LEARNER GUIDE

Unit Standard Title:	**Use Mathematics to investigate and monitor the financial aspects of personal, business, national and international issues**
Unit Standard No:	**7468**
Unit Standard Credits:	**6**
NQF Level:	**4**

Table of Contents

Module 1
Use Mathematics to plan and control financial instruments.

Learning Outcomes
By the end of this module you should be able to plan and control the following :
- Insurance
- Assurance
- Stock exchange dealings
- Options
- Futures
- Bonds

Assessment Criteria
The following assessment criteria will be used to determine your competency for this specific outcome:

- Plans are sufficient to ensure effective control of financial instruments.

- Calculations are carried out using computational tools efficiently and correctly and solutions are verifiable.

- Measures used for control purposes are appropriate to the need and are in line with control plans.

1.1 Planning and controlling your wealth

Why is it that only 8% of people are financially independent while the other 92% have money problems? The reason is that most people do not make the best use of what money they have.
Ask anybody who is receiving a salary and they will say that they do not earn enough – whether they are at the top end or the lower end of the salary scale. However, with good money management, one can use the money one has to provide for the future and cope with the present.
The only way to accumulate money is to work for it and then to make it work for you. To do this, it is essential to **SET GOALS** for the future. Decide what you want to do with your money – buy a house, a car, pay for education, invest in a retirement annuity etc. – and then plan how long you are going to take to do this. Saving for short term goals should be in an easily accessible, interest generating account. Saving for long term goals should be in the form of investments.
For example, if you want to save R3000 over the next 2 years you can plan for it by saving R125 per month for the next 24 months. If you are not committed to your goal you will probably not achieve it because you will find all sorts of reasons why you couldn't save R125 this month. You need to be disciplined to put the R125 into your savings account every month rather than spend it on other things.

Remember that good money management is not necessarily increasing the money you get in, but applying skills to control the money going out.

First though, identify what your goals are.

Activity 1

Turn to your Learner Work File and complete Activity 1

LEARNER WORK FILE

1.2 Financial Instruments

When deciding on which financial instruments will best suit your needs, planning is absolutely essential. Many investors use the services of financial planners or financial advisers to help them make the best choices for their situation.

Let's investigate the financial instruments available.

> Note:
> Although the term "insurance" encompasses the entire industry, the generally accepted norm – in South Africa, at least – is to speak of **short-term** business (i.e. insuring items such as cars, houses, TV's, etc) as "**insurance**", and of **long term or life business** (life and disability cover for people) as "**assurance**".

1. Short term insurance

Generally compensation is paid for the loss of goods by theft or hijack, and this kind of protection takes the form of **SHORT TERM INSURANCE.** Property or business can be insured against a variety of disastrous events such as fire, theft, burglary, earthquake, storm damage, loss of profits and many more.

In order for a person to be able to **control** the amount of insurance they need to protect them from loss of their valuables, they need to work out the value of the items to be insured. It is best to use a reasonable replacement value for each item, taking into account its age and current market conditions for replacement cost, because insurance companies do not pay out more than the current market value of the item lost or stolen. Remember too, that no claim will be paid out if you are in breach of any obligations in your contract.

2. Life assurance

The reasons why people need life assurance are varied, but the needs can usually be boiled down to three broad categories:

i.   A person dies too soon

ii.   A person lives too long

iii.   A person loses his earning ability

(i) When a **person dies too soon**, life assurance can ensure that the family left behind do not suffer financial hardship and deprivation.
In order to control the amount of life assurance a person requires they would need to calculate how much income their family would need to live on from today (you cannot plan to die in the future!) for a reasonable time into the future. Once you have established the term and the monthly income required, you would need to convert this requirement into a lump sum. Once the lump sum is calculated you would buy life assurance for that amount.

Thus a person can ensure that there is sufficient capital available at his/her death to pay any estate duties and taxes due, to pay for his funeral, to leave money for an income to maintain his family and ensure his/her children to get an education.

(ii)A **person living too long**, beyond the point where society will provide him employment or considers him to be an asset to the economy, becomes a burden to that society, to the state, and to his relatives. Savings to ensure a carefree independent retirement form an integral part of the life assurance business.
In order to save enough money to have a comfortable retirement a person needs to do a similar exercise to the one above. Calculate how much money is needed on a monthly basis for living expenses and how long the income will be required, bearing in mind that one or more people may outlive the person saving the money. Once you have established the term and the monthly income required you would need to convert this requirement into a lump sum. Once the lump sum is calculated you would buy an assurance product that provides savings (as opposed to life cover) such as an Endowment Policy or a Retirement Annuity to provide that amount. If a person is a member of a Pension or Provident Fund it can be used to provide for retirement.

(iii) A **person losing his earning ability** because of illness or accident resulting in disablement does not need to lose his dignity as well because of dependence upon others for his livelihood. Disability assurance is readily available through most life assurers.
In order to control the amount of disability assurance a person requires they would need to calculate how much income he and his family would need to live on from today *(you cannot plan to become disabled in the future!)* for a reasonable time into the future. Once you have established the term and the monthly income required you would need to convert this requirement into a lump sum. Once the lump sum is calculated you would buy disability assurance for that amount.

