



# basic education

Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

## **NATIONAL SENIOR CERTIFICATE**

**GRADE 12**

**MATHEMATICAL LITERACY P2**

**NOVEMBER 2014**

**MARKS: 150**

**TIME: 3 hours**

**This question paper consists of 14 pages and 4 annexures.**

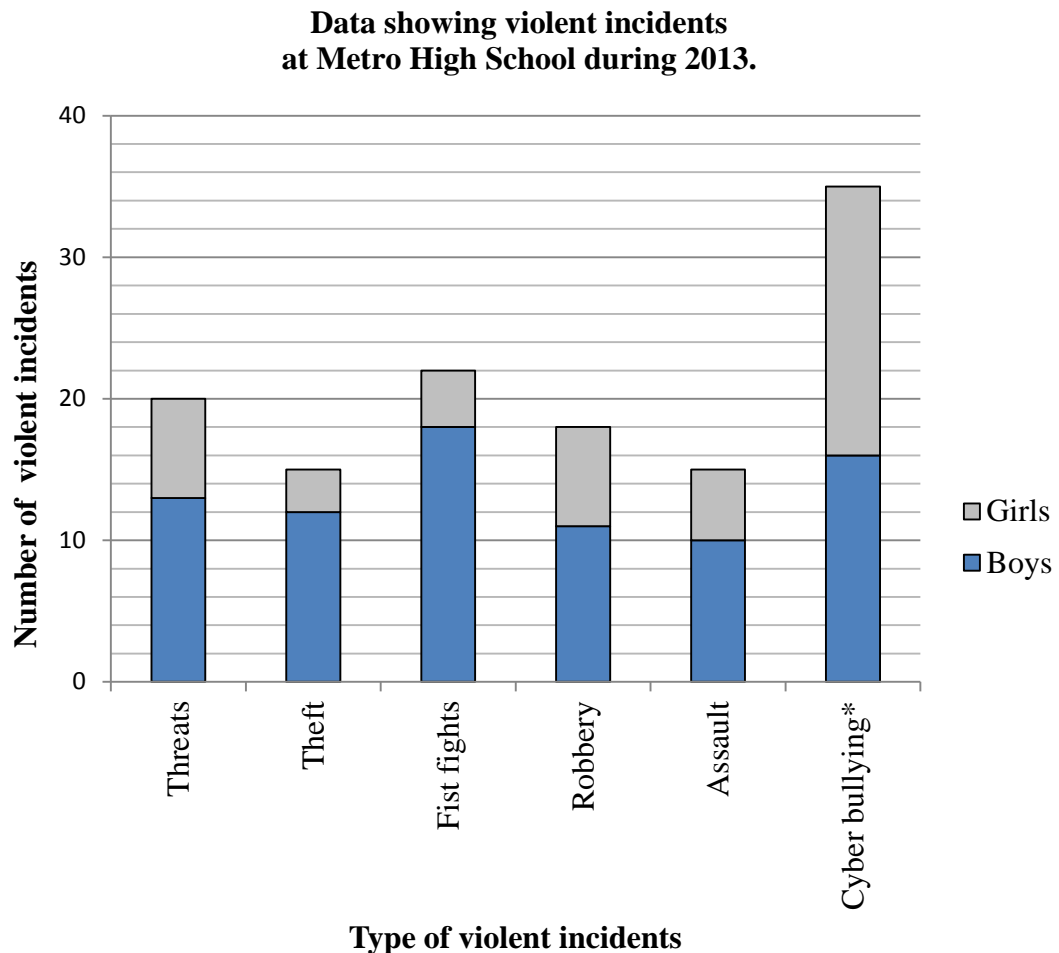
**INSTRUCTIONS AND INFORMATION**

1. This question paper consists of FOUR questions. Answer ALL the questions.
2. Use ANNEXURE A and ANNEXURE B to answer QUESTION 1.3 and use ANNEXURE C and ANNEXURE D to answer QUESTION 4.1.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Start EACH question on a NEW page.
5. You may use an approved calculator (non-programmable and non-graphical), unless stated otherwise.
6. Show ALL calculations clearly.
7. Round off ALL final answers appropriately according to the given context, unless stated otherwise.
8. Indicate units of measurement, where applicable.
9. Diagrams are NOT necessarily drawn to scale, unless stated otherwise.
10. Write neatly and legibly.

**QUESTION 1**

1.1 Violent incidents in South African schools are a national concern. Young persons are as much at risk of being victims of violence at school as they are outside the school.

The stacked bar graph below shows the recorded data of the number of times boys and girls committed certain types of violent acts at Metro High School during 2013.



\* **Cyber bullying** is the use of social media like SMS, BBM, WhatsApp, Facebook, Twitter, et cetera on cellphones, tablets or computers to deliberately harass, threaten or intimidate another person.

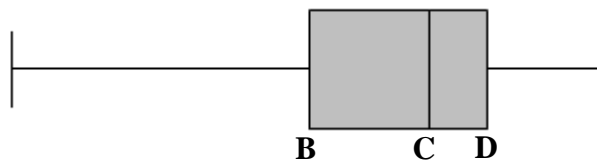
[Adapted from the South African School Administration and Management System]

- 1.1.1 Explain, with justification, whether the given data is discrete or continuous. (2)
- 1.1.2 Determine how many more boys than girls were involved in violent incidents at Metro High School during 2013. (4)
- 1.1.3 Determine the modal violent incident committed by girls at Metro High School during 2013. Explain why this type of incident is the modal violent incident committed by girls. (3)

1.2 The majority of Metro High Schools' learners who committed violent incidents were Grade 9 boys.

The arranged ages of these Grade 9 boys and a corresponding box-and-whisker plot are given below.

