basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

MATHEMATICAL LITERACY

SELF-STUDY GUIDE

GRADE 12

BOOK 1

PREFACE

The Department of Basic Education has noted that, whilst Mathematical Literacy remains one of the subjects with a high pass rate, in a considerable number of schools teachers teaching Mathematical Literacy lack the necessary skill and knowledge. It has to be noted that at the time of the implementation of the subject there were no professional teachers specifically trained to teach it.

Mathematical Literacy continues to provide an important role in the FET band in terms of providing access to a level of numeracy to many learners who, without the option of Mathematical Literacy, may have opted not to take mathematics at all. It is also one of the accredited subjects for university admission purposes. That is, it is one of the subjects considered for accumulating credit points required for admission at universities and for certain programmes. However, different universities allocate different points for all subjects.

This Self-Study Guide does not intend to present the entire Mathematical Literacy curriculum. Rather, model examination items have been used in explaining concepts and addressing common mistakes or errors done by learners. Model answers are provided as well. Focus is also on the contexts within which the problems are to be solved.

Whilst it is understood that there are no concepts or terms that are exclusively applicable to Mathematical Literacy language register, it has been established that the use of language in the subject is crucial. In Mathematical Literacy learners either have difficulty in interpreting the discourse on the context within which a problem is presented or fail to attach a mathematical meaning to a particular concept. In an attempt to alleviate the latter challenge, the Mathematical Literacy Self-Study Guide Book 1 concludes by providing explanations of some of the common mathematical concepts. It has to be indicated that the list is not exhaustive.

Although the content and/or skills in MATHEMATICS are organised and categorised according to topics, problems encountered in everyday contexts are never structured according to individual content topics. Rather, the solving of real-life problems commonly involves the use of content and/or skills drawn from a range of topics, and so, being able to solve problems based in real-life contexts requires the ability to identify and use a wide variety of techniques and skills integrated from across a range of content topics. For this reason, the sections in the Guides are not necessarily Mathematical Literacy topics. They simply denote content and/skills drawn from a particular context.

The Mathematical Literacy Self-Study Guide Book 1 has been pitched at the level of Paper 1. The Self-Study Guide Book 2 that has been pitched at the level of Paper 2 will be available by 01 April 2013.

NB: Whilst every effort has been taken to rectify errors, it is possible that some have not been picked up. Should you come across any error as you work with these Self-Study Guides write to masango.t@dbe.gov.za so that we can rectify them for future editions.

Table of Contents

SECTION A: Basic Mathematical Calculations

1. Write $\frac{49}{140}$ as a decimal.	To write a fraction as a decimal means converting that fraction to a decimal or giving a decimal that is equivalent to the fraction. You would require a calculator to do that.
Solution: $\frac{49}{140}$ = 0,35	
2. Simplify 65 : 208.	This means write the ratio in its simplest form. The first thing here is to find a common factor between 65 and 208 (other than 1), i.e. a number that divides both 65 and 208. **That number is 13.**
Solution: 65 : 208 = 13 x 5 : 13 x 16 = $\frac{13 \times 5}{13} : \frac{13 \times 16}{13}$ = 5 : 16	
3. Convert 2,35 ℓ to mℓ.	Here we are converting from litres to millilitres. You should know that a litre is bigger than a millilitre or conversely a millilitre is smaller than a litre. So there are *a number* of millilitres in a litre. Find that number! That number is 1000. Hence: **1 ℓ = 1000 mℓ**. (ALWAYS do this analysis as it will tell you if you need to divide or multiply in the conversion.) That is, there are: • 1x1000 millilitres in 1 litre; • 2x1000 millilitres in 2 litres; and therefore • 2,35x100 millilitres in 2,35 litres.
Solution: 2,35 ℓ = 2,35 × 1 000 mℓ = 2 350 mℓ	
4. Convert R1 360,00 into dollars, where $1 = R8,50.	Here you are required to convert R to $ and yet you are given $ to R. (That is, $1 = R8,50.) If R8,50 = $1, Then $\frac{R8,50}{8,50} = \frac{\$1}{8,50}$ That is R1 = $\frac{\$1}{8,50}$ Therefore to convert any amount (say x) in R to $ you simply need to divide that number by 8,50 and write the answer in dollars ($). e.g. If $1 = R8,50 then R425,00 = $ 50.
Solution: R1 360,00 = $\$\frac{1\ 360}{8,50}$ = $160	

5. Calculate: $\frac{3}{4} \times (4)^3 - \sqrt{25}$	It is always advisable that you first simply the expression before using a calculator. Work out each term of the expression such that it is in its simplest form. Take note that there are **two** terms in this expression (one subtracted from the other), viz.: $\frac{3}{4} \times (4)^3$ and $\sqrt{25}$. Then apply your BODMAS rule, in this case first workout $(4)^3$ in the first term before multiplying the answer by $\frac{3}{4}$. Then the first term in its simplest form becomes 48, where the second term in its simplest form becomes 5. You may now subtract 5 from 48.
Solution: $\frac{3}{4} \times (4)^3 - \sqrt{25} = \frac{3}{4} \times 64 - 5$ $= 48 - 5$ $= 43$	
6. Decrease R1 360,00 by 14%.	This is the same as saying calculate: R1 360,00 - (14% of R1 360,00). We therefore need to find out what is 14% of R1 360,00 before we can do the decrease (subtract).
Solution: $14\% \times$ R 1 360,00 $= \frac{14}{100} \times$ R1 360,00 = R190,40 New amount = R1 360,00 – R190,40 = R1 169,60	
7. Determine the number of 2,5 m lengths of material that can be cut from a roll of material that is 40 m long.	That is, the number of lengths you would find when you cut material that is 40 m long into equal lengths of 2,5 m.
Solution: Number of lengths $= \frac{40m}{2{,}5m}$ = 16 lengths	
8. Convert 220 °C to °F using the following formula: **Temperature in °F = (Temperature in °C $\times \frac{9}{5}$) + 32°**	Each time a formula is provide all what is required is the correct SUBSTITUTION and the calculations. Here we are to convert °C to °F and the given formula is already in °F.
Solution: Temperature in °F = (Temperature in °C $\times \frac{9}{5}$) + 32° = (220° $\times \frac{9}{5}$) + 32° = 396°F + 32°F = 428°F	

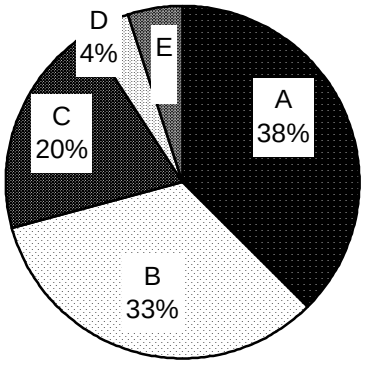
SECTION B: Working with Percentages on a Pie Chart

Nontokozo and Daniel compared the way they spend the 24 hours in one particular school day. They drew pie charts to illustrate the time spent on different activities shown in the table below:

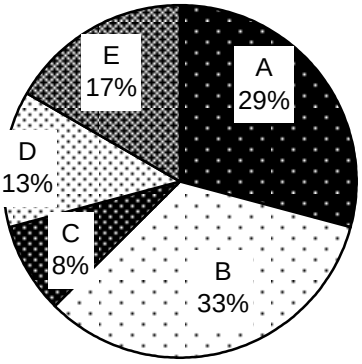
Symbol	Activity
A	Spent at school and travelling to school
B	Eating, sleeping and bathing
C	Doing homework
D	Doing extra-curricular activities
E	Watching television

Study the pie charts and answer the questions below

Nontokozo's 24-hour day



Daniel's 24-hour day



1. Name TWO activities that are extra-curricular activities.

Answer:

Any sport activity (rugby, netball, soccer, swimming etc), any cultural activity (dance, debating choir etc) or any other club activity (SCA – students Christian association etc.)

Activities beyond (or outside) the subjects that are taught at school.

2. Did Nontokozo or Daniel spend more time at school?

Answer: Nontokozo

Look for symbol A on both charts and determine whose chart has more percentages for that symbol.