Assurance is available to cover the **costs of a funeral**. These are generally low cost products and they only insure a person (*and sometimes family members as well*) for the cost of a funeral. .
In order to control the amount of funeral assurance a person requires they would need to calculate how much a funeral would cost today (*you cannot plan to die in the future*!). Once the cost is calculated you would buy funeral assurance for that amount.

Some examples of assurance and insurance needs are outlined below. Use your imagination to speculate on the sums of money involved:

- I insure my house against fire because I have a financial interest in it and will suffer damage if it burns down.

- I lent money to someone and may suffer a financial loss if he dies.

- a person on his own life (to an unlimited amount subject to financial substantiation)

- a husband and wife on each other's lives (to an unlimited amount subject to financial substantiation)

- a parent on the life of his child or a child in the life of his parent (up to a reasonable amount)

- partners on one another's lives (limited to their interests in the partnership)

- a creditor on the life of his debtor (at least to the amount of the debt)

3. Unit trusts:

The fundamental premise behind a unit trust is simple: a large number of investors pool their money in order to get a spread of professionally managed investments. Investors could not normally get such a good spread individually because the dealing costs would make it uneconomical to buy a large number of small investments.

The principles of using maths to control unit trusts are very similar to those for insurance and assurance. Unit trusts are an investment designed to enable people to build up wealth by accumulating a lump sum of capital which can be used for various objectives in a person's life, for example education costs, holidays, renovations, deposit on a house plus provision for income needs on death, disability and retirement.

In order to use unit trusts effectively a person would need to take the same steps as used in the insurance and assurance examples (calculate the exact amount needed). However, there is one major difference. When investing in unit trusts there is a variable in the calculation – fund performance. In order to be accurate the calculations will need to take into account the funds recent performance and its potential for future performance in order to achieve the objective.

4. Stock exchange dealings:

A share is exactly what the name implies: it gives the owner a share in the underlying company. It also gives the shareholder voting powers at general meetings, the extent of which depends on how many shares he/she owns. The shareholder therefore has a (limited) say in the management of the company.

The shareholder does not have control over the payment of dividends, neither is he/she involved in the daily running of the business. Shareholders appoint a board of directors who in turn appoint the management. Both have a responsibility to act in the best interests of the company as well as its shareholders.

When a share is bought on the stock exchange, the proceeds go to the seller and not to the company. The buyer therefore obtains the seller's interest in the company as well as all the associated rights and privileges.

In order to use shares effectively a person would need to take the same steps as used in the insurance and assurance examples (calculate the exact amount of capital and income needed). However, there is one major difference. When investing in shares, there is a variable in the calculations – company and general market performance. In order to be accurate the calculations will need to take into account the different performances.

5. Options and futures:

Option The right, but not the obligation, to buy (a call option) or sell (a put option) a predetermined quantity of shares or other investments at a specified price (the strike price) during a specified period of time. Options usually expire on a specific day each month.

Future A contract to buy or sell a fixed number of commodities, currencies or shares at a fixed future date and price. The contract can be traded on a formal exchange or in the over-the-counter, unregulated market.

The distinction between the two is simply options are primarily price driven and futures are primarily date driven.

In order to use options and futures effectively a person would need to take the same steps as used in the insurance and assurance examples (calculate the exact amount or income needed). However, there is one major difference. When investing in options and futures there is a variable in the calculation – performance. In order to be accurate the calculations will need to take into account recent performance and the potential for future performance in order to achieve the objective.

6. Bonds:
Government and local authorities issue bonds to fund their expenditure. This is known as the Capital Market. The capital market involves the buying and selling of long-term securities (such as government and Escom stock, for example). A financial security is simply a written promise by a borrower of money to repay a certain sum (the face value) to the lender of the money on a specific date in the future (maturity). The written promise also involves the periodical (e.g. 6-monthly) payment of interest until maturity and is specified on the stock. The most important sellers of these securities are the government, local authorities and corporations like Escom, while the most important buyers are the PIC, insurance companies and pension funds.

The value of stock will rise and fall depending on the supply of and demand for these types of securities. Put another way: In order to convince investors to invest their money in stock, the government will have to offer attractive interest rates.The higher the interest rate, the lower the market value of existing stock.

In order to use bonds effectively a person would need to take the same steps as used in the insurance and assurance examples. However, when investing in bonds there is a variable in the calculation – interest rates available. In order to be accurate the calculations will need to take into account the differing rates offered in the market place.

Summary:
In order to ensure effective control of these various instruments you need to do two basic things
- make sure you can afford to invest and
- make sure that you have accurately calculated the capital and/or income required.

It is a question of choice as to which investment is chosen – life assurance, bonds, etc.

