basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL
SENIOR CERTIFICATE

GRADE 12

MATHEMATICAL LITERACY P2

NOVEMBER 2013

MARKS: 150

TIME: 3 hours

This question paper consists of 13 pages and 4 annexures.

INSTRUCTIONS AND INFORMATION

1.   This question paper consists of FIVE questions. Answer ALL the questions.

2.   Answer QUESTION 3.2.1 on ANNEXURE A and QUESTION 4.2.3 on ANNEXURE C. Use ANNEXURE B and ANNEXURE D to answer QUESTION 3.4 and QUESTION 4.3. Write your centre number and examination number in the spaces on the ANNEXURES and hand in the ANNEXURES with your ANSWER BOOK.

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 the calculations clearly.

7.   Round off ALL the final answers to TWO decimal places, unless stated otherwise.

8.   Units of measurement MUST be indicated, where applicable.

9.   Maps and diagrams are NOT necessarily drawn to scale, unless stated otherwise.

10.   Write neatly and legibly.

QUESTION 1

Franz is a citrus farmer in Zebediela, Limpopo. He supplies oranges to the local and export market.

The harvesting of oranges requires various phases. Oranges are first hand-picked and collected into cylindrical baskets. The baskets are then emptied into a trailer to be transported to the packing house.

Franz also has another company that makes orange juice.

Cylindrical section
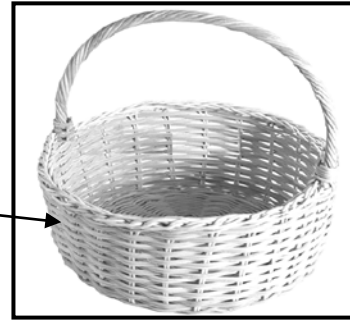
Consider all oranges to be spherical in shape. The average diameter measurement of an orange is 90 mm.

1.1   Approximately 2,5 kg of oranges are used to make 1 ℓ of juice. The juice is poured into 5 ℓ plastic bottles.

Determine the number of 5 ℓ bottles of juice that can be made from 400 kg of oranges.   (3)

1.2   Determine the:

1.2.1   Surface area (in mm^2) of an orange   (3)

1.2.2   Volume (in mm^3) of an orange   (2)

The following formulae may be used:

Surface area of a sphere = $4 \times \pi \times r^2$

Volume of a sphere = $\dfrac{4}{3} \times \pi \times r^3$

where $\pi = 3,14$ and r = radius

1.3   The cylindrical section of a basket has a height of 25 cm and a diameter of 30 cm. The space in the cylindrical basket not occupied by the oranges is 113 040 mm^3.

Franz states that a basket can hold at most 44 oranges.

Verify, by showing ALL the necessary calculations, whether Franz's statement is correct.

The following formula may be used:
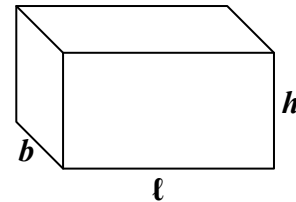
Volume of a cylinder = $\pi \times r^2 \times h$

where $\pi = 3,14$, r = radius and h = height   (7)

1.4 | Franz uses rectangular boxes to pack the oranges as shown in the diagram below. He then packs the boxes of oranges into the rectangular trailer of his truck for delivery.

Open box of oranges   **Measurements of the box**

b = breadth = 0,215 m
ℓ = length = 0,3 m
h = height = 0,235 m

The boxes can be arranged in the trailer in two possible ways with the top of the box always facing upwards as shown in the two options below:

OPTION 1	OPTION 2
Layout on the floor of the trailer:	Layout on the floor of the trailer:

The trailer is imported and the dimensions are given as:

Length = 394 inches; breadth = 119 inches; height = 94,5 inches
NOTE: 1 inch = 2,54 cm

Show, with calculations, which ONE of the two options (Option 1 or Option 2) you would advise Franz to use so that he can pack the maximum number of boxes on the floor of the trailer. (9)

[24]

QUESTION 2

2.1

Rodney is a public servant who owns two vehicles with engine capacities of 1,5 ℓ and 2,3 ℓ.

The government has two vehicle subsidy schemes for distances travelled while on official duty:

Scheme A: The vehicles are subsidised* and maintained by the government (employer). Employees are re-imbursed (paid back) per kilometre travelled for petrol cost only.

Scheme B: The vehicles are owned and paid for by the employee, who also has to maintain the vehicle. Employees are re-imbursed per kilometre travelled at a higher rate than that of scheme A to cover petrol and maintenance costs.

Subsidised vehicles are proportionally paid for by both the employee and the employer.

Rodney has to submit a travel claim each month.

