basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICAL LITERACY P2

FEBRUARY/MARCH 2014

MARKS: 150

TIME: 3 hours

MATHEMATICAL LITERACY: Paper 2
1060E
10602E

This question paper consists of 14 pages and 2 annexures.

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GAUTENG

INSTRUCTIONS AND INFORMATION

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

2. Answer QUESTION 1.3.3 on ANNEXURE A and QUESTION 2.2.2 on ANNEXURE B. Write your centre number and examination number in the spaces on the ANNEXURES and hand in the ANNEXURES together 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 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.

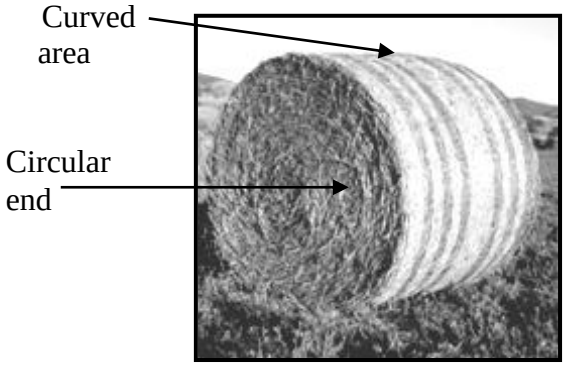
10. Write neatly and legibly.

QUESTION 1

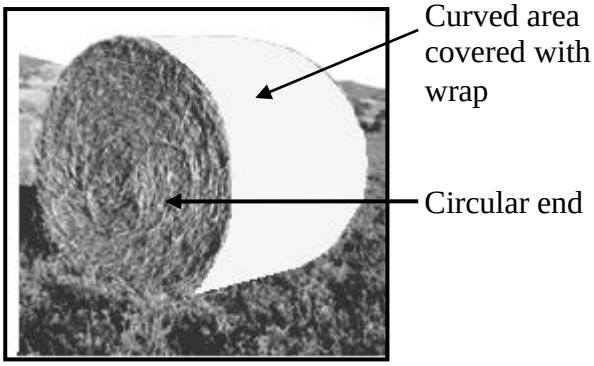
1.1 Mathys is the owner of Roseleigh farm. He makes bales of hay in order to feed his livestock (cattle, sheep and horses) during winter.
[Hay is a mixture of grass, clover, barley and wheat plant materials.]

The hay is allowed to dry and then picked up by machines to be processed into cylindrical bales. A cylindrical bale has a curved side and two circular ends, as shown in the photographs below. The curved side of each bale is covered with a rectangular wrap in order to control moisture. The wrap repels moisture but leaves the circular ends exposed so that the hay can breathe.

Photograph of cylindrical bale of hay



Photograph of wrapped cylindrical bale of hay



1.1.1 Each cylindrical bale has a radius of 70 cm. Its height is the same length as the diameter.

The area of the wrap is 6% more than the curved area of the cylindrical bale.

Calculate the area of the wrap required to cover the curved area of ONE bale.

The following formula may be used:

Curved area of a cylinder = 2 $\times \pi \times$ ***r*** $\times$ ***h***
Use π **= 3,14**, where ***r*** **=** radius of the cylinder and ***h*** = height of the cylinder. (6)

1.1.2 The bales must conform to a standard ratio of volume to total surface area that is less than 25 **:** 1.

Determine, by calculation, whether Mathys's bales conform to the standard ratio.

The following formulas may be used:

Volume of a cylinder = $\pi \times r^2 \times h$
Total surface area of a cylinder = 2 $\times \pi \times$ ***r*** **(*r* + *h*)**
Use π **= 3,14**, where ***r*** **=** radius of the cylinder and ***h*** = height of the cylinder. (6)

1.1.3 The temperature of each bale must be controlled to prevent fermentation (decay due to moisture) and combustion (burning due to dryness).

The table below gives guidelines for actions to be taken for different bale temperatures.

TABLE 1: Guidelines for actions to be taken for different bale temperatures

Bale temperatures	Action to be taken
Lower than 120 °F	None
120 °F to 140 °F	Separate from the rest of the bales to cool off
Higher than 140 °F	Separate from the rest of the bales and destroy

Mathys measures the temperature of a specific bale. He finds it to be 55 °C and then destroys the bale.

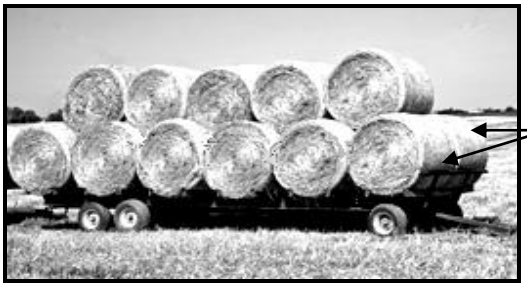
Determine, showing ALL the necessary calculations, whether the action taken by Mathys is correct.

