The Free High School Science Texts: Textbooks for High School Students Studying the Sciences
Mathematics

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September 28, 2006

[1]See http://savannah.nongnu.org/projects/fhsst

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Chapter 1

Finance - Grade 10

(NOTE: JP: The content for this chapter is complete. Exercises and simple activities will strenghthen the content. A few more detailed worked examples would also help.)

1.1 Introduction

Should you ever find yourself stuck with a trigonometry question on any television quiz show, you will probably wish you had remembered the Cosine Rule for the sake of R1 000 000. And who does not want to be a millionaire, right?

Welcome to the Grade 10 Finance Chapter, where we apply maths skills to everyday financial situations that you are likely to face both now and along your journey to purchasing your first private jet.

If you master the techniques in this chapter, you will grasp the concept of *compound interest*, and how it can ruin your fortunes if you have credit card debt, or make you millions if you successfully invest your hard-earned money. You will understand the effects of fluctuating exchange rates (and its impact on your spending power during your overseas holidays!).

1.2 Recap of Earlier Work

The following terminology should already be familiar:

1. profit and loss
2. budgets
3. accounts
4. loans
5. simple and compound interest
6. hire purchase
7. exchange rates
8. commission
9. rentals
10. banking

1.3 The Traveller's Guide to Foreign Exchange Rates

1.4 Foreign Exchange

The syllabus requires:

- Demonstrate an understanding of the implications of fluctuating foreign exchange rates (e.g. on the petrol price, imports, exports, overseas travel).

(NOTE: JP: I have removed the use of the word *quote* to refer to what is commonly known in South Africa as the exchange rate.)

Is \$500 ("500 US dollars") per person per night a good deal on a hotel in New York City? The first question you will ask is "How much is that worth in Rands?". A quick call to the local bank or a search on the Internet (for example on `http://www.x-rates.com/`) for the Dollar/Rand exchange rate will give you a basis for assessing the price.

A foreign exchange rate is nothing more than the price of one currency in terms of another. For example, the exchange rate of 6,18 Rands/US Dollars means that \$1 costs R6,18. In other words, if you have \$1 you could sell it for R6,18 - or if you wanted \$1 you would have to pay R6,18 for it.

But what drives exchange rates, and what causes exchange rates to change? And how does this affect you anyway? This section looks at answering these questions.

1.4.1 How much is R1 really worth?

We can quote the price of a currency in terms of any other currency, but the US Dollar, British Pounds Sterling or even the Euro are often used as a market standard. You will notice that the financial news will report the South African Rand exchange rate in terms of these three major currencies.

Table 1.1: Abbreviations and symbols for some common currencies.

Currency	**Abbreviation**	**Symbol**
South African Rand	ZAR	R
United States Dollar	USD	\$
British Pounds Sterling	GBP	£
Euro	EUR	

So the South African Rand could be quoted on a certain date as 6,7040 ZAR per USD (i.e. \$1,00 costs R6,7040), or 12,2374 ZAR per GBP. So if I wanted to buy \$1 000 for a holiday in the United States of America, this would cost me R6 704,00; and if I wanted £1 000 for a weekend in London it would cost me R12 237,40.

This seems obvious, but let us see how we calculated that: The rate is given as ZAR per USD, or ZAR/USD such that \$1,00 buys R6,7040. Therefore, we need to multiply by 1 000 to get the number of Rands per \$1 000.

Mathematically,

$$\begin{aligned} \$1{,}00 &= \text{R}6{,}0740 \\ \therefore \quad 1\ 000 \times \$1{,}00 &= 1\ 000 \times \text{R}6{,}0740 \\ &= \text{R}6\ 074{,}00 \end{aligned}$$

as expected.

What if you have saved R10 000 for spending money for the same trip and you wanted to use this to buy USD? How much USD could you get for this? Our rate is in ZAR/USD but we want to know how many USD we can get for our ZAR. This is easy. We know how much \$1,00 costs in terms of Rands.

$$\begin{aligned} \$1{,}00 &= \text{R}6{,}0740 \\ \therefore \quad \frac{\$1{,}00}{6{,}0740} &= \frac{\text{R}6{,}0740}{6{,}0740} \\ \$\frac{1{,}00}{6{,}0740} &= \text{R}1{,}00 \\ \text{R}1{,}00 &= \$\frac{1{,}00}{6{,}0740} \end{aligned}$$

As we can see, the final answer is simply the reciprocal of the ZAR/USD rate. Therefore, R10 000 will get:

$$\begin{aligned} \text{R}1{,}00 &= \$\frac{1{,}00}{6{,}0740} \\ \therefore \quad 10\,000 \times \text{R}1{,}00 &= 10\,000 \times \$\frac{1{,}00}{6{,}0740} \\ &= \$1\,647{,}34 \end{aligned}$$

We can check the answer as follows:

$$\begin{aligned} \$1{,}00 &= \text{R}6{,}0740 \\ \therefore \quad 1\,647{,}34 \times \$1{,}00 &= 1\,647{,}34 \times \text{R}6{,}0740 \\ &= \text{R}10\,000{,}00 \end{aligned}$$

as expected.