The following table shows the claim tariffs for 2012:

TABLE 1: Claim tariffs (in cents) per engine capacity for 2012

ENGINE CAPACITY (in litres)	CLAIM TARIFF (in cents per km)	
	SCHEME A	SCHEME B
Up to 1,250	77,9	236,2
1,251 to 1,550	88,8	299,4
1,551 to 1,750	96,7	328,6
1,751 to 1,950	108,3	384,4
1,951 to 2,150	111,9	397,5
2,151 to 2,500	130,3	467,0
2,501 to 3,500	137,1	578,6
Greater than 3,500	160,6	660,8

[Source: www.kzntransport.gov.za]

2.1.1   Write down a formula that can be used to calculate the amount that can be claimed for a 2,3 ℓ vehicle using scheme B, in the form:

Amount claimed (in rand) = ...   (2)

2.1.2   Rodney, using scheme B, claimed an amount of R9 430 for travelling 1 960 km using his 2,3 ℓ vehicle while performing official duties for the month of November 2012.

Verify, showing ALL calculations, whether Rodney claimed the correct amount.   (3)

2.2 | Rodney needs to determine whether it is better for him to use his 1,5 ℓ or 2,3 ℓ vehicle. He travels approximately 1 960 km per month while performing his official duties.

The comparison of the monthly maintenance and petrol cost per kilometre is summarised in Table 2 below.

TABLE 2: Comparison of monthly costs for Rodney's two vehicles

ENGINE CAPACITY	MAINTENANCE (in rand)				PETROL (in rand per km)
	Service	Tyres	Insurance	Warranty	
1,5 ℓ	450	125	500	200	1,013
2,3 ℓ	700	210	800	450	1,317

2.2.1   Calculate Rodney's total monthly cost (including petrol and maintenance) if he uses his 1,5 ℓ vehicle.   (3)

2.2.2   In October 2012 Rodney, using scheme B, used his 1,5 ℓ vehicle for his official duties and in November 2012 he used his 2,3 ℓ vehicle for his official duties. He travelled 1 960 km each month.

Determine the difference in the **remaining amount** from his claims for October 2012 and November 2012 after the maintenance and petrol costs have been deducted.

[The **remaining amount** is the difference between the amount claimed and the total monthly cost for the vehicle.]   (9)

2.3   Rodney decides to deposit a fixed amount into his bank account at the end of each month. The bank offers an interest rate of 9% per annum, compounded monthly.

At the end of two years, the final amount in his account was R104 753,89.

Calculate the fixed amount that was regularly deposited at the end of each month.

The following formula may be used:

$$x = \frac{A \times \dfrac{i}{12}}{\left[\left(1 + \dfrac{i}{12}\right)^{n} - 1\right]}$$

where x = fixed monthly deposited amount A = final amount
        i = annual interest rate n = number of deposits   (4)

2.4   Rodney's wife is 66 years old. Her taxable income for 2012 was R315 054.

The amount of tax payable is calculated using the following table:

TABLE 3: Tax calculation table

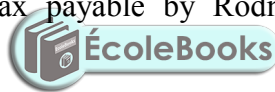| TAXABLE INCOME (in rand)	RATES OF TAX (in rand)
0 to 160 000	18%
160 001 to 250 000	28 800 + 25% of the amount above 160 000
250 001 to 346 000	51 300 + 30% of the amount above 250 000
346 001 to 484 000	80 100 + 35% of the amount above 346 000
484 001 to 617 000	128 400 + 38% of the amount above 484 000
617 001 and above	178 940 + 40% of the amount above 617 000

[Source: www.sars.gov.za on 17 November 2012]

Taxpayers qualify for:

- A primary rebate* of R11 440
- An additional rebate* of R6 390 if they are 65 years or older

* *A rebate is an amount by which an individual's calculated tax is reduced.*

Determine the amount of tax payable by Rodney's wife after the rebates have been deducted.   (5)

                                                                                        [26]

QUESTION 3

3.1   The results of Census 2011 were released by Statistics South Africa in November 2012.

TABLE 4 below summarises the highest level of education for all South Africans who were 20 years and older in the years 1996, 2001 and 2011.

TABLE 4: Highest level of education of persons 20 years and older for 1996, 2001 and 2011

EDUCATION LEVEL	1996		2001		2011	
	Number	**%**	**Number**	**%**	**Number**	**%**
No schooling	4 055 646	19,1	4 567 498	17,9	2 665 875	8,6
Some primary	3 522 956	16,6	4 083 742	16,0	3 790 134	12,3
Completed primary	1 571 774	7,4	1 623 467	6,4	1 413 895	4,6
Some secondary	7 130 121	33,6	7 846 125	30,8	10 481 577	33,9
Grade 12	3 458 434	16,3	5 200 602	20,4	8 919 608	28,9
Tertiary education	1 512 602	7,0	2 151 336	8,5	3 644 617	11,7

[Source: *Census 2011 Fact sheet*]

3.1.1   The number of persons aged 20 years and older with no schooling increased from 1996 to 2001.

Explain, with calculations, why the table shows a lower percentage of persons with no schooling in 2001 compared to 1996.   (5)

3.1.2   In 2011, the number of persons who were 20 years and older was approximately 59,7% of the total South African population.

Determine the total number of persons who were younger than 20 years in 2011.   (4)

3.1.3   The total population in South Africa was 44 819 778 in 2001.

If a person was randomly chosen in 2001, determine the probability that the person's highest level of education would only be Grade 12.   (3)

3.2   Line graphs representing the highest level of education for persons 20 years and older for 1996 and 2001 have already been drawn on ANNEXURE A.