Example:
You need R60 000 per year to pay your living expenses in case you get disabled. You know that you can get 6% p.a. interest. How much capital do you need to invest to produce this income?
Answer: You need R1 000 000
       (R1 000 000 X 6% = R60 000 interest per annum.)
       Now decide what type of investment you will use.

Self- assessment

Turn to your Learner Work File and complete the self- assessment exercise.

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Assessment 1

Turn to your Learner Work File and complete Assessment 1.

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Module 2
Use simple and compound interest to make sense of and define a variety of situations

Learning Outcomes

By the end of this module you should be able to
- perform calculations involving simple and compound interest
- describe the following situations
    - mortgage loans
    - hire purchase
    - present values
    - annuities
    - sinking funds.

Assessment Criteria

The following assessment criteria will be used to determine your competency for this specific outcome:

- The differences between simple and compound interest are described in terms of their common applications and effects.
- Methods of calculation are appropriate to the problem types.
- Computational tools are used efficiently and correctly and solutions obtained are verified in terms of the context or problem.
- Solutions to calculations are used effectively to define the changes over a period of time.

2.1 Interest rates

Interest is the 'cost' of borrowing money or the' reward' for investing money. If you do not have money and need to borrow it from somewhere, there is a cost involved called interest. If you have money and are prepared to give it to a financial institution like a bank, they will reward you by paying you interest.
Sophisticated investors will also not keep any surplus cash in a safe at home but rather invest it until such time as they need the capital.

Answer the following questions:

How will you benefit by putting your surplus capital in an interest bearing investment compared to keeping it under the mattress?
By earning interest on surplus capital you will be able to finance some of your needs from the interest. This means that the person who invests to earn interest will be able to stretch existing capital further than the person who prefers keeping capital under the mattress.

Where will you look for an acceptable up to date interest rate?

Most financial magazines and daily newspapers provide this information.

2.2 Calculation of Interest

1. Simple Interest
Simple interest is the amount of interest paid on the capital (investment) amount only. This interest is paid to the investor and not left to accumulate.

Eg. Michael invests R2 000.00 at an interest rate of 10% p.a. **simple interest** for 4 years.
After 1 year, Michael's investment will have grown as follows:
10% of R2000.00 = R200.00
After 4 years, he would have earned R200 x 4 = R800.00 interest on his investment.
His investment **amounts to** R2000 + R800 = R2800.00 after 4 years.

We can use a formula to calculate this: **SI = P x r x t**

Where
      P = **Principal** (the amount of money invested or borrowed)
      r = **Interest rate** given as a percentage i.e. **10% = 10/100 = 0.10**
      t = **time** in years for which the principal has been invested
          i.e. **6 months = 6/12 = 0.5years**

So Michael earns: SI   = R2000 x 10% x 4
                   = R2000 x 0.10 x 4
                   = R800 interest

His investment **amounts to** R2000 + R800 = R2800.00 after 4 years
  Or
First calculate future investment amount after 4 years; calculated as follows
          FV   **= P (1 + r x t)**
                 = R2000 (1 + 10% x 4)
                 = R2000 (1 + 0.10 x 4)
                 = R2000 (1 + 0.4)
                 = R2000 (1.4)
                 = R2800

Therefore, Interest earned   **= FV – P**
                             = R2800 – R2000
                             = R800

2. Compound interest
Compound interest is the interest earned on a sum of money which is then paid into the account so that **interest is calculated on the sum plus the interest on that sum** i.e. the interest is not taken out and spent but left with the capital amount, so it **compounds or accumulates all the time.**

Eg. Michael invests R2 000.00 at a fixed interest rate of 10% p.a. **compound interest** for a period of 4 years.

Year no.	Principal	Interest
1	R2000	10% of R2000 = R200
2	R2200	10% of R2200 = R220
3	R2420	10% of R2420 = R242
4	R2662	10% of R2662 = R266.20
Final Amount	R2928.20	

Interest = R2928.20 – R2000 = **R928.20**

So the **future value** of R2000, due in 4 years time at 10% interest p.a. is R2928.20

Alternatively, the **present value** of R2928.20 due in 4 years time at 10% interest p.a. is R2000.

There is a formula which is used for compound interest:

$$FV = P(1 + r/100)^n$$

Where **FV** is the amount at the end of the investment period
　　　　P is the principal that is invested at the beginning of the period
　　　　r is the rate in percentage per annum
　　　　n is the number of periods (not necessarily years)

Let's use the formula to calculate Michael's interest.
　　　　P = R2000　　　r = 10　　n = 4

　　FV = P(1 + r/100)^n
　　　　= $2000(1 + 10/100)^4$
　　　　= $2000(1,1)^4$
　　　　= R2928.20

His investment amounts to R2928.20.

His interest earned is R2928.20 – R2000.00 = R 928.20

Note: *You may use the formula you are comfortable with when calculating compound interest as long as it gives you the correct answer.*

Activity 2

Turn to your Learner Work File and complete Exercise 2

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WORK FILE

2.3 The effect of compounding in time periods less than a year

In compound interest calculations, the interest can be compounded half-yearly, quarterly, monthly, weekly or even daily. This means that the amount will grow very rapidly. This is good news if you are investing money and accumulating interest but very bad news if you have borrowed money.