3. On which activity did the two of them spend the same amount of time?

Answer: Eating, sleeping and bathing

That is, on which activity do both charts have the same percentage.

4. What percentage of the day did Nontokozo spend watching television?

Answer:

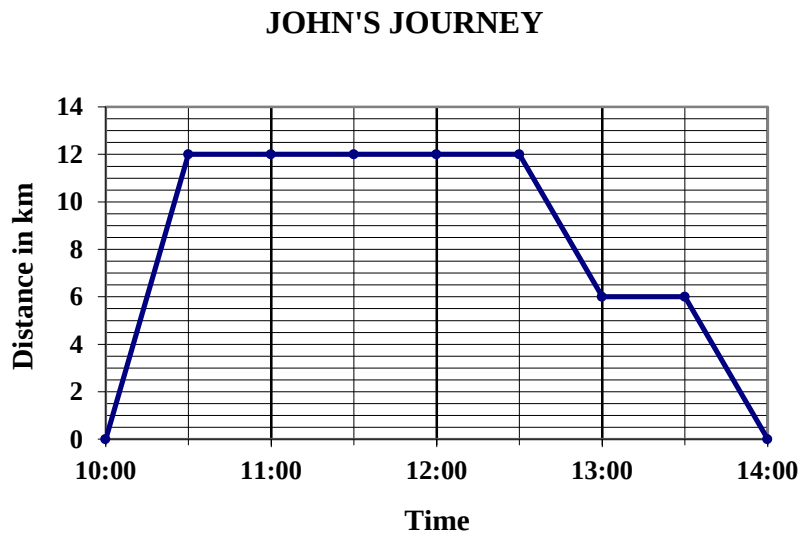
Time spent watching television = 100% – (38 + 33 + 20 +4)%
= 100% – 95%
= 5%

All the percentages of activities added together make up the **whole** 24-hour day. Remember that 'whole' in percentages is 100%. Therefore if we add all the given percentages and subtract their sum from 100% we get percentage of time Nontokozo spent watching

	television.
5. How many hours did Nontokozo spend doing homework?	On Nontokozo's chart the symbol C (which stands for doing homework) has 20%. This means that she spent 20% of the 24-hour day doing homework. Hence 20% of 24 hours. You should ALWAYS give the required units of measurement in your answer. In this case the question is "How many **hours**…". Hence the answer is 4.8 hours.
Answer: Time spent doing homework = 20% of 24 hours $= \frac{20}{100} \times 24$ hours = 4,8 hours	
6. How many minutes did Daniel spend watching television?	Here the question is "How many **minutes**…". We have been working with hours all along, so it means we have to do conversions from hours to minutes in our calculations. Remember: 1 hour = 60 minutes Therefore: 24 hours = 24x60 minutes. Minutes watching television = 17% of 24 hours = 17% of (24x60min)
Answer: Minutes watching television = 17% of 24 $\times$ 60 minutes $= \frac{17}{100} \times 24 \times 60$ minutes = 244,8 minutes	

SECTION C: Graph Interpretation (Distance and Time)

John cycled from his home to visit his friend. He spent some time at his friend's home and then left to go back home. On the way home he stopped at the library. The graph below shows his journey.



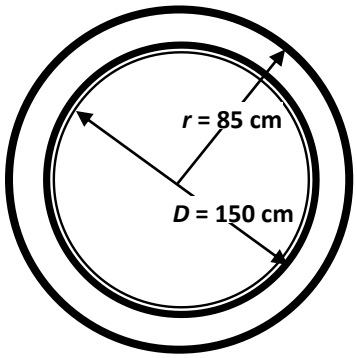
Use the graph to answer the following questions.

1. At what time did John leave home?	Check the time at which the graph starts.
Answer: 10:00	
2. How far did he cycle to his friend's home?	'How far…' is asking the distance. So the required distance has to be in km as indicated on the graph. His friend's home is the furthest point we are told he has cycled to (and came back). So the required distance is the highest point of the graph.
Answer: 12 km	
3. How much time (in hours) did he spend at his friend's home?	Spending time at his friend's home means time moves but distance stays the same (at 12 km). Look at the graph and see from what time to what time does that happens. Take note that half the distance between hours is 30 minutes.
Answer: Time spent at his friend's house = 12:30 – 10:30 = 2 hours	
4. How far is the library from John's home?	As John comes back, he travels back the 12 km he has taken to his friend. When he reaches home there will be no further distance to travel. That is, on the graph the distance will read '0'. Take note that again he 'spends time' at the library as he comes back. Now we know what happens to the graph at that time. Now check: • how much distance is he left with to arrive home; and • for how long does the graph behaves that way (time moving but distance stationary).
Answer: 6 km	
5. How much time (in minutes) did John spend at the library?	
Answer: Time spent at the library = 13:30 – 13:00 = 30 minutes	
6. For how many hours was John away from	Count the number of hours from where the graph

home?	starts up to where it ends.
Answer: Time away from home = 14:00 – 10:00 = 4 hours	

SECTION D: Measurement (Area of a Circle)

Daisy made a table-cloth that hangs over the edge of a table of diameter 150 cm.
The radius of the table-cloth is 85 cm.

