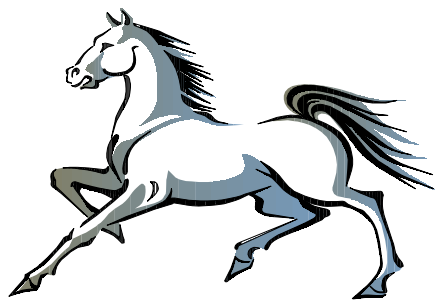


Mathematical Literacy, Mathematics and Mathematical Sciences

Illustrative Learning Programme

Grade 7

Module 1: FARMING AND GROWTH



TEACHER'S GUIDE

Phase Organisers: Communication
Economy and Development

Programme Organiser: Farming and Growth

Specific Outcomes and Assessment Criteria from the MLMMS Learning Area:

- SO1: Demonstrate an understanding about ways of working with numbers
AC 2: Evidence of knowledge of number history
AC 4: Performance of operations accurately
AC 5: Evidence of knowledge of percent, rate and ratio
AC 6: Solving of real life and simulated problems
AC 7: Demonstration of skills of investigative approaches within mathematics
- SO3: Demonstrate an understanding of the historical development of mathematics in various social and cultural contexts
AC 1: Understanding of mathematics as a human activity
AC 2: Knowledge of contestation and Eurocentrism in the development of mathematics
- SO4: Critically analyse how mathematical relationships are used in social, political and economic relations
AC 1: Evidence of knowledge of mathematical relationships in the workplace
AC 2: Evidence of knowledge of mathematical relationships in the economy
AC 5: Evidence of knowledge of mathematics use in the media
- SO5: Measure with competence and confidence in a variety of contexts
AC 2: Evidence of knowledge of working with concepts and units of measurement
AC 3: Evidence of knowledge of working with time
AC 4: Evidence of knowledge of working with temperature
- SO6: Use data from various contexts to make informed judgments
AC 1: Identify situations for investigation
AC 2: Collection of data
AC 3: Organisation of data
AC 4: Application of statistical tools
AC 5: Display of data
AC 6: Communication of findings
AC 7: Critical evaluation of findings
- SO9: Use mathematical language to communicate mathematical ideas, concepts, generalisations and thought processes
AC 1: Use of language to express mathematical observations
AC 2: Use of mathematical notation, symbols
AC 3: Use of mathematical conventions and terminology
AC 4: Interpretation and analysis of models
AC 6: Representation of real life and simulated situations.
- SO10: Use various logical processes to formulate tests and justify conjectures
AC 1: Evidence of logical reasoning in the solution of problems
AC 2: Ability to prove familiar and unfamiliar hypotheses

Specific Outcomes and Assessment Criteria from other Learning Areas:

HSS6: Demonstrate an understanding of inter-relationships between society and the natural environment

AC 1: Understanding of the earth as a life-sustaining system in the universe is demonstrated

HSS9: Use a range of skills and techniques in the human and social sciences context

AC 2: Ability to make informed judgments is demonstrated

AC 3: Competence in the graphic techniques is demonstrated

AC 4: Independent and co-operative learning skills that promote critical understanding of social and environmental issues are demonstrated.

LLC1: Make and negotiate meaning and understanding

AC 2,3: A key message is identified and clarified. Meaning is created through reading and inferences are made from texts.

AC 4: Meaning is constructed through interaction with other language users

AC 7: Writer's / speaker's / signers point of view is critically reflected on.

AC 8,9: Reasoned arguments about interpretation and meaning are developed. Discourse is sustained.

LLC4: Access, process and use information from a variety of sources and situations

AC 1: The information need is defined

AC 3: Information is located, accessed and selected

AC 6: Organisational skills are applied

NS3: Apply scientific knowledge and skills to problems in innovative ways

AC 1: Problems are identified

AC 2: Relevant information is gathered

AC 4: Relevant scientific and mathematical skills are selected.

T1: Understand and apply the technological process to solve problems and satisfy needs and wants

AC 1: Problems, needs and wants are identified and explained

AC 2: A range of possible and relevant solutions are considered

AC 3: An informed choice is made

Strands:

This module contains material from the Number, Measurement, Shape and Space, and Data Strands

Levels:

The ideal Grade 7 learner should be doing maths at Level 4 or 5 on the Progress Maps.

Because of the nature of the subject, it is quite possible, in one classroom, to have learners who are at Level 1 in maths and others who are at levels 5 or 6.

Duration:

About 5 to 5 ½ weeks, with 5 hours of Maths per week

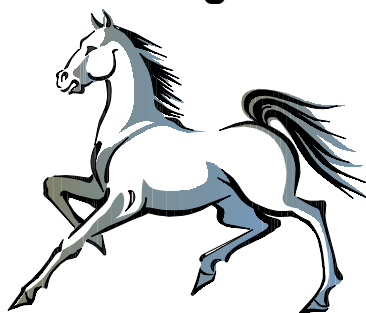
Knowledge

- of farming in South Africa
- of farming in ancient times
- of calendars other than the one generally used in South Africa
- of the Egyptian Numeration System
- of the Hindu-Arabic Numeration System
- of decimals
- of measurement
- of percentages
- of different ways of collecting data
- of different ways of presenting data
- of different ways of analysing data

Skills

- working with a time-line
- working with calendars from other cultures
- working with the Egyptian Numeration System
- being able to compare the Egyptian Numeration System and the Hindu-Arabic Numeration system
- working out perimeter and the costs of fencing
- using the % symbol correctly
- collecting, presenting and analysing data

Farming and



Growth

Values and Attitudes

- recognising the role of farming in contributing to the economy and to society
- recognising the role of effective planning for the farmer
- creating an awareness of the unpredictability of nature and its effects on farming
- recognising and valuing the contribution of other societies to the development of knowledge

Overview of the module

Introduction:

- This module uses the theme of farming to introduce working with a time-line; working with different calendars; working with the Egyptian Numeration system and the Hindu-Arabic Numeration system.
- It then introduces Mrs Dlomo (Ma Dlomo) and Mr Mbatha (Baba Mbatha), who are neighbours who have gone into partnership and own a piece of land. It is through the two of them that we introduce measurement examples (including perimeter and finding the cost of fencing), as well as simple, practical percentage examples
- The two of them then have to make decision about their farm. It is through these examples that we introduce knowledge and skills of data handling.

The reason for choosing this programme organiser:

- One of the reasons we had for selecting Farming and Growth as one of our Programme Organisers, was that all learners, whether urban children or rural children, would have some prior knowledge of farming on which we could build.

Hints for assessment:

OBE is about achieving outcomes. Therefore, you need to ask “have my learners achieved the outcomes?” OR “have my learners made progress towards achieving the outcomes?” OR “are my learners developing towards the outcomes?”

In order to answer these questions, you have to observe your learners’ behaviour when they work in groups; you have to look at the work that the group has done (its output) or the work pairs of learners working together have achieved. You also have to look at individual work.

- When you look at the work that your learners have produced, you are assessing their learning.
- When you compare your assessments of their learning at different times, you are assessing their progress. You are seeing whether they have got better at certain skills, redefined or strengthened attitudes and values, or understood concepts more fully.

Assessment is therefore a very important part of the curriculum.

In this module on Farming and Growth, the learners are encouraged to work in groups right from Unit 1. Hence one of the outcomes of the first unit is “learners should be able to show that they are beginning to work together in groups”. Thus the assessment of the unit includes assessing whether the learners have achieved this outcome or not.

It is easier to assess the output of a group, especially when they are working on open ended tasks (i.e. tasks which could be answered in different ways), when you use a scoring rubric. This is a description of what you expect from a group (or individual) who gives an excellent answer; one which gives an average answer; and one which gives a weak answer. We will deal with more assessment at the end of every unit.

Suggestions for working with groups:

- Where possible, learners should be arranged in groups of 4 or 5.
- Usually, when learners start working in groups, it is easiest to allow them to form their own group from their friends.
- Suggest that one person in the group should write down their ideas (in other words, be the **scribe**).
- When they have to discuss a topic, allow the groups about 10 minutes to discuss it and to write down their ideas.
- When it is time to share their ideas with the rest of the class, suggest that another person, beside the scribe, could report back to the rest of the class.
- Let the groups take turns to report back to the rest of the class.
 - The first group to report should list all their points.
 - When it is time for the next group to report back, they should only list any **new** points that they have.
- If a learner disagrees with any of the points raised by individual groups, allow them to explain to the rest of the class why they disagree.

Structure of this module:

- The learners' material is divided into units. The contents of each unit is linked together either because of the theme, or because of the maths covered in it.
- The teachers' guide is also divided into units which correspond to the learners' units. Each unit in the Teacher's Guide gives
 - a) the duration i.e. how much teaching time the unit should take.
 - b) the resources needed i.e. whether you need to prepare any special equipment beforehand
 - c) the class organisation for that unit i.e. are the learners going to be working in groups, in pairs or on their own
 - d) the outcomes for the unit
 - e) how the outcomes will be achieved i.e. a short description of the activities that the learners will do in order to achieve the outcomes, and the answers and hints for teaching and for getting the answers
 - f) suggestions for how the learners' achievements could be assessed.
- The teacher will have to work with both the Learner's Material and the Teacher's Guide, although, in the Teacher's Guide, for each activity, we have given both the question (*in italics*) and the answers (and often an explanation as to how we got the answer – although often we give only one way of getting there, when there are other possible correct methods.)

UNIT 1: LET US FIND OUT ABOUT FARMING

DURATION: This unit should take about 3 hours to complete

RESOURCES NEEDED: The learners will need access, where possible, to an English Dictionary.

CLASS ORGANISATION:

- Cut out articles from the newspaper and from magazines (like “Farmer’s Weekly”) that are relevant to farming and put them up around the classroom.
- Activity 1.1, Activity 1.2, and Activity 1.4 are group activities. Activity 1.3 is an individual activity.

WHAT ARE THE OUTCOMES FOR THIS UNIT?

The learners should be able to:

- say what it is that farmers have to take into consideration in order to produce good crops
- use their knowledge of fractions to do calculations about farming
- find out what a subsistence farmer is, and be able to describe what a subsistence farmer is in such a way that another learner will understand the description
- write down a list of crops grown, and livestock raised, by farmers in South Africa.
- understand what is meant by crop rotation, and why it is necessary for a farmer to rotate crops.
- understand what root vegetables, brassicas and legumes are, and be able to give examples of each.
- fill in information on a diagram in such a way that it will be confirmed that they understand crop rotation.
- show that they are beginning to work together in groups.

WHAT WILL BE DONE TO ACHIEVE THIS LEARNING?

- There are four activities in this unit.

Activity 1.1 - WHAT IS NEEDED TO GROW CROPS SUCCESSFULLY

- This exercise starts off with some facts about farming that either you could read to the class, or individual learners could read.
- The learners then discuss in groups what is needed to grow crops successfully.

ANSWERS TO ACTIVITY 1.1

Some of the things that farmers have to consider in order to produce good crops :

- 1) They need to consider the CLIMATE in their area - certain crops grow better in some climates than others. When we think of climate, we think of whether it is a summer rainfall or a winter rainfall area; whether the area often has droughts; what the average temperature is, and what the average winter temperature is.
- 2) Farmers need to till the soil in order to loosen it before they plant the seeds or the seedlings. They need to consider how they are going to do this. Are they going to use farm machinery like tractors, or are they going to do it manually?
- 3) They need to consider how the seeds or seedlings are going to be planted. Are they going to use farm machinery or are they going to do it manually?
- 4) They need to consider whether they are going to use fertiliser or not.

- 5) They need to consider whether the crops they are planting are prone to diseases or not, and whether there are any insects which attack that particular crop. If there are, they have to consider whether they are going to use pesticides or other chemicals to fight them. One of the problems of using pesticides and other chemicals is that they are very effective when it comes to killing insects or diseases that affect the crops, but often also kill other “useful” insects, and innocent animals like birds. Another problem about using pesticides and other chemicals is that they cost quite a lot. The decision may, therefore be, that they decide not to grow that crop, but to change to one that will not be prone to diseases.
 - 6) If the crops need to be irrigated, they have to consider how they are going to do that, and how often they will need to water them each week.
- They might come up with other points that are not listed here. Encourage the learners to share these other points with the rest of the class.

