with the 2010 World Cup. Long before the tournament even started people already predicted who will win. That is not to say that everybody agreed.

One place in which these predictions manifest themselves is in sports betting. Bookmakers offer odds on each of the different teams winning the tournament. People (punters) place bets with the bookmakers and if they are correct then they get paid out according to the odds of the bet. If they are wrong they lose their bet.

Illustration: A bookmaker offers odds of 15 – 1 (we say: "fifteen to one") on a particular team winning. A punter places a R5 bet on that team. The team wins. The punter will be paid out R5 × 15 = R75 plus the R5 bet that he placed: total payout = R5 + R75 = R80.

At the end of February 2010 the odds for each of the teams winning the tournament one bookmaker offered were:

| Country | Odds | Country | Odds | Country | Odds | Country | Odds |
|---|---|---|---|---|---|---|---|
| Algeria | 250 - 1 | France | 14 - 1 | Mexico | 80 - 1 | Slovakia | 200 - 1 |
| Argentina | 9 - 1 | Germany | 12 - 1 | Netherlands | 12 - 1 | Slovenia | 200 - 1 |
| Australia | 100 - 1 | Ghana | 50 - 1 | New Zealand | 1500 - 1 | South Africa | 100 - 1 |
| Brazil | 5 - 1 | Greece | 125 - 1 | Nigeria | 100 - 1 | South Korea | 300 - 1 |
| Cameroon | 80 - 1 | Honduras | 500 - 1 | North Korea | 1500 - 1 | Spain | 9 - 2 |
| Chile | 50 - 1 | Italy | 11 - 1 | Paraguay | 66 - 1 | Switzerland | 200 - 1 |
| Denmark | 100 - 1 | Ivory Coast | 25 - 1 | Portugal | 28 - 1 | Uruguay | 100 - 1 |
| England | 11 - 2 | Japan | 300 - 1 | Serbia | 50 - 1 | USA | 50 - 1 |

5.1 Answer the following questions based on the information in the table:

5.1.1 What odds does the bookmaker offer for Ghana winning? (2)

5.1.2 What odds does the bookmaker offer for Uruguay winning? (2)

5.2 Consider the Netherlands. The odds the bookmaker offers for the Netherlands winning are 12 – 1.

5.2.1 What would be the total payout for a bet of R25 if the Netherlands won the tournament (6)

5.2.2 What amount would a person have bet if the Netherlands won and they were paid out a total of R2 080 for their bet on the team? (6)

5.3 According to the odds:

5.3.1 Which team is least likely to win the tournament? Justify your answer. (3)

5.3.2 Which team is most likely to win the tournament? Justify your answer (3)

5.3.3 What chance does the bookmaker give South Africa of winning the tournament? Explain your answer. (3)

**[25]**

# Grade 12 Mathematical Literacy: Memorandum Paper 1

1.1.1 41,57c/kWh + 24,8% = 51,88c/kWh ✓✓ 2

1.1.2 51,88c/kWh + 25,8% = 65,27c/kWh ✓✓
65,27c/kWh + 25,9% = 82,17c/kWh ✓✓ 4

1.1.3 % change = $(82{,}17-41{,}57)/41{,}57$. =
97,67% ✓✓✓ 3

1.2.1 24 389 GWh ✓✓ 2

1.2.2 4% ✓✓ 2

1.2.3 (a) 15% × 213 881 = 32 082 GWh ✓✓✓
(b) $\frac{59\ 965}{213\ 881}$ = 28% ✓✓✓
Note – alternate approaches are possible. 6

1.3.1 ≈ 154 (accept 154 ± 2) ✓✓ 2

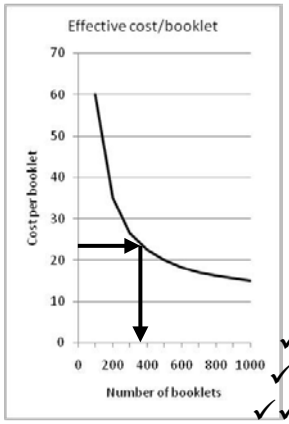
1.3.2 75% of 200 = 150 ✓✓✓ 3

2.1

| No. of booklets | 100 | 300 | 500 | 700 |
|---|---|---|---|---|
| Printing costs | 6000 | 8000 | 10000 | 12000 |
| Eff cost per booklet | R60 | R26,67 | R20,00 | R17,14 |
| | ✓✓✓ | ✓✓✓ | ✓✓✓ | ✓✓✓ |