The following formula may be used:

Temperature in °F $= \frac{9}{5} \times$ **Temperature in °C + 32°** (3)

1.2 Mathys has to transport the bales with a trailer.

The photograph below shows an example of a stack of two layers of bales loaded onto a trailer.



Only the bottom layer of bales on the trailer consists of two rows of 6 bales each to ensure balance. The 2nd layer of bales on the trailer consists of one row of 5 bales. Each subsequent layer that has to be stacked has one less bale than the previous layer.

Determine the total number of bales that can be loaded onto the trailer in this way if FOUR layers of bales are to be stacked. (5)

1.3 Mathys calculates that each cow needs to be fed an average of 12 kg of hay daily. Each bale weighs 1 440 kg.

1.3.1 Determine the maximum number of days one bale will last if it is used to feed 10 cows. (3)

1.3.2 Write down a simplified formula that can be used to calculate the maximum number of days one bale will last if it is used to feed a number of cows. (3)

1.3.3 Use the equation obtained in QUESTION 1.3.2, or otherwise, to draw a curve, on ANNEXURE A, showing the maximum number of days one bale can last if it is used to feed a number of cows. (5)

[31]

QUESTION 2

The school governing body (SGB) of Onverwag High School was concerned about the high cost of transporting learners for educational excursions. It was decided to raise funds to purchase a school bus in five years' time.



2.1 The current purchasing price of a new bus is R650 000,00.

Calculate the purchase price of a new bus at the end of five years if the purchase price of a new bus increases by 7,2% per annum due to inflation.

The following formula may be used:

$A = P(1 + i)^n$, where

A = increased value P = initial value
i = annual interest rate n = number of years (3)

2.2 The old students' union of Onverwag High School agreed to assist the SGB in raising the funds to purchase a new school bus. A decision was made to have quarterly meetings of the old students' union. Each old student attending would contribute R400,00 per meeting. The meetings would only be held when at least 10 old students attended. An amount of R1 000 would be given to the school to award the top achievers in that quarter if more than 20 old students attended the quarterly meeting. The balance of the quarterly contributions by the old students was donated towards buying a new school bus and was deposited into a special savings account.

2.2.1 The following formula can be used to calculate the quarterly amount to be donated towards buying a new school bus if 10 to 20 old students attend the quarterly meeting:

Amount (in rand) = 400*n*
where n = the number of old students attending the meeting

Write down a formula that can be used to calculate the quarterly contribution made towards buying a new school bus if more than 20 old students attended the quarterly meetings. (2)

2.2.2 Use the formulas in QUESTION 2.2.1 to draw TWO line graphs on ANNEXURE B, showing the quarterly amount that the old students contributed towards buying a new school bus at each meeting, if at least 10 old students and a maximum of 35 old students attended the meetings. (7)

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2.2.3 Use the formulas in QUESTION 2.2.1 or the graphs drawn for QUESTION 2.2.2 to answer the following:

Determine the number of old students who attended a specific meeting if an amount of R8 600 was contributed towards buying a new school bus. (2)

2.3 The SGB also made regular quarterly deposits of R40 000, which included the old students' contribution, into a special savings account at the beginning of each quarter over five years. The total accumulated amount of these savings including interest was R911 408,73.