Activity 1.2 - WORKING WITH LARGE NUMBERS

- Allow the learners time to work out their own methods and answers.
- The numbers used are too large to fit into most calculators, so the learners will not be able to use their calculators here.
- Encourage them to work together as a group.
- Allow each group to share their answers and methods with the rest of the class.

ANSWERS TO ACTIVITY 1.2

1. *About $\frac{1}{3}$ of the earth’s surface is used for farming. If the surface of the earth is 510 100 000 square kilometres, what area is used for farming? Write your answer correct to 1 decimal place.*

$$510\ 100\ 000 \div 3 = 170\ 033\ 333,333 \dots$$

$$= 170\ 033\ 333,3 \text{ (correct to 1 decimal place)}$$

So, 170 033 333,3 square kilometres of the earth’s surface is used for farming.

(We say this as “one hundred and seventy million, thirty three thousand, three hundred and thirty three comma three”)

2. *About $\frac{1}{2}$ of the workers in the world are involved in farming. Suppose there are 1 812 617 000 workers in the world, how many of them are involved in farming?*

$$1\ 812\ 617\ 000 \div 2 = 906\ 308\ 500$$

So, 906 308 500 of the workers in the world are involved with farming.

(We say this as “nine hundred and six million, three hundred and eight thousand, five hundred”)

3. *In Africa, 67 people out of every 100 work on farms. Suppose the population of Africa is 749 000 000. How many of them work on farms?*

Encourage learners to use any method they like to come up with the answer.

- One method they could use is: $\frac{67}{100} \times 749\ 000\ 000 = 501\ 830\ 000$

- Another method they could use is:

Out of every **100**, **67** work on farms.

Out of every **1 000**, **670** work on farms.

Out of every **10 000**, **6 700** work on farms

Out of every **100 000**, **67 000** work on farms.

Out of every **1 000 000**, **670 000** work on farms.

Out of every **2 000 000**, **(2 x 670 000)** work on farms.

Out of every **749 000 000**, **(749 x 670 000)** work on farms.

Now, $749 \times 670\,000 = 501\,830\,000$

So, 501 830 000 people in Africa work on farms.

(We say this as “five hundred and one million, eight hundred and thirty thousand”)

4. *There are large deserts and tropical rain forests in Africa, and only $\frac{1}{3}$ of Africa is suitable for farming. If the area of Africa is 30 340 000 square kilometres, what area is available for farming? Give your answer correct to 1 decimal place.*

$$\begin{aligned} 30\,340\,000 \div 3 &= 10\,113\,333,333 \dots \\ &= 10\,113\,333,3 \text{ (correct to 1 decimal place)} \end{aligned}$$

So, 10 113 333,3 square kilometres of the land in Africa is suitable for farming.

(We say this as “ten million, one hundred and thirteen thousand, three hundred and thirty three comma three”)

Activity 1.3 - WHAT IS FARMED IN SOUTH AFRICA

- In order to find out what a subsistence farmer is, the learners have to look the word up in the dictionary. If the learners do not have dictionaries, we suggest that you initiate a class discussion to see whether the learners know what it means. You can give the meaning of the word to them if they have no idea.

ANSWERS TO ACTIVITY 1.3

1. *Most farmers are subsistence farmers. Look this up in the dictionary, and write down what it means to be a subsistence farmer.* - Subsistence farmers work with basic tools on small farms. They generally produce only enough food to feed themselves and their families. They generally do not grow enough crops to sell to make money.

2. *South Africa has one of the best climates in Africa for farming, and has large, fertile farmlands.*
 - a) *Write down a list of the crops grown in South Africa* - The learners could write down answers from what they have observed or read about. These could include wheat, barley, oats, sorghum, mealies, sunflowers, any of the vegetables and fruit that we eat, etc.
 - b) *Write down a list of the animals (or livestock) raised by farmers in South Africa* - These could include cattle, sheep, pigs, chickens, turkeys, goats, etc.

Activity 1.4 - CROP ROTATION

- Encourage the learners to share what they understand about crop rotation.
- Where possible, encourage them to do more research on this area.

ANSWERS TO ACTIVITY 1.4

1. *Why do you think that radishes, carrots and beetroot are called root vegetables?* - All three of the vegetables mentioned are roots that grow beneath the ground.

2. *Look up the word brassicas in the dictionary, and write down what it says.* - Where possible, learners should be encouraged to look up the word in their dictionary. Where not possible, the teacher could give them the meaning, and discuss it with the learners.

brassica - (n) any one of a genus of herbs of the mustard family, including the cabbage, kale, broccoli, turnip, rape, and mustard (Latin brassica: cabbage)

3. *Look up the word legumes in the dictionary, and write down what it says. Why do you think beans and peas are called legumes?* - Once again, learners should be encouraged to look the word up in the dictionary. Again, where not possible, the teacher could give them the meaning and discuss it with the learners.

legumes - (n) a plant which bears pods containing a number of seeds.

All legumes are distinguished by their fruit, which grows in the form of a pod that splits along its seams when mature and opens to reveal the seeds.

Beans and peas are called legumes because both plants bear pods which can be split open to get to the beans and peas inside.

4. *Look at the diagrams on the next page of a farmer's 3 garden plots. Each of the garden plots has been divided into 3 sections.*

- *In Plot 1, in the first season, the farmer has planted three root vegetables i.e. radishes, carrots and beetroot.*
- *He wants to rotate his crops so, in the second season, he decides to grow three different brassicas in the three different sections of Plot 1.*
- *In the third season, he grows three legumes in the three different sections of Plot 1.*

- a) *Copy the diagrams of the 3 garden plots*

- b) Fill in the vegetables grown over the three seasons in Plot 1
- c) Then fill in the vegetables grown over the last three seasons in Plot 2 and Plot 3. Show how you would rotate the vegetable crops so that, in each season, you grow a different crop from each different group in each of the sections.

This is what the original table looks like:

	Plot 1			Plot 2			Plot 3		
Season 1	Roots Radish	Roots Carrots	Roots Beetroot	Brassica Cabbage	Brassica Cauli - flower	Brassica Brussels Sprouts	Legume Beans	Legume Peas	Legume Lentils
Season 2									
Season 3									

FIGURE 1

There is more than one answer for this question.

This is one of them:

- We are told that, in the second season, he decides to grow three different brassicas in Plot 1
- Fill these in on the table. The order in which they are filled in is not important.

	Plot 1			Plot 2			Plot 3		
Season 1	Roots Radish	Roots Carrots	Roots beetroot	Brassica Cabbage	Brassica Cauli - flower	Brassica Brussels Sprouts	Legume Beans	Legume Peas	Legume Lentils
Season 2	Cabbage	Cauli- flower	Brussels Sprouts						
Season 3									

FIGURE 2

- We are then told that he grows three legumes in Plot 1 in the third season.
- Fill them in. Once again, the order in which they are filled in is not important.

	Plot 1			Plot 2			Plot 3		
Season 1	Roots Radish	Roots Carrots	Roots beetroot	Brassica Cabbage	Brassica Cauli - flower	Brassica Brussels Sprouts	Legume Beans	Legume Peas	Legume Lentils
Season 2	Cabbage	Cauli- flower	Brussels Sprouts						
Season 3	Beans	Peas	Lentils						

FIGURE 3

- Finally, the learners have to fill in the names of the vegetables in Plots 2 and 3.
- Again, there are many solutions possible here.
- Here is one of them:

	Plot 1			Plot 2			Plot 3		
Season 1	Roots Radish	Roots Carrots	Roots Beetroot	Brassica Cabbage	Brassica Cauli - flower	Brassica Brussels Sprouts	Legume Beans	Legume Peas	Legume Lentils
Season 2	Cabbage	Cauli- flower	Brussels Sprouts	Beans	Peas	Lentils	Radish	Carrots	Beetroot
Season 3	Beans	Peas	Lentils	Radish	Carrots	Beetroot	Cabbage	Cauli- flower	Brussels Sprouts

FIGURE 4

HOW WILL THE LEARNER'S ACHIEVEMENT BE ASSESSED?

- As one of the planned outcomes of this unit is that the learners should start to show that they are working together as a group, we suggest that this is what you should focus your attention on.
- A list of things to look for follows. We suggest that if you notice that there are problems with any of the groups, that you point out where they are going wrong, and make suggestions as to how they should change their group behaviour.
 1. Are the members of the group working together on one solution?
 2. Are they including all the members of the group in the discussion, or are they leaving some members of the group out?
 3. Is one member of the group dominating the conversation, and insisting that everyone do the solution his or her way?
 4. If a member of a group does not understand something, do they ask the rest of the members of the group, or do they ask you?
- We suggest that you praise the groups that are working well together, and encourage the groups that are having trouble working together.

UNIT 2: THE HISTORY OF FARMING

DURATION: This unit should take learners about 1½ hour to complete

RESOURCES NEEDED: Where possible, the learners should have access to a dictionary.

CLASS ORGANISATION: Encourage the learners to work on the activity with either their group, or with a partner.

WHAT ARE THE OUTCOMES OF THIS ACTIVITY?

The learner will be able to:

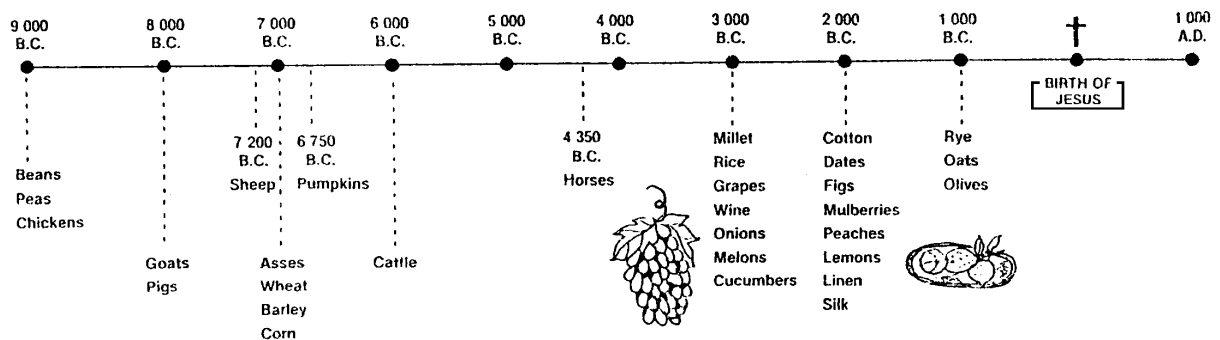
- use a time-line showing when some of our crops were first planted and approximate times when various animals were domesticated to do calculations about dates.

WHAT WILL BE DONE TO ACHIEVE THIS LEARNING?

- There is one activity in this unit.
- In this activity, the learners have to read information off a time-line, and have to do calculations involving the dates on the time-line.
- An additional fact about farming, not given in the learner's material is that although thousands of plant and animal species exist, only 200 plant and about 50 animal species have been domesticated.

ANSWERS

- Use the time-line to answer the questions.



1. Calculate the number of years between 9 000 BC and 5 000 BC.
 $9\ 000 - 5\ 000 = 4\ 000$ i.e. there are 4 000 years between 9 000 BC and 5 000 BC
2. Calculate the number of years between 100 BC and 100 AD.
From 100 BC to the year 0 there are 100 years
From the year 0 to 100 AD is another 100 years.
i.e. between 100 BC and 100 AD there are 200 years.