<b>A</b>	14	14	14	14	15	15	15
15	15	16	16	16	16	16	16
16	16	16	16	17	17	17	17
17	17	17	17	17	17	17	17
17	18	18	18	18	18	18	18



[Adapted from the South African School Administration and Management System]

- 1.2.1 Determine the missing value **A** if the range of the ages of the Grade 9 boys who committed violent incidents is 5 years. (2)
- 1.2.2 Calculate the mean age of the Grade 9 boys who committed violent incidents. (3)
- 1.2.3 Calculate the missing quartile values **B**, **C** and **D** of the box-and-whisker plot. (5)
- 1.2.4 A Grade 9 boy who committed a violent act is randomly selected. Determine the probability (expressed in decimal form) that the boy would be 16 years or older. (3)
- 1.2.5 Give a possible reason why so many Grade 9 boys at Metro High School committed violent incidents. (2)

1.3 The Department of Correctional Services became aware of the problem that Metro High School was experiencing with violent incidents at the school. They invited the school to visit one of their prisons on condition that one teacher had to accompany every group of 10 learners or fewer.

Mr Palm, the principal, must hire a bus to take the learners and teachers to visit the prison.

Graphs representing the total cost of hiring buses from two different transport companies are drawn on ANNEXURE A.

1.3.1 The total cost for hiring a bus from Company P is calculated by using the following formula:

$$\text{Total cost (in rand)} = \text{number of passengers} \times 35$$

Use the graphs on ANNEXURE A and write down a formula for calculating the total cost (in rand) for Company Q in the form:

$$\text{Total cost (in rand)} = \dots \quad (4)$$

1.3.2 Mr Palm has budgeted R900 for the total cost of the bus transport. Use the graphs on ANNEXURE A or the formulas in QUESTION 1.3.1 to determine the following:

(a) The maximum number of passengers that can be transported. (2)

(b) The ratio of learners to teachers, if the maximum number of passengers is transported according to the condition set out by Correctional Services regarding the number of teachers. (5)

1.3.3 Two of the teachers decided to play a game with two unbiased dice to determine who will accompany the learners on the trip.

Miss Ansie says she will go if the two rolled dice show a double six. Mr Boitumelo says he will go if the two rolled dice show a sum of seven.

The possible outcomes of rolling two unbiased dice are shown on ANNEXURE B.

Explain, with calculations, why it is more likely that Mr Boitumelo rather than Miss Ansie will accompany the learners. (3)

[38]

**QUESTION 2**

2.1

Daya, a health worker, needs to purchase a car to travel to work. She sees advertisements for two models, a Sonic 1.6 and an Aveo 1.6.

Both cars need the same percentage deposit and have a full maintenance plan. The running costs for the first year will only be the monthly instalments and petrol costs.

TABLE 1 below shows the monthly instalment and average petrol consumption for the two models.

**TABLE 1: Monthly instalment and petrol consumption of the two models**

MODEL	MONTHLY INSTALMENT	AVERAGE PETROL CONSUMPTION
<b>Sonic 1.6</b>	R2 657	6,7 litres per 100 km
<b>Aveo 1.6</b>	R1 942	7,3 litres per 100 km

The petrol price was R14,04 per litre on 16 May 2014.

[Source: *Daily News*, Friday 16 May and [www.chevrolet.co.za](http://www.chevrolet.co.za)]

2.1.1 State, showing calculations, which model will cover a greater distance using R500 worth of petrol.

**NOTE:** All other conditions for both models will be identical. (6)

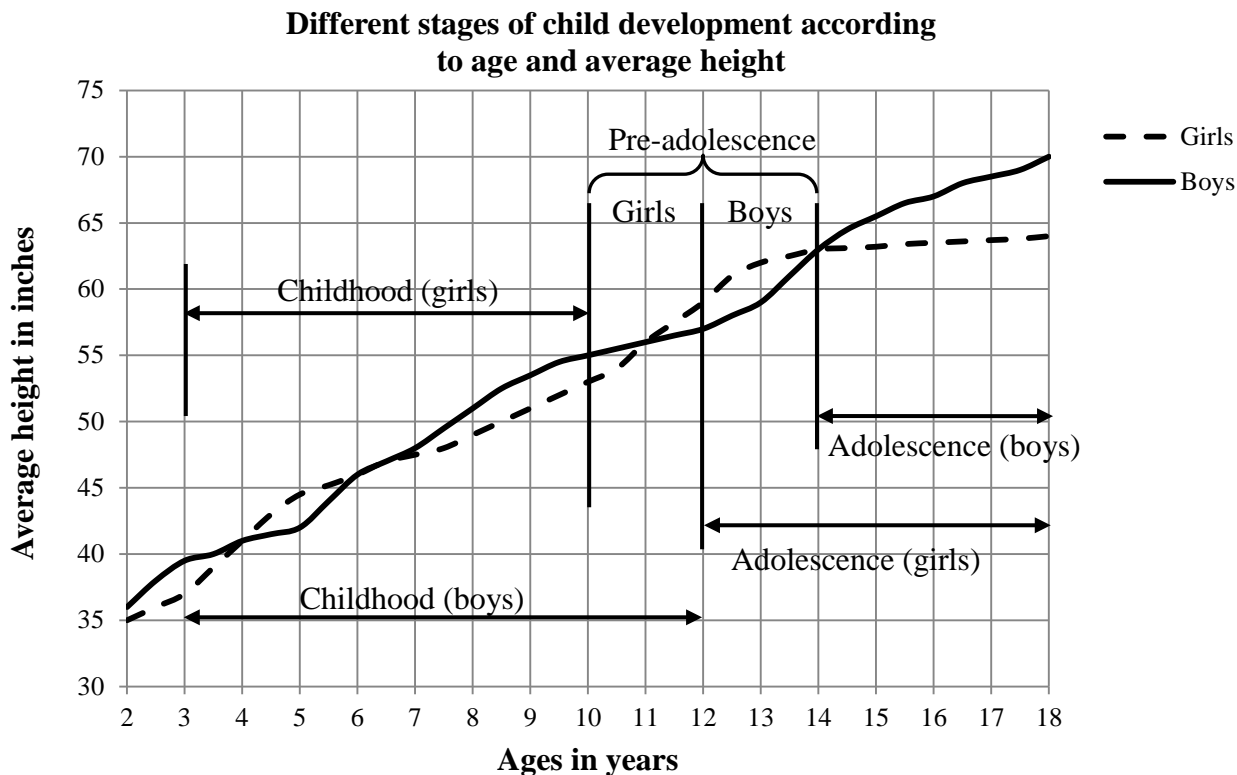
2.1.2 State TWO other factors, besides petrol consumption, that could influence the distance travelled by a car using a full tank of petrol. (2)

2.1.3 Daya estimates that she will travel a total distance of 35 000 km during the first year.

Show, with calculations, which one of the models would be more economical for her to use for the first year. (8)

2.2 Daya is interested in the different stages of child development, namely childhood, pre-adolescence and adolescence.

The graph below shows the different stages of child development according to age and average height.