3.2.1   Use ANNEXURE A and TABLE 4 to draw the line graph that represents the highest level of education for 2011.   (6)

3.2.2   Describe TWO trends in the highest level of education by comparing Grade 12 and tertiary education from 1996 to 2011.   (4)

3.3   The percentage distribution (per province) of persons aged 20 years and older whose highest level of education was Grade 12 in 2011 is shown in the table below.

TABLE 5: Percentage distribution (per province) of persons with Grade 12 as highest level of education during 2011

Province	KZN	EC	FS	WC	NC	NW	GP	MP	LP
Percentage	30,9	19,8	26,8	28,2	22,7	25,2	34,4	29,0	22,4

KEY:

KZN – KwaZulu-Natal   EC – Eastern Cape   FS   – Free State
WC   – Western Cape   NC – Northern Cape   NW – North West
GP   – Gauteng   MP – Mpumalanga   LP – Limpopo

3.3.1   Explain why the total of the percentages in Table 5 does not add up to 100%.   (2)

3.3.2   Determine the province that had the median percentage of persons with grade 12 as the highest level of education in 2011.   (2)

3.3.3   For the data given above, the 25th percentile is 22,55% and the 75th percentile is 29,95%.

Identify the province(s) whose percentage distribution is less than the lower quartile.   (2)

3.3.4   Give a reason why each of the following types of graphs is NOT suitable to represent the above data:

(a)   A pie chart   (2)

(b)   A histogram   (2)

3.4   ANNEXURE B contains a map that shows the provincial boundary changes from 2001 to 2011. The provincial boundary changes are changes to the borders of provinces as a result of municipalities that were absorbed into other provinces.

3.4.1   Write down the names of the provinces which gained land from North West due to the boundary changes.   (2)

3.4.2   Tshidi resides at point T in the Northern Cape.
Determine, using measurement, the actual distance (TS) from Tshidi's home (T) to point S on the new boundary.
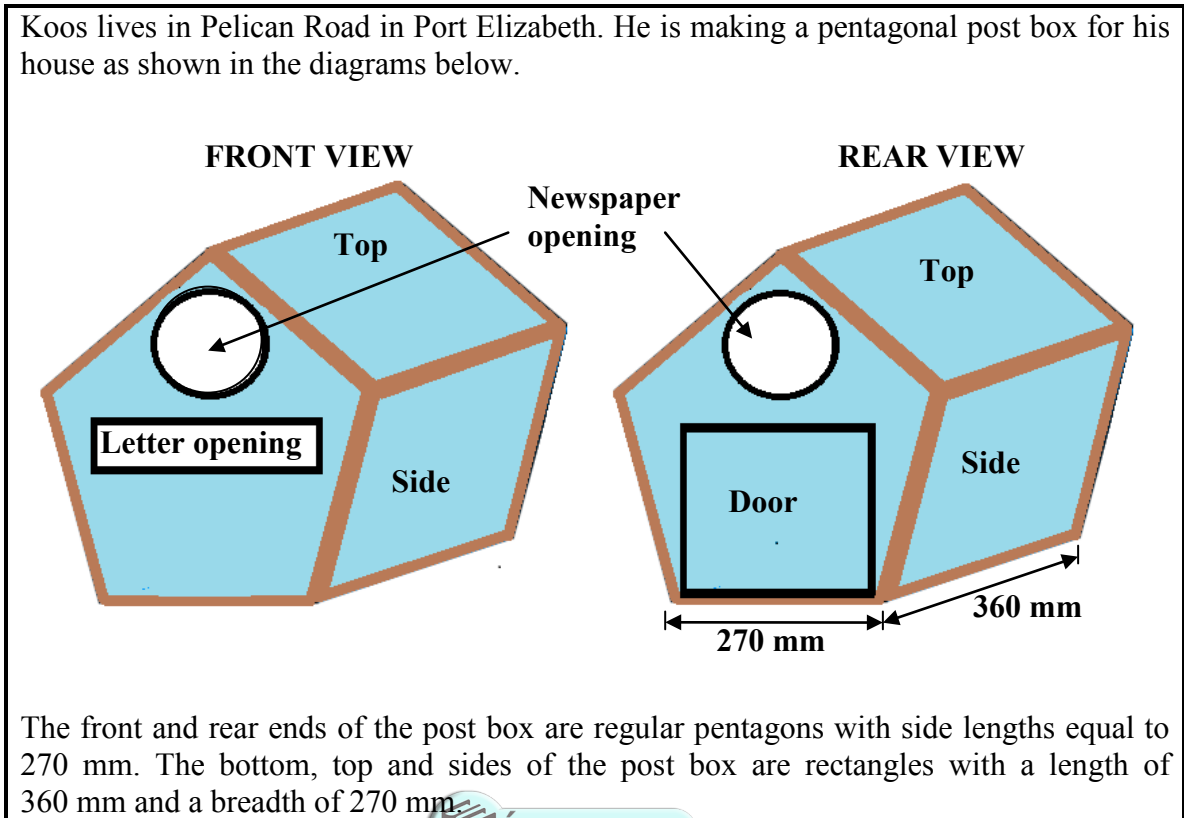Give your answer in kilometres.   (4)

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QUESTION 4

4.1   Koos lives in Pelican Road in Port Elizabeth. He is making a pentagonal post box for his house as shown in the diagrams below.