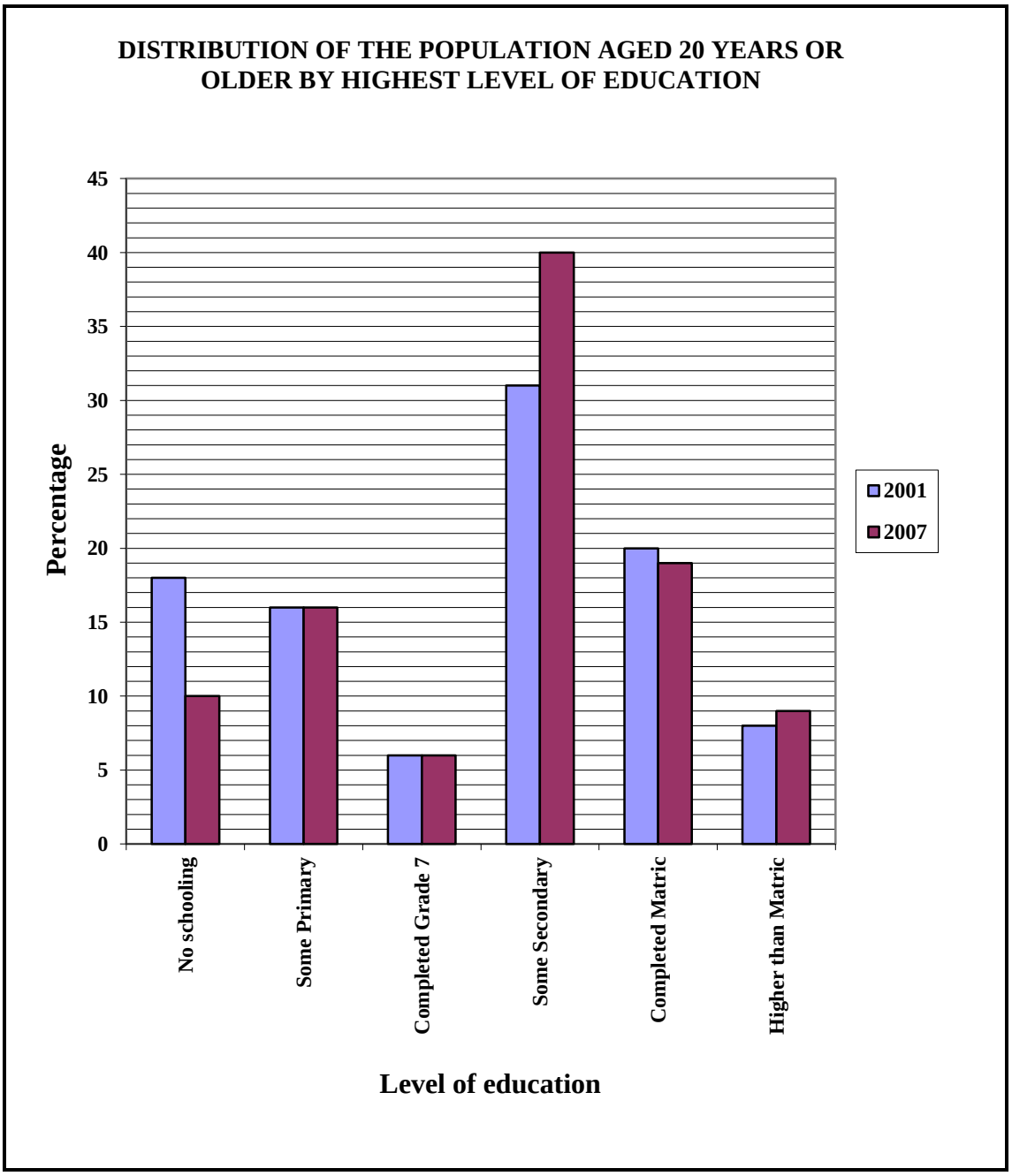


1.What is the radius of the table?	Take note that there are two circles here; each with its own radius. r = 85 cm is the radius of the table cloth; not the table.
Answer: Radius = $\frac{1}{2} \times$ diameter = $\frac{1}{2} \times 150$ cm = 75 cm	
2.Calculate the circumference of the table-cloth. Use the formula: **Circumference = 2 $\times$ π $\times$ radius**, and use π = 3,14	Here we need to identify the radius of the table-cloth and substitute (r = 85 cm). Then substitute π and **radius** in the formula and use a calculator to find the answer.
Answer: Circumference = 2 $\times$ π $\times$ radius = 2 $\times$ 3,14 $\times$ 85 cm = 533,8 cm	
3.Calculate the area of the table-cloth. Use the formula **Area = π $\times$ (radius)^2**, and use π = 3,14 Give your answer correct to the nearest whole number.	Each time a formula is provided we need to: • identify the unknown in the formula; • substitute it with its correct value; and • do the calculations. Once more the radius of the table cloth is the unknown here. NB: Brackets ( ) first in your calculations.
Answer: Area = π $\times$ (radius)^2 = 3,14 $\times$ (85)^2 cm^2 = 22 686,5 cm^2 = 22 687 cm^2	
4.Calculate the length of the table-cloth that hangs over the edge of the table.	What will be hanging is the difference (in length) of the two radiuses. That is, the longer radius minus the shorter one.
Answer: Length of overlap = 85 cm – 75 cm	

= 10 cm	
5.It cost Daisy R60,00 to make the table-cloth. The same table-cloth sells for R99,99 in the linen shop. How much money did Daisy save by making the table-cloth herself?	She spent R60,00 to make the table-cloth herself. **How much more** would she pay if she were to buy it at R99,99?
Answer: Savings = R99,99 – R60,00 = R39,99	

SECTION E: Bar Graph

The bar graph below shows the distribution of the South African population aged 20 years or older by highest level of education.



1. In 2001, what percentage of the population had no schooling?	This graph comes with a legend (an explanation of symbols/colours used on a graph. In this case each colour stands for a particular year. Always keep the legend in mind when interpreting a graph.
Answer: 18%	
2. Which level of education has the same percentage in both 2001 and 2007?	Check for the level of education (on the horizontal Axis) that has both bars equal in length.
Answer: Some primary school education.	
3. Which level of education had the greatest increase in percentage from 2001 to 2007?	Check for the level of education where the increase in length from the first bar to the second bar is the greatest on the graph. Take note that there is also an increase in 'Higher than Matric' level of education, but it is not the greatest increase.
Answer: Some secondary school education	
4. In 2007, what percentage of the population aged 20 years or older had some secondary education or higher?	These are all percentages of some secondary education and above added together.
Answer: Total = 40% + 19% + 9% = 68% ✓**A**	

SECTION F: Data Handling and Rate of Change

Mrs. Mkhize has a choice of two routes when she travels to work. She can drive through the city centre or take a longer route on the freeway. She wants to know which is the best route to use to travel to work. She times her journey over a 21-day period where she sometimes travels through the city centre and at other times travels on the freeway. Her results are recorded in the table below.

TABLE 1: Time taken to travel to work in minutes

City-centre route	30	36	38	30	32	37	30	32	39	38	49
Freeway route	30	32	35	30	31	30	34	30	34	31	

Mrs. Mkhize's times when travelling through the city centre, listed in ascending order are:

30 ; 30 ; 30 ; 32 ; 32 ; 36 ; 37 ; 38 ; 38 ; 39 ; 49

1. Arrange the times taken to travel on the freeway in ascending order.	Ascending means from lowest to highest. Make sure that there is no number left out. You need to verify the arrangement because once you get it wrong here then either your mean, median, mode, or range (if not all) will be incorrect.
Answer: 30 ; 30 ; 30 ; 30 ; 31 ; 31 ; 32 ; 34 ; 34 ; 35	
2. Calculate the range of the times taken to travel through the city centre.	The range is the highest number minus the lowest number. Take note that the range required here is of the times taken to travel **through the city centre** and not **on the freeway.**
Answer: Range = 49 – 30 = 19 minutes	
3. Write down the mode of the times taken to travel on the freeway.	The mode is the number that occurs the most number of times. Again be careful not to read from the wrong data here.
Answer: Mode = 30 minutes	
4. Determine the median of the times taken to travel through the city centre.	The median is the middle entry (number) when the number of entries is odd as in this case. (When the number of entries is even, the median is determined by adding the middle two entries and divide the sum by 2).
Answer: Median = 36 minutes	
5. The average time to travel on the freeway is 31,7 minutes. Calculate the average time taken for Mrs. Mkhize to travel through the city centre.	By being provided the average time to travel on the freeway you are in a way being reminded to use the correct set of data.
Answer: Average = $\frac{3(30)+2(32)+36+37+2(38)+39+49}{11}$ $=\frac{391}{11}$ = 35,5 minutes	
6. What percentage of Mrs. Mkhize's trips to work on the freeway takes less than 32	This is expressing the number of trips less than 32 as a percentage. In order to do that you need that

minutes? **Answer:** Percentage of trips less than 32 minutes $= \frac{\text{number of times less than 30 minutes}}{\text{total number of trips}} \times$ 100% $= \frac{6}{10} \times 100\%$ = 60%	number of trips and the total number of trips. That is, 6 out of 10 as a percentage.
7. Determine Mrs. Mkhize's average speed (in km per minutes) if the distance on the freeway is 40 km and the time taken is 30 minutes. (Round off the answer to TWO decimal digits.) Use the formula: **Speed =** $\frac{\textbf{distance}}{\textbf{time}}$ **Answer:** Speed = $\frac{\text{distance}}{\text{time}}$ $= \frac{40km}{30\,\text{min}}$ $= \frac{40}{30}$ km/min = 1,33 km/min	Take note that in this question the distance is given in km and time is given in minutes. You need to use these units right from where you make substitutions as shown in the solution. Otherwise you will lose the concept of km/min. You may mistakenly have the answer as: • either 1,33 km (which no more speed but distance); or • 1,33 min (which is time); or • just 1,33 (which can be a measurement of anything). In all these cases you will have failed to answer the question correctly.
8. Mrs Mkhize decides to always travel on the freeway. The longest time taken by Mrs. Mkhize to travel to work on the freeway is 35 minutes. She has to be at work at 07:30 every morning. Calculate the latest time she must leave home to ensure that she arrives at work before 07:30. **Answer:** Time to leave home = 07:30 – 00:35 = 06:55	The easiest way to calculate the latest time she must leave home would be to start from 07:30 (arrival time) and count 35 minutes backwards. The solution provided would need to subtract 35 minutes from 30 minutes. To do that you need to convert 1 hour (from 7 hours) to 60 minutes ("borrow 1") and then subtract the 35 minutes from 90 minutes now. Hence 06:55 is the answer.