[Source: [www.WHO/growthcharts](http://www.WHO/growthcharts)]

- 2.2.1 In which age group will both boys and girls have approximately the same average height for nearly a whole year? (2)
- 2.2.2 Give TWO possible reasons why it cannot be said with certainty that a 10-year-old boy will be 55 inches tall. (2)
- 2.2.3 Identify the different age groups where the average height of girls is more than that of boys. (2)
- 2.2.4 A colleague of Daya made the following statement: 'All the stages of child development for boys are longer than those for girls.'  
Give a detailed motivation why this statement is NOT correct. (5)
- 2.2.5 Describe a possible trend for the average height of girls who are 14 years and older. (2)
- 2.2.6 Daya's 14-year-old son is 165 cm tall. Show by calculation whether he is above or below the average height for his age. (4)

**NOTE:** 1 cm = 0,3937 inches (4)

**QUESTION 3**

3.1

Mr Fortune is a 40-year-old male who receives a basic monthly salary of R20 416,67 and an annual bonus equal to his basic monthly salary. His gross annual income for the 2013/2014 tax year is made up of his basic monthly salary and annual bonus.

He contributes 6% of his basic monthly salary towards his pension fund, but no pension contribution is deducted from his annual bonus.

The following table showing the annual income tax deductions for individuals and special trusts for the 2013/2014 tax year is used by Mr Fortune to calculate his income tax payable to SARS.

**TABLE 2: Annual income tax deductions for individuals and special trusts**

2013/2014	
INCOME TAX: INDIVIDUALS AND SPECIAL TRUSTS	
Tax rates (year of assessment ending 28 February 2014)	
<b>Individuals and special trusts</b>	
Taxable income (R)	Rate of tax (R)
0–165 600	18% of taxable income
165 601–258 750	29 808 + 25% of taxable income above 165 600
258 751–358 110	53 096 + 30% of taxable income above 258 750
358 111–500 940	82 904 + 35% of taxable income above 358 110
500 941–638 600	132 894 + 38% of taxable income above 500 940
638 601 and above	185 205 + 40% of taxable income above 638 600
<b>Tax rebates</b>	
Primary	R12 080
Secondary (Persons 65 year and older)	R6 750
Tertiary (Persons 75 year and older)	R2 250

**NOTE:**

1. Annual income tax is calculated on income after the total pension contributions have been deducted.
2. Income tax payable on annual bonus amounts is spread equally over 12 months.

[Source: [www.sars.gov.za](http://www.sars.gov.za)]

- 3.1.1 Calculate Mr Fortune's gross annual taxable income. (4)
- 3.1.2 Use the annual income tax table above to calculate his annual income tax payable for the year ending 28 February 2014. (5)
- 3.1.3 Hence, calculate Mr Fortune's net monthly salary if only income tax and pension deductions are considered. (3)



3.2

Dr Khoza, a representative of the South African National Defence Force, wants to compare the amount budgeted for defence in relation to the total national budget.

TABLE 3 below compares the amount budgeted for the 2012/13 to 2014/15 financial years for defence with the total national budget for the same years.

**TABLE 3: The amounts budgeted for defence and the total national budget**

Financial year	Amount budgeted for defence in billion rand	Total national budget in trillion rand
2012/13	41,6	1,06
2013/14	44,8	1,15
2014/15	47,9	1,25

The annual inflation rate for 2013 was 5,77%.

**NOTE:** 1 trillion = 1 000 billion

[Source: [www.treasury.gov.za](http://www.treasury.gov.za) and [www.inflation.eu/inflation-rates/cpi-inflation-2013.aspx](http://www.inflation.eu/inflation-rates/cpi-inflation-2013.aspx)]

3.2.1 Dr Khoza claimed that her department's percentage budget increase for the 2014/15 financial year exceeded the annual inflation rate for 2013.

Show by calculation whether her claim is valid.

(5)

3.2.2 Dr Khoza also compared the percentage growth for her department's budget with the percentage growth of the total national budget from 2013/14 to 2014/15. She stated that the defence budget is not increasing at the same annual rate as the national budget.

Verify, by calculation, whether statement is correct.

(5)

3.2.3 The percentage growth figures published with each year's budget are as follows:

- 2013/14: up by 8,1%
- 2014/15: up by 5,9%

Calculate the actual amount allocated for the 2014/15 financial year using the budgeted amount of R41,6 billion and the percentage growth figures as given above.