To do the interest calculation you need to work out how many time periods there will be.

Eg. If the interest is compounded half-yearly, there will be 2 time periods each year.
  If the interest is compounded quarterly, there will be 4 time periods each year.
  If the interest is compounded monthly, there will be 12 time periods each year.

You will then share the interest rate over the same number of time periods
Eg. If the interest is compounded half-yearly, the rate will be divided by 2.
  If the interest is compounded quarterly, the rate will be divided by 4.
  If the interest is compounded monthly, the rate will be divided by 12.

Example 1: Lesley invests R600 for 3 years at a rate of 9% per annum. Interest is compounded monthly. How much interest does he earn?

P = R600   r = 9/12 = 0,75   n = 12 x 3 = 36

$$FV = P (1 + r/100)^n$$
$$= 600 (1 + 0,75/100)^{36}$$
$$= 600 (1,0075)^{36}$$
$$= R785.19$$

Interest   = FV - P
$$= R785.19 – R600.00$$
$$= R185.19.$$

So Lesley earns R185.19 interest.

2.4 Investing using Simple and Compound Interest

 It will be more profitable to have simple interest when you are investing over a period less than a year and when you are investing over a period more than one year, it is more profitable to have compound interest.

Example: Johan; has invested R10 000 over a period of 9 months, interest is at 10% = 10/100 = 0.10 per annum. We will calculate the future value using the simple interest and the compound interest.

The period is 9 months which is 9/12=0.75 because the interest rate is given per year.

Using the **simple interest** we will get:

FV=PV(1+Ni)
= R10 000(1+(0.75x0.10))
= R10 000(1+0.075)
= R10 000(1.075)
= **R10 750**

Using simple interest the Investment will grow to R10 750 after 9 months

Now let us see using the **compound interest**

FV= PV(1+i)^N
= R10 000(1+0.10)^0.75
= R10 000(1.1)^0.75
= R 10 000x (1.074099499)
= **R10 740 .99**

Using compound interest, the investment will grow to R10 741 after 9 months. We can thus see that the simple interest method grows more than the compound interest method, if the investment is for a period of **less than one year**.

Let's consider the same problem when the money has been invested for a period of **one year**.
Using the simple interest we will get:
FV=PV(1+Ni)
= R10 000(1+(1x0.10))
= R10 000(1+0.1)
= R10 000(1.1)
= **R11 000**
Using simple interest the Investment will grow to R11 000 after 12 months or 1 year
Now let us see using the compound interest
FV= PV(1+i)^N
= R10 000(1+0.10)^1
= R10 000(1.1)^1
= R10 000x1.1
= **R11 000**

Using compound interest, the investment will grow to R11 000 after 12 months or 1 year. We can thus see that the simple interest method grows to the same amount with the compound interest method, if the investment is for a period of exactly one year.

Let's consider the same problem when the money has been investment has been invested for a period of **more than one year** (2 years in this case).
Using the simple interest we will get:
FV=PV(1+Ni)
= R10 000(1+(2x0.10))
= R10 000(1+0.2)
= R10 000(1.2)
= **R12 000**
Using simple interest the Investment will grow to R12 000 after 24 months or 2 years.

Now let us see using the compound interest method.
FV= PV(1+i^)N
= R10 000(1+0.10)^2
= R10 000(1.1)^2
= R10 000x1.21
= **R12 100**

Using compound interest, the investment will grow to R12 100 after 24 months or 2 years. We can thus see that the compound interest method grows more than the simple interest method, if the investment is for a period more than one year.

Activity 3

Turn to your Learner Work File and complete Exercise 3

LEARNER WORK FILE

2.5 Calculating Present Values

We can also calculate the **present value** of an investment which must be worth a certain amount at **a future date**, by re-arranging the compound interest formula.

$$FV = P (1 + r/100)^n$$

$$so\ P = \frac{FV}{(1 + r/100)^n}$$

<u>Example.</u> If a car and caravan will cost R 600 000 at retirement, what lump sum must be invested now to give that return over 15 years at a growth rate of 12% p. a.? (ie. what is the present value of R600 000?)

FV = R600 000   n = 15   r = 12

$$P = \frac{FV}{(1 + r/100)^n}$$
$$= \frac{600\ 000}{(1 + 12/100)^{15}}$$
$$= \mathbf{R\ 110\ 000}$$

Activity 4

Turn to your Learner Work File and complete Exercise 4

LEARNER WORK FILE

Now that you understand interest calculations, let's look at the situations described in this specific outcome requiring these calculations.