2.3.1 Calculate the total amount of interest earned over the five years. (4)

2.3.2 The attendance of old students at each quarterly meeting for the five years was as follows:

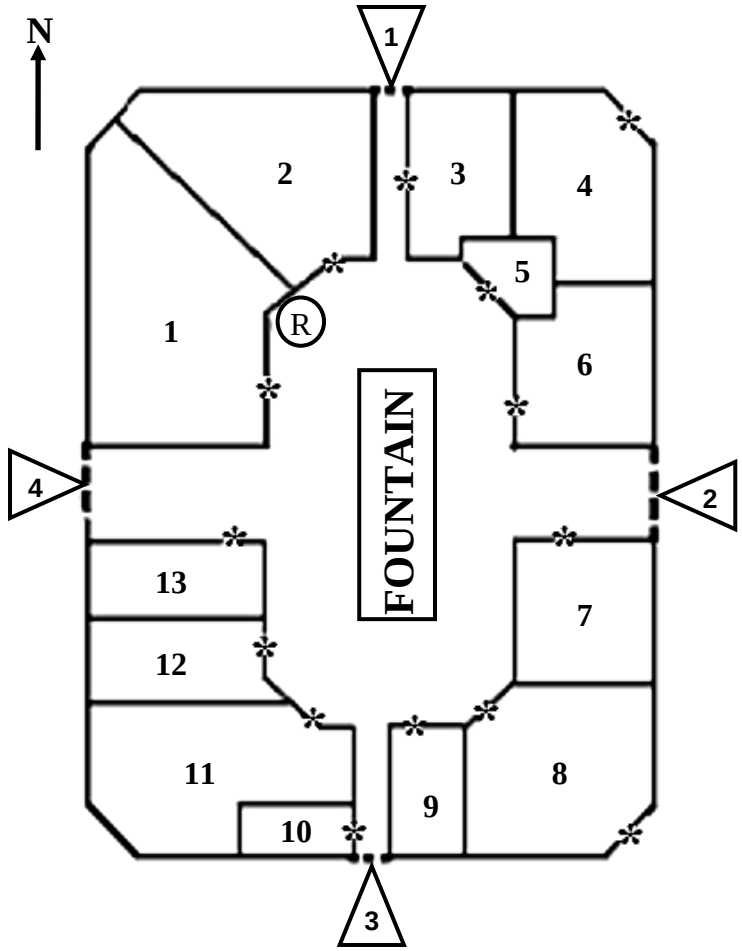
- During the first year an average of 18 old students, but not more than 20, attended each meeting.
- During the next three years an average of 25 old students were present at each meeting, but more than 20 always attended.
- During the last year an average of 35 old students were present at each meeting, but more than 20 always attended.

The chairman of the SGB stated that the old students' unions contributed 25% of the total amount deposited into the special savings account.

Determine whether his statement is correct. (8)
[26]

QUESTION 3

A new shopping mall has opened in Roseville. The layout plan as well as the store directory of Roseville Shopping Mall is shown in the diagram below.



Store Directory

Name Type of store	Shop number
Amani Men's clothing	6
Cash 4 U Pawn shop	4
Stitches Women's clothing	7
Aéro Men's clothing	9
Super Store Groceries	1
Rings & Beads Accessories	13
AE Food Groceries	8
Ricks' Sport Sport equipment	3
Hallmark Cards & Gifts	5
Gems & Jewels Jewellers	12
Pixi Children's clothing	11
ZZ Bank Bank	2
Cafe Teen Coffee shop	10

3.1 Nkululeko and Peggy agree to meet at Cafe Teen.

3.1.1 Nkululeko enters the shopping centre through the western entrance.

Give the general direction that she will have to walk to reach AE Food. (2)

3.1.2 Peggy buys gifts at Hallmark.

Describe the route she has to take from Hallmark to walk to Cafe Teen. (2)

3.1.3 Name the store that cannot be entered from inside the mall. (1)

3.1.4 Nkululeko looks at the names and positions of stores given in the store directory and remarks that she finds the store directory confusing.

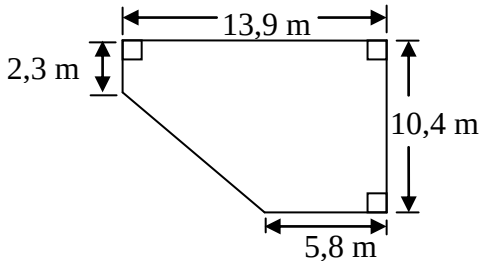
Give TWO possible reasons to support her remark. (2)

3.1.5 Determine the probability that if Peggy randomly chose to visit one of the stores, this store would be a clothing store. (2)

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3.2 The Hallmark store is in the shape of a pentagon. The floor plan of the store has the following dimensions as indicated in the diagram below:

Floor plan of the store



3.2.1 Calculate the total floor area of the store.

You may use the following formulae:

Area of a rectangle = length × breadth

Area of a triangle = $\frac{1}{2}$ × base × height

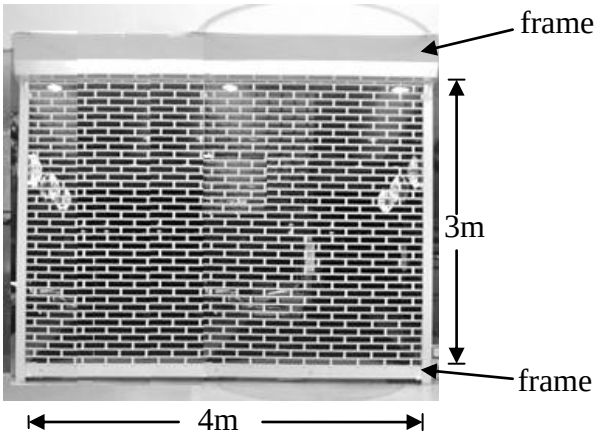
Area of a trapezium = $\frac{1}{2}$ × (sum of the parallel sides) × height (6)

3.2.2 Use the dimensions given for the Hallmark store. Determine, using accurate measurement, the distance (to the nearest 10 metres) from the northern entrance door to the southern entrance door of the mall. (4)

3.2.3 Hallmark's entrance has a security curtain gate, which is shown in the photograph alongside.

The security curtain gate, excluding the frame, has a mass of 4,7 kg/m^2.