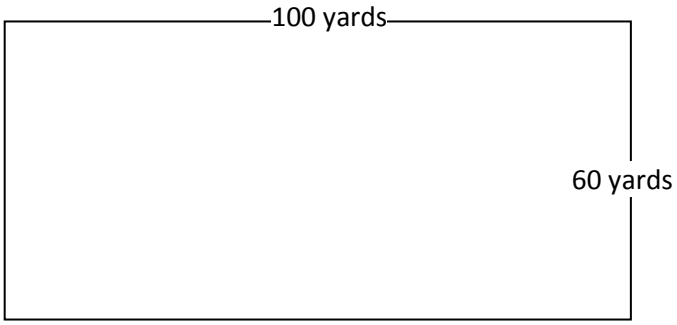
SECTION G: Interest, Measurement (Perimeter and Area) and Conversions

Shining Stars Soccer Club have received a donation of R100 000 to revamp their home grounds.

The management of the team decides to invest the money for six months before the renovations begin.

The renovations will include:

- Relaying the grass on the soccer pitch
- Installing new goal posts
- Buying new soccer balls



1. The manager decides to invest the R100 000,00 at 12% compound interest per annum compounded monthly. Calculate how much money the team will have for renovations after six months.

Use the formula: $A = P(1 + i)^n$, where
A = final amount; ***P*** = amount invested; ***i*** = monthly interest, and
n = number of months the money will be invested for.

Answer:

$n = 6$
P = R100 000,00
$i = \frac{12}{12} \times \frac{1}{100} = 0,01$

$A = P(1 + i)^n$
$= 100\,000(1 + 0,01)^6$
= R106 152,02

The money to be calculated (that the team will have after six months is) is the 'final amount' denoted by **A** in the formula provided. The values of **p** and **n** are provided. They are R100 000,00 and n, respectively. We now need to calculate ***i***.

If the money is invested at 12% compound interest **per annum** (for 12 months) compounded monthly, it means that the monthly interest is:

$\frac{1}{12}$ of 12% = $\frac{1}{12} \times \frac{12}{100}$

Therefore i = 0,01.

From here we can substitute all the unknown values in the values to find the correct answer.

2. Convert 60 yards into metres. (1 yard = 0,914 m)

Round off the answer to TWO decimal places.

Answer:

60 yards = 60 × 0,914 m
= 54,84 m

If 1 yard = 0,914 m, then:
60 yards = 60 × 0,914 m.

3. Calculate the area of the pitch in square yards.

Use the formula: **Area of rectangle = length × breadth**

Answer:

This question is so simple that it even reminds us that the area is in **square units.**

Area of rectangle = Length × Breadth = 100 yards × 60 yards = 6 000 (yards)^2	
4. Calculate the perimeter of the pitch in yards. Use the formula: **Perimeter = 2 ×(length + breadth)**	Make substitutions and start calculations inside brackets.
Answer: Perimeter = 2 ×(length + breadth) = 2 ×(100 yards + 60 yards) = 320 yards	
5. A set of goal posts cost R900,00 and each soccer ball cost R67,26, including VAT. How much will they pay for one set of goal posts and 12 soccer balls?	The price of goal posts also includes VAT.
Answer: Costs = R900,00 + 12 ×67,26 = R900,00 + R807,12 = R1 707,12	

SECTION H: Graph Drawing, Rate of Change and Probability

Mrs. Gumede has started a small business making sets of necklaces and earrings. It cost her R320,00 to purchase the set of tools to make the necklaces and the earrings. Each set cost R40,00 to make. Mrs. Gumede intends selling the sets at R60,00 each.

1. Mrs Gumede prepared a table (Table 2) of her cost to make the first 24 sets of necklaces and earrings using the formula:

Cost of sets = Cost of tools + (number of sets × R40,00)

TABLE 2: Cost price to make the necklace and earrings sets

Number of sets made	0	4	8	12	16	**B**	24
Cost price	320	480	640	**A**	960	1 120	1 280

Calculate the value of:

1.1 A	It is given that the 'cost of tools' is R320,00. Substitute in the given equation to find A (cost price when the number of sets is 12).
Answer: A = R320,00 + 12 × R40,00 = R800,00	
1.2 B	Now you know the cost price. That is, find the number of sets when the cost price is 1120.
Answer: 1 120 = R320,00 + B× R40,00 B = (1120 – 320) ÷40 = 20	1 120 = R320,00 + B× R40,00 means 1 120 - R320,00 = B× R40,00. You can now divide both sides by 40. Apply 'BODMAS' rule correctly.

2. TABLE 3 illustrates Mrs Gumede's income if all 24 necklace and earring sets are sold.

TABLE 3: Income from sale of the necklace and earrings sets

Number of sets made	0	4	10	12	16	**D**	24
Cost price	0	240	**C**	720	960	1 200	1 440

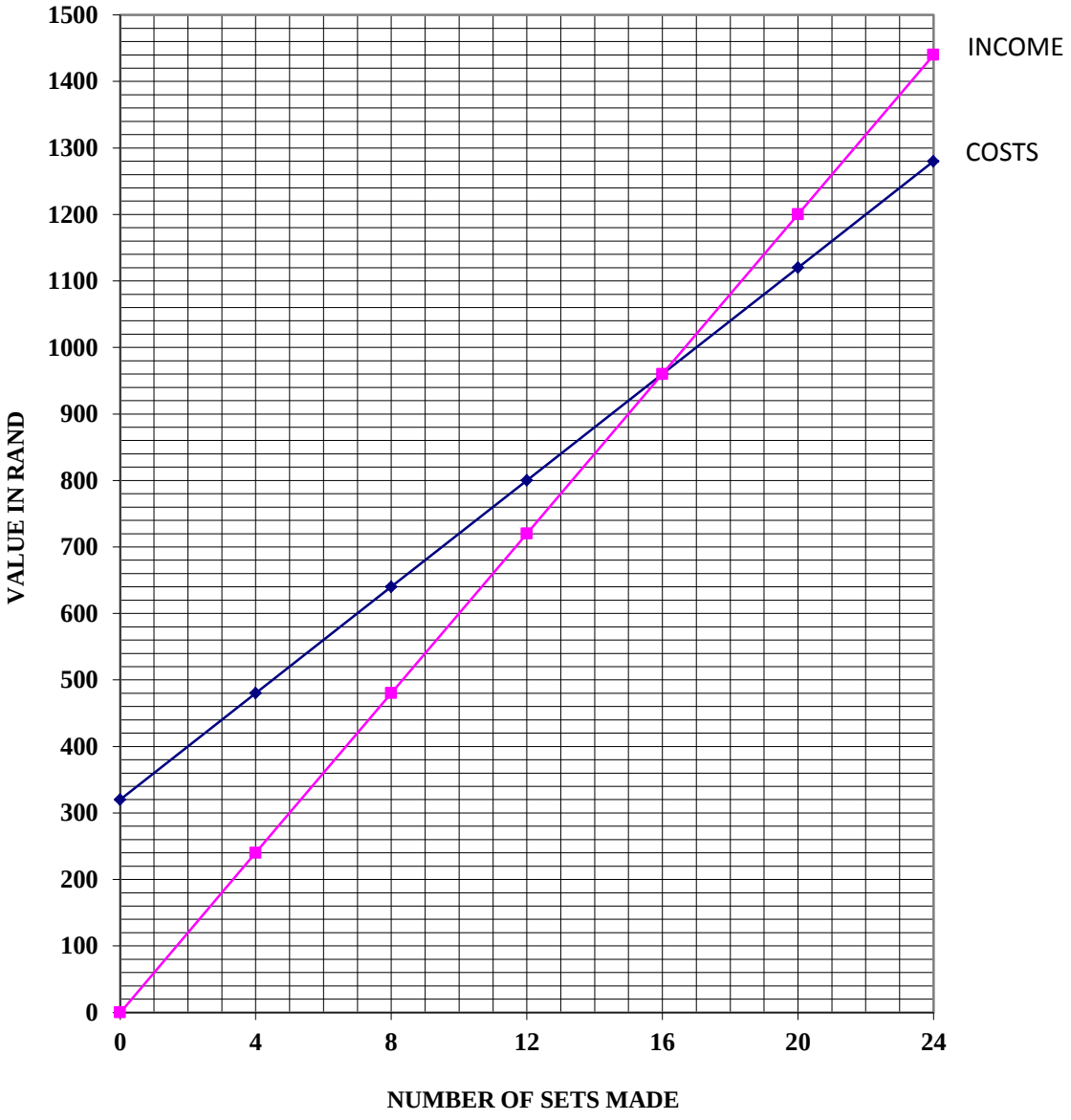
Calculate the value of:

2.1 C	
Answer: C = 10 × R60,00 = R600,00	Remember: Each set is sold at R60,00. It helps to always refer from the problem statement.
2.2 D	
Answer: D = $\frac{1\ 200}{60}$	Here a certain number of sets (we refer to that number as D) has been sold at R1 200; where each sets was sold at R60,00. We must find that number.