Compound and simple interest are also used in calculating interest to be charged on:

1. Mortgage Loans

A mortgage loan is the amount which is borrowed from a financial institution to buy a home. A mortgage loan is different from other loans in that it is self-amortising. This means that the monthly payments are calculated to cover both the principal and the interest. This results in the loan being fully paid at the end of the mortgage term. The term of a mortgage loan is usually 20 years and the interest charged is the current prime interest rate. If you can make extra payments into your mortgage loan, you can reduce the term of the loan and considerably reduce the amount of interest charged.

Tables can be obtained from banks to calculate the monthly payments on mortgage loans.

2. Hire Purchase

When you buy something on H.P. you pay more than if you pay cash because of the high rate of interest which you have to pay. Hire purchase is different from other credit systems in that ownership is only passed to the purchaser when all the payments have been made.

3. Annuities

An annuity is a lump sum you pay to a life insurance company to be guaranteed an income for the rest of your life. It is a financial contract with an insurance company, designed to be a source of income in your retirement. The income you receive will obviously depend on the capital you pay. In addition, factors such as your age and your gender will be taken into account as statistics will be used to determine your life expectancy. There are different types of annuities such as a non-guaranteed annuity which stops paying at death or a fixed term annuity which pays out for a fixed term only. Annuities can be paid annually or monthly from the date of retirement until death for a non – guaranteed annuity or term determined in the contract for a fixed term annuity.

4. Sinking Fund

A sinking fund is a means of repaying funds which have been advanced through a bond issue.

5. Present Values

We have already touched on present and future values in our compound interest calculations. Let's have a look at them in more depth now.

We all have a concept of the current value of money and the cost of items. If nothing changes, we will also understand the future value of money because that will be exactly the same as today's values. But………, is it? No, definitely not. Why? Inflation is probably the biggest contributor to the different values. We do not want to discuss what causes inflation in this module but rather what the impact of inflation (or different values of money at various time intervals) will be.

The effect that inflation has is that the price of items increases every year. If inflation is 10% and a TV costs R 1 000 this year, then that very same TV will cost R 1 100 next year. Had there been no inflation, then that very same TV will cost R 1 000 in 10 years' time. If we needed to replace the TV in 10 years time, we need to put away R

100-00 every year (even under the mattress!) to have R 1 000 in 10 years to buy the TV at that price.

Inflation occurs at different rates for different items. That means that I have to provide more to buy the same items that I can buy today at a lower price.

Example.
If the TV costs R 1 000 today and someone plans to buy the TV after ten years, knowing that the price of the TV will increase at the inflation rate of 10%, then that person will have to provide R2 593-74 at that time to purchase the TV. Saving R 100-00 per annum will not get to the capital amount needed to buy the TV. This will only give R 1 000-00 (ignoring any interest earned) – perhaps a deposit on the TV. However, if I have R 1 000 today and I can invest that a growth rate equal to the inflation rate, I shall have enough to buy the TV cash after 10 years.

The above example gets more complex the moment that the interest rate (or growth rate) is different from the inflation rate. This results in me having either more money or less money after 10 years. If the growth rate is higher than the inflation, then I will have more money than what I need to buy the TV. If the growth rate is lower than the inflation rate, then I will not have enough money to buy the TV cash.
Inflation causes 'inflated' future values. Very few people can comprehend the purchasing power of future values in present realities. An example will be the purchase power of an endowment policy in present economic terms. However, if the future value is discounted to present values, it makes more sense.

To be able to compare values when working into the future on financial planning, we need to convert all values to either present values or future values before comparing. It is often better to work in present values because we can relate to present values better than to future values.

Example 1:
If I plan to sell my house when I retire in 15 years time, what can I expect to get for the property if it is worth R400 000 now and inflation runs at 8% over the term?

Present value: **P = R400 000   r = 8   n = 15**

$$FV = P (1 + r/100)^n$$
$$= 400\ 000 (1 + 8/100)^{15}$$
$$= R1\ 268\ 867$$
So the future value of the house is R1 268 867

Example 2:
What will the present purchase power be of R 1 million from a maturing policy 20 years from now, if inflation is calculated at 7% p.a.?

Future value : **FV = R1 000 000   r = 7   n = 20**

$$P = \frac{FV}{(1 + r/100)^n}$$

$$= \frac{1\ 000\ 000}{(1 + 7/100)^{20}}$$

$$= R\ 258\ 419$$

So the present value of R1 million rand in 20 years is R258 419.

6. Principles of Capitalisation

Capitalising is a very simple principle. It is the technique of converting a monthly income requirement into a capital amount (to be invested at a certain rate of return) so that income is secured over a predetermined term protected against the devaluing effect of inflation.

Example

If a grocery account for this year amounts to R 10 000 and you want to budget to purchase the same next year, knowing that inflation is 10% per annum, then you must budget for R 11 000 next year!
If you decide to put your Lotto winnings in a safe to finance your grocery account for the years to come, the calculation will be as follows:

Groceries year 1   R 10 000
Groceries year 2   R 11 000
Groceries year 3   R 12 100
Total   R 33 100

In the same fashion you can calculate for ten or twenty years how much you will need.