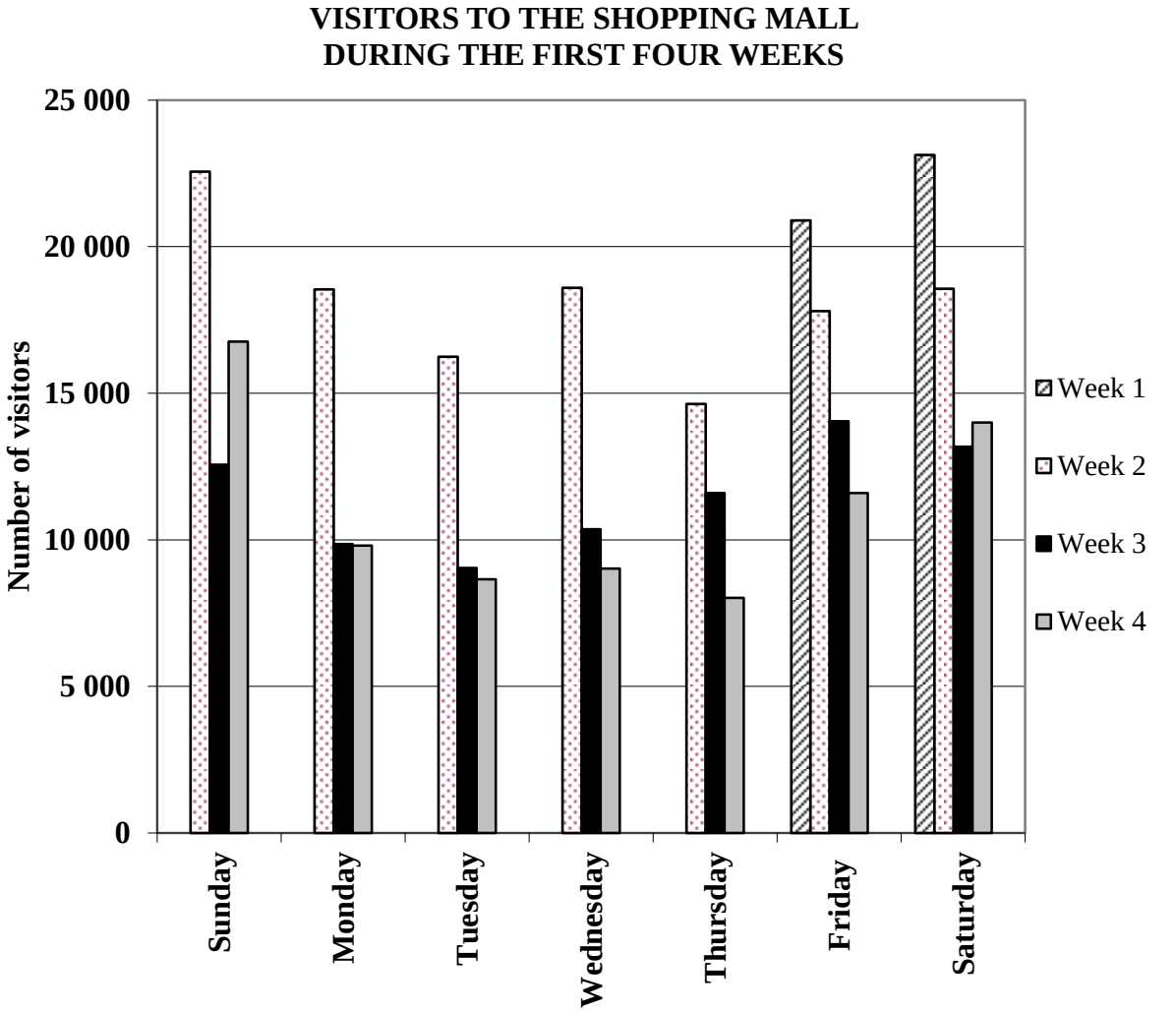
The material that is used to make the security curtain gate, excluding the frame, costs R12,50 per kilogram.