3. *Discuss how you would find out for how many years farmers have been growing beans.*
 Early farmers started growing beans in about 9 000 BC.
 From 9 000 BC to the year 0 is 9 000 years.
 From the year 0 to say the year 2 000, is 2 000 years.
 So, from the year 9 000 BC to the year 2 000 AD, is $9\ 000 + 2\ 000 = 11\ 000$ years
4. *Use your method to find out how many years farmers have been growing the following crops: a) grapes b) cotton c) oats d) pumpkins*
- a) Grapes were first grown in 3 000 BC
 The answer is found by working out $3\ 000 +$ the current year
- b) Cotton was first grown in 2 000 BC
 The answer is found by working out $2\ 000 +$ the current year
- c) Oats was first grown in 1 000 BC
 The answer is found by working out $1\ 000 +$ the current year
- d) Pumpkins were first grown in 6 750 BC
 The answer is found by working out $6\ 750 +$ the current year
5. *Name three kinds of material used for clothing before the birth of Jesus.* - They used cotton, linen and silk.
6. a) *What is another name for an ass?* - An ass is also called a donkey. A donkey is a relative of a horse. It has large ears, and is smaller and sturdier than a horse.
- b) *What is a mule?* A mule is also a relative of a horse. It has longer ears than a horse, but looks more like a horse than a donkey.
- c) *What is the relationship between a mule and a horse?* A mule is the offspring of a female horse (a mare) and a male donkey (a jackass). (The offspring of a male horse (a stallion) and a female donkey (a jenny) is called a hinny.) All male mules, and most female mules are sterile (i.e. they cannot reproduce)
7. *For how many years have farmers raised the following animals:*
- a) *cattle? b) goats? c) horses? d) sheep?*
- a) Cattle was domesticated round about 6 000 BC
 The answer is found by working out $6\ 000 +$ the current year
- b) Goats were domesticated round about 8 000 BC
 The answer is found by working out $8\ 000 +$ the current year
- c) Horses were domesticated round about 4350 BC
 The answer is found by working out $4350 +$ the current year
- d) Sheep were domesticated round about 7 200 BC
 The answer is found by working out $7\ 200 +$ the current year

8. *Name the different kinds of grain which farmers grew before the birth of Jesus.*

Around 7 000 BC, they started growing wheat, barley and corn.

Around 3 000 BC, they started growing millet.

Around 1 000 BC, they started growing rye.

- Allow the learners to discuss various method of reaching the answer.
- It is important that learners are given an opportunity to “speak” the language of mathematics. They should, as far as possible, be encouraged to explain how they reach their answer.

HOW WILL THE LEARNER’S ACHIEVEMENT BE ASSESSED?

Once again, the learners are encouraged to work together in a group. In that way, it is hoped that weak learners will learn from the rest of the group members.

- A group that gives an **excellent** answer will have managed to complete the questions with few, if any errors. Whatever errors there are will be due to copying error, or will be minor arithmetic mistakes. These learners are probably at Level 5 in Number on the Progress Maps.
- A group that gives an **average** answer will have managed to understand the fact that to find the length of time between a date before 0 and another after 0, they should add the two numbers together. However, they may have made mistakes with the addition of the two numbers. These learners are probably at Level 4 in Number on the Progress Maps
- A group that gives a **weak** answer will have struggled to understand the fact that to find the length of time between a date before 0 and another after 0, they should add the two numbers together. They will also have made mistakes when adding (or subtracting) two numbers. These learners are probably at Level 3 in Number on the Progress Maps

UNIT 3: DIFFERENT CALENDARS

DURATION: This unit should take about 2 hours to complete

RESOURCES NEEDED: The learners will have to draw a time-line, so they will need a ruler measured in either centimetres or millimetres.

CLASS ORGANISATION: Encourage the learners to work on the activity with either their group, or with a partner. This means that they should consult one another, and give only one group answer.

WHAT ARE THE OUTCOMES OF THIS UNIT?

The learners should:

- Be aware of the fact that the calendar used in most of the Western World is not the only calendar that exists or is used in the world today.
- Be able to work out when a century begins or ends, and also be able to work out which century a year falls in.
- Be able to draw a time line to show the relative positions of the beginning of various calendars.
- Be able to do calculations in order to work out conversions between one calendar and another.

WHAT WILL BE DONE TO ACHIEVE THIS LEARNING?

- There is one activity in this unit
- The teacher and the learners will have to discuss what is meant by a century, and when a century begins, and when it ends.
- They will be introduced to the Gregorian calendar, the Hebrew calendar, the Islamic calendar and the Chinese calendar.
- The learners will do calculations using the information they have been discussing.

ADDITIONAL INFORMATION THAT MIGHT BE USEFUL FOR THE TEACHER:

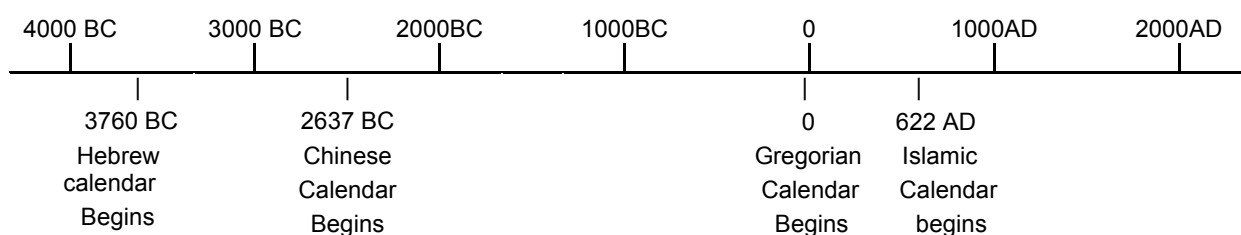
1. Most people in the Western World use the Gregorian calendar. It is called the Gregorian calendar as it was worked out in the 1580's by Pope Gregory the thirteenth. As we all know, it consists of 12 months, 11 of them with 30 or 31 days, and the twelfth one, February, normally having 28 days. This gives us 365 days. But, because our year is actually 365 and a quarter days long, in every fourth year, called a leap year, February has 29 days. But, even though we have this correction every fourth year, there still needs to be another slight adjustment. In century years that cannot be divided exactly by 400, such as 1700, 1800 and 1900, the extra day in February must be dropped. The rest of the century years are leap years. The century year 1600 was a leap year, and the year 2000 is one.
2. The dates of Christian holidays are regulated partly by the sun and partly by the moon. *Immovable* feasts such as Christmas are based on the solar calendar. *Movable* feasts such as Easter are based on the lunar calendar.
3. The Islamic year is much shorter than the solar year, with only 354 days. As a result, the Islamic New Year moves backwards through the seasons.

ANSWERS

1. *If the second century was from the year 101 to the year 200, what century started in 801 and ended in the year 900? - The 9th Century.*
2. *What century started in 1601 and ended in the year 1700? - The 17th Century.*
3. *When did the 20th Century start and when did it end? - It started in 1901 and ended in the year 2000. (It started on 1 January 1901, and ended on 31 December 2000.)*
4. *When will the next century begin? - It will begin in the year 2001.*
5. *Draw a time-line that you could use to show the Hebrew calendar, the Islamic calendar and the Chinese calendar relative to the Gregorian calendar.*

Points to consider:

- *Make sure that you use the correct scale*
- *Write the dates above the time-line and write a brief description of why the date is important below the time-line.*
- *The four dates to consider are:*
 - *The year 0*
 - *The year 3760 BC - the date from which the Hebrew calendar began*
 - *The year 622 AD – the date from which the Islamic calendar begins*
 - *The year 2637 BC - the date from which the Chinese calendar begins.*
- *It is important to decide on a scale so that the distances on the time-line will give an indication of the number of years between the dates.*
 - *We decided to show every thousand years on the top of the time-line. You could allow 2 centimetres between each date.*



6. *South Africa had its first Democratic Elections in 1994. What would the year have been on the*
 - a) *Hebrew calendar*
 - b) *Islamic calendar*
 - c) *Chinese calendar*

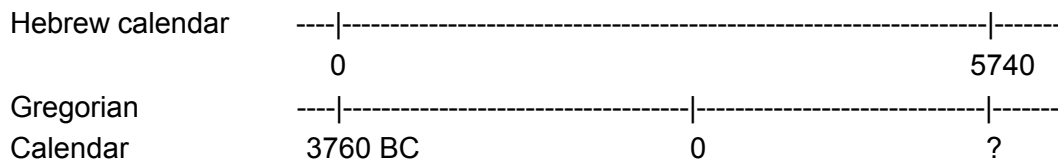
- *It is hoped that this will generate much discussion amongst the learners in a group. Encourage the learners to use the number line they have just drawn to assist them here.*

- a) The year on the Hebrew calendar = $1994 + 3760 = 5754$
- b) The year on the Islamic calendar = $1994 - 622 = 1372$
- c) The year on the Chinese calendar = $1994 + 2637 = 4631$

N.B. Questions 7, 8 and 9 are more difficult than the rest. If you want to, you could give these as extension work to your faster learners. Another alternative is to get the whole class to try number 7, and then to suggest to the groups that manage to find the answer, that they then try numbers 8 and 9.

7. *If it is the year 5740 in the Hebrew calendar, what would the year be on the Gregorian calendar?*

- If we drew a diagram, it would look like this:



We know that $3\ 760 + ? = 5\ 740$

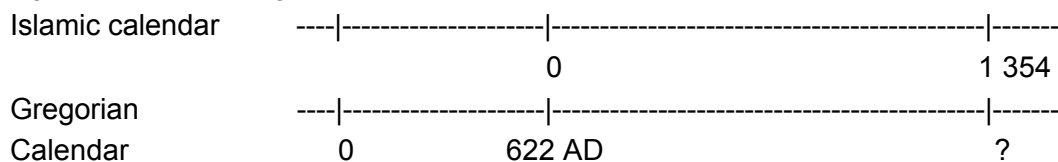
To find that unknown year, we have to subtract 3 760 from 5 740

i.e. $5\ 740 - 3\ 760 = 1980$

So, it will be 1980 on the Gregorian calendar.

8. *If it is the year 1 354 in the Islamic calendar, what would the year be on the Gregorian calendar?*

Again we draw a diagram



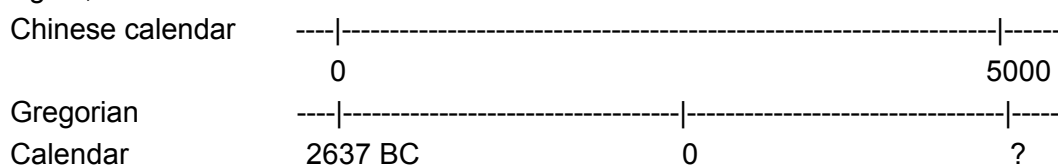
We know that when the Islamic calendar started, the Gregorian calendar had already gone through 622 years.

So, when the Islamic calendar had gone through 1354 years, the Gregorian calendar had gone through $622 + 1354$ years.

So, the date on the Gregorian calendar = $622 + 1354$ years = 1976

9. *If it is the year 5000 on the Chinese calendar, what would the year be on the Gregorian calendar?*

Again, we draw a date-line



We know that $2\ 637 + ? = 5\ 000$

To find the unknown year, we subtract 2 637 from 5 000

So, the date on the Gregorian calendar = $5\ 000 - 2\ 637 = 2\ 363$ (in other words, some time in the future)

10. The word “**millennium**” means “one thousand years”. If the first millennium in the Gregorian calendar started in the year 1 AD,

- a) when did the first millennium end?
- b) when did the second millennium begin, and when did it end?
- c) when did the third millennium begin, and when did it end?

- Question 10 is very topical at the time of writing this module (June 1999) as there is a lot of discussion at the moment as to when the “new millennium” actually begins. Is it 1 January 2000, or is it 1 January 2001? The answer to question 10 should answer this.

- a) The first millennium started on 1 January in the year 1 and ended on 31 December in the year 1000.
- b) The second millennium began on 1 January 1001 and ended on 31 December 2000.
- c) The third millennium will begin on 1 January 2001 and end on 31 December 3000.

HOW WILL THE LEARNER’S ACHIEVEMENT BE ASSESSED?

The groups should be assessed on how well they answered the questions in Activity 3.1. It is easier to assess a groups’ answer by looking at their whole output, rather than at individual parts of the answer. We suggest that:

- a) if a group gives an **excellent** answer, that you allocate **3 marks**;
- b) where a group gives an **average** answer, allocate **2 marks**;
- c) where a group gives a **weak** answer, allocate **1 mark**.

- Questions 1, 2, 3 and 4 are fairly straightforward, so the groups should be able to answer them with very little difficulty.

- Question 5 involves the drawing of a time-line.