The front and rear ends of the post box are regular pentagons with side lengths equal to 270 mm. The bottom, top and sides of the post box are rectangles with a length of 360 mm and a breadth of 270 mm.

4.1.1   Calculate the perimeter of ONE of the pentagonal ends of the post box.   (2)

4.1.2   Calculate the total surface area (in m^2) of the post box (excluding the openings for the newspaper and letter), if the following are given:

SHAPE	AREA
Pentagon	0,13 m^2
Letter opening	0,017 m^2
Newspaper opening	0,013 m^2

The following formula may be used:

Area of a rectangle = length $\times$ breadth   (5)

4.1.3   A newspaper folded into a cylindrical shape has a diameter of 12 cm. The area of the newspaper opening of the post box is 0,013 m^2.

Show, with calculation, whether the folded newspaper will fit in the newspaper opening of the post box.

The following formula may be used:

Area of a circle = $\pi \times r^2$

where π = 3,14 and r = radius   (5)

4.2 | A courier company charges a certain rate for the delivery of ordinary parcels. It costs R30,50 to deliver an ordinary parcel for the first kilogram or less. If a parcel has a mass of more than 1 kg, there is an additional charge of R4,50 per kg. |

     4.2.1   Write down the formula that could be used to calculate the delivery cost of ordinary parcels of different masses.   (3)

     4.2.2   TABLE 6 below summarises the delivery cost of ordinary parcels according to mass.

Table 6: Delivery cost of an ordinary parcel according to mass

Mass (in kg)	0	0,5	1	2,5	3	**B**
Cost (in rand)	0	30,50	30,50	**A**	39,50	70,55

     Determine the missing values **A** and **B**.   (6)

     4.2.3   Use TABLE 6 above and the grid on ANNEXURE C to draw a line graph that represents the relationship between the delivery cost and mass of an ordinary parcel.   (6)

4.3   ANNEXURE D shows a section of the map of Port Elizabeth where Koos lives.

     Use the map on ANNEXURE D to answer the following questions:

     4.3.1   Koos was given directions to travel from his home to a particular place.

     From his home he should:

*   turn left into Pelican Road,
*   then turn left into Swift Road,
*   then turn left into Aylesbury Road,
*   then turn right into Coly Road,
*   then turn left into Villiers Road,
*   then turn right into 14th Ave, and
*   then drive across Main Road to his destination on the left-hand side.

     Determine the place that was Koos's destination.   (3)

     4.3.2   Zoliswa, a property developer, bought the vacant land enclosed by Swallow Crescent and Starling Crescent with a plan to build houses.

     She measured the vacant land and claimed that if she marked sites with an area of 0,15 cm^2 each on the map, she can get 14 sites on which she can build houses.

     Verify, showing all calculations, whether her claim is valid.   (4)
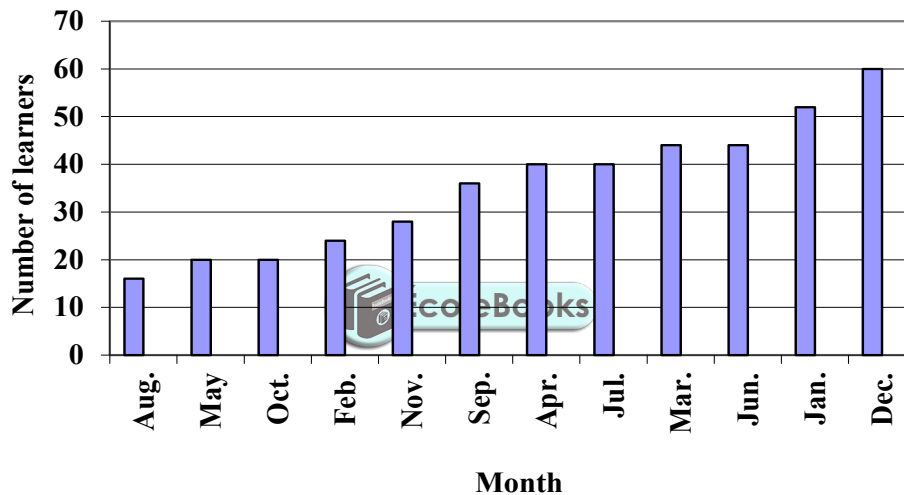
     [34]

QUESTION 5

5.1   Toni owns a driving school and she teaches learners how to drive.

Toni recorded the number of learners that passed their driver's licence test at the first attempt on a monthly basis for a full year. Below is a graph that she drew based on the data.

**NUMBER OF LEARNERS PASSING THE DRIVER'S LICENCE TEST AT THE FIRST ATTEMPT**

5.1.1   Give a possible explanation why the number of learners that passed their test the first time was more in December than in any other month of the year.   (2)

5.1.2   Determine the range of the number of learners passing the test at the first attempt.   (2)

5.1.3   Toni looked at the graph and claimed: 'There has been a marked increase in the number of learners that pass their driver's licence test the first time.'