= 20	Hence D X R60,00 = R1 200.

3. Draw, on the same set of axes:	
3.1. A line graph using the data in TABLE 2. Clearly label the graph COSTS.	
3.2. A line graph using the data in TABLE 3. Clearly label the graph INCOME.	

Answer:



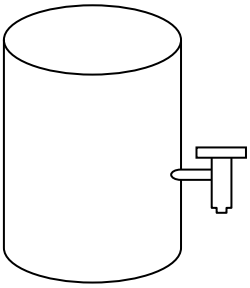
COMMENT: The 'COSTS' graph indicates how much it costs to make the sets. The 'INCOME' graph indicates how much income you make out of the number of sets.

Use the values in TABLE 2 and TABLE 3 and graphs drawn in QUESTION 5.3 to determine the following:	
4.1 The number of sets sold at the break-even point	This is the number of sets where the graphs meet. That is, when Mrs Gumede sells 16 sets, she gets the same money she spent when making the necklaces and earrings.
Answer: 16	

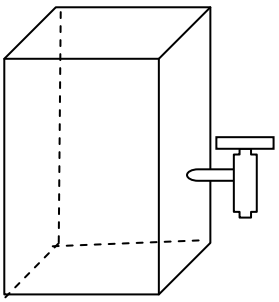
4.2 The profit made if all 24 sets are made and sold	Income – Cost at 24 sets.
Answer: Profit = R1 500,00 – R1 120,00 = R480,00	
4. Mrs. Gumede selects the beads from a mixed bag of 10 blue beads, 8 red beads and 12 yellow beads. Determine the probability that Mrs. Gumede will select randomly from the bag:	
5.1 One red bead	Not $\frac{1}{30}$
Answer: P(1 red bead) = $\frac{number of\ red\ beads}{total\ number of\ beads}$ = $\frac{8}{30}$ **OR** $\frac{4}{15}$ **OR** 0,27 **OR** 27,67%	
5.2 One black bead	There are no black beads in the bag (hence 0).
Answer: P(1 black bead) = $\frac{number of\ black\ beads}{total\ number of\ beads}$ = $\frac{0}{30}$ = 0 **OR** 0%	

SECTION I: Volume and Surface Area

Jabu has moved into an informal settlement. There are only two taps in the informal settlement. He has to collect water from the tap and keep it in a container in his room. He wants to buy a container, and has a choice of a cylindrical container or a rectangular container.



The cylindrical container has
a height of 60 cm, and
a radius of 30 cm.



The rectangular container has
a height of 60 cm, and
a square base with sides of 30 cm.

1. The container will stand on a shelf in his room. Jabu would like to build a second shelf that is 10 cm above the container on the shelf. How high above the first shelf must he place the second shelf?

There is a 10cm space between the container and the shelf above; AND the container is 60 cm long.

Therefore the shelves will be 70 cm apart.

Answer:
Height between shelves = 60 cm + 10 cm space
= 70 cm

2. Calculate:

2.1 The volume of the cylindrical container, rounded off to ONE decimal place.

Use the formula: **Volume of cylinder = $\pi \times$ (radius)$^2 \times$ height**

Calculations become easier when you start by squaring the radius and then multiply throughout.

Answer:
Volume of a cylinder = $\pi \times (\text{radius})^2 \times$ height

$= 3{,}14 \times (30\text{ cm})^2 \times (60\text{ cm})$

$= 169\,560\text{ cm}^3$

Take note of the units in the answer (cm^3). It is incorrect to leave the answer without the units. Volume is always in cubic units. In this case we multiplied cm^2 by cm to arrive at cm^3.

2.2 The volume of the rectangular container

Use the formula:
Volume of rectangular container = length $\times$ breadth $\times$ height

The square base of 30 cm means all the sides of the base are 30 cm. That is, both the length and breadth are 30 cm each.

Again take note of the units in the answer :

Volume of a rectangle = length $\times$ breadth $\times$ height
$= (30\text{ cm}) \times (30\text{ cm}) \times (60\text{ cm})$

$= 54\,000\text{ cm}^3$

cm $\times$ cm $\times$ cm = cm^3.

2.3 The surface area of the cylindrical container, rounded off to ONE decimal place

Use the formula:

Surface area = $2 \times \pi \times (\text{radius})^2 + 2 \times \pi \times \text{radius} \times \text{height}$

Answer:

Surface Area

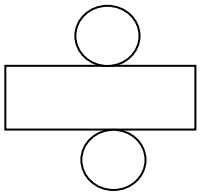
$= 2 \times \pi \times (\text{radius})^2 + 2 \times \pi \times \text{radius} \times \text{height}$

$= 2 \times 3{,}14 \times (30)^2 + 2 \times 3{,}14 \times (30\text{ cm}) \times (60\text{ cm})$

$= 5\,652\text{ cm}^2 + 11\,304\text{ cm}^2$

$= 16\,956\text{ cm}^2$

NOTE: A cylindrical container can be 'cut open' into **two circles** (the top part and the base) and a rectangle (whose breadth is the height and whose length is the circumference) as shown below:



And also take note that $2 \times \pi \times$ radius is the length of the circumference.

3. Jabu received an 8% discount on the price of the container because he paid using cash. Calculate the original price of the container if the discounted price is R30,80.

Answer:

8% discount means that Jabu paid 92% of the price

92% of the price = R30,80

$$\text{the price} = \frac{R30{,}80}{92\%} \times \frac{100\%}{1}$$

$$= R33{,}48$$

OR:

92% of the price = R30,80

That is, $\frac{92}{100}$ X the price = R30,80

Therefore the price = $\frac{R30{,}80}{92} \times \frac{100}{1}$

SECTION J: Maps, Directions and Conversions

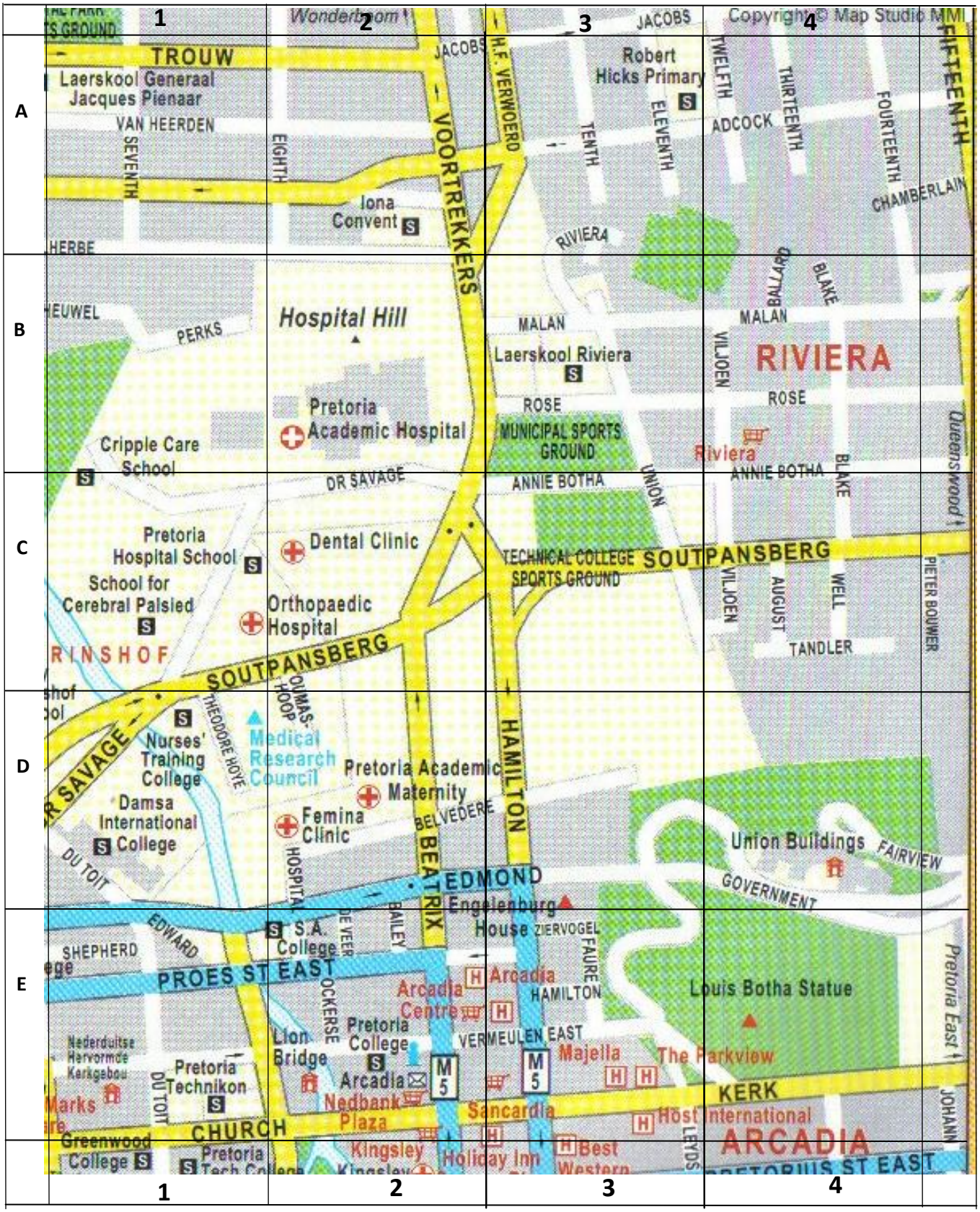
Dr Nerisha Naidu is from India. She is spending three months visiting the public hospitals in Pretoria. She uses the map of Pretoria on ANNEXURE B to help her to find her way around town.

Use the map on ANNEXURE A to answer the questions below.

1. Name the schools (labelled **S**) situated in grid reference C1.	Grid reference C1 is a cell (or a block) where **Row C** and **Column 1** meet. A row is horizontal (↔), while a column is vertical (↕). Remember, a column of a building is an upright supporting pillar.
Answer: Cripple Care School Pretoria Hospital School School for the Cerebral Palsied	
2. The Dental Clinic is situated in grid reference C2. Which hospital is situated due north of the Dental Clinic?	Always regard the NORTH of a position on a map as the direction vertically above that point.
Answer: Pretoria Academic Hospital	
3. Write down the grid reference for the Union Buildings.	Find the Union Buildings on the map and check the intersection in which it is located. In this case it is in the intersection of **Row D** and **Column 4**.
Answer: D4	
4. Use the cardinal points of the compass to write down the following:	
4.1 The direction of the traffic flow in Beatrix Street (E2, D2 and C2)	The direction of the flow is 'vertically upwards'.
Answer: Due North	
4. 2 The general direction that Pretoria Academic Maternity Hospital (D2) is from the Dental Clinic (C2)	The more appropriate answer is South-East since Pretoria Academic Maternity is not (exactly) vertically below the Dental Clinic. It is skewed to the right (East).
Answer: South / South-East	
5. The scale on the map is 1:15 000. Dr Naidu walks from the Orthopaedic Hospital to the Dental Clinic. The distance on the map is 2,5 cm. How far, in metres, does she walk?	1 cm on map represents 15 000 cm in real life, 2 cm on map represents 30 000 cm in real life, and ,5 cm (i.e. half cm) represents 7 500 cm. Therefore 2,5 cm represents: 30 000 cm + 7 500 cm = 37 500 cm
Answer: 2,5 cm = 2,5 × 15 000 cm = 37 500 cm = 375 m	
6. Dr Naidu regularly sends money to her mother in India. Use the exchange rate 1 rupee = R0,18 and R1,00 = 5,56 rupees to answer the following questions:	

6.1 How many rupees will Dr Naidu's mother receive if she was sent R500,00?	If R1,00 = 5,56 rupees Then R500,00 = 500 X 5,56 rupees
Answer: Number of rupees = 500 $\times$ 5,56 = 2780,00	
6.2. Dr Naidu's mother bought an article in India that cost 300 rupees. How much is that in South African rand?	If 1 rupee = R0,18 Then 300 rupees = 300 X R0,18
Answer: Number of rand = 300 $\times$ 0,18 = R54,00	

ANNEXURE A


1
2
3
4
A
B
C
D
E
N
Copyright © Map Studio MMI
TROUW
Laerskool Generaal Jacques Pienaar
VAN HEERDEN
SEVENTH
EIGHTH
VOORTREKKERS
JACOBS
H.F. VERWOERD
Robert Hicks Primary
TENTH
ELEVENTH
TWELFTH
ADCOCK
THIRTEENTH
FOURTEENTH
FIFTEENTH
CHAMBERLAIN
Iona Convent
RIVIERA
HERBE
HEUWEL
PERKS
Hospital Hill
MALAN
Laerskool Riviera
RIVIERA
BLAKE
VILJOEN
ROSE
Pretoria Academic Hospital
MUNICIPAL SPORTS GROUND
Riviera
Cripple Care School
DR SAVAGE
ANNIE BOTHA
UNION
Queenswood
Pretoria Hospital School
Dental Clinic
TECHNICAL COLLEGE SPORTS GROUND
SOUTPANSBERG
School for Cerebral Palsied
Orthopaedic Hospital
AUGUST
WELL
PIETER BOUWER
TANDLER
RINSHOF
OUMAS-HOOP
THEODORE HOYE
Nurses' Training College
Medical Research Council
Pretoria Academic Maternity
Damsa International College
Femina Clinic
BELVEDERE
HAMILTON
Union Buildings
FAIRVIEW
GOVERNMENT
DU TOIT
HOSPITAL
BEATRIX
EDMOND
Engelenburg House
ZIERVOGEL
FAUREL
EDWARD
SHEPHERD
S.A. College
DE VEER
BAILEY
PROES ST EAST
Arcadia
Arcadia Centre
Louis Botha Statue
Pretoria East
OCKERSE
Pretoria College
Lion Bridge
VERMEULEN EAST
Majella
The Parkview
Nederduitse Hervormde Kerkgebou
Pretoria Technikon
Arcadia
Nedbank Plaza
Sancardia
KERK
Host International
Marks
CHURCH
Greenwood College
Kingsley
Holiday Inn
Best Western
LEYDS
ARCADIA
JOHANN
PRETORIUS ST EAST

EXPLANATION OF CONCEPTS

CONCEPT	EXPLANATION/ILLUSTRATION
Addition	Combining two or more numbers together to get a new number called the sum. Addition is represented by the symbol +, called the plus sign.
a.m. (*ante meridiem)*	Latin for 'before noon' and used to show times between 12 O'clock midnight and 12 O'clock noon.
Anti-clockwise	Turning the opposite way to the hands of a clock.
Apex	The point that is furthest away from the base.
Area	How much surface a shape has. Area is measured in square units, e.g. square centimetres (cm^2), square metres (m^2), and square kilometres (km^2).
Ascending *(ascending* order)	Going up or increasing in size. e.g. 6 9 15 20 33
Average (Mean)	A number that best represents a group (set of numbers). It is obtained by adding all the members of the group and dividing the sum by the number of the members. Consider the following numbers ranging from 2 to 10: 2 3 4 6 8 9 10 The average of these numbers is 6.
Axis	A straight line through the middle of a 3D shape, e.g. horizontal axis (X-Axis) and vertical axis (Y-Axis).
Base	The part on which the shape stands. It is usually the horizontal part but not always. OR The total countable digits in a system of calculation. The Mathematics system is called a base 10 system because we use 10 digits to record all our numbers. The digits are: 0 1 2 3 4 5 6 7 8 9. OR A number raised to a power denoted by a superscript. For example, in the equation: $10^2 = 100$, 10 is the base.
Billion	A thousand million, i.e.: 1 000 000 000