A group that gives an **excellent** answer will have got the scale correct, and would be able to represent the time between dates in terms of the correct lengths on the number line. The dates would be filled in correctly, and each date would be correctly labeled.

A group that gives an **average** answer will have drawn the number line, have put in the dates in the correct order, would have labeled each date correctly, but would not necessarily have got the scale correct.

A group that gives a **weak** answer, will have drawn a number line, would not have got the scale correct and would not have put the dates in the correct order.

- Question 6, involves converting the date 1994 into dates on other calendars.

- # A group that gives an **excellent** answer will get all three answers correct.
- # A group that gives an **average** answer will probably get 2 out of 3 correct, and these answers will probably be a) and c), where they have to add, and not b) where they have to subtract to get the answer.
- # A group that gives a **weak** answer will probably get no answers correct.
- Questions 7, 8, 9 and 10 involves converting a date on one of the other calendars into a date on the Gregorian calendar, and answering questions about when a millennium begins and when it ends. There will be quite a few of the learners who will struggle with getting these answers. Allow them to struggle, and to try and come up with an answer.
 - # A group that gives an **excellent** answer will get all the answers correct.
 - # A group that gives an **average** answer will probably get 2 or 3 correct.
 - # A group that gives a **weak** answer will probably not get any correct.
- Members of a group that whose answers are mostly **excellent**, are probably at **Level 5** in Number on the Progress Maps.
- Members of a group that whose answers are mostly **average**, are probably at **Level 4** in Number on the Progress Maps.
- Members of a group whose answers are mostly **weak**, are probably at **Level 3** in Number on the Progress Maps.

UNIT 4: DIFFERENT NUMERATION SYSTEMS

DURATION: This unit should take the learners about 2 hours to complete.

RESOURCES NEEDED: Nothing special is needed for this unit.

CLASS ORGANISATION: In Activity 4.1, learners are asked to work on their own, and in Activity 4.2, learners work with their group.

WHAT ARE THE OUTCOMES OF THE UNIT?

The learners should be able to

- translate Ancient Egyptian numerals into the numerals we usually use.
- translate our numerals into Ancient Egyptian numerals.
- write down two differences between our numeration system and the Ancient Egyptian numeration system.
- have an understanding of why our numerals are called Hindu-Arabic numerals.
- write down as many different numbers as possible using three given digits
- follow instructions to do a calculation; repeat the calculation; and then be able to say why the particular answer occurs all the time.

WHAT WILL BE DONE TO ACHIEVE THIS LEARNING?

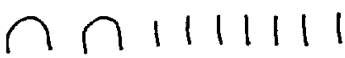
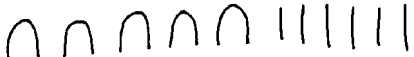
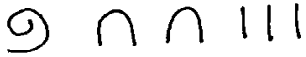
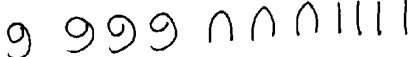


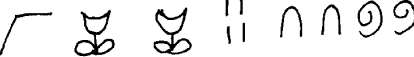

- There are two activities in this unit.

Activity 4.1 - THE EGYPTIAN NUMERATION SYSTEM






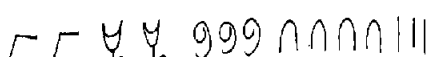


- In this activity, the learners are introduced to how the Ancient Egyptians wrote their numbers.
- There are many other Ancient systems, such as the Roman, Mayan, Babylonian, Chinese, etc, system, that could be studied here. We leave that up to the teachers to add in here if they wish.
- One of the important differences between the Ancient Egyptian system and our system of writing numbers, is that the Ancient Egyptian system did not use place value, whereas our system does. This means that the *value* of a numeral depends on the *place* that it occupies in a number
 - e.g. The 2 in the number 952 has the value *2 units*.
 - The 2 in the number 925 has the value *2 tens*
 - The 2 in the number 295 has the value *2 hundreds*
- Another important difference is that our numeration system has a symbol for zero. We use it to indicate that we have nothing of something (e.g. I have 0 brothers and sisters), and we also use it as a place holder (e.g. if I have 2 hundreds, no tens and 5 units, I can write 205; the 0 hold the place open in the tens position so that the number in the hundreds position is in the correct place.)
- All of this means that we can write any number in our system using the digits 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9.

ANSWERS TO ACTIVITY 4.1




1. Write each of the following Egyptian numerals in the way we would write them:

- a.  = 27
- b.  = 56
- c.  = 123
- d.  = 434
- e.  = 1 250
- f.  = 600 000
- g.  = 12 224
- h.  = 2 000 000




2. Write each of the following as Egyptian numerals:

- a. 45 = 
- b. 96 = 
- c. 425 = 
- d. 1 833 = 
- e. 6 000 = 
- f. 22 343 = 
- g. 614 000 = 
- h. 1 230 005 = 

3. a) Write 123, 213 and 312 using Egyptian numerals

- 123 = 
- 213 = 
- 321 = 

3. b) We use the same 2 to represent 2 units, 2 tens and 2 hundreds. How did the Ancient Egyptians represent 2 units, 2 tens, and 2 hundreds?

2 units = 
 2 tens = 
 2 hundreds = 

4. When we write the number “four hundred” using digits, we write 400. The zeros tell us that there are no tens and no units, only four hundreds. How did the Ancient Egyptians write four hundred?

They wrote 

5. Write down two differences between our numeration system, and the Ancient Egyptian numeration system.

- There are many answers that are possible here. They could just talk about the differences between the symbols that are used; they could talk about place value; they could talk about zero; they could talk about zero being a place holder; etc.

Activity 4.2 - THE HINDU-ARABIC NUMERATION SYSTEM

- In this activity, the learners extend what they have learned about number systems to an understanding of what the Hindu-Arabic numeration system is.
- An additional fact that might be interesting: In the 800’s a Persian mathematician wrote a book that was translated into Latin about 300 year later. This translation brought the Hindu-Arabic numerals into Europe.

ANSWERS TO ACTIVITY 4.2

- 1 Write down the number “seventeen thousand five hundred and ninety-eight” using
 a) Egyptian numerals and b) Hindu-Arabic numerals.

a) 

b) 17 599

- 2 Which one took the shortest time to write down? - The Hindu-Arabic numerals
- 3 Why did it take the shortest time? - There were fewer numerals to write
- 4 In which one is the position of the numerals important - The Hindu-Arabic numbers
- 5 Why do you think the Hindu-Arabic system is now the one used around the world?
 Because it is much easier to write numbers and do calculations with it than with any other numeration system.

6 Make as many numbers as you can from the digits 5, 3 and 6. Each number should use all three digits.

356	563	653
365	536	635

- a) Which is the largest of these numbers? 653
 b) Which is the smallest of these numbers? 356

7. a) Choose any 3-digit number and write it down e.g. 486
 b) Write the number backwards 684
 c) Decide which number is larger 684
 d) Subtract the smaller number from the larger number $684 - 486 = 198$
 e) Write the answer to d) backwards 891
 f) Add your answers to d) and e) together $198 + 891 = 1\ 089$
 g) Choose another 3-digit number and work through this question again.
 What do you notice?

105
501
$501 - 105 = 396$
$693 + 396 = 1\ 089$

- You should notice that each time the answer is 1 089.

- h) Write down why you end up with the answers that you do. Compare your answer with other learner's answers.

When you subtract the two numbers, you end up with a 3-digit number. The middle digit is always a 9, and the other two always add up to 9. The two middle numbers always add up to 18. So the answer is always $900 + 180 + 9 = 1089$

HOW WILL THE LEARNER'S ACHIEVEMENT BE ASSESSED?

1. Assessing the learners understanding of the questions in **Activity 4.1**

- Questions 1, 2, 3 and 4 are fairly straightforward, and should be able to be completed by all learners.
- Answers will differ when it comes to question 5. Some learners will be able to complete the question so that their answer have some meaning. Let them share their answers with the rest of the class, and allow the class to comment on the reasons, and perhaps add more of their own.

2. Assessing the learners understanding of the questions in **Activity 4.2**

A group that gives an **excellent** answer to this activity, will manage to

- a) complete all questions 1, 2, 3 and 4 correctly,
 b) answer questions 4 and 5 with insight
 c) find 6 numbers that they can write with the numbers 5, 3 and 6, and will be able to decide which one is the largest and which one is the smallest.
 d) follow the instructions in question 7, and will reach a correct conclusion to question 7h.

- # A group that gives an **average** answer to this activity, will manage to
- a) complete questions 1, 2 and 3 correctly
 - b) answer questions 4 and 5, but the answers may lack insight
 - c) answer question 6, but may make a few errors
 - d) to follow most of the instructions in question 7, but probably won't be able to reach any conclusion nor give reasons for the answer that recurs.

- # A group that gives a **weak** answer to this activity, will probably
- a) manage to complete questions 1, 2 and 3 correctly
 - b) not be able to answers 4 and 5 with much insight;
 - c) be able to answer at least some of question 6
 - d) not understand all of the language in question 7, and hence will not be able to follow all the instructions, and not be able to reach a conclusion.

- Learners in a group that gives an excellent answer to the activity are probably all at Level 5 in Number on the Progress Maps.
- Learners in a group that gives an average answer to the activity are probably all at Level 4 in Number on the Progress Maps.
- Learners in a group that gives an average answer to the activity are probably all at Level 3 in Number on the Progress Maps.

UNIT 5: HELPING TWO FARMERS USING DECIMALS AND MEASUREMENT

DURATION: This unit should take about 2 hours to complete.

RESOURCES NEEDED: The learners will need a ruler to help them with the drawings. They will need a piece of string/wool/thread to help them find the perimeter of a circle. They may also use a calculator to work out the answers.

CLASS ORGANISATION: The learners should be encouraged to discuss the examples with the rest of the members of their group, and to come up with a group solution.

WHAT ARE THE OUTCOMES OF THE UNIT?

The learners should be able to:

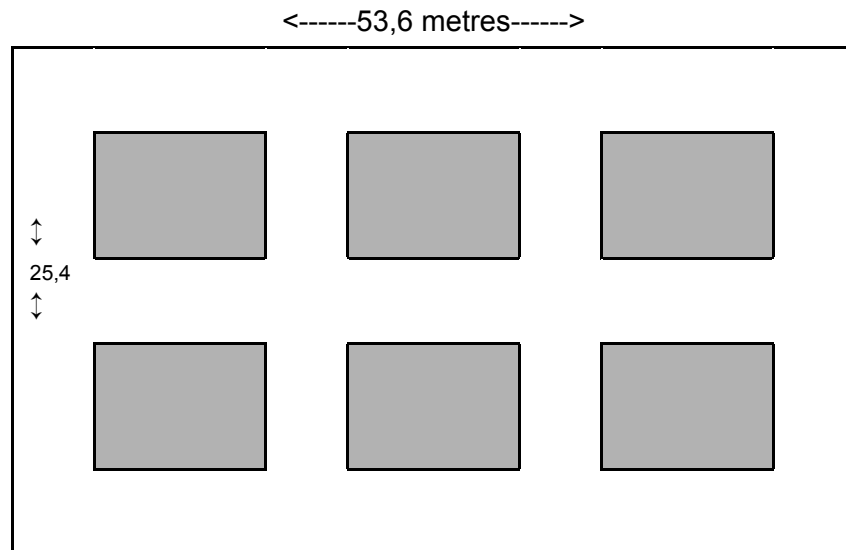
- Remember what they have learned about perimeter in previous years, and apply what they have learned to solve problems about the fencing of land.
- Work out the dimensions of smaller pieces of land given the dimensions of the larger piece of land, and the widths of the pathways.
- Work out how much water is being wasted by a tap that is leaking.

WHAT WILL BE DONE TO ACHIEVE THIS LEARNING?