(4)

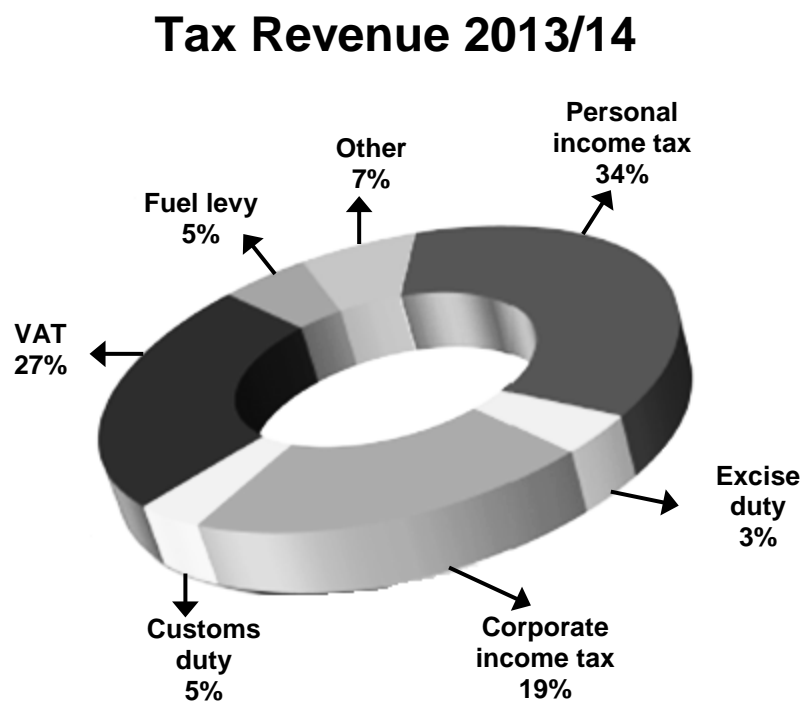
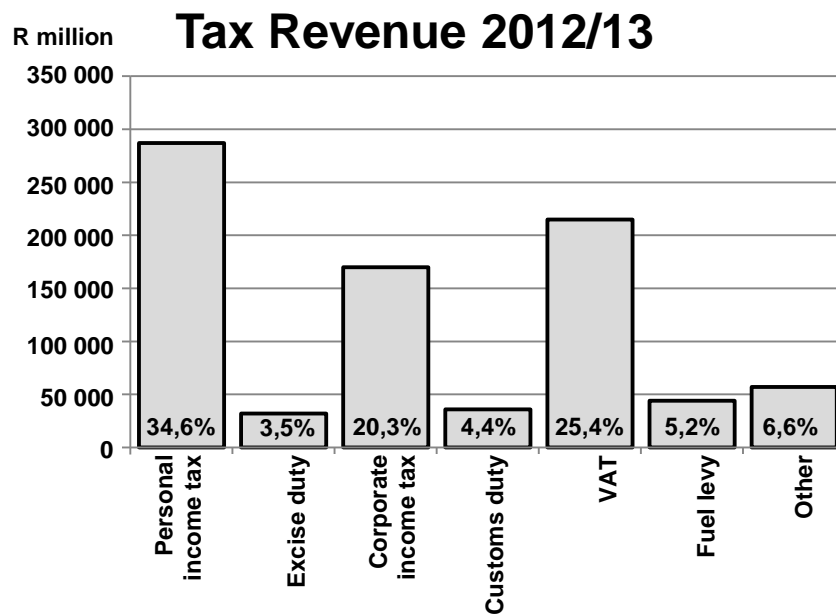
3.2.4 If the amount R47,9 billion is rounded off to the nearest billion, it becomes R48 billion.

Give a reason, with an example, to show why rounding off to the nearest billion will influence the budget allocation.

(3)

3.3

The graphs below shows the tax collected in different tax categories in South Africa over two financial years.



[Source: [www.treasury.gov.za](http://www.treasury.gov.za)]

3.3.1 Why do you think graphical representations were used to show the data of tax collected? (2)

3.3.2 Explain which type of graphical representation would be most suitable to represent the general trend in tax collection showing the different tax categories over a two-year period. (3)

[34]

**QUESTION 4**

4.1

Jackie and her friend plan to attend an opera performance at the Royal Opera House in Muscat, the capital of Oman. She will pay the total cost of the trip for both of them. The currency of Oman is the Omani rial (OR).

The opera house in Muscat has four levels of seating. ANNEXURE C shows the layout of the seats of Level 0 only. Each level has different seating zones. The price for each zone for opera performances is summarised in the table below.

**TABLE 4: Prices for opera performances**

Zones	Number of seats per level				Price per ticket in OR
	Level 0	Level 1	Level 2	Level 3	
A		72			78
B	380		8		48
C	X	12	23		42
D			81		28
E			34	78	15
F			8	74	10

[Adapted from [www.rohMuscat.org.om/book-now/pricing-seat-plans](http://www.rohMuscat.org.om/book-now/pricing-seat-plans)]

Use ANNEXURE C and the information in TABLE 4 to answer the following questions.

4.1.1 All the seats of the Opera House, except for two seats in Zone B of Level 0, were sold out for one of the opera performances. These available seats are located in the fifth row from the stage and are exactly in the middle of the row. Jackie decided to book these two available seats.

- Identify the seat numbers of the seats that Jackie booked. (3)
- Determine the missing value X. (2)
- Calculate the total income, in Omani rial, from ticket sales for this performance. (6)