Six of one and half a dozen of the other

So we have two different ways of expressing the same exchange rate: Rands per Dollar (ZAR/USD) and Dollar per Rands (USD/ZAR). Both exchange rates mean the same thing and express the value of one currency in terms of another. You can easily work out one from the other - they are just the reciprocals of the other.

If the South African Rand is our Domestic (or home) Currency, we call the ZAR/USD rate a "direct" rate, and we call a USD/ZAR rate an "indirect" rate.

In general, a direct rate is an exchange rate that is expressed as units of Home Currency per units of Foreign Currency, i.e, Domestic Currency / Foreign Currency.

The Rand exchange rates that we see on the news are usually expressed as Direct Rates, for example you might see:

Table 1.2: Examples of exchange rates

Currency Abbreviation	**Exchange Rates**
1 USD	R6,71
1 GBP	R12,21
1 EUR	R8,10

The exchange rate is just the price of each of the Foreign Currencies (USD, GBP and EUR) in terms of our Domestic Currency, Rands.

An indirect rate is an exchange rate expressed as units of Foreign Currency per units of Home Currency, i.e Foreign Currency / Domestic Currency

Defining exchange rates as direct or indirect depends on which currency is defined as the Domestic Currency. The Domestic Currency for an American investor would be USD which is the South African investor's Foreign Currency. So direct rates from the perspective of the American investor (USD/ZAR) would be the same as the indirect rate from the perspective of the South Africa investor.

Terminology

Since exchange rates are simple prices of currencies, movements in exchange rates means that the price or value of the currency changed.

If the Rand exchange rate moved from say R6,71 per USD to R6,50 per USD, what does this mean? Well, it means that $1 would now cost only R6,50 instead of R6,71. The Dollar is now cheaper to buy, and we say that the Dollar has depreciated (or weakened) against the Rand. Alternatively we could say that the Rand has appreciated (or strengthened) against the Dollar.

What if we were looking at indirect exchange rates, and the exchange rate moved from $0,149 per ZAR ($=\frac{1}{6{,}71}$) to $0,1538 per ZAR ($=\frac{1}{6{,}50}$).

Well now we can see that the R1,00 cost $0,149 at the start, and then cost $0,1538 at the end. The Rand has become more expensive (in terms of Dollars), and again we can say that the Rand has appreciated.

Regardless of which exchange rate is used, we still come to the same conclusions.

In general,

- for direct exchange rates, the home currency will appreciate (depreciate) if the exchange rate falls (rises)
- For indirect exchange rates, the home currency will appreciate (depreciate) if the exchange rate rises (falls)

As with just about everything in the Mathematics of Finance section, do not get caught up in memorising these formulae - that is only going to get confusing. Think about what you have and what you want - and it should be quite clear what the correct answer is.

1.4.2 Cross Currency Exchange Rates

We know that the exchange rates are the value of one currency expressed in terms of another currency, and we can quote exchange rates against any other currency. The Rand exchange rates we see on the news are usually expressed against the major currency, USD, GBP and EUR.

So if for example, the Rand exchange rates were given as 6,71 ZAR/USD and 12,71 ZAR/GBP, does this tell us anything about the exchange rate between USD and GBP?

Well I know that if $1 will buy me R6,71, and if £1.00 will buy me R12,71, then surely the GBP is stronger than the USD because you will get more rands for one unit of the currency, and we can work out the USD/GBP exchange rate as follows:

Before we plug in any numbers, how can we get a USD/GBP exchange rate from the ZAR/USD and ZAR/GBP exchange rates?

Well,

$$\text{USD/GBP} = \text{USD/ZAR} \times \text{ZAR/GBP}.$$

Note that the ZAR in the numerator will cancel out with the ZAR in the denominator, and we are left with the USD/GBP exchange rate.

Although we do not have the USD/ZAR exchange rate, we know that this is just the reciprocal of the ZAR/USD exchange rate.

$$\text{USD/ZAR} = \frac{1}{\text{ZAR/USD}}$$

Now plugging in the numbers, we get:

$$\begin{aligned} \text{USD/GBP} &= \text{USD/ZAR} \times \text{ZAR/GBP} \\ &= \frac{1}{\text{ZAR/USD}} \times \text{ZAR/GBP} \\ &= \frac{1}{6{,}71} \times 12{,}71 \\ &= 1{,}894 \end{aligned}$$

Worked Example 1: **Cross Exchange Rates**

Question: If \$1 = R 6,40, and £1 = R11,58 what is the \$/£ exchange rate (i.e. the number of US\$ per £)?