Brackets	Brackets indicate which part of the calculation to work out first. e.g. 23 + (3 x 4) = 23 + 12 = 35.
Breadth	Also called the width, it is the distance or measurement of something from one side to the other. When measuring length and breadth, the breadth is taken as the shorter length.
Calculation	A calculation is when you have to work out the answer to a number problem.
Cancel	To cancel a fraction is to divide the numerator and denominator by the same number.
Capacity/ Volume	Capacity is how much something holds. It is usually measured in litres and millilitres.
Centilitre (cl)	A centilitre is one hundredth of a litre. There are 10 millilitres in 1 centilitre.
Centimetre (cm)	A centimetre is one hundredth of a metre. There are 10 millimetres in 1 centimetre.
Chart	A chart is a diagram or table showing information in an orderly way. A commonly used chart in Mathematical Literacy is a Pie chart. It is shaped like a round pie that is dived into segments.
Circle	A circle is a 2D shape that is completely round. Something that looks like a circle is circular.
Circumference	A two-dimensional geometric figure formed of a curved line surrounding a centre point such that every point on the line is an equal distance from the centre point.
Clockwise	Clockwise is turning the same way as the hands of a clock.
Column	A column is a vertical arrangement of numbers.
Common denominator	A common denominator is the multiple of the denominators of two or more fractions. Changing fractions to a common denominator allows you to compare, add and subtract the fractions.
Compass	An instrument used to find direction.
Compass points	Also known as the cardinal points of a compass, these are NORTH, SOUTH, EAST and WEST.
Convert	To change something from one form to another. For example, converting cm to m means writing the same distance given in cm as m.
Coordinates	Two numbers or letters that describe a position on a map, graph or chart. The horizontal coordinate is always written first and the vertical coordinate second.
Cost price	What a person pays to buy something.
Income	1.An amount a business gets after selling a product 2.salary earned by an employee

profit	Is a measure of gain made in business
expenditure	Capital spent to run a business Money spent by an individual
Break-even point	A point where no profit or loss is happening
repayment	An amount paid on a monthly / weekly basis
Decimal comma (,)	Is used to separate whole numbers from the fractions in a decimal number. Some countries use a decimal point.
Decimal fraction	A fraction that uses tenths, hundredths, thousandths, and so on. Decimal fractions have digits to the right of the decimal point.
Decimal number	A number expressed in a counting system that uses units of 10, especially a decimal fraction. In a decimal number, the whole number and the decimal fraction are separated by a decimal comma.
Decimal place	The number of digits after the decimal point.
Decrease	To make something less or smaller.
Depth	The measure of deepness.
Descending	Going from highest to lowest or reducing in size.
Diagram	A drawing or picture used to represent something.
Difference	The amount by which one quantity is smaller or greater than another. Example: The difference between 7 and 3 is 4.
Digit	One of the numerals 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. These digits are used to build up other numbers.
Dimension	Measurements of size such as length, width, height and radius.
Discount	A reduction in the cost of something.
Distance	How far apart two things are. The shortest distance between two places is a straight line.
Divide	Share things equally.
Dividend	The quantity that has to be divided. **OR** What you receive as interest on money that you have invested.
Divisor	A divisor is a number that is divided into another.

Equal	Worth the same.
Equal sign	The equal sign is used to show equal quantities or numbers. 24 X 3 = 72
Equation	An equation has two parts separated by an equal sign. The left part of an equation is always worth the same as the right part.
Equivalent	Equivalent means worth the same. Equivalent things may look different but they always have the same value.
Equivalent fraction	Equivalent fractions are worth the same. When you simplify a fraction, the new fraction is equivalent to the original fraction.
Estimate	When you make an estimate you judge the amount without measuring or calculation. A guess is different to an estimation. When you guess you don't have an idea of the answers.
Even	An even number is any whole number that can be divided by 2 exactly.
Factor	A factor is a whole number that will divide exactly into another number.
Formula	A formula is a rule. A formula can be given in words or using letters and symbols.
Fraction	Fractions are usually parts of something. The bottom part of a fraction is called the denominator. It tells you the number of equal parts. The top part is the numerator. It tells you the number of those parts you are dealing with.
Fraction as a quotient	A quotient is the result of dividing two numbers. When a larger number is divided into a smaller number the quotient is a fraction. When one number is not exactly divisible by another the quotient can be written as a mixed number.
Fraction of a quantity	When you find the fraction of a quantity you divide by the denominator and multiply by the numerator
Gram (g)	Grams are metric units of mass used to weigh things. There are 1000 grams in a kilogram. One gram is very light.
Graph	A graph is a picture, chart or diagram showing information about things.
Halve	If you halve something you divide it into two equal pieces. Halving a number is the same as dividing it by two.
Height	1. Height is how tall something is. 2. Height is the vertical distance from the ground.
Horizontal	A horizontal line is parallel to the horizon or ground. A table has a horizontal top.
Hour	An hour is a measurement of time. There are 24 hours in one day. An hour is divided up into minutes and seconds.
Increase	When you increase something you make it more or larger.

Interest	Interest is payment for using money. If you borrow money you pay interest. If you lend money you receive interest. Interest is usually written as a percentage called the interest rate.
Kilogram (kg)	A kilogram is a metric unit of mass used for weighing. There are 1000 grams in 1 kilogram. *Kilo* at the start of a word often means '1000'.
Kilometre (km)	A kilometre is a metric unit of length used to measure long distances. There are 1000 metres (m) in 1 km.
Leap year	A leap year has 29 days in February. This happens every fourth year. There are 366 days in a leap year. Leap years happen because it takes approximately 365¼ days for the earth to orbit the Sun, not 365 days.
Length	1. Length is the measurement along a line or curve. When you measure the length and width of something the length is usually the longer distance. 2. You can measure the length of time in seconds, minutes, hours, days, weeks and years.
Line	Usually a line is used to mean a straight line. However a line can also be curved. If you are asked to draw a line between two points always draw a straight line.
Litre (l)	A litre is a metric unit used to measure capacity or volume. It is usually used for measuring liquids.
Maximum	The maximum is the largest number in a set. Maximum is the largest possible size, amount or value.
Mean	Mean is a kind of average. There are different types of average called mean, median and mode. To find the mean, total the quantities then divide by the number of quantities.
Measure	A measure is the size of something using a measuring unit. The measuring units are usually metric or imperial. When you have measured something you record the measurement. Measurements include grams, metres, seconds, and degrees.
Median	1. Median is a kind of average. There are different types of average called mean. Median and mode. To find the median, write out the quantities in order. The median is the quantity that has the middle value. 2. Median is the special name given to a line drawn from a corner of a triangle to the middle of the opposite side.
Metre (m)	A metre is a metric unit used to measure length or distance.
Mid	Mid is short for middle. Words such as midday, midsummer, and midpoint all have something to do with the middle.
Midday	Midday is the middle of the day. It is another name for noon. Midday happens 12 hours after midnight. Midday is the time when a.m. times become p.m. times.
Midnight	Midnight is the middle of the night. Midnight happens 12 hours after midday. Midnight is the time when p.m. times become a.m. times. Using a 24 hour clock,