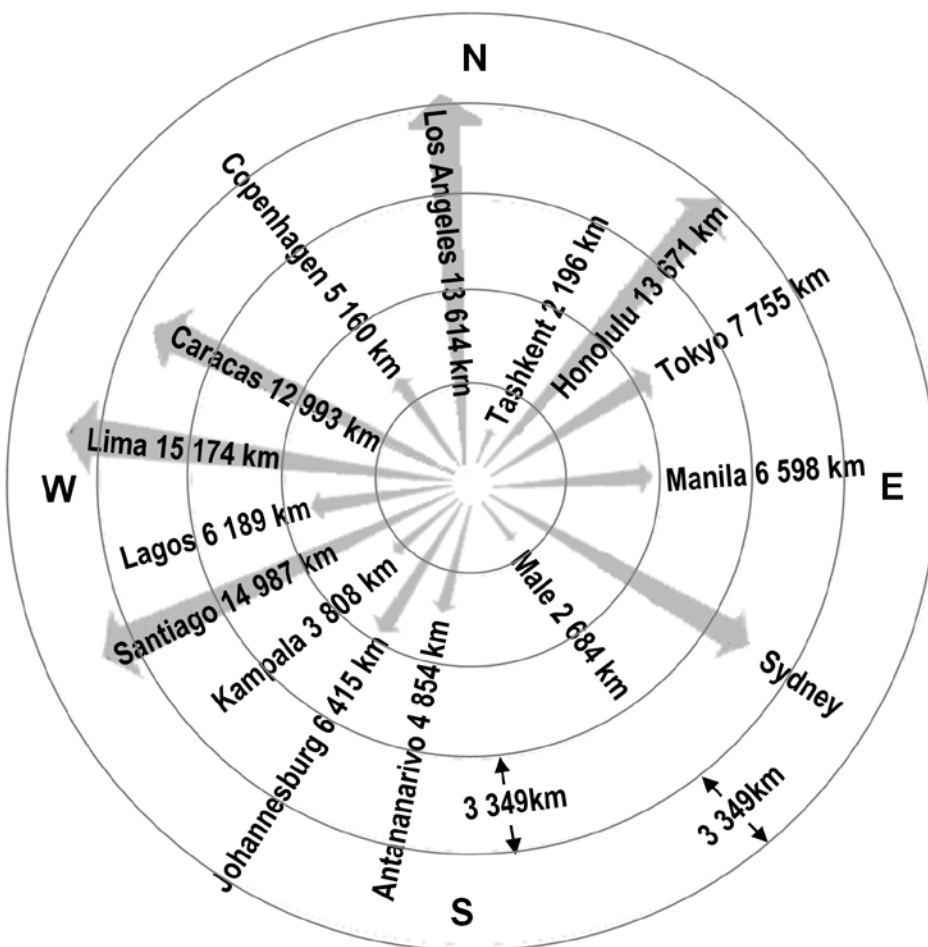
4.1.2 When she made her booking, Jackie also obtained information from the Internet regarding exchange rates and flight details, as shown in the tables given on ANNEXURE D.

Use the tables on ANNEXURE D to answer the following questions.

- Calculate the total cost, in rand, of the opera tickets and return airline tickets for both of them. (7)
- Calculate the time in South Africa when they arrive in Muscat. (2)

4.2

While Jackie was searching for more information about Muscat she came across the following distance chart. On the chart Muscat is the centre point of the concentric circles.



**NOTE:** Concentric circles are circles having the same centre.

[Source: [www.dateandtime.com](http://www.dateandtime.com)]

Use the distance chart above to answer the following questions.

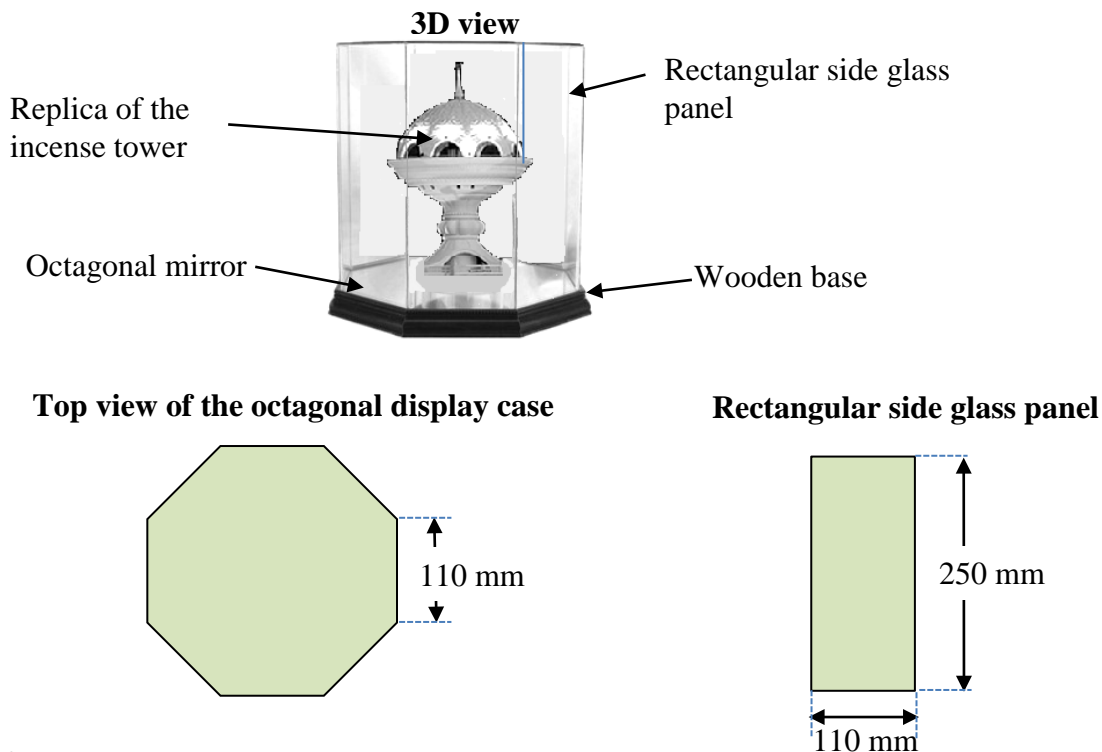
- 4.2.1 In what general direction is Johannesburg from Muscat? (2)
- 4.2.2 Kampala is a capital city in Africa. Explain why it would not be possible to calculate the distance between Johannesburg and Kampala using this distance chart. (2)
- 4.2.3 The distance between each of the concentric circles on the chart is 3 349 km, as shown on the chart. Calculate the approximate distance from Muscat to Sydney. (3)

4.3

Jackie bought a replica of the giant incense tower she saw in Muscat as a souvenir. She displays the replica in an octagonal glass display case with a wooden base as shown in the picture below. On top of the base is an octagonal mirror to enhance the display of the incense tower.

The inside dimensions of the identical rectangular side glass panels of the display case is 110 mm by 250 mm.

The inside surface area of the octagonal top is 0,058 423 m<sup>2</sup>.