Photograph of security curtain gate

If the dimensions of the curtain gate, excluding the frame, are 3 m × 4 m, determine whether the cost of the material to make the security curtain gate exceeds R800. (5)

3.3 The manager of the shopping mall kept a record of the number of visitors to the shopping mall during the first four weeks.



3.3.1 On which day of the week did the shopping mall open for business for the first time? Explain your answer. (2)

3.3.2 The mall manager stated that the mall was the busiest from Fridays to Sundays.

Explain why the manager was justified in making this statement. (2)

3.3.3 Determine the week and the day during which the shopping mall had the least number of visitors. (2)

[30]

QUESTION 4

4.1 Thandi is a Grade 12 learner who is interested in the composition of the South African population. She found information from Census 2011 about the population distribution of South Africa during 2001 and 2011.

TABLE 2 below shows the population distribution of South Africa during 2001 and 2011, according to race.

NOTE: In South Africa citizens are classified as black, coloured, white or Indian.

TABLE 2: Population distribution of South Africa during 2001 and 2011, according to race

	PERCENTAGE OF DIFFERENT RACE GROUPS				TOTAL POPULATION
	Black	**Coloured**	**White**	**Indian**	
2001	79,0	8,9	9,6	2,5	44 819 778
2011	**P**	9,0	8,9	2,5	51 770 560

[Source: Statsa.gov.za]

4.1.1 Determine, using the value of **P**, the number of black people in South Africa in 2011. (4)

4.1.2 In 2001, 48,36% of white people in South Africa were male.

Thandi calculated that the actual number of white males in South Africa in 2001 was 2 080 780.

Determine whether Thandi's calculation is correct. (5)

4.1.3 Thandi stated that the actual number of Indians in South Africa was the same in 2001 and 2011.

Determine, showing ALL calculations, whether her statement is valid. (3)

4.2 The table below shows data relating to the gender and age of the South African population for 1996, 2001 and 2011.

TABLE 3: South African population according to gender and age

		Census Year		
		1996	**2001**	**2011**
Gender	**Male**	19 520 887	21 434 041	25 188 791
	Female	21 062 685	23 385 737	26 581 769
Age (in years)	**0–14**	13 766 443	14 365 288	15 100 089
	15–64	24 882 465	**A**	33 904 480
	65 and older	1 934 664	2 215 211	2 765 991

[Source: Statsa.gov.za]

4.2.1 (a) Determine the missing value **A**. (2)

(b) The ratio of males to females during 1996 was approximately 1 **:** 1,08.

Use this ratio to determine the gender distribution of 100 babies born during 1996. (3)

4.2.2 The dependency percentage is used to calculate the percentage of people in a population that are dependent upon other people due to their age.

The following formula is used to calculate the dependency percentage:

$$\textbf{Dependency percentage} = \frac{n + m}{p} \times 100\%$$

where:
n = the number of persons 0–14 years
p = the number of persons 15–64 years
m = the number of persons 65 years and older

(a) Calculate the difference between the dependency percentages of the South African population from 1996 to 2011. (5)

(b) Hence, give a possible reason for the change in the dependency percentage of the South African population from 1996 to 2011. (2)

4.3 Thandi lives in Port Elizabeth and wanted to know how many learners in South Africa own at least one cellphone. She could not find this data anywhere and decided to do her own survey in ten schools in her city.

TABLE 4 below shows the data collected from the ten schools, which have an average of 1 400 learners.

TABLE 4: Survey of learners who own at least one cellphone

School	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Number of learners	814	921	1 201	1 290	**Q**	966	864	**P**	828	829

4.3.1 School 8 has the smallest number of learners who own cellphones and School 5 does not have the highest number of learners who own cellphones.

Calculate the missing value **P** if the range of the number of learners who own at least one cellphone is 569. (3)

4.3.2 Hence, calculate the missing value **Q** if the mean number of learners who own at least one cellphone is 936. (4)

4.3.3 Hence, calculate the median number of learners who own at least one cellphone. (3)

4.3.4 Thandi concluded from the data that more than 70% of learners in South Africa own at least one cellphone.

Paul stated that her conclusion was not valid.

Give TWO possible reasons to justify Paul's statement. (4)
[38]

QUESTION 5

Financial institutions granting home loans use a loan factor table to determine the monthly repayment on a home loan.

TABLE 5 below is a loan factor table that shows the monthly repayments per R1 000 on a home loan with interest rates ranging from 14,25% to 16% per annum, over 15, 20, 25 or 30 years.