It would not be wise to keep the money in your house if banks are prepared to pay you interest to put the money in the bank. If you are lucky enough to negotiate an interest rate equal to inflation, then interest will cancel the devaluing effect of inflation.

Activity 5

Turn to your Learner Work File and complete Exercise 5

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Self- assessment

Turn to your Learner Work File and complete the self- assessment exercise.

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Assessment 2

Turn to your Learner Work File and complete Assessment 2.

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Module 3
Investigate various aspects of costs and revenue

Learning Outcomes
By the end of this module you should be able to investigate aspects of cost and revenue including

- marginal costs
- marginal revenue
- optimisation of profit

Assessment Criteria
The following assessment criteria will be used to determine your competency for this specific outcome:

- Values are calculated correctly.
- Mathematical tools and systems are used effectively to determine and describe the relationships between the various aspects of cost and revenue.
- Terminology is used in the correct context.
- Reasonable methods are described for the control of costs and optimisation of profits in relation to given data.

Every business, whether selling a product or a service, will have to carefully evaluate its pricing. The selling price has to be high enough to cover costs and earn a reasonable profit, but low enough to attract customers. Underpricing will cause the business to fail but overpricing could lose you customers. In order to set your selling price, you have to know your **costs**. Let's examine these in more detail.

3.1 Costs

1. Fixed expenses
These are relatively constant expenses that don't vary from month to month. They don't have to be the same every month, but they have to be paid regardless of how many sales have been made.
They are things like rent, water, telephone, office supplies, insurance, salaries, wages, accounting fees and maintenance of equipment.

2. Variable expenses (Costs of goods)
These are the actual costs of making the product. They will change with the number of items that are made and will include things like material costs, transport costs and labour costs (if workers are paid for the work they do and don't get a fixed wage).

3.Total product costs
Total Product Cost = Fixed Expenses + Variable Expenses
The total product cost is worked out **per unit of production** ie. the total cost of producing **one unit** of whatever is being manufactured by the company. This is the absolute minimum that one unit can be sold at.

4. Marginal cost
This is the addition to total cost required to produce **one additional unit of the product**.

5. Revenue
A company's revenue is simply the value of its sales. It is equal to the price (P) of its product multiplied by the quantity (Q) sold. ie Revenue = P x Q

6. Marginal revenue
This is the additional revenue earned by selling **one additional unit of the product**.

7. Profit
Profit is the **difference between revenue and cost**. In other words, a company's profit is the difference between the revenue it earns by selling its product and the cost of producing it.

Gross Profit = Selling price – Cost Price

When total costs are equal to total income, no profit (or loss) is made. This is called the **break-even point.**

Useful formulae:

Mark-up % = $\dfrac{\text{(Selling Price – Cost Price)} \times 100}{\text{Cost Price}}$

Gross Profit % = $\dfrac{\text{(Selling Price – Cost Price)} \times 100}{\text{Selling Price}}$

Example
A can of soda costs R2.50 and you sell it for R5.00

Your mark-up % = $\dfrac{\text{(R5 - R2.50)} \times 100}{\text{R2.50}}$ = 100%

Your gross profit % = $\dfrac{\text{(R5 - R2.50)} \times 100}{\text{R5}}$ = 50%

3.2 Optimisation of Profit
For any business, the aim is to earn the highest possible income at the lowest possible cost ; that is earn the most profit.
The profitability of a company will be determined by:
- the unit selling price of the product
- the total product cost
- the volume of production

All of these factors will determine how much profit the company makes. It is the job of management to **maximise or optimise** this profit. (This should not be seen as the only aim of a business. Other goals could be to grow the business and also to fulfil its social responsibility).

To optimise profits in a business; management have to improve the cost to income ratio. Management will have to reduce the costs and increase the income that they get from a business activity. The ways a business can reduce costs includes; cutting on unnecessary costs and expenses, buying stock in bulk from suppliers etc. Also, a business can increase income by venturing into new markets, advertising more to publicise the business activities, increase production etc.

3.3 Analysis of costs and revenue

An analysis of costs and revenue will help a business to increase its efficiency by making the right decisions. No decision can be made by only considering revenue – a business must compare revenue and costs. Conducting an analysis can help the business determine how to

- reduce costs
- increase revenue relative to costs
- ensure cost effective processes for delivery of service

Activity 6

Turn to your Learner Work File and complete Exercise 6

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Self- assessment

Turn to your Learner Work File and complete the self- assessment exercise.

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Assessment 3

Turn to your Learner Work File and complete Assessment 3.

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Module 4
Use mathematics to debate aspects of the national and global economy

Learning Outcomes
By the end of this module you should be able to investigate:
- exchange rates
- imports and exports
- comparative effectiveness of currency in relation to remuneration
- monetary policy
- the control of inflation.

Assessment Criteria
The following assessment criteria will be used to determine your competency for this specific outcome:

- Values are calculated correctly.
- Mathematical tools and systems are used effectively to determine, compare and describe aspects of the national and global economy.
- Debating points are based on well-reasoned arguments and are supported by mathematical information.