**NOTE:** All eight sides of the octagon are equal in length.

The following formula may be used:  $TSA = P \times H + K$ , where:

- TSA** = The total inside surface area of the octagonal display case, excluding the mirror
- P** = The perimeter of the octagonal base
- H** = The height of the rectangular side glass panels
- K** = The inside surface area of the octagonal top

4.3.1 Jackie would like to tint the inside of the glass using a special type of spray paint. This paint is sold in 250 ml spray cans.

The following information is printed on the side of the spray can:

- 100 ml of spray paint can cover 0,07 m<sup>2</sup> of glass per coating.
- Apply two coats.

Calculate the number of spray cans of paint needed to tint the glass of the display case. (8)

4.3.2 The scale of the replica is 1 : 164.

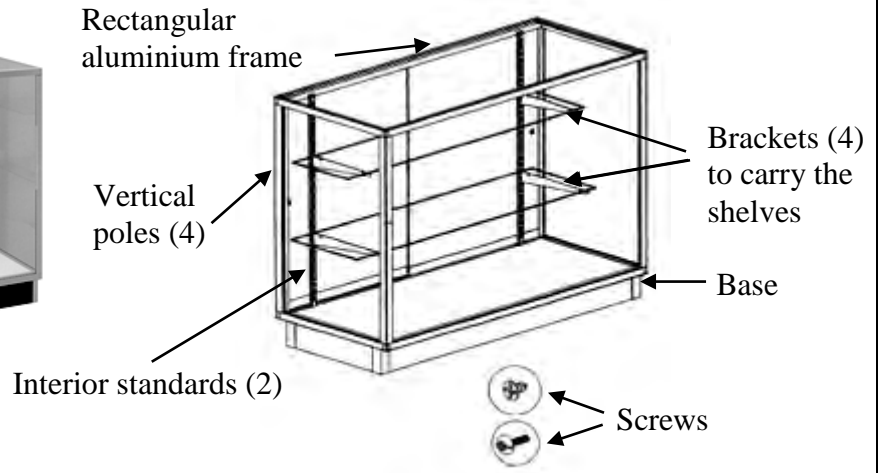
Calculate the actual height, in metres, of the tower if the height of the replica inside the display case is only 1 cm less than the height of the side glass panels. (3)

4.4 Jackie bought another glass display cabinet for her other souvenirs. The photograph and diagrams below show five diagrammatic instructions on how the display cabinet must be assembled.

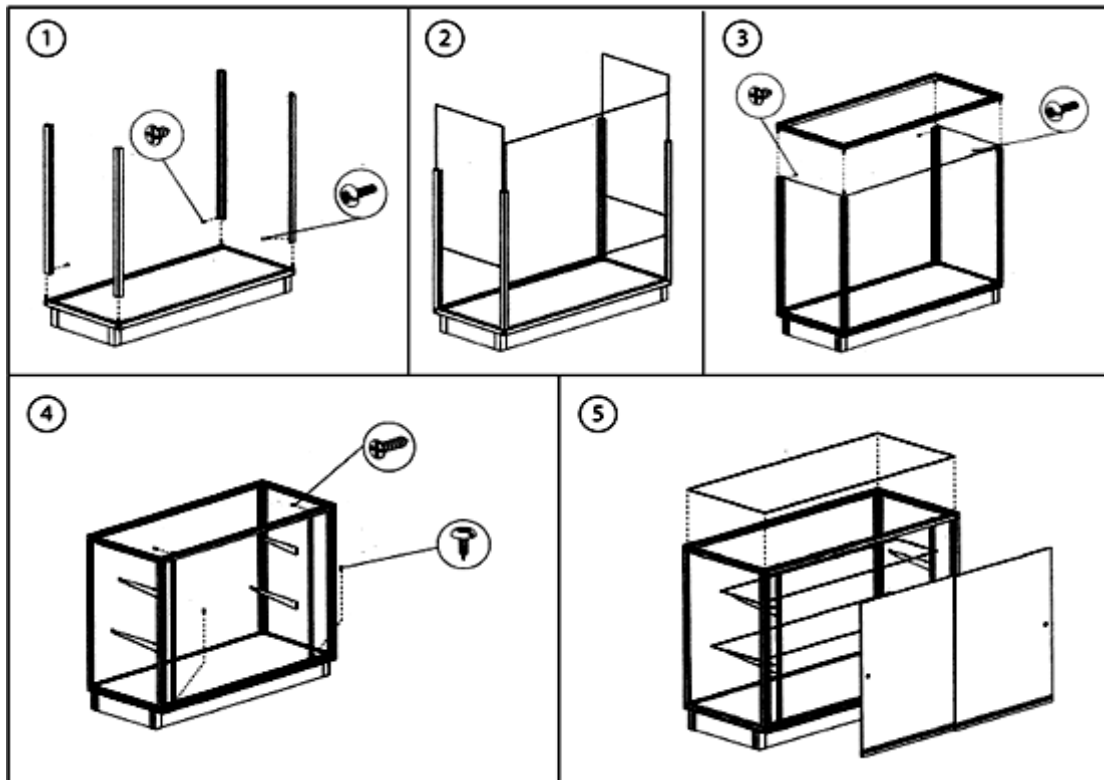
**Photograph of the glass display cabinet**



**Diagram of the completed glass display cabinet**



**Diagrammatic instructions to assemble the cabinet:**



[Source: [www.fireflystoresolutions.com](http://www.fireflystoresolutions.com)]

Write a detailed set of instructions, using only the first FOUR diagrammatic instructions, to describe how the display cabinet should be assembled.