Explain why her claim is INCORRECT. Give ONE example to justify your explanation.   (3)

5.2 | Toni charges the learners according to the payment options illustrated in the line graphs below. The line graphs only show the first 22 hours.

COST OF DRIVING LESSONS
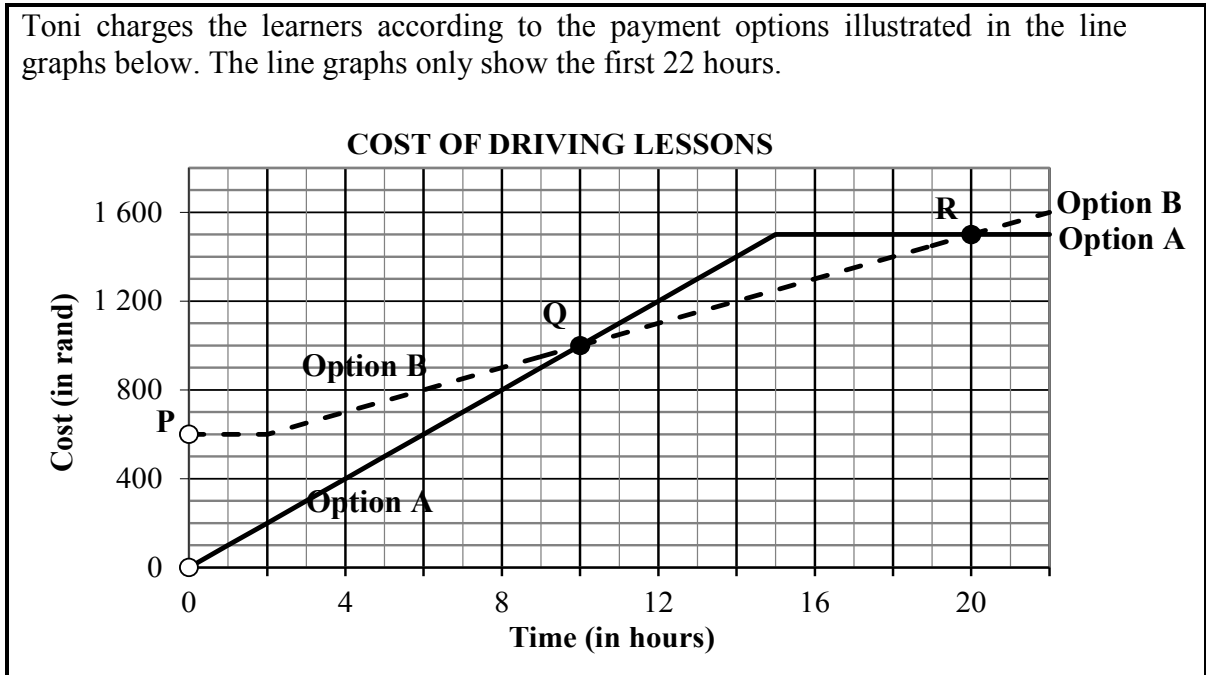
5.2.1   Interpret the horizontal section of the line graph for payment Option A.   (2)

5.2.2   Payment Option B starts at point **P**.

   (a)   Explain why point **P** is represented by an open circle on the graph.   (2)

   (b)   Describe in detail the cost of driving lessons if option B is used.   (3)

5.2.3   The graphs intersect at points **Q** and **R**. Interpret the graphs at point **Q**.   (2)

5.2.4   Zaheera budgeted R1 200 for her driving lessons.

   Explain which option would be better for:

   (a)   Zaheera   (2)

   (b)   Toni   (2)

5.2.5   In an attempt to further reduce the total cost of her driving lessons, Zaheera asks a friend to teach her some basic driving skills. After a series of free lessons with her friend, she realises that she only requires 6 hours of lessons from a driving school.

   Identify the option she should now choose. Explain your answer.   (3)