TABLE 5: Loan factor table for calculating monthly repayments on a home loan per R1 000

Annual Interest Rate	LOAN FACTOR			
	15 years	20 years	25 years	30 years
14,25%	13,49	12,62	12,23	12,05
14,50%	13,66	12,80	12,42	12,25
14,75%	13,83	12,98	12,61	12,44
15,00%	14,00	13,17	12,81	12,64
15,25%	14,17	13,35	13,00	12,84
15,50%	14,34	13,54	13,20	13,05
15,75%	14,51	13,73	13,39	13,25
16,00%	14,69	13,91	13,59	13,45

[Source: *Property and Tax Guide 2012*]

The monthly repayment can be calculated using the following formula:

Monthly repayment (in rand) = (loan amount ÷ 1 000) × loan factor

5.1 The National Credit Act (NCA) stipulates that the home loan amount that a person qualifies for should be calculated based on disposable income*.

[*Disposable income – the total amount of money a person has available in a month, after all compulsory expenses have been deducted from the person's gross salary]

Pragashni is planning to buy a house and has a disposable income of R17 550 per month.

5.1.1 Calculate the maximum loan amount she qualifies for if she wants to take a loan over 25 years at an interest rate of 15,25% per annum. (4)

5.1.2 Give TWO possible reasons why it would not be advisable for her to take the full maximum loan amount that she qualifies for. (4)

5.2 Pragashni has home loan options from EP Bank and STL Bank. To make a comparison, she summarised the two options in TABLE 6 below.

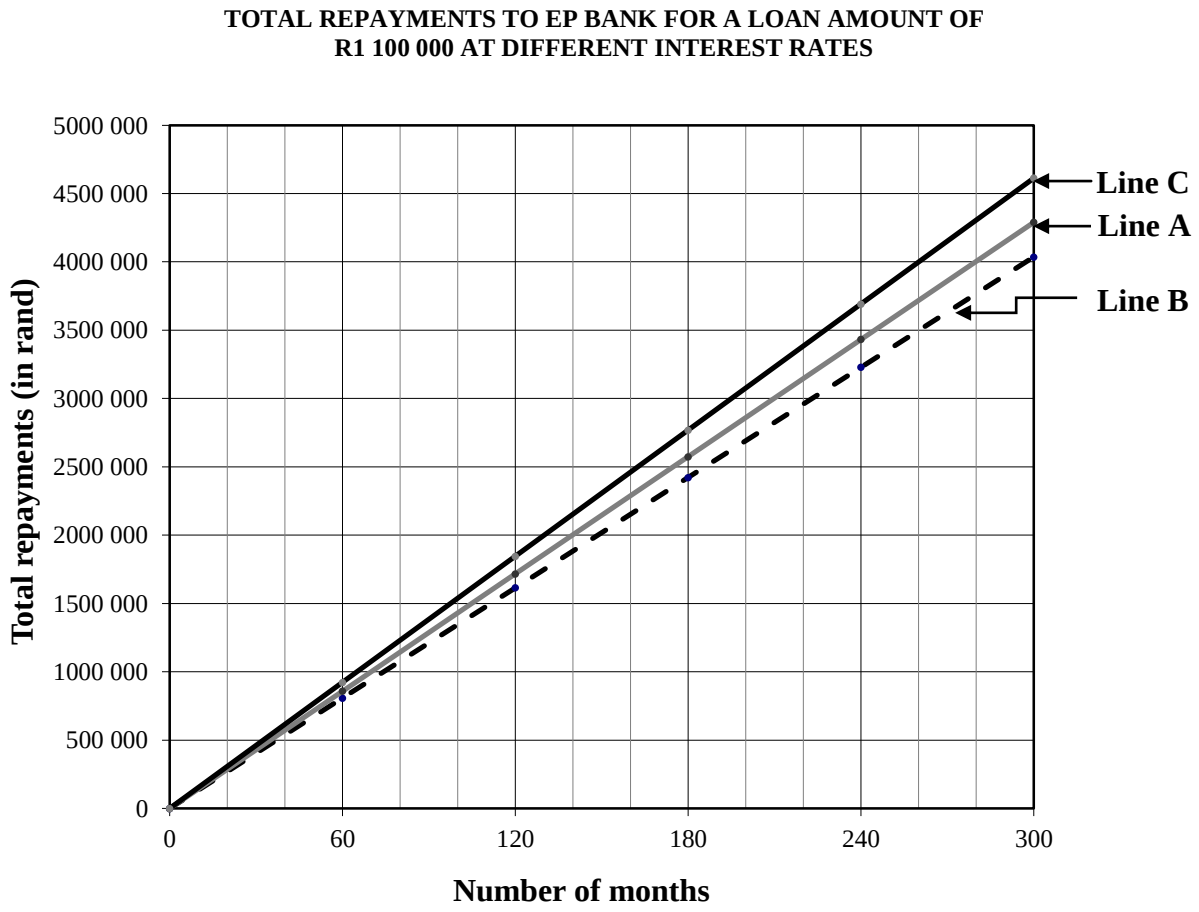
TABLE 6: Comparison of home loan options