	midnight is 24:00 or 00:00; both these are correct.
Millennium	A millennium is one thousand years.
Millilitre (ml)	A millilitre is a metric unit used to measure a small capacity or volume. There are 1000 millilitres in 1 litre. A teaspoon holds about ml.
Multiple	A multiple is lots of the same number or quantity. Multiples are like multiplication tables. The sixth multiple of 7 is 42.
Multiplication	Multiplication is adding lots of the same number together. The multiplication symbol is x.
Multiply	When you multiply you increase something a number of times. Multiplying is the same as multiplication.
Negative number	Negative numbers are less than zero. On a number line they are to the left of zero. Negative numbers have the minus sign in front of them.
Nought	Nought is another word for zero, nothing or none. The symbol for nought is 0.
Number	We use numbers to count quantity or to measure. Numbers have a position on the number line. There are many different kinds of numbers: whole numbers, negative numbers, positive numbers, integers, decimal numbers, fractional numbers, square numbers, triangle numbers and prime numbers.
Numeral	A numeral is any symbol or word for a number.
Numerator	The top number of a fraction is called the numerator. The numerator always tells you how many equal parts there are.
Order	You often put things in order of size or quantity. The alphabet is an order for letters.
Origin	The origin is where something starts. On a graph the origin is where the two axes cross.
Pair	A pair is two of anything.
Pattern	A pattern is an arrangement of numbers, lines, or shapes that follows a rule.
Percent (%)	Percent means out of a hundred. A percentage is another way of writing a fraction that has a denominator of 100. the symbol for percent is %.
Perimeter	The perimeter is the distance all the way round a shape.
Pi	Pi is just bigger than 3. It is the number you get when you divide the circumference of a circle by its diameter. This always comes to the same number. Pi is approximately 3.142 . the symbol for pi is π.
Pie chart	In a pie chart information is shown as a circle. The different- sized slices of the pie chart stand for the quantities.
Plan	A plan is a diagram showing where things are. Often plans have a scale because they

	cannot be drawn life size.
Plane	A plane is flat surface. It can be vertical, horizontal, or oblique.
Plus (+)	Plus is the name for the addition symbol +.
p.m.	The letters p.m. stand for *post meridiem*, which is Latin for 'after midday'. The letters are used to show times after 12 noon but before 12 midnight.
Point	1. You plot points on a graph. A point is really like a very small dot but is often marked with a small cross. The point is the middle of the cross. 2. A compass has points. The four points of a compass are N, S, E and W.
Positive number	Positive numbers are more than zero. On a number line they are to the right of zero. Positive numbers have the plus sign in front of them.
Probability	Probability is the chance of something happening. You often write the probability of something happening as a fraction. Words you might use when talking about probability include: chance, likelihood, odds.
Product	The product is the answer you get by multiplying numbers together.
Profit	Profit is what you make when you sell something for more than you paid for it. The profit is the difference between the buying and selling price.
Quotient	The quotient is the answer to a division. A quotient can be a whole number, fraction, mixed number, or decimal.
Radius	A radius is any straight line from the centre of a circle to the circumference.
Range	The range is the difference between the smallest value and the largest value. You often need to know the range when you are finding averages.
Ratio (:)	A ratio is a way of comparing one quantity to another.
Rectangle	A rectangle is a 2D shape that has 4 straight sides and 4 right angles. The opposite sides of a rectangle are equal. A square is a special type of rectangle. Usually rectangle is used to mean the obtuse rectangle. A rectangular shape is one that looks like a rectangle.
Reduce	When you reduce something you make it smaller. You can reduce quantity and size. The opposite of reduce is enlarge or increase
Remainder	A remainder is what is left after you share something.
Rounding	Rounding is writing a number as an approximate. Numbers are often rounded to the nearest one, nearest ten, or nearest hundred. Rounding often means round up or round down to the nearest whole unit.
Route	A route is the direction or path taken between two or more places. You can plan a route on a map. You can draw a route on a grid.
Row	A row goes horizontally from side to side.

Rule	When you follow a rule you follow instructions on how to do something. A formula is a shorthand way of writing a rule.
Ruler	A ruler is a straight edge marked with measurements. It is used to draw straight lines and to measure lines. You rule straight lines with a ruler.
Scale	A scale is a set of points on a line used for measuring. You can see a scale on maps, thermometers, measuring jugs, or rulers.
Scale drawing	A scale drawing is smaller, larger or same size as the real thing. Everything on the scale drawing is in proportion to the real thing.
Semi circle	A semi circle is half of a circle. The straight side is a diameter of the circle.
Set	A set is a collection of numbers, shapes, or objects that have something in common.
Side	1. Some 2D shapes have sides. The sides can be straight or curved. 2. The sides of a shape are not the top, bottom, front, or back. Sides can be left or right.
Sign	A sign is a short way of saying something. A sign usually tells you what to do.
Simplify	To simplify you write something in a more simple way. Fractions are written in the simplest way when both numerator and denominator are as small as possible.
Size	Size is the dimension of an object. Size can be the amount of something. Size can be the weight, volume, or capacity of things.
Solution	A solution is an answer to a problem. When you solve something you find the solution. Sometimes there are several solutions to a problem.
Speed	Speed is the distance travelled in a given unit of time. Speed is often measured in kilometres per hour (km/h) or miles per hour (mph).
Square	1. A square is a four-sided shape with all its sides and angles the same size. 2. The square of a number is when you multiply a number by itself.
Square centimetre (cm^2)	A square centimetre is a unit used to measure area. It is an area that is the same as that of a 1 cm square. A square centimetre can be written as cm^2.
Squared	When a number is squared, it is multiplied by itself. Whole numbers, fractions and decimals can be squared.
Square metre (m^2)	A square metre is a unit used to measure large areas. It is an area that is the same as that of a 1 m square. A square metre can be written as m^2.
Square millimetre (mm^2)	A square millimetre is a unit used to measure very small areas. It is an area that is the same as that of a 1 mm square. A square millimetre can be written as (mm^2).
Square number	A square number is the product of two identical whole numbers. 1x1=1 2x2=4 3x3=9 4x4=16
Square root √	A square root of a number is that number which, multiplied by itself, gives that number.

	The square root of 9 is 3 because 3 x 3 = 9
Subtraction (–)	1. Subtraction is taking away one number from another. 2. Subtraction is the difference between two numbers. 3. Subtraction is the inverse of addition. The sign for subtraction is –. This called the minus sign.
Sum	1. The sum is the result of adding two or more numbers. 2. To sum a set of numbers you must add them. 3. The word sum is often used to mean calculate using addition, subtraction, multiplication, or division. Strictly speaking, this is wrong.
Surface	A surface is the face of a shape. It has length and breadth but no thickness. A surface can be flat or curved.
Symbol	A symbol is a sign used to stand for words. It is a mathematical shorthand way of writing something. e.g. CCVI, π, =, +
Table	When information is written in a list, it is often called a table. Multiplication facts written in order are called the multiplication tables. Tables often have rows and columns of information
Tally	A tally is a mark which shows how often something happens.
Time	Time is how long something lasts. It is measured in units such as seconds, minutes, hours, days, weeks, months and years. Clocks and watches are used to tell the time. Stopwatches and timers are used to measure time.
Times	Times is how often an addition is to be done
Total	A total is found by adding all the numbers together. A total is the sum of numbers.
Triangle	A triangle is any polygon that has three sides. The three angles of a triangle add up to 180˚. All triangles will tessellate. The words equilateral, isosceles, and scalene tell you about the sides of a triangle. The words acute, obtuse, and right-angled tell you about the angles of a triangle. A triangular shape has three sides.
Volume	Volume is the amount of space taken up by a solid shape. When measuring volume, cubic units such as cm^3 and m^3 are used.
Weigh	To use an instrument like a balance or scale to find out how heavy something is.
Weight	Weight is the heaviness of something. Weight is the force with which an object is pulled towards the centre of the Earth. The word ‘weight’ is often used instead of ‘mass’ even though they are not quite the same.
Width	The width is the distance from one side to the other and is sometimes called the breadth. When measuring length and width, the width is usually the shorter distance.

X-axis	The horizontal axis of a graph is sometimes called the x-axis. The vertical axis is called the y-axis.
X-coordinate	The x-coordinate is the horizontal distance from the origin. It is the first number in the number pair.
Y-axis	The vertical axis of a graph is sometimes called the y-axis. The horizontal axis is called the x-axis.
Y-coordinate	The y-coordinate is the vertical distance from the origin. It is the second number in the number pair.
Zero (0)	Zero is another word for nothing or naught. Zeros are used as a place holder in large numbers. Zero is an integer that separates positive and negative numbers. The sign for zero is 0.