5.2.6   Calculate the difference in cost for a learner using OPTION A and another learner using OPTION B if they both require 30 hours of lessons.   (5)
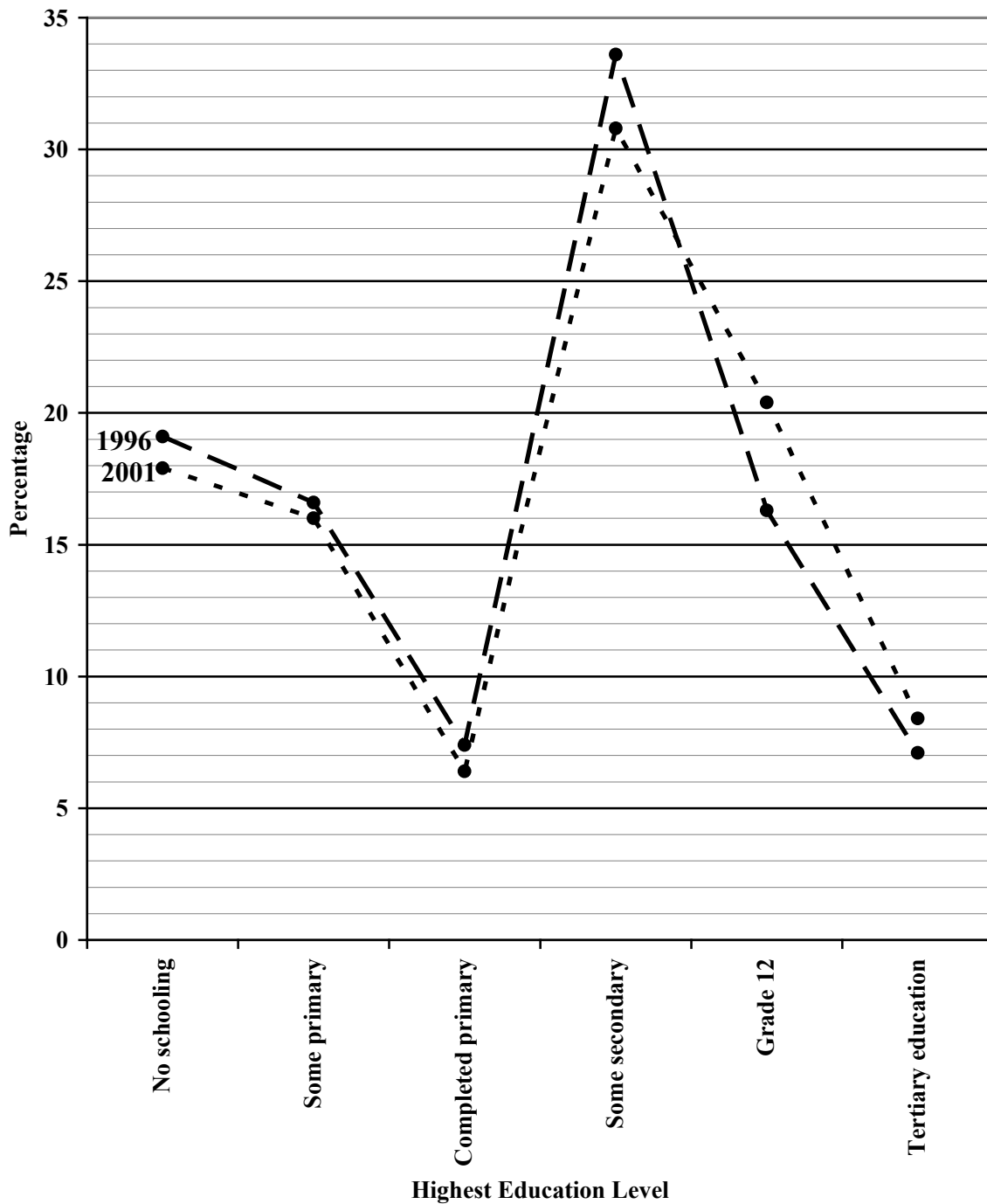
[28]

TOTAL: 150

ANNEXURE A

CENTRE NUMBER:
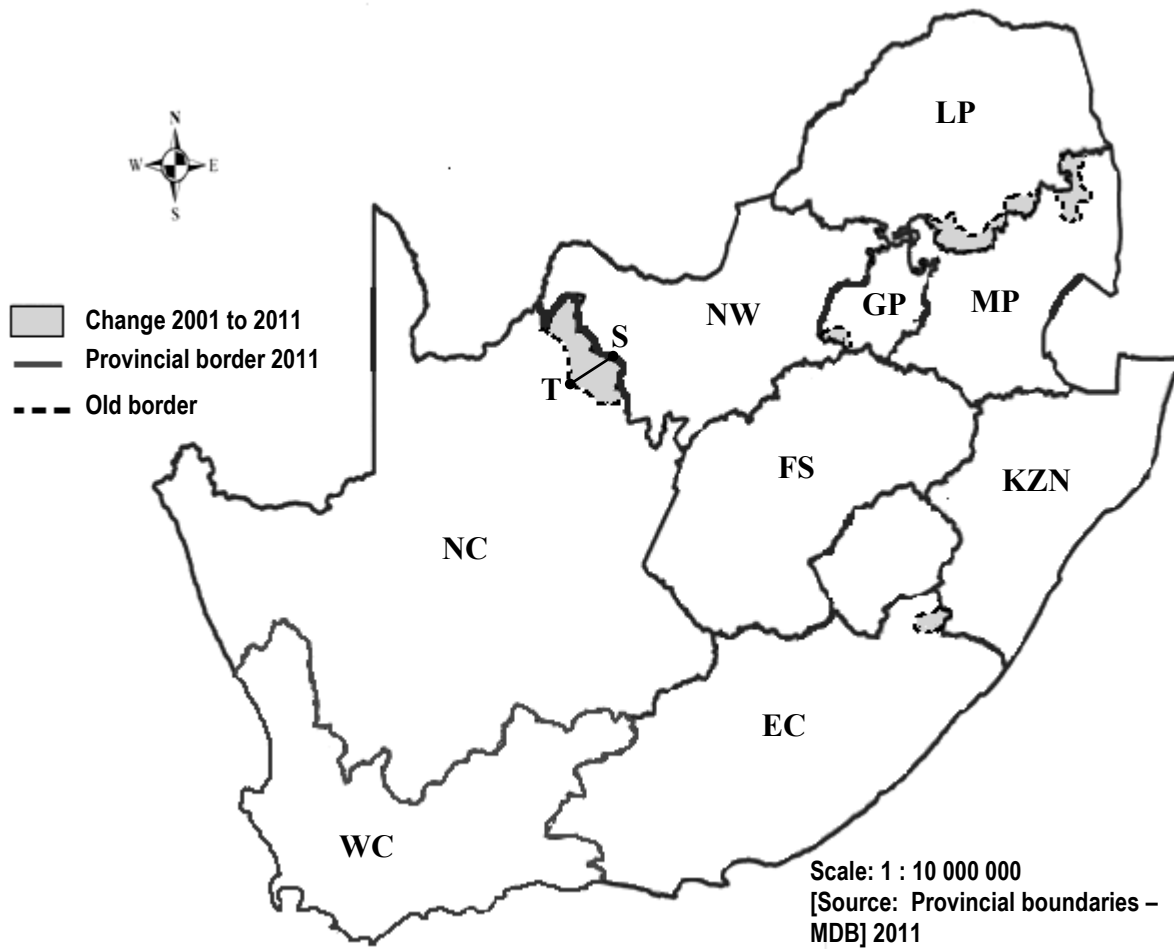
EXAMINATION NUMBER:

QUESTION 3.2.1

PERCENTAGE HIGHEST EDUCATION LEVEL

ANNEXURE B

QUESTION 3.4

Scale: 1 : 10 000 000
[Source: Provincial boundaries – MDB] 2011

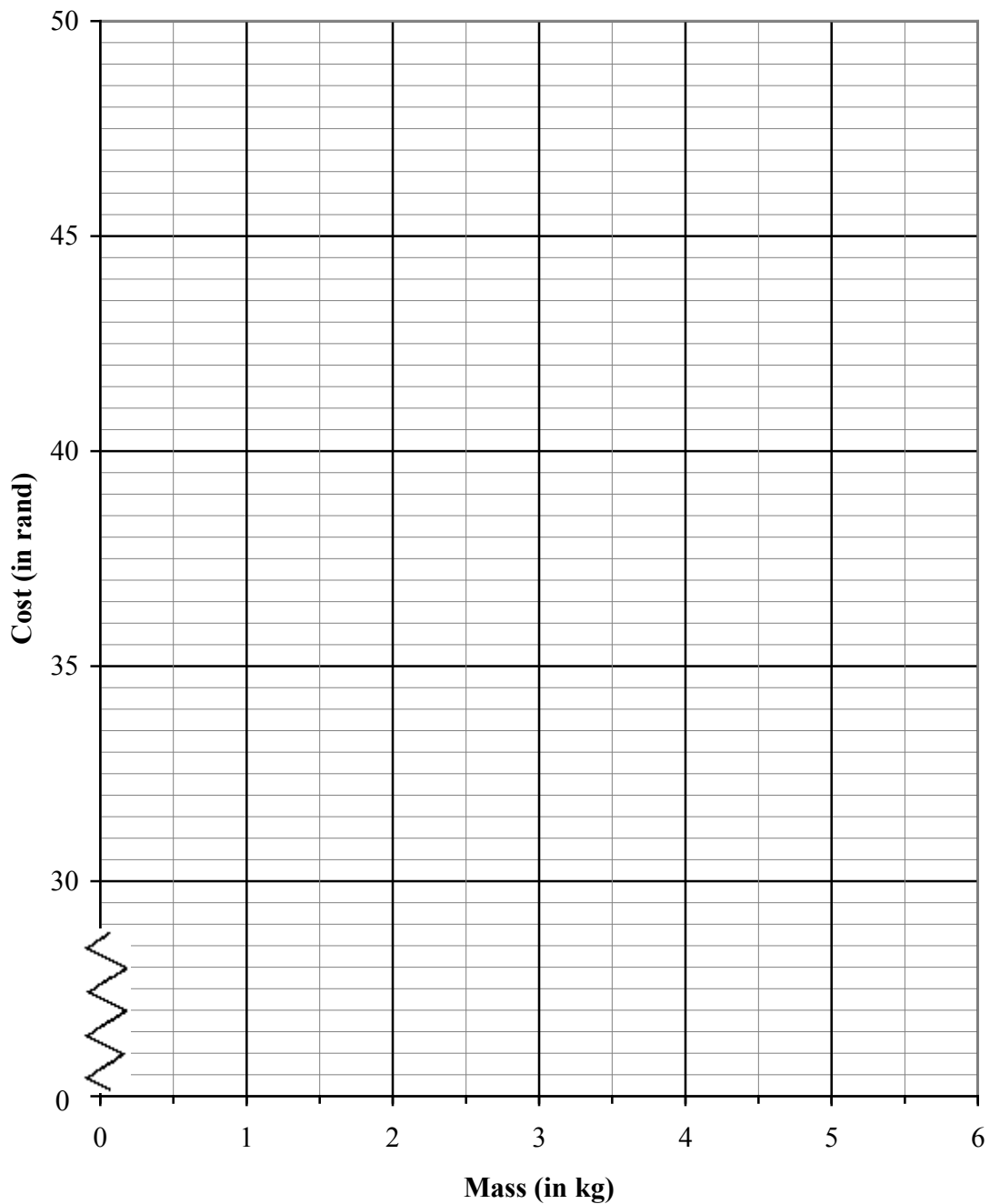| KZN – KwaZulu-Natal | EC – Eastern Cape | FS – Free State |
| WC – Western Cape | NC – Northern Cape | NW – North West |
| GP   – Gauteng | MP – Mpumalanga | LP – Limpopo |