4.1 National and Global Economics
In the previous modules, we investigated finances in our personal and business lives. We saw that we are constantly faced with choices and decisions regarding our financial situation. The same is true of the government of a country – they constantly have to make decisions on how the money they receive is going to be spent.

There are many definitions of economics, such as the following by Joseph Stiglitz:
Economics is the study of how individuals, firms, governments and other organisations within our society make choices and how those choices determine how the resources of society are used.

Decision makers involved in planning the economic affairs of a country have a huge responsibility. Their decisions affect the people of the country and their quality of life. Their decisions also have to take into account their relationship with the government of other countries.

4.2 Imports and Exports

No country has all the things it needs in order to give its people a safe and comfortable life. It has to buy goods or services from sellers in other countries. This is known as **importing** goods.

The country has to sell some of its own goods to buyers in other countries to get the money to pay for the imports. This is known as **exporting** goods.

Every country wants to get stronger by having **more exports than imports**, as more money will then be coming into the country than going out. This is a **favourable balance of trade.**

An **unfavourable balance of trade** will occur if the **exports are less than the imports**. A country will try to control its imports because they are expensive and the money leaving the country could rather have been used to improve the local economy.

Activity 7

Turn to your Learner Work File and complete Exercise 7

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4.3 Exchange rates

An exchange rate is the rate at which the currency of one country may be converted into the currency of another. If businesses or people overseas want South African money to buy goods from South Africa, they pay for it in foreign currency in their countries. For example, if a company in the United Kingdom bought wine worth R20 000 from South Africa, they would buy rands and pay for it in pounds. How much they pay will be determined by the exchange rate at the time.

The 'price' of money is also to a large extent subject to the rules of supply and demand. If a lot of people want South African money, the price is high. If people don't want to buy from South Africa, the price of the rand is low.

If, for example, South Africans want to buy more U.S.dollars than they have to sell during any given period, dollars become relatively scarce and so the price of the dollar relative to the rand goes up. When South African money is cheap, our exports become cheaper to foreign customers and South African businesses should be able to increase their exports. However, the negative side is that as the rand weakens, imported articles become more expensive and the demand for them decreases.

The reverse situation occurs when the rand strengthens against the dollar, for example. In this case, imports become cheaper which means that imported goods could be sold for less (or the businesses could make a bigger profit). It also means that less money is leaving the country which affects our balance of trade. At the same time, our exports (if they are priced in rands) become more expensive to the U.S.A. and they will therefore buy fewer South African exports. If the export price is

fixed in dollars, the South African business which is exporting the goods, will receive less rands for each dollar and this would reduce its profit margins.
International currencies are traded in the foreign exchange market according to specific currency codes known as the ISO codes.

Currency	ISO codes and symbols
South African Rand	ZAR, R
American Dollar	USD, $
British Pound (Sterling)	GBP, STG, £
Japanese Yen	JPY, ¥
Canadian Dollar	CAD, CAN$, C$
Euro	EUR,€

When exchanging your money look for a cheaper rate as it will give you **more value** for your money.

For example you are importing beauty products from America and you have R10 000.If one bureau de change is offering $1:R10 and another $1:R8. It would be better to change with the lower rate as it will give you more dollars for your exchanged rands.

i.e. for $1:R10 = R10 000/10
                              = $1000

                              And

for $1:R8   = R10 000/8
                   = $1250

Group Discussion

Turn to your Learner Work File and complete the group discussion

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4.4 Balance of trade
Balance of trade is the difference between a country's import and its exports.
 As we have already discussed, if a country has more exports than imports, it will have a strong economy as more money will be coming into the country than going out. South Africa has to import things which it does not have. There are also things which it does have, but the quality and price are not as good as the imported goods. The Government has to make very difficult decisions about whether to impose import duties or to allow free trade.
Import duties protect local industries by ensuring that the imported goods are more expensive. If no import duties were imposed, imported goods would be allowed into the local market and this would reduce the demand for locally produced goods.

4.5 Global Economics

Globalisation is when a country allows local businesses to compete with foreign businesses for customers within its own country and for customers in other countries. There are many advantages to entering the global market but if a country's local businesses are not as strong as foreign businesses, the country's economy would be badly affected.

Computer technology has revolutionised how people in different countries can communicate with one another and globalisation is increasing rapidly.

4.6 Inflation

Inflation may be described as a constant rise in the general level of prices throughout the economy. It is caused when the money supply is allowed to increase at a faster rate than increases in the production of goods and services, or at a faster rate than can be absorbed into the production of goods and services. Inflation is normally shown as a percentage. For example, we might hear that inflation this year is 10%. What this means, is that if a basket of food cost you R200 last year, this year it will cost you 10% of R200 more. Ie. the same food basket will cost R220 this year.