- There is one activity in this unit.
- In this section we meet Mrs Dlomo and Mr Mbatha. They are neighbours who have gone into partnership to farm a piece of land. We follow them and look at the various decisions they have to make in their daily lives.
- In this activity, they have acquired a piece of land, which they decide to fence.
- They then divide the land up into smaller pieces, and they then decide to work out how much it will cost to fence the smaller pieces of land.
- There is a question on working out the perimeter of various shapes, and one where the learners work out how much water is wasted by a leaking tap.
- Ensure that your learners remember that when we ask them to find out the perimeter of something, we are asking them to find the distance all the way around it. At this stage we are not focussing on any formulae, but are revising the concept of perimeter.
- Make sure that your learners understand what is meant by the word “dimensions”. When we talk about the dimensions of a piece of land, we are talking about its measurements. i.e. if it is rectangular, we would be talking about the length of the piece of land, and the breadth, or width of the piece of land.
- Get the learners to do a rough sketch of the diagram in the books, and to fill in the dimensions on the diagram. (i.e. that the length is 53,6 m long, and the breadth is 25,4 m wide)

ANSWERS:

1. Draw this diagram of their piece of land, and fill in the dimensions on it.



2. Find the perimeter of the piece of land
We are told that the land is 53,6 m long, and 25,4 m wide.
The perimeter = $53,6 + 25,4 + 53,6 + 25,4$ m
= 158 m
3. Mrs Dlomo and Mr Mbatha decide to put a fence around their land. They will need to have a gate in the fence so that they can get in and out.
- The fence costs R 40,00 per metre
 - The gate costs R300,00, and is 1 metre wide
- a) Decide where you think they would put the gate. Draw it on your diagram.



- Learners will have to draw a rectangle, and then decide where they would put the gate. (It, in fact, makes no difference to the calculations that follow, as to where they would put the gate.)
- b) Calculate how much Mrs Dlomo and Mr Mbatha would have to pay to fence their land.
The perimeter is 158 metres.
If the gate is 1 m wide, that means that they would have to buy 157 m of fencing.
The cost of 157 m of fencing = $157 \times R 40,00 = R 6\ 280$
The cost of the gate is R 300,00,
So the cost of the gate and the fence is R 6 580,00.

- c) *Would the position of the gate make any difference to the cost of fencing the property?* - No it would not.
- d) *If Mrs Dlomo and Mr Mbatha decide to share the costs of the fencing equally, what would they each have to pay?*
 $R\ 6\ 580,00 \div 2 = R\ 3\ 290,00$
 So, they would each have to pay R 3 290,00
- e) *Why do you think Mrs Dlomo and Mr Mbatha decide to fence the land?*
 Answers will vary here. Perhaps they want to keep the animals out of their crops; perhaps they don't want people to walk over their crops; perhaps they don't want others to pick their crops.

4. *They decide to divide the land up into 6 smaller pieces, each the same size. The paths are all 50 cm wide.*

a) *Use your diagram to help you work out what the dimensions of each of the smaller pieces of land would be.*

- Study the diagram on the previous page. Look at the length (which is usually taken to be the longest side) of the piece of land.
- It consists of : path – land – path – land – path - land - path
 Each path is 50 cm wide, and there are 4 paths
 $\text{Now, } 4 \times 50 \text{ cm} = 200 \text{ cm} = 2 \text{ m}$
 This means that 2m of the length of the rectangle is taken up by the paths
- $53,6 \text{ m} - 2 \text{ m} = 51,6 \text{ m}$
 This means that 51,6 m of the length is taken up by the length of three pieces of land.
- $51,6 \div 3 = 17,2$
This means that the length of each smaller piece of land is 17,2 m
- Now let's look at the breadth (or width) of the piece of land. (The breadth or width is generally taken to be the shortest side.)
- It consists of : path – land – path – land – path
 Each path is 50 cm wide, and there are 3 paths.
 $\text{Now, } 3 \times 50 \text{ cm} = 150 \text{ cm or } 1,5 \text{ m}$
 This means that 1,5 m of the width of the rectangle is taken up by the paths
- $25,4 - 1,5 = 23,9 \text{ m}$
 This means that 23,9 m of the width is taken up by the widths of two pieces of land.
- $23,9 \div 2 = 11,95 \text{ m}$
This means that the width of each smaller piece of land is 11,95 m

So the dimensions of each smaller piece of land are 17,2 m by 11,95 m.

b) *If they decide to fence each of the smaller pieces of land, rather than the large piece of land, how much would the fencing cost? (Remember the gates.)*

- The perimeter of each of the smaller pieces of land
 $= 17,2 + 11,95 + 17,2 + 11,95 \text{ m} = 58,3 \text{ m}$
- But, each piece of land will need a gate 1 m wide,
So the amount of fencing needed $= 57,3 \text{ m}$
- The cost of the fencing $= 57,3 \times \text{R } 40,00 = \text{R } 2\,292,00$
The cost of the gate is R 300,00
So, the total cost for fencing each of the smaller pieces of land
is $\text{R } 2\,292,00 + \text{R } 300,00 = \text{R } 2\,592,00$
- There are 6 smaller pieces of land
 $6 \times \text{R } 2\,592,00 = \text{R } 15\,552,00$

So, it would cost R15 552,00 to fence the six smaller pieces of land.

c) *This time, Mrs Dlomo said that she would pay 2/3 of the costs of the fencing, if Mr Mbatha would pay the rest of the cost of the fencing. How much did each pay?*

$$\text{R } 15\,552,00 \div 3 = \text{R } 5\,184,00$$

This means that Mr Mbatha would have to pay R 5 184,00.

Mrs Dlomo would have to pay $2 \times \text{R } 5\,184,00 = \text{R } 10\,368,00$

4. *Find the perimeters of these shapes. You will need to measure the sides.*

- Encourage the learners to measure all the way around each shape. It is not necessary to use formulae here.
- One way of working out the perimeter (or circumference) of the circle is to take a piece of string/wool/thread, and to use it to measure around the circle. The length of the piece of string can then be measured on a ruler

a) 12,7 cm b) 14,1 cm c) 13,3 cm d) 11,9 cm

5. *There is a water tap on the piece of land. This tap is leaking, and water is constantly running from the tap.*

➤ *Mrs Dlomo puts a measuring cup under the tap, and finds out that 15 ml of water drips into the cup in 1 minute.*

a) *How much water is wasted in 1 hour? How many cups of water is that?*

There are 60 minutes in 1 hour.

i.e. in 1 hour, the amount of water wasted is $60 \times 15 \text{ ml} = 900 \text{ ml}$

- 900 ml of water is wasted in 1 hour.
- This is 3 cups (of 250ml each) with 150 ml left over.

b) *How much water is wasted in 1 day. How many cups of water is that?*

There are 24 hours in a day.

i.e. In 1 day, the amount of water wasted is $24 \times 900 \text{ ml} = 21\,600 \text{ ml} = 21,6 \text{ litres}$

- 21,6 litres of water is wasted in 1 day.
- This is 86 cups of water with 100ml left over.

c) *How much water is wasted in 1 month of 30 days? How many cups of water is*

that?

There are 30 days in this month.

i.e. in 1 month of 30 days, the amount of water wasted is

$$30 \times 21,6 \text{ litres} = 648 \text{ litres}$$

- 648 litres of water is wasted in 1 month of 30 days.
- This is 2 592 cups of water.

d) *How much water is wasted in a year?*

There are 365 days in a year.

$$\begin{aligned} \text{i.e. in a year, the amount of water wasted is } 365 \times 21,6 \text{ litres} &= 7\,884 \text{ litres} \\ &= 7,884 \text{ kilolitres} \end{aligned}$$

- 7,884 kilolitres of water is wasted in a year.

e) *If water costs R2,50 per kilolitre, how much money is wasted in 1 year?*

1 kilolitre of water costs R2,50

$$\begin{aligned} \text{So, } 7,884 \text{ kilolitres of water will cost } 7,884 \times \text{R}2,50 \\ = \text{R } 19,71 \end{aligned}$$

f) *How does one repair a leaking tap?*

Generally, a tap leaks because its rubber washer has become worn. When this washer is replaced, the tap should stop leaking.

HOW WILL THE LEARNER'S ACHIEVEMENT BE ASSESSED?

Activity 5.1 involves many calculations

- # A group that gives an **excellent** answer will understand what it means to find the perimeter of a piece of land. They manage to answer all the questions correctly, and explain clearly how to fix a leaking tap.
- # A group that gives an **average** answer will understand what it means to find the perimeter of a piece of land and so will answer questions 1 and 4 correctly; they can answer question 2 correctly, but do not necessarily get the whole of question 3 correctly. They can answer some parts of question 5 correctly, but may have made some errors in calculations.
- # A group that gives a **weak** answer should understand what it means to find the perimeter of a piece of land, but may make arithmetical errors when working out the answers to questions 1 and 4. They manage to answer a few parts of question 2 correctly, but will probably have trouble answering question 3 and question 5.

UNIT 6: HELPING THE NALEDI FARMERS USE PERCENTAGE

DURATION: This unit should take about 2 hours to complete.

RESOURCES NEEDED: The learners will not need any special resources for this unit.

CLASS ORGANISATION: In Activities 6.1, 6.4 and 6.5, the learners work on their own. In Activities 6.2 and 6.3, the learners work with a partner.

WHAT ARE THE OUTCOMES OF THIS UNIT?

The learners should be able to

- arrange 100 trees on different shaped pieces of land
- understand that we can write a fraction out of 100 as a percentage
- write a fraction as a percentage
- write a percentage as a fraction
- write a percentage as a decimal

WHAT WILL BE DONE TO ACHIEVE THIS LEARNING?

- There are five activities in this unit.

Activity 6.1 - INTRODUCING PERCENTAGE

- Mrs Dlomo and Mr Mbatha of Naledi Farm want to plant fruit trees on a piece of land that they buy next to their original piece of land.
- The learners are asked to work out how 100 trees can be arranged in a rectangular shape, and then asked to work out how to arrange 100 trees on another shape

ANSWERS TO ACTIVITY 6.1

Suppose Mrs Dlomo and Mr Mbatha could choose the shape of their piece of land

1) *Suppose they choose a rectangular piece of land.*

Work out as many ways as possible of arranging 100 trees on a rectangle.

The rectangle could be

100 trees long and 1 tree wide

50 trees long and 2 trees wide

25 trees long and 4 trees wide

20 trees long and 5 trees wide

10 trees long and 10 trees wide - *a square is a special kind of rectangle*

2) *Choose another shape*

Work out how to arrange 100 trees on that shape.

Answers will vary here. Use this opportunity to get the learners to explain to the rest of the class which shape they choose, and how they arranged the trees on the shape.

Activity 6.2 – CONVERSIONS

- In this activity, the learners are introduced to the meaning of the percentage sign (%)
- They write fractions out of 100 as percentages, and then write percentages as fractions out of 100.

ANSWERS TO ACTIVITY 6.2

1. Write each of the following as a percentage:

a) $\frac{9}{100} = 9\%$ b) $\frac{25}{100} = 25\%$ c) $\frac{80}{100} = 80\%$

d) $\frac{99}{100} = 99\%$ e) $\frac{2}{100} = 2\%$

2. Write each of these as a fraction out of 100:

a) $33\% = \frac{33}{100}$ b) $71\% = \frac{71}{100}$ c) $20\% = \frac{20}{100}$

d) $1\% = \frac{1}{100}$ e) $102\% = \frac{102}{100}$

Activity 6.3 - WRITING A FRACTION AS A PERCENTAGE

- In this activity, the learners work with fractions where the denominators are factors of 100 i.e. with denominators of 2, 4, 5, 10, 20, 25 and 50.
- To write these fractions as percentages, the learners write them as equivalent fractions with a denominator of 100.

ANSWERS TO ACTIVITY 6.3

1a). $\frac{23}{50} = \frac{46}{100} = 46\%$ b) $\frac{43}{50} = \frac{86}{100} = 86\%$

c) $\frac{7}{25} = \frac{28}{100} = 28\%$ d) $\frac{12}{25} = \frac{48}{100} = 48\%$

e) $\frac{25}{25} = \frac{100}{100} = 100\%$ f) $\frac{6}{10} = \frac{60}{100} = 60\%$

g) $\frac{2}{5} = \frac{40}{100} = 40\%$ h) $\frac{5}{5} = \frac{100}{100} = 100\%$

i) $\frac{1}{2} = \frac{50}{100} = 50\%$ j) $\frac{6}{20} = \frac{30}{100} = 30\%$

- 2.
- Encourage the learners to compare their answers to those obtained by others in the class.
 - □ Also encourage them to try to work out where they have made their mistakes with the ones they have got wrong.