	EP BANK	STL BANK
Loan amount	R1 100 000	R1 100 000
Loan period in years	25	20
Annual interest rate	15,25%	16%
Total repayment	R4 290 000	***x***

5.2.1 Determine, showing ALL calculations, which home loan option will be advisable for her to choose by using the missing value for ***x***. Give ONE reason for this choice. (8)

5.2.2 She can afford a maximum of R13 255 for her monthly repayments. Determine, showing ALL calculations, the period and interest rate that will best suit her needs. (5)

5.3 Line A in the graph below shows the loan option that was offered to Pragashni by EP Bank at an interest rate of 15,25% per annum.



Identify the line that shows a loan option at 14,25% and the line that shows a loan option at 16%. Give a reason for your answer. (4)

[25]

TOTAL: 150

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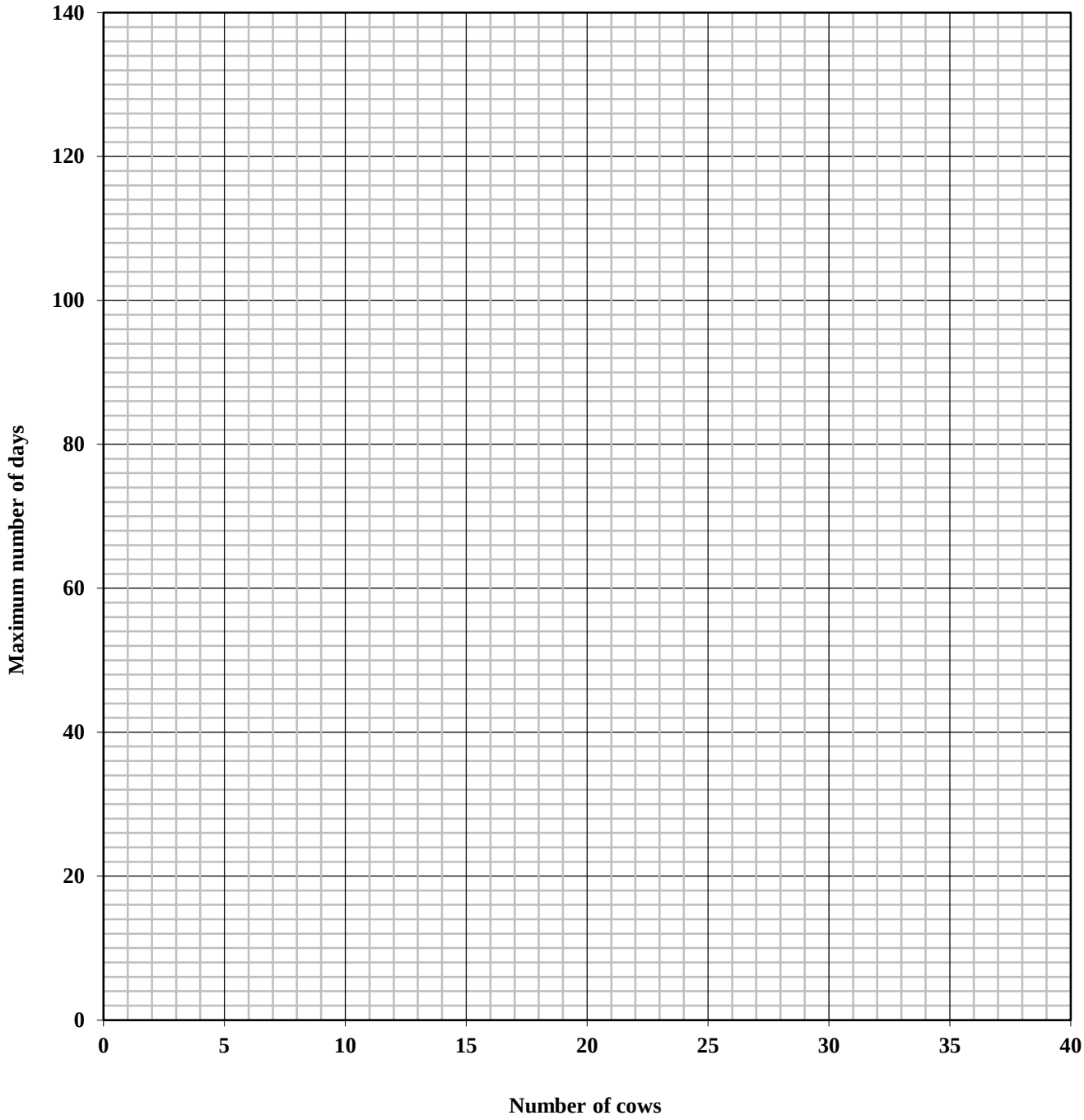
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ANNEXURE A