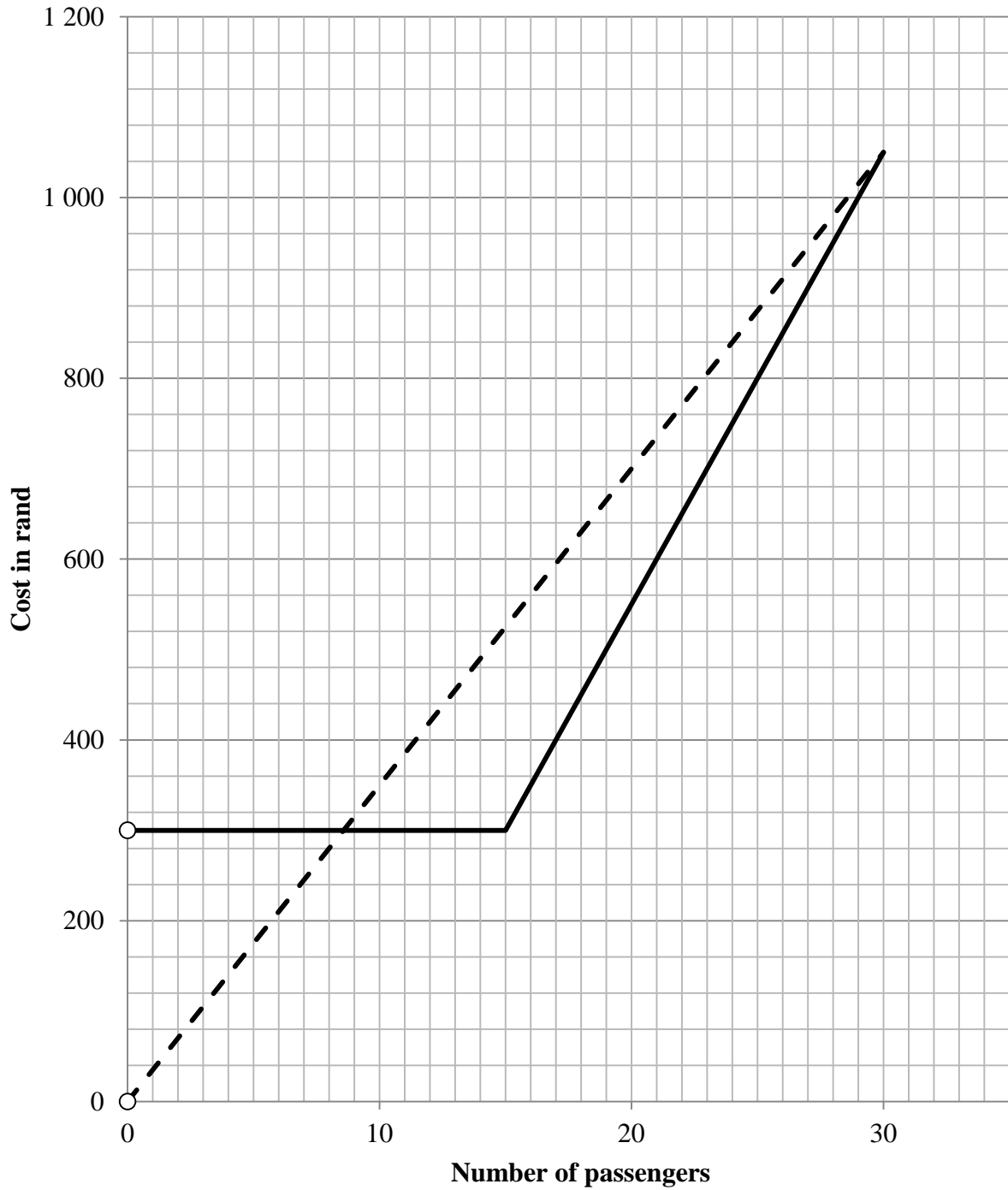
(7)  
[45]