12

2.2.1




✓✓ correct points
✓✓ shape of curve
✓✓ labeling of axis 6

2.2.2 (a) 380 ± 10 ✓✓✓
(b) see marking on graph for (2.2.1) ✓✓✓

2.3 Income – expenses = profit ✓
23 × bks – (5 000 + 10 × bks) = 5 000 ✓✓
13 × bks = 10 000
bks ≈ 770 ✓✓ 5

2.4 770 booklet ⇒ 800 booklets ✓
Cost = 5 000 + 8 × 1 000 = R13 000 ✓✓ 3

3.1 Missing values only

| | Debit | Credit | Balance | |
|---|---|---|---|---|
| 20 Feb | | R 1 150,00 | -R 6 850,00 | ✓✓✓ |
| 28 Feb | -R 137,00 | | -R 6 987,00 | ✓✓✓ |
| 25 Mar | | R 3 450,00 | -R 3 537,00 | ✓✓✓ |
| 31 Mar | -R 70,74 | | -R 3 607,74 | ✓✓✓ |

12

3.2 To settle loan: income ≥ R3 607 ✓
3 607 ÷ 23 ≈ 157 ✓✓
She must sell at least 157 booklets. 3

3.3 To break even Maxine must also cover her own investment of R 5 000.
To break even: income ≥ R5 000 ✓
5 000 ÷ 23 ≈ 218✓✓
She must sell at least 218 booklets. ✓ 4

4.1.1 R 46 000 ✓✓ 2

4.1.2 R 12 960 ✓✓ 2

4.2 R 95 000 × 18% = R17 100 ✓✓
R 17 100 – rebate
= R 17 100 – R 8 280✓✓
= R 8 820 ✓ 5

4.3.1 Tax payable
= 70 650 + (350 000 – 305 000) × 35% – 8 280 ✓✓✓
= 70 650 + 15 750 – 8 280
= R78 120 ✓✓ 5

4.3.2 Effective tax rate = $\frac{78\ 120}{350\ 000}$ ✓
= 22,32%✓✓ 3

5.1.1 1 day ✓✓ 2

5.1.2 7 days ✓✓ 2

5.1.3 2 tablets daily ✓✓ 2

5.2 1 day before trip + 10 days of trip + 7 days after trip = 18 days ✓✓✓
18 days = 18 tablets ✓ 4

5.3.1 Adult tablets:
2 × (1 day + 8 days + 7 days) ✓✓✓
= 2 × 16 days = 32 days
= 32 adult tablets ✓✓ 5

5.3.2 Child 1 (18 kg) = 16 days × 1 tablet/day
= 16 tablets ✓✓
Child 2 (36 kg) = 16 days × 3 tablet/day
= 48 tablets ✓✓
∴ 64 pediatric tablets ✓✓ 6

5.3.3 Cost = 32 × 12 + 64 × 8 = R 896 ✓✓✓ 3

6.1 The first sheet is 40 m long. ✓
The second sheet overlaps the first sheet by 1m leaving 39 m of additional canvas to cover the pitch.✓✓
40 m + 39 m = 79 m ✓
Since 79 m > 78 m – this sheet will cover the pitch and surroundings from one side to the other. ✓ 5

6.2 Working edge to edge the sheets cover:
17 m + 16 m + 16 m + 16 m + … ✓✓✓
The total distance to be covered must be > 115 m ✓
∴ 8 widths will be needed ✓✓
(check 17 + 7 × 16 = 129 m) 6

6.3 Number of rolls needed = 2 × 8 = 16 ✓✓ 2

6.4 Area of pitch and surroundings:
= 115 m × 78 m = 8 970 $m^2$ ✓✓
Total area of canvas
= 16 × 40 m × 17 m = 10 880 $m^2$ ✓✓
% extra = $\frac{10\ 880 - 8\ 970}{8\ 970}$ ≈ 21% extra ✓✓ 6

7.1.1 Cigarettes, glue, alcohol and cannabis ✓✓ 2

7.1.2 ≈ 32% ✓✓ 2

7.1.3 ≈ 100% - 25% = 75% ✓✓ 2

7.2 % using alcohol after 16
≈ 80% - 34% = 46% ✓✓
∴ number = 46% × 470 ≈ 220 ✓✓✓ 5

7.3 We cannot say.
Some students may have used more than one of the substances listed.
Since the totals of usage for all of the substances exceed 100%, it is possible that all of the respondents used one (or more) of the substances and we cannot be sure that any respondent used none. ✓✓✓✓ 4