1. The Consumer Price Index

The inflation rate in South Africa is measured by changes in the Consumer Price Index or CPI. The CPI is the weighted average of prices which consumers are paying for certain goods. Every month surveys are conducted in 600 categories of goods at approximately podgh3 000 outlets in South Africa. From these figures an average is calculated by the Department of Statistics.

When economists talk about a drop in inflation as reflected by a change in the CPI, this does not mean that prices have dropped or that items have got any cheaper. What it means is that price increases will be less than they were. So, for example, if inflation has dropped from 14% to 9% it means that prices will, on average, be only 9% higher than the previous year.

A distinction may be drawn between two basic types of inflation.

2. Cost-push inflation

This occurs when total production costs increase without a corresponding increase in output. This could be due to
- wages increasing faster than productivity
- raw materials price increases e.g. escalating cost of imported goods, resulting in an increased price of the final product.
- decreased productivity resulting in fewer goods being made at the same cost
- natural disasters such as floods or drought pushing up the price of fresh produce

Let's see how this form of inflation works by looking at an example:

Example: XYZ Bakery produces bread. A loaf of bread costs R1.00 to produce and XYZ sells it to its customers for R1.25. As a result of an increase in the price of flour, XYZ has no choice but to put up the price of a loaf of bread to R1,50. Thus the production costs, in this case the price of raw materials making up the final product, have increased without a corresponding increase in output.

3. Demand-pull inflation

This is often described as "too much money chasing too few goods". In this case the increases in the demand for final goods are said to cause the increases in their prices. While an increase in the demand for goods may arise because money is more freely available through lower interest rates or through easier bank or HP credit, it may also be the result of a reduction in the general level of savings.

Demand-pull inflation involves a self-perpetuating wage-price spiral. As demand becomes excessive and prices move up, labour demands wage increases. This in turn generates additional money and further stimulates spending. Let us look at this form of inflation by the way of an example:

Example: If you have 5 CD's to sell at 5 units of exchange (in other words, R5,00) in the economy, each CD will cost R1.00. If another unit of exchange, that is R1.00, is introduced into the economy and no further CDs are produced, each CD will cost R1.20 (R6.00/5). In other words, the price of CDs has increased by 20 cents per CD because of the fact that the number of units of exchange has increased without a corresponding increase in the amount of goods available.

4.7 Fiscal and monetary policy

Monetary policy is the control of either the money supply or interest rates by the South African Reserve Bank in order to control inflation and stabilise the currency. The Reserve Bank is not controlled by government, but helps government to carry out its monetary policy. Fiscal policy is the government's policy as to taxes and its expenditure. With monetary policy, the government need only control one of these two variables. In other words, if it controls the money supply, the government must accept what happens to the interest rates and vice versa. There are various instruments available to the government to effect this control.

1. Effect of monetary and fiscal policies

To increase real economic growth during a period of recession, the government may take the following steps:

- A relaxed monetary policy. This would allow the money supply to increase within the system. As money becomes more readily available, interest rates will drop accordingly
- An easy fiscal policy. This involves a reduction in taxes and an increase in government expenditure and results in an increase of money supply and a decrease in interest rates.

As a result of increased money supply and decreased interest rates, demand for goods and services from both the government and private sectors rises, causing an increase in the real economic growth and a decrease in unemployment. However, inflation tends to rise, especially if business confidence is low and the increased money supply is not used in the creation of new goods and services. So increases in

the money supply should ideally be effected in an atmosphere of business confidence, where investors are willing to take the risks of investments into new or expanding business undertakings.

2. Conclusion

Periods of economic growth and progress are usually interspersed with periods of lower production and a decline in employment. These periodic fluctuations in economic activity are known as business cycles. A full cycle usually comprises 2 clear phases: An upswing (recovery) and a downswing. The upswing is characterised by an increase in economic activity and reaches its peak during a so-called boom, while the downswing phase reaches its turning point in a recession or even a depression.

During an upswing, South Africa's income from exports rises, the current account of the balance of payments shows a greater surplus, gold and foreign reserves improve, there is increased liquidity, interest rates fall, consumer spending rises, fixed investment increases, employment goes up and the production of goods and services rises to meet the increased demand.

During a downswing, the opposite happens. Owing to the rise in local spending, prices increase faster and imports rise in order to satisfy the greater demand for goods and services. This leads to a weakening in our balance of payments position and a resulting decline in our reserves. The restrictive measures implemented by the authorities to cool off the economy and control the inflation rate, lead to higher interest rates and a slackening off in spending. The reduced demand for goods and services means a decline in fixed investment and therefore in employment.

We should also now understand that other influences such as the gold price, natural disasters, our public debt obligations and the economic conditions of our international trading partners also have an important effect on South Africa's business cycles. Keep a look out for the financial reports on television and in the newspaper. They should make a lot more sense now.

Activity 8

Turn to your Learner Work File and complete Exercise 8

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Activity 9

Turn to your Learner Work File and complete Activity 9

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Self- assessment

Turn to your Learner Work File and complete the self- assessment exercise.

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Assessment 4

Turn to your Learner Work File and complete Assessment 4.

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