**TOTAL: 150**

**ANNEXURE A**

**QUESTION 1.3**

**Total cost of hiring a bus from two different transport companies**

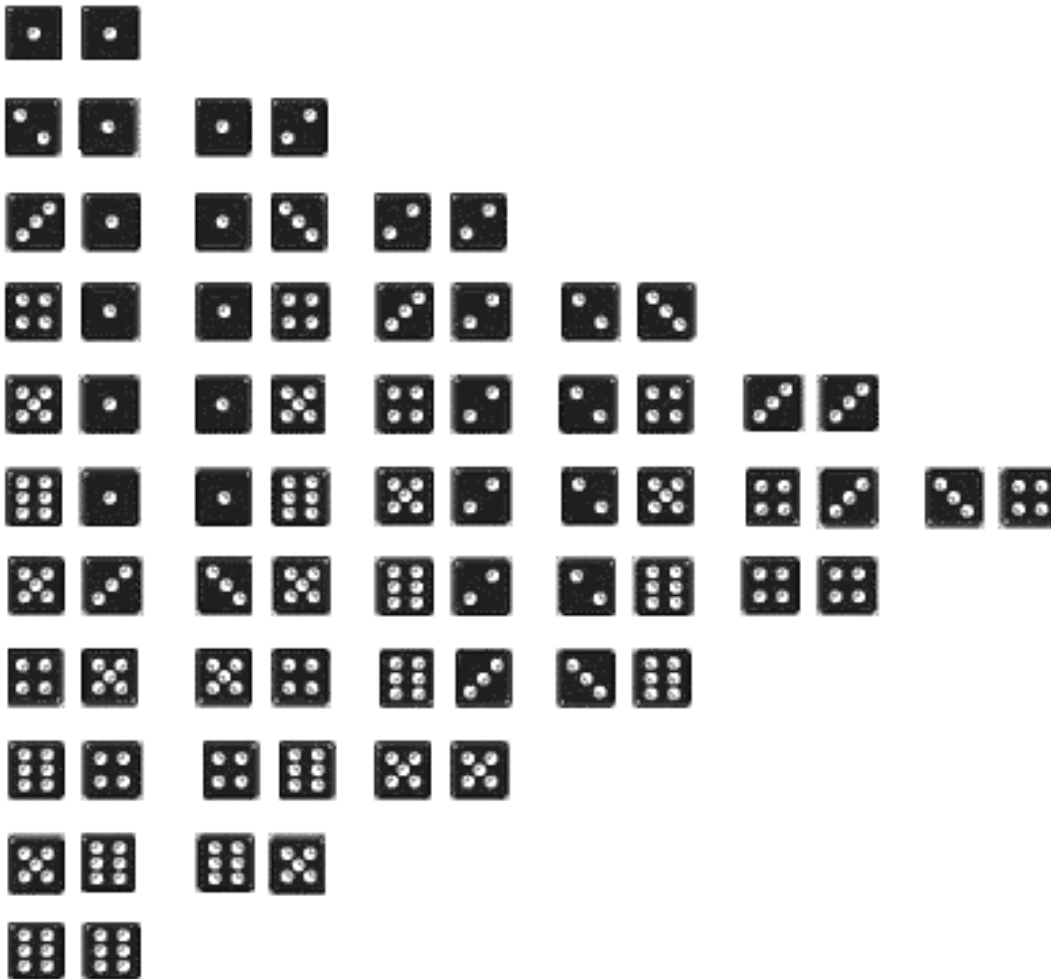


**KEY:**  
- - - Company P  
— Company Q

**ANNEXURE B**

**QUESTION 1.3.3**

**A representation of all the possible outcomes of rolling two unbiased dice**

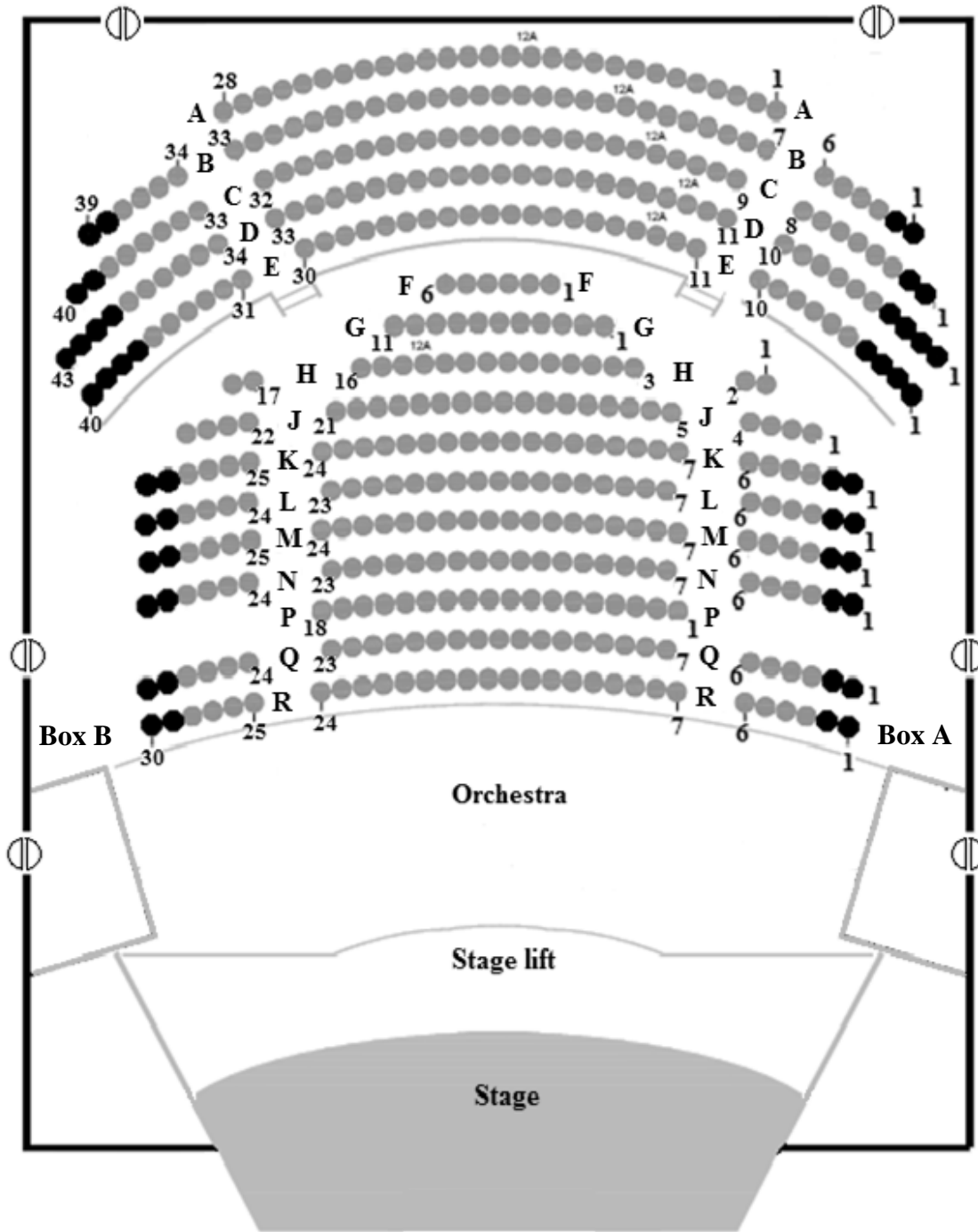






ANNEXURE C

QUESTION 4.1

SEATING PLAN FOR LEVEL 0



**KEY**  Exit

 Zone B  
 Zone C

## ANNEXURE D

## QUESTION 4.1

**TABLE 5: Exchange rates for the Omani rial**

OR exchange rates				
	 Indian Rupee (R)	 Euro (€)	 US dollar (\$)	 South African rand (R)
1 OR	156,188	1,87126	2,59673	27,2183

[Source: [www.xe.com/currency/omr-omani-rial?c=ZAR](http://www.xe.com/currency/omr-omani-rial?c=ZAR)]**TABLE 6: Flight details from Johannesburg to Muscat for the return flight of Jackie and her friend**

€492,29 per passenger		DEPARTURE TIME		ARRIVAL TIME		DURATION OF TRIP
	Departure	20:30	Johannesburg	09:55	Muscat	11 hours 25 minutes
	Return	05:25	Muscat	17:10	Johannesburg	13 hours 45 minutes

Airline fare per passenger in euro; tax included; service fees not included