# Grade12 Mathematical Literacy: Memorandum Paper 2

1.1.1 US $450 ✓✓ 2
1.1.2 R1 050 ✓✓ 2
1.1.3 Cat. 1 ticket for the final: US $900 ✓✓✓ 3
1.1.4 Cat. 4 ticket for a group match: R 140✓✓✓ 3
1.2.1 R 9,00 to 1 US $ ✓✓ 2
1.2.2 January 2008 ✓✓ 2
1.2.3 November 2008 ✓✓ 2
1.2.4 R7,00 to 1 US $ ✓✓
Take the price of any ticket in ZAR and divide it by the price of the same ticket in US $. For example Cat. 1 opening match:
3 150 ÷ 450 = 7 ✓✓ 4
1.2.5 (a) 1 120 ÷ 7 = 160 ✓✓
(b) 250 × 7 = 1 750 ✓✓ 4
1.3 South African's have been advantaged by the use of the R 7,00 to 1 US $. ✓✓ In the other months before 2010 the exchange rate was always higher ✓✓ and had these rates been used the tickets for South Africans would have been more expensive. ✓✓ 6
2.1.1 18 tournaments ✓✓ 2
2.1.2 Spain ✓✓ 2
2.1.3 32 matches ✓✓ 2
2.1.4 2 500 000 tickets ✓✓ 2
2.1.5 ≈ 2 750 000 ÷ 64 ≈ 43 000 ✓✓✓✓ 3
2.2.1 The line graph creates the impression that attendance at the world cups has seen a steady increase from the first tournament to the present – with a peak in attendance at the 1994 tournament in the USA. We get this impression because the graph is increasing from left to right. ✓✓✓✓ 4
2.2.2 The number of matches has also increased over the years from 17 matches in 1930 to 64 matches at each tournament since France in 1998. ✓✓✓✓ 4
2.2.3 (a) ≈ 1 000 000 ÷ 22 ≈ 45 000 ✓✓
(b) ≈ 1 600 000 ÷ 32 ≈ 50 000 ✓✓
(c) ≈ 3 600 000 ÷ 52 ≈ 69 000 ✓✓
(d) ≈ 3 400 000 ÷ 64 ≈ 53 000 ✓✓ 8
2.2.4 Average match attendance has not varied much over the years. This is almost certainly the result of limited stadium capacity ✓✓ 2
2.2.5 The people building stadiums would be interested in the average match attendance – this will impact on the size of the stadiums they manufacture. ✓✓
The people running the tournament would be interested in the total number of tickets sold as this impacts on budgeting for the tournament. ✓✓ 4
3.1.1 Johannesburg ✓✓ 2
3.1.2 17 June, 16h00 ✓✓ 2
3.1.3 The Republic of Korea ✓✓ 2
3.1.4 Thursday ✓✓ 2
3.1.5 Johannesburg → Mangaung/Bloemfontein → Durban ✓✓✓✓ 4
3.2.1 Monday ✓✓ 2
3.2.2 18:50 ✓✓ 2
3.2.3 16:00 on Tuesday ✓✓ 2
3.2.4 08:00 on Wednesday ✓✓ 2
3.2.5 Abadom will be in Bloemfontein to watch the match against Greece on Thursday 17 June. ✓✓ The first time that he can take train 61002 to Durban is on Tuesday 22 June at 16:00 – the same time that the match starts in Durban. ✓✓ This train will not get him to Durban on time. ✓✓ 6
3.3 Several solutions are possible. One option:
- 74205 dep JHB at 14:20 on 14 June, arr BLM at 21:36 on 14 June ✓✓✓✓
- 57035 dep BLM at 18:00 on 18 June, arr JHB at 08:10 on 19 June ✓✓✓✓
- 76009 dep JHB at 07:44 on 20 June, arr DBN at 07:10 on 21 June ✓✓✓✓
- 67010 dep DBN at 19:15 on 23 June, arr JHB at 07:44 on 24 June ✓✓✓ 15

4.1.1 91 m ✓✓ 2
4.1.2 190 m ✓✓ 2
4.2 3 cm : 91 m = 7 cm : x ✓✓✓
$\Rightarrow x = \frac{91 \times 7}{3}$ ✓✓✓
≈ 210 m ✓✓ 8
4.3.1 $H \geq \frac{220\text{ m}}{500}$ ✓✓
H ≥ 0,44 m ✓✓ 4
4.3.2 horiz length = 20 × 0,7× 0,44 = 6,16 m ✓✓
vertical height = 8 × 0,44 = 3,52 m ✓✓ 4
5.1.1 50 – 1 ✓✓ 2
5.1.2 100 – 1 ✓✓ 2
5.2.1 winnings = 12 × 25 = R300 ✓✓✓
payout = winnings + bet = R300 + R25
= R325 ✓✓✓ 6
5.2.2 payout = bet + 12 × bet ✓✓
∴ 13 × bet = R2 080 ✓✓
∴ bet = R2 080 ÷ 13 = R160 ✓✓ 6
5.3.1 New Zealand/North Korea ✓
The odds are the highest: 1500 – 1 ✓✓ 3
5.3.2 Spain ✓
The odds are the lowest: 9 – 2 = 4,5 – 1 ✓✓ 3
5.3.3 Although South Africa has not been given odds as low as those of New Zealand / North Korea at 1 500 – 1, the odds for South Africa are nonetheless 100 – 1, which is not very favourable. The bookmakers do not expect South Africa to win the tournament. At best they give them a very slight chance. ✓✓✓ 3