Activity 6.4 – CHANGING A PERCENTAGE BACK TO A FRACTION

- In this activity, the learners first change a percentage back into a fraction with a denominator of 100.
- They then write this fraction in simplest form by cancelling.

ANSWERS TO ACTIVITY 6.4

1. Write each of the following as a fraction in its simplest form

a) $10\% = \frac{10}{100} = \frac{1}{10}$

b) $20\% = \frac{20}{100} = \frac{2}{10} = \frac{1}{5}$

c) $30\% = \frac{30}{100} = \frac{3}{10}$

d) $40\% = \frac{40}{100} = \frac{4}{10} = \frac{2}{5}$

e) $50\% = \frac{50}{100} = \frac{5}{10} = \frac{1}{2}$

f) $60\% = \frac{60}{100} = \frac{6}{10} = \frac{3}{5}$

g) $70\% = \frac{70}{100} = \frac{7}{10}$

h) $80\% = \frac{80}{100} = \frac{8}{10} = \frac{4}{5}$

i) $100\% = \frac{100}{100} = \frac{1}{1} = 1$

j) $25\% = \frac{25}{100} = \frac{5}{20} = \frac{1}{4}$

k) $75\% = \frac{75}{100} = \frac{15}{20} = \frac{3}{4}$

l) $200\% = \frac{200}{100} = \frac{2}{1} = 2$

2. Write down any patterns that you notice amongst the answers

- The learners may give varying answers here.

- They may notice that $10\% = \frac{1}{10}, \dots, 20\% = \frac{2}{10}, \dots, 30\% = \frac{3}{10}$, etc

- They may notice that $25\% = \frac{1}{4}, \dots, 50\% = \frac{1}{2} = \frac{2}{4}, \dots, 75\% = \frac{3}{4}$, etc

- Encourage the learners to speak about the patterns that they have discovered.

3. Compare your answers with those in the rest of the group
Discuss the ones where you have different answers.

Activity 6.5 - CHANGING A PERCENTAGE INTO A DECIMAL

- In this activity, the learners get an opportunity to change a percentage into a decimal.
- Once they have written the percentage as a number out of a hundred, then it is easy to change the fraction into a decimal.

ANSWERS TO ACTIVITY 6.5

1. Write each of the following as a decimal

a. $35\% = \frac{35}{100} = 0,35$

b. $74\% = \frac{74}{100} = 0,74$

c. $97\% = \frac{97}{100} = 0,97$

d. $7\% = \frac{7}{100} = 0,07$

e. $3\% = \frac{3}{100} = 0,03$

f. $100\% = \frac{100}{100} = 1$

g. $103\% = \frac{103}{100} = 1,03$

h. $305\% = \frac{305}{100} = 3,05$

2. Write down any patterns that you notice amongst the answers

Many answers are possible here. They may say that when the number is less than 100%, then we end up with a number with two decimal places. When the number is more than 100%, then we end up with a number with a digit in the units position and then followed by two decimal places.

Once again, encourage learners to explain the patterns that they see.

3. Compare your answers to those in the rest of the group
Discuss the ones where you have different answers

HOW WILL THE LEARNER'S ACHIEVEMENTS BE ASSESSED?

Unit 6 consists of activities which are mainly purely mathematical. As a result, assessment of the calculations in this unit is done in the way that assessment has always been done: either the answer is right or it is wrong.

Learners who are getting a lot of the calculations wrong, should be encouraged to work at more examples, made up by the teacher, or from one of the various textbooks currently in use, until they can adequately manage to convert a number from a fraction to a percentage; and from a percentage to a fraction and a decimal. This is a skill that all learners should strive towards.

Learners at Level 4 or at Level 5 in Number in the Progress Maps should cope with these activities with ease. Learners who struggle with the conversions, are probably at Level 3 in Number

UNIT 7: FINDING OUT ABOUT STATISTICS

DURATION: This unit should take about 5 hours to complete

RESOURCES NEEDED: In Activity 7.5, the learners are required to look in newspapers, advertising brochures and magazines for examples of tables or graphs. As a result, we suggest that you ask them now to start collecting material, and we also suggest that you start collecting material as well.

CLASS ORGANISATION:

Activity 7.1 is an individual activity; they should work on Activity 7.2 and Activity 7.4 in pairs; Activity 7.3 and Activity 7.5 are a group activities

WHAT ARE THE OUTCOMES FOR THIS UNIT?

The learners should be able to:

- understand what we mean when we talk about statistics
- be able to distinguish between questions which ask about facts, opinions and trends
- draw up a frequency table and fill in information on it
- do their own survey
- be able to read information off various ways of representing data
- be able to classify tables and graphs in different ways

WHAT WILL BE DONE TO ACHIEVE THIS LEARNING?

- There are 5 activities in this unit

Activity 7.1 - ASKING QUESTIONS

- This activity starts off by defining what we mean when we talk about **statistics**.
- It then goes on to distinguishing between questions which ask about facts, questions which ask about opinions, and questions which ask about trends.

ANSWERS TO ACTIVITY 7.1

1. *What is your favourite colour?*
This question is asking you for your OPINION. There is no right or wrong answer to the question.
2. *Where is the biggest mealie growing area in South Africa?*
This is a question about a FACT. We can do an investigation and find out the answer to this question.
3. *Do you think we will have good rains this summer?*
This is a question about TRENDS. We can look at the conditions and use them to try to make a prediction about whether we are going to have a lot of rain or a little rain. These predictions could turn out to be right, or they could turn out to be wrong.
4. *Which is the fastest selling fruit yoghurt in the supermarket?*
This is a question about FACT. We can do a survey and find out the actual answer to this question.

Activity 7.2 - DOING A SURVEY

- In this activity, the learners are told about the survey that Mrs Dlomo and Mr Mbatha want to do.
- They are shown how to draw up a frequency table.
- They are asked to draw up two frequency tables, and to fill the given information on them.
- Notice that the TOTAL is a way of checking whether all the data has been included.

ANSWERS TO ACTIVITY 7.2

1 *The learners are given data about what the favourite vegetables are of some of the learners in Grade 7C.*

a) *They are asked to copy and complete the following frequency table:*

Type of vegetable	Tallies	Frequency
potatoes	++++	5
rice	++++	6
cabbage	++++	6
carrots		2
tomatoes		3
none		1
	TOTAL	23

b) *They are asked to answer the following questions:*

- (i) *Which was the Grade 7C's favourite vegetable?*
· Grade 7C's favourite vegetables are rice and cabbage
- (ii) *Which was the Grade 7C's least favourite type of vegetable?*
· Grade 7C's least favourite vegetable is carrots

2. *Dumi, who is Mrs Dlomo's niece, had to do a survey for school. She decided to ask the farmers in the area how many times a week they listen to the Farmer's Report on the radio.*

- *She asks 40 people, and writes down their answers.*

a) Copy the frequency table, and fill it in.

Number of times people listen to the Farmer's Report in a week.	Tally	Frequency
0		7
1		7
2		10
3		6
4		7
5		3
TOTAL		40

b) Use the frequency table to answer the following questions:

- i) How many people didn't listen to the Farmer's Report at all?
 - 7 people don't listen to Farmer's Report at all.
- ii) How many people listened to the Farmer's Report five times a week?
 - 3 people listened to Farmer's Report five times a week.
- iii) How many more people listened twice a week than people who listened three times a week?
 - 4 more people listened twice a week than those who listened 3 times a week.

Activity 7.3 - DOING YOUR OWN SURVEY

- In this activity the learners have to do a survey of their own.
- They have to work with their group to conduct a survey amongst twenty learners in their class to find out what everybody's favourite vegetable is.
- They have to fill in the information on a frequency table, and then answer questions about the information they collected.

NB: they must keep this survey as they will be needing it for Activity 8.4.

ANSWERS TO ACTIVITY 7.3

- Learners can select the type of vegetable, as well as the number of different vegetables, that they are going to list in the first column of the frequency table.
- Their frequency table should look something like the one in number 1 of Activity 7.2.

Activity 7.4 - REPRESENTING DATA

- In this activity, the learners study the various ways that data could be represented.
- They discuss what information is given by each different way, and are then asked to write down a description of each one.

ANSWERS TO ACTIVITY 7.4

1. *Discuss what information is given by each way of representing data.*
The learners should be given an opportunity to discuss, in their groups, what information is represented by each way of recording data.

2. *Write down a description of each graph*
 - These are suggestions for descriptions
 - Allow groups an opportunity to read their descriptions to the rest of the class.
 - Some learners may disagree with some of the group's description. Allow them to put forward an argument as to why they disagree with the group's answer. This may stimulate a class discussion, which you should encourage, but yet should also control. Don't let the discussion move too far from the point of this activity.

1. The frequency table tells us how many people work on each of 3 farms.
 - 23 people work on Farm A
 - 27 people work on Farm B
 - 14 people work on Farm C
2. The list tells us which vegetables were planted during 1998.
3. The table tells us the seasons when vegetables should be planted.
4. The Venn diagram tells which vegetables are liked by Dan and Angie. Dan likes carrots, potatoes, peas and beans, whereas Angie likes peas, beans, cabbage, lentils and sprouts. The part in the middle of the Venn diagram (the intersection) tells us that both Dan and Angie like peas and beans.
5. The bar graph tells the amount of rainfall that fell each month during 1988. J, F, M, A, M, ... stands for January, February, March, etc.
6. The pie graph shows the fraction of the crop that was made up of each different vegetable. The graph is divided into 12 parts.
 - Just over 8/12 of the crop was potatoes,
 - 2/12 of the crop was cabbage,
 - just over 1/12 of the crop was beans
 - just under 1/12 of the crop was peas
7. The line graph shows how much was spent on fertiliser each month during the year.

Activity 7.5 - DATA IN THE NEWS

- In this activity, the learners are asked to go through newspapers, advertising brochures, and magazines for examples of tables or graphs.
- Often there are several graphs in the business section of the newspaper.

ANSWERS TO ACTIVITY 7.5

- *Look in newspapers, advertising brochures and magazines for examples of tables or graphs*
- *Cut them out to use for this activity.*

Both the business section and the news section of the newspaper are good sources for graphs. News magazines like Time or Newsweek, or any of the Financial magazines are also a good source of material.

Start collecting them yourself so that you can hand them out to the learners who haven't managed to find their own examples of graphs.

1. *Work with your group*
 - a) *Sort your examples into the different formats e.g. tables, pictographs, block graphs, pie charts, etc.*
 - b) *Now re-sort them according to whether they record facts, opinions or trends.*
 - c) *Look at each example that you cut out. Decide whether it tells you about the present, the past or the future (or maybe all or more than one of these).*
 - d) *Sort the tables and graphs into different topics e.g. those that are about money; those that are about people's choices; those that are about different products; etc*
 - e) *Write down anything else that you notice about them.*
 - Exercises like this give the learners an opportunity to share their ideas with their classmates. It gives them an opportunity to debate their point of view.
 - They are also opportunities for the groups to continue getting used to working together.
- *Study the graph*
 - *Look at the way the line goes up and down*
 - *the graph has no label, so it could be about anything!*
Perhaps it is about ...
>> the rise and fall in the price of potatoes!
>> the changing value of the rand!
 - *Work with a partner*
2.
 - a) *Make up your own story that would explain the graph, and write it down in a few sentences*
 - b) *Think of a heading that best describes your explanation of the graph*
 - c) *Label the horizontal and the vertical axes*
 - d) *Compare your story with the stories that the other groups have made up.*
 - Answers will vary here
 - Ensure that the answers make sense
 - Let the learners explain their answers to one another, and to the rest of the class.
 - Focus on the fact that it is possible to have many solutions to this example.

HOW WILL THE LEARNER'S ACHIEVEMENT BE ASSESSED?

In this unit, the learners need to be able to conduct their own survey; be able to read information off various representations of data that are new to them, and be able to classify various representations of data that they get out of the media into various groupings.