ANNEXURE C

CENTRE NUMBER:

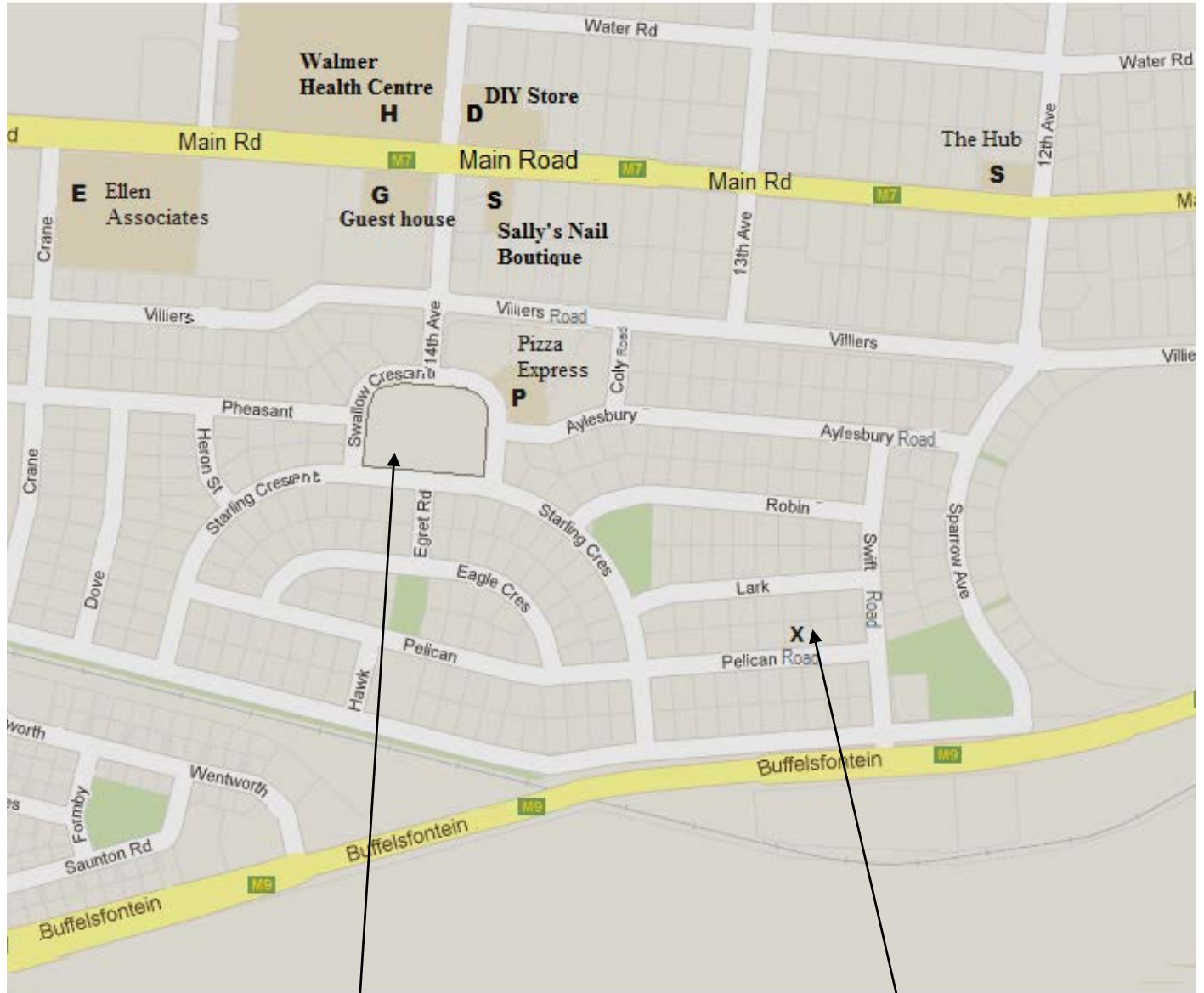**EXAMINATION NUMBER:**

QUESTION 4.2.3

COST OF ORDINARY PARCELS
ACCORDING TO MASS

ANNEXURE D

QUESTION 4.3

Vacant land

Koos's house