QUESTION 1.3.3

MAXIMUM NUMBER OF DAYS ONE BALE WILL LAST TO FEED A NUMBER OF COWS



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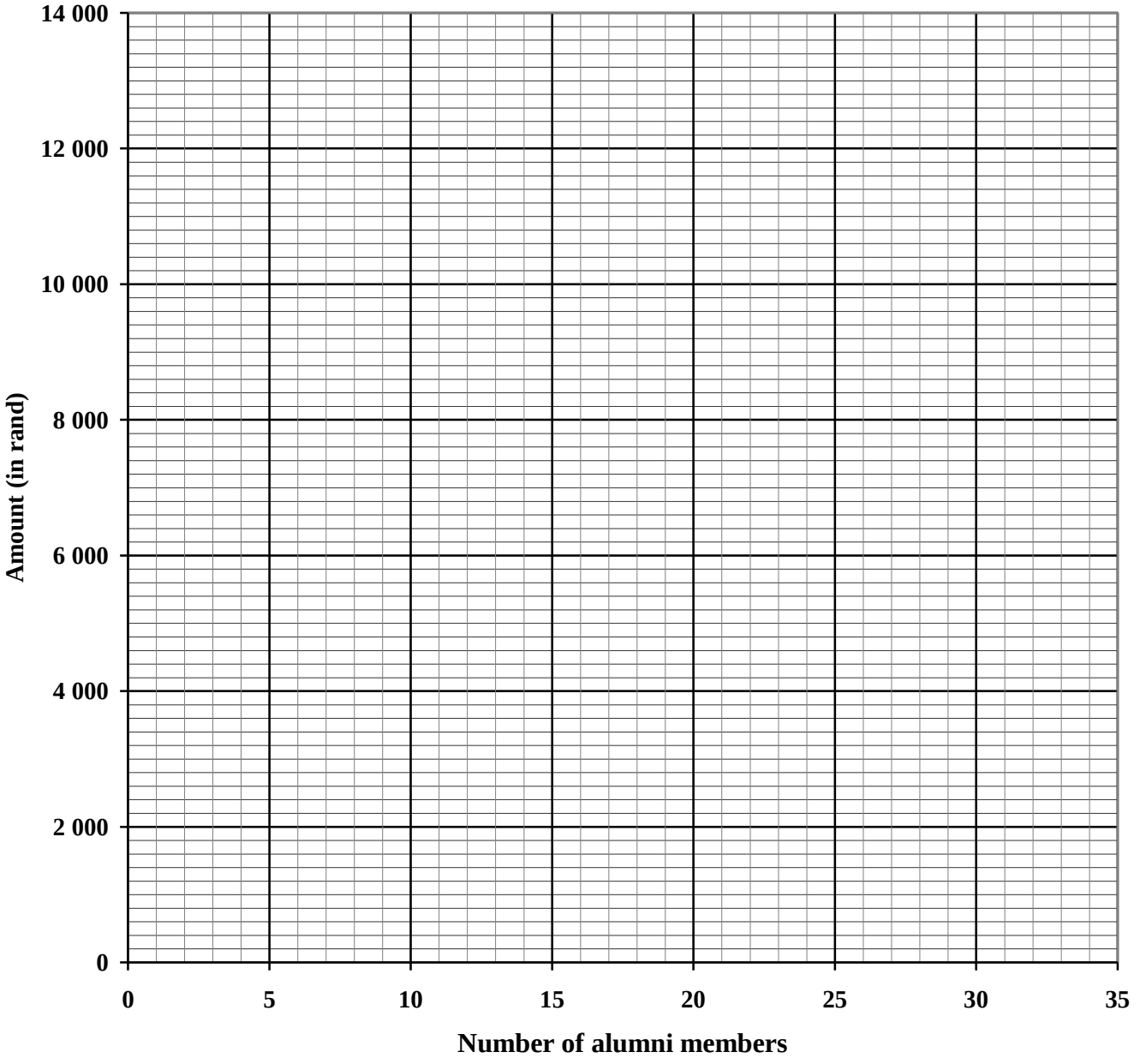
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ANNEXURE B

QUESTION 2.2.2

QUARTERLY CONTRIBUTION BY OLD STUDENTS' UNION TOWARDS BUYING A NEW SCHOOL BUS



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