A learner who is working at level 3 in data collection should be able to use tallies to count objects or events and summarise the tallies in a tally chart

A learner who is working at level 4 in data collection should be able to organise collected data into categories of their own choice to answer specific questions

UNIT 8: DRAWING GRAPHS

DURATION: This unit should take about 5½ hours to complete

RESOURCES NEEDED: The learners need to draw graphs, and to fill in tables. It is often easier for them to do this if they can use squared paper. We assume that they have access to a ruler and pencil for drawing the graphs. If calculators are available, then they can be used.

CLASS ORGANISATION: In Activity 8.1 and Activity 8.5 they work in pairs; in Activity 8.2, Activity 8.3 and Activity 8.6 they work on their own; in Activity 8.4 they should work with the same group that they worked with on Activity 7.3

WHAT ARE THE OUTCOMES FOR THIS UNIT?

The learners should be able to:

- Read information from a bar graph, and draw their own bar graph
- Interpret information shown on a pictograph
- Read information off a pie graph, and draw their own pie graph

WHAT WILL BE DONE TO ACHIEVE THIS LEARNING?

- There are six activities in this unit

Activity 8.1 - KEEPING RECORDS

- In this activity, the learners are introduced to one situation where it is important to keep records i.e. farmers need to know whether they can expect rain in a particular month or not, and approximately how much they can expect.
- In other words, is it a month in which they can expect a lot of rain, or a little rain? Records of rainfall will generally give this information, and farmers can use them to predict the amount of rainfall they can expect.
- These predictions may not always be true, however, as the amount of rain expected is also affected by whether that year is a drought year or not.

ANSWERS TO ACTIVITY 8.1

1. *The Naledi farmers are wondering whether it is likely to rain this August. They have a record of monthly rainfall figures for the last four years.*
 - *In your group discuss how you think they would collect this information.*

Usually, people use a rain gauge to measure the amount of rain that has fallen every day. They would keep a record of all the rain fallen in a particular month and add them together to give the monthly total.

2. *Here is the rainfall chart that the Naledi farmers drew to show the number of millimetres of rain that fell on their farm last year.*

The rainfall, as read off the graph, is as follows:

January - 50 mm	February - 35 mm	March - 45 mm
April - 15 mm	May - 25 mm	June - 10 mm
July - 5 mm	August - 10 mm	September - 20 mm
October - 30 mm	November - 30 mm	December - 50 mm

- a) *In which month did the least rain fall? - July (5mm)*
- b) *In which month(s) did the most rain fall? (January and December - 50mm)*

Activity 8.2 – DRAWING A PICTOGRAPH

- In this activity, Mrs Dlomo and Mr Mbatha draw a pictograph to represent the milk produced by their five cows.
- The learners have to answer questions about this pictograph

ANSWERS TO ACTIVITY 8.2

1. *How much milk was produced in that week by:*
 - a) *Luleka?* - 48 litres
 - b) *Mambo?* - 18 litres
 - c) *Thandi?* - 34 litres
 - d) *Grace?* - 32 litres
 - e) *Pheta?* - 38 litres
2. *Arrange the names in order, from the cow that produces the most milk, to the cow that produces the least milk.*
Luleka; Pheta; Thandi; Grace; Mambo
3. *How much more milk does Luleka produce than Mambo?* - 30 litres

The following information can be read off the pictograph:

Number of litres produced every day:

Monday - 30 litres Tuesday - 24 litres Wednesday - 22 litres Thursday - 20 litres
Friday - 26 litres Saturday - 24 litres Sunday - 24 litres

4.
 - a) *On which day is the most milk produced?* - Monday
 - b) *On which day is the least milk produced?* - Thursday
5. *How much milk is produced by all the cows in the first week of March, 2000?* - 170 litres
6. *If Mrs Dlomo and Mr Mbatha sell the milk for R1,20 per litre, how much do they earn from the milk in that week?* - R204,00
7. *We are told that one of the cows is still feeding her calf, and is only milked once a day.*
 - a) *Which cow are we talking about?* - Mambo
 - b) *Explain why you selected her.* - she is producing the least milk
8. *One of their cows used to produce over 60 litres a week. We are told that her milk production is now only three quarters of that amount.*
 - a) *Which cow are we talking about?* - Luleka
 - b) *Explain why you selected her.*
 $\frac{1}{4}$ of 60 litres = $60 \div 4 = 15$ litres
 3×15 litres = 45 litres
This means that $\frac{3}{4}$ of 60 litres = 45 litres - and Luleka produced 48 litres of milk, which is closer to 45 litres than any of the other cows.

9. *Make up your own questions about the Pictograph. Give them to another group to answer.*

Questions and answers will vary here. If there are any arguments about the questions and the answers, ask the rest of the class for their opinions as to the correctness of them.

Activity 8.3 - TWO FARMERS DRAW A BAR GRAPH

- In this activity, the learners read about Mrs Dlomo and Mr Mbatha who have bought two milking machines to help speed up the milking of their cows.
- This presents a good opportunity to discuss what a milking machine does; whether the cost of a milking machine is justified, and similar economics problems.

EXTRA INFORMATION:

- A milking machine is a device that milks cows. A motor-driven vacuum pump sucks the milk through rubber-lined cups that fit over the cow's teats. Hoses link the cups to the pump. The milk flows into a closed bucket, or through a pipeline to a tank. The action of the cups resembles the sucking of a calf.
- This system keeps the milk cleaner than the milk from hand-milked cows.
- Milking machines lower the cost of producing milk by reducing the labour costs.

ANSWERS TO ACTIVITY 8.3

1. *The article says that a healthy cow should produce about 5 000 litres of milk a year.*

a) *How many litres of milk would this be per day?*

$$\begin{aligned} 5\,000 \text{ litre} \div 365 \text{ days} &= 13,698\,63 \text{ litres per day} \\ &= 13,7 \text{ litres (correct to 1 decimal place)} \end{aligned}$$

b) *How many litres of milk would this be per week?*

There are two ways of working out this answer

$$\begin{aligned} \text{(i)} \quad 5\,000 \text{ litres} \div 52 \text{ weeks} &= 96,153 \text{ litres per week} \\ &= 96,2 \text{ litres (correct to 1 decimal place)} \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad 13,698\,63 \text{ litres} \times 7 \text{ days} &= 95,890\,41 \text{ litres per week} \\ &= 95,9 \text{ litres (correct to 1 decimal place)} \end{aligned}$$

Although these two answers look different, if you round both of them off to the nearest whole number, you would get 96 litres - so they are nearly the same.

c) *How much milk would it produce in 5 years?*

$$5\,000 \text{ litres} \times 5 \text{ years} = 25\,000 \text{ litres}$$

2. *Look at the pictograph in Activity 8.2. Are any of the five cows producing this amount per day? None of them are producing 13 litres of milk a day. Luleka came the closest when she produced 10 litres on Tuesday.*

3. *If the cows continued producing milk at their current rate,*
- how many litres of milk would Luleka produce in a year?*
Luleka produced 48 litres of milk that week.
 $52 \times 48 \text{ litres} = 2\,496 \text{ litres of milk}$
So, she produced 2 496 litres of milk in a year
 - how many litres of milk would Pheta produce in a year?*
Pheta produced 38 litres of milk that week
 $52 \times 38 \text{ litres} = 1\,976 \text{ litres}$
So, she produced 1 976 litres of milk in a year
 - how many litres of milk would Thandi produce in a year?*
Thandi produced 34 litres of milk that week
 $52 \times 34 \text{ litres} = 1\,768 \text{ litres}$
So, she produced 1 768 litres of milk in a year

The two farmers decide to draw a bar graph to show the information about the expected annual yield of milk per cow over the years from 1960 to 2000 that they read in the Farmer's Bulletin.

4. *Study the bar graph, and then answer the following questions:*
- The article about milk production did not give a figure for 1990. How do you think the farmers worked out the amount of milk that a cow was expected to produce in 1990?*

The figures given are:

1960 - 3 000 litres

1970 - 3 500 litres

1980 - 4 000 litres

1990 - ?

2000 - 5 000 litres

Following the pattern, we can see that the amount of milk that a cow was expected to produce in 1990 was probably 4 500 litres.

EXTRA INFORMATION: It might be a good idea to ask the learners WHY milk production had increased over the years. Reasons that they might come up with are: better feeding for the cows; better medication so that the cows suffer from fewer illnesses, and in general, better farming methods.

- What is plotted along the horizontal axis?* - the years under consideration
- What is plotted along the vertical axis?* - the number of litres of milk produced
- What scale is used on the vertical axis? (In other words, what does each space on the vertical axis represent?)* - each mark stands for 500 litres
- What is the title of the bar graph?* - "Expected Annual Yield of Milk per Cow"

Activity 8.4 - WORKING WITH BAR GRAPHS

- In this activity, the learners are introduced to a horizontal bar graph.
- They have to answer questions about the given graph.
- They then have to take the information that got in the survey they conducted in Activity 7.3, and draw a bar graph to illustrate the information

ANSWERS TO ACTIVITY 8.4

- 1
- Which type of bird is bred by the most farmers? - chickens*
 - How many farmers breed geese? - 6 farmers*
 - How many more farmers breed ducks than turkeys?*
5 farmers breed ducks; 2 farmers breed turkeys; so 3 more farmers breed ducks than turkeys.
 - How many more farmers breed bantams than guinea fowl?*
4 farmers breed bantams; 4 farmers breed guinea fowl; so the same number breed bantams as breed guinea fowl.
 - Which type of bird is bred by the least number of farmers? - turkeys and ostriches*
 - How many people were in Kevin's survey? - 30 farmers*

2. *In Activity 7.3, you conducted a survey amongst 20 learners in your class to find out what their favourite vegetable is.*

- Draw a bar graph to illustrate the information you collected in the survey. It could be a vertical bar graph or a horizontal bar graph.*

The groups should work together to produce a bar graph

- Don't forget to include the title (or description of what the graph is showing); a list of the categories that are being looked at along one axis; and numbers and a description on the other axis..*

This list gives the all the things that should be included when drawing the graph

Activity 8.5 - READING INFORMATION OFF A PIE GRAPH

- In this activity, the learners answer questions about information shown on pie graphs.

ANSWERS TO ACTIVITY 8.5

- Write down the names of the provinces*
 - Start with the one which has the greatest fraction shaded in, and end with the one which has the smallest fraction of the circle shaded in*
 - Write the names in alphabetical order of the provinces with the same fractions shaded in*
- Next to the name of the province, write down the fraction of the circle that has been shaded in.*

ANSWERS TO 1 AND 2:

Northern Cape; Northern Province - $\frac{5}{8}$ of the circle has been shaded in

Mpumalanga - $\frac{4}{8}$ (or $\frac{1}{2}$) of the circle has been shaded in

Eastern Cape; Free State; KwaZulu Natal; North West Province; Western Cape - $\frac{3}{8}$ of the circle has been shaded in

Gauteng - $\frac{1}{8}$ of the circle has been shaded in

3. *Discuss the following points with your group:*

a) *What are some of the important crops that grow in each of the provinces?*

The list of crops grown is long. Here are a few examples:

Kwa Zulu Natal - sugar cane

Northern Cape - mealies

Gauteng - vegetables

Western Cape - fruit

Free State - mealies

North West - mealies

Eastern Cape - vegetables, pineapples

Mpumalanga - mealies, tea, coffee, tropical fruit

Northern Province - mealies; oranges

b) *Why do you think the number of farm workers in each province varies?*

Generally, where there are many other industries, then workers tend to move away from the farms where salaries generally are low, to better paid positions.

Where there are no other alternatives, they tend to stay on the farms.

4. *Study the information in the box, and then answer the questions*

a) *If their total income was R120 000 for the year, how much was earned by each activity?*

The pie chart shows us that $\frac{1}{4}$ of their income comes from fruit; $\frac{1}{4}$ of their income comes from milk; $\frac{1}{4}$ of their income comes from vegetables and $\frac{1}{4}$ of their income comes from herbs.

$$R120\ 000 \div 4 = R30\ 000$$

So each activity earned them R30 000

b) *Suppose their total income for the year was R215 000,00, what would each sector have earned? (Write your answer correct to the nearest cent.)*

$$R215\ 000 \div 4 = R53\ 750,00$$

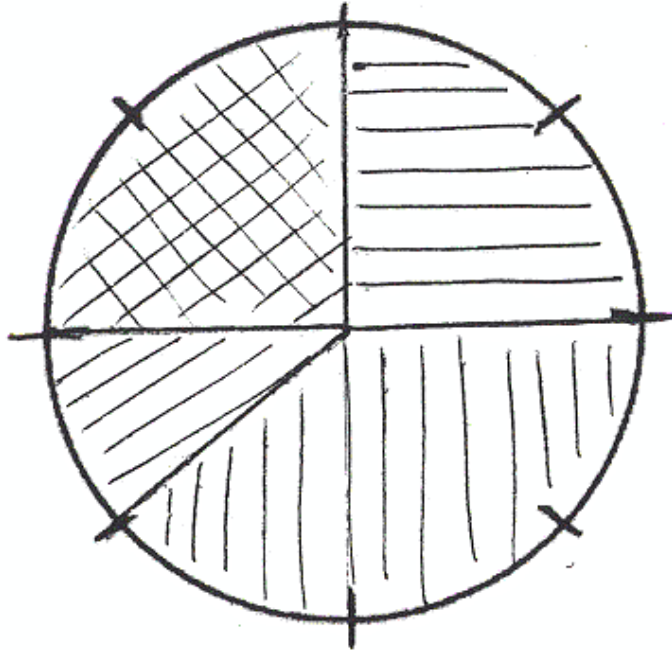
So each activity earned them R53 750,00

Activity 8.6 - DRAWING A PIE GRAPH

- In this activity, the learner has to trace a circle in their books, and use it to show how the farmers income was made up
- They then have to work out how much each activity earned them

ANSWERS TO ACTIVITY 8.6

1. Trace the circle in your books
Use the circle to show the fractions of their income that comes from fruit, vegetables, milk and herbs



2. If their total income for the year was R168 000, how much money did each sector earn?

1/4 from fruit: $R168\ 000 \div 4 = R42\ 000$
i.e. they earned R42 000 from fruit

3/8 from vegetables: $R168\ 000 \div 8 = R21\ 000$
 $R21\ 000 \times 3 = R63\ 000$
i.e. they earned R63 000 from vegetables

1/8 from milk: $R168\ 000 \div 8 = R21\ 000$
i.e. they earned R21 000 from milk

the rest from herbs - from the pie graph, it can be seen that 1/4 is earned from herbs
i.e. they earned R42 000 from herbs

(As a check, add the 4 amounts together - you should end up with R168 000)

HOW WILL THE LEARNER'S ACHIEVEMENT BE ASSESSED?

The main tasks that learners have to achieve is to be able to read information off of

- a) a bar graph
- b) a pictograph
- c) a pie graph

They also have to be able to draw a bar graph and a pie graph (with guidance)

The progress maps describe a learner who is at level 3 as one who can

- Draw bar graphs with a numerical scale
- Read information from a bar graph and interpret the data.
- Draw conclusions based on the results of their data collections

The progress maps describe a learner who is at level 4 as one who can

- Read, interpret and critically discuss information from graphs and tables found in other subjects and in newspapers or magazines
- Fill in fractional sectors on a pie graph

UNIT 9: AVERAGES

DURATION: This unit should take about 1½ hours to complete

RESOURCES NEEDED: The learners need access, where possible, to a calculator. Where the learners do not have access to a calculator, anticipate that the exercise might take longer than 1½ hours to complete. They will also need to use the pictograph of the milk production of the 5 cows which is Activity 8.2.

CLASS ORGANISATION: The learners should work in pairs to complete this unit

WHAT ARE THE OUTCOMES FOR THIS UNIT?

The learners should be able to:

- have some understanding of what we mean when we talk about "average"
- work out the average using numerical methods

WHAT WILL BE DONE TO ACHIEVE THIS LEARNING?

- There is one activity in this unit.
- In this activity, the learners are introduced to "average" by means of a bar graph.
- They then go on to examples where they use numeric methods to find the average.

ANSWERS TO ACTIVITY 9.1

1. Use the information given on the pictograph in Activity 8.2 which shows the amount of milk produced by the cows on Naledi Farm in the first week of March 2000.

- a) *You have already worked out the average amount of milk produced by the cows in that week. Now work out the average amount of milk produced by each cow per day.*

Total amount of milk produced by Luleka = 48 litres
Average amount of milk produced = $48 \div 7 = 6,857\dots$ litres
= 6,9 litres (correct to 1 decimal place)

Total amount of milk produced by Mambo = 18 litres
Average amount of milk produced = $18 \div 7 = 2,571\dots$ litres
= 2,6 litres (correct to 1 decimal place)

Total amount of milk produced by Thandi = 34 litres
Average amount of milk produced = $34 \div 7 = 4,857\dots$ litres
= 4,9 litres (correct to 1 decimal place)

Total amount of milk produced by Grace = 32 litres
Average amount of milk produced = $32 \div 7 = 4,571\dots$ litres
= 4,6 litres (correct to 1 decimal place)

Total amount of milk produced by Pheta = 38 litres
Average amount of milk produced = $38 \div 7 = 5,428\dots$ litres
= 5,4 litres (correct to 1 decimal place)

- b) *Work out the average amount of milk produced per day by all 5 cows.*

Total amount of milk produced on Monday = 30 litres

Average amount of milk produced by each cow on Monday = $30 \div 5 = 6$ litres

Total amount of milk produced on Tuesday = 24 litres

Average amount of milk produced by each cow on Tuesday = $24 \div 5 = 4,8$ litres

Total amount of milk produced on Wednesday = 22 litres

Average amount of milk produced by each cow on Wednesday = $22 \div 5 = 4,4$ l

Total amount of milk produced on Thursday = 20 litres

Average amount of milk produced by each cow on Thursday = $20 \div 5 = 4$ litres

Total amount of milk produced on Friday = 26 litres

Average amount of milk produced by each cow on Friday = $26 \div 5 = 5.2$ litres

Total amount of milk produced on Saturday = 24 litres

Average amount of milk produced by each cow on Saturday = $24 \div 5 = 4,8$ litres

Total amount of milk produced on Sunday = 24 litres

Average amount of milk produced by each cow on Sunday = $24 \div 5 = 4,8$ litres

2. The Naledi Farmers sell vegetables to their friends and neighbours. They keep a record of the amounts of money they make each day. On Monday they make R145,89; on Tuesday they make R156,98; on Wednesday they make R278,90; on Thursday they make R98,56; on Friday they make R135,05 and on Saturday they make R256,12

What is the average amount of money they make per day?

Total amount of money made over the 6 days = R1 071,50

Average amount made over the 6 days = $R1\ 071,50 \div 6$

= R178,58333...

= R178, 58 (correct to the nearest cent)

3. *The Farmers keep a record of the number of dozen eggs they sell per month. Work out the average number of dozen eggs sold per month*

Total number of dozen eggs sold over the 12 months = 623

Average number of dozen eggs sold per month = $623 \div 12$

= 51,91666...

= 51,9 (correct to 1 decimal place)

HOW WILL THE LEARNER'S ACHIEVEMENT BE ASSESSED?

- The learners need to have an understanding of how to find an average
- A learner operating at level 5 will have no problems with the calculations that are involved.
- A learner operating at levels 3 or 4 will have problems adding decimals and dividing the decimals by a whole number

UNIT 10: EXCHANGE RATES

DURATION: This unit should take about 2 hours to complete

RESOURCES NEEDED: The learners need access, where possible, to the financial section of a newspaper in order to look up exchange rates. The exchange rates can also be obtained from Radio and TV Broadcasts.

CLASS ORGANISATION: The learners should work on their own for Activity 10.1, and with a partner for Activity 10.2.

WHAT ARE THE OUTCOMES FOR THIS UNIT?

The learners should be able to:

- Use the Rand/Pound exchange rate in order to work out how many Rand they will get for each pound, and conversely, how many rand each pound will cost.
- Complete an activity in which they work out how much money will be needed to buy cups of tea. This activity involves the learners in looking for patterns

WHAT WILL BE DONE TO ACHIEVE THIS LEARNING?

- There are two activities in this unit

Activity 10.1 - EXCHANGE RATES

- In this Activity the learners use the Rand/Pound exchange rate to do calculations

ANSWERS TO ACTIVITY 10.1

1. *If the Rand/Pound exchange rate is 9,00*
 - a) *How many Rand would Antonio receive for each pound?* - R9,00
 - b) *How many Rand would he receive for ten pounds?* - $10 \times R9,00 = R90,00$
 - c) *How many Rand would he receive for fifty pounds?* - $50 \times R9,00 = R450,00$
 - d) *How many Rand would he receive for seventy-five pounds?*
 $75 \times R9,00 = R675,00$
 - e) *How much would it cost him to buy twenty pounds?*
 $20 \times R9,00 = R180,00$
2. *Suppose the Rand/Pound exchange rate is 10,25*
 - a) *How many Rand would Antonio receive for each Pound?* - R10,25
 - b) *If a book is marked four Pounds (£4,00), how much would it cost in Rand?*
 $4 \times R10,25 = R41,00$
 - c) *If a tractor is on sale for £1 000,00, how much would it cost in Rand?*
 $1\ 000 \times R10,25 = R10\ 250,00$
3. Find current exchange rates in the financial section of the newspaper.
 - a) *Work out how many Rand you would get for £10,00 at the current exchange rate?*
 - b) *Work out how many Rand you would get for 10 United States dollars (\$10,00)*
 - c) *Choose another currency, and work out how many Rand you would get for 10 of their units of money.*

Answers will vary for number 3

Activity 10.2 - A CUP OF TEA

- In this activity, learners use the context of buying tea for friends to develop a pattern
- They have to predict how the pattern continued

ANSWERS TO ACTIVITY 10.2

- *If you go to England and order a cup of tea, you will pay round about one pound (£1,00) per cup.*

1. *Suppose the Rand/Pound exchange rate was 11, how much would a cup of tea cost in Rand? - R11,00*
2. *Suppose you bought tea in England for 11 of your friends, how much would the tea cost in Rand? - $11 \times R11 = R121$*
3. *Suppose you bought tea in England for 111 of your friends, how much would the tea cost in Rand? - $111 \times R11 = R1\ 221$*
4. *What would the cost be in Rand if you bought tea for 1 111 people?
 $1\ 111 \times R11 = R12\ 221$*
5. *Look at the pattern developing*
 - a) *Predict how much it would cost in Rand if you bought tea for 11 111 people.*
 - b) *Work out the answer and check whether your prediction was correct*

$$\begin{aligned}11 \times 11 &= 121 \\111 \times 11 &= 1221 \\1111 \times 11 &= 12221 \\11111 \times 11 &= 122221, \text{ etc}\end{aligned}$$

6. *Explain how you could use the pattern to predict how much it would cost in Rand if you bought tea for 11 111 111 people.*

ONE POSSIBLE ANSWER IS:

- When we multiply 11 by 11, we end up with two ones and a 2 in between (121).
 - When we multiply 11 by 111, we end up with two ones and two 2s in between (1221)
 - When we multiply 11 by 111, we end up with two ones and three 2s in between (12221)
- So, when we multiply by 11 111 111, we end up with two ones and six 2s in between (i.e. 12 222 221)

HOW WILL THE LEARNER'S ACHIEVEMENT BE ASSESSED?

In Activity 10.1, the learners work on their own.

- The learner who is working at Level 5 should get all the answers correct.
- The learners who gets more than half of the answers wrong will need remediation.
- As very few textbooks contain examples of this sort, we suggest that you ask the learners who have an understanding of the concepts involved to make up more questions of this type. These examples can then be used for remediation.

In Activity 10.2, the learners work with their partner on an activity where the answers form a pattern.

- Learners who are at Level 3, would probably be able to answer 1, 2, 3 and 4 correctly, but would have trouble with 5.
- Learners who are at Level 4, would probably be able to answer 1, 2, 3, 4 and 5 correctly, but would have trouble with 6.
- Learners who are at Level 5, would probably be able to answer all 6 questions correctly. Their only mistakes would be slight arithmetical errors.

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