Answer

Step 1: Determine what is given and what is required

The following are given:

- ZAR/USD rate = R6,40
- ZAR/GBP rate = R11,58

The following is required:

- USD/GBP rate

Step 2: Determine how to approach the problem

We know that:

$$\text{USD/GBP} = \text{USD/ZAR} \times \text{ZAR/GBP}.$$

Step 3: Solve the problem

$$\begin{aligned} \text{USD/GBP} &= \text{USD/ZAR} \times \text{ZAR/GBP} \\ &= \frac{1}{\text{ZAR/USD}} \times \text{ZAR/GBP} \\ &= \frac{1}{6{,}40} \times 11{,}58 \\ &= 1{,}8094 \end{aligned}$$

Step 4: Write the final answer

\$1,8094 can be bought for £1.

1.4.3 Fluctuating exchange rates

If everyone wants to buy houses in a certain suburb, then house prices are going to go up - because the buyers will be competing to buy those houses. If there is a suburb where all residents want to move out, then there are lots of sellers and this will cause house prices in the area to fall - because the buyers would not have to struggle as much to find an eager seller.

This is all about supply and demand, which is a very important section in the study of Economics. You can think about this is many different contexts, like stamp-collecting for example. If there is a stamp that lots of people want (high demand) and few people own (low supply) then that stamp is going to be expensive.

And if you are starting to wonder why this is relevant - think about currencies. If you are going to visit London, then you have Rands but you need to “buy” Pounds. The exchange rate is the price you have to pay to buy those Pounds.

Think about a time where lots of South Africans are visiting the United Kingdom, and other South Africans are importing goods for the United Kingdom. That means there are lots of Rands (high supply) trying to buy Pounds. Pounds will start to become more expensive (compare this to the house price example at the start of this section if you are not convinced), and the exchange rate will change. In other words, for R1 000 you will get fewer Pounds than you would have before the exchange rate moved.

Another context which might be useful for you to understand this: consider what would happen if people in other countries felt that South Africa was becoming more and more politically stable, and that more people were wanting to invest in South Africa - whether in properties, businesses - or just buying more goods from South Africa. There would be a greater demand for Rands - and the "price of the Rand" would go up. In other words, people would need to use more Dollars, or Pounds, or Euros ... to buy the same amount of Rands. This is seen as a movement in exchange rates.

Although it really does come down to supply and demand, it is interesting to think about what factors might affect the supply (people wanting to "sell" a particular currency) and the demand (people trying to "buy" another currency). This is covered in detail in the study of Economics, but let us look at some of the basic issues here.

Well there are various factors affect exchange rates, some of which have more economic rationale than others:

- economic factors (such as inflation figures, interest rates, trade deficit information, monetary policy and fiscal policy)
- political factors (such as uncertain political environment, or political unrest)
- market sentiments and market behaviour (for example if FX markets perceived a currency to be overvalued and starting selling the currency, this would cause the currency to fall in value - a self fulfilling expectation).

1.4.4 Exercises - Foreign Exchange

1. (NOTE: This section needs some exercises.)

1.5 Being Interested in Interest

If you had R1 000, you could either keep it in your wallet, or deposit it in a bank account. If it stayed in your wallet, you could spend it any time you wanted. If the bank looked after it for you, then they could spend it, with the plan of making profit off it. As a way of encouraging you to deposit it with them, the bank usually "pays" you to deposit it into an account. This payment is like a reward, which provides you with a reason to leave it with the bank for a while, rather than keeping the money in your wallet.

We call this reward "interest".

If you deposit money into a bank account, you are effectively lending money to the bank - and you can expect to receive interest in return. Similarly, if you borrow money from a bank (or from a department store, or a car dealership, for example) then you can expect to have to pay interest on the loan. That is the price of borrowing money.

The concept is simple, yet it is core to the world of finance. Accountants, actuaries and bankers, for example, could spend their entire working career dealing with the effects of interest on financial matters.

In this chapter you will be introduced to the concept of financial mathematics - and given the tools to cope with even advanced concepts and problems.

> **Tip: Interest**
> The concepts in this chapter are simple - it is really just looking at the same thing, but from different angles. The best way to learn from this chapter is to do the examples yourself, as you work your way through. Do not just take our word for it!

1.6 Simple Interest

The syllabus requires:

- Use a simple growth formula ($A = P(1 + n \cdot i)$) to solve problems, including interest, hire-purchase, inflation, population growth and other real-life problems.

Simple interest is (NOTE: a short definition of simple interest is needed.)

1.6.1 The Basic Calculations

If a bank pays you 5% interest for your R1 000, what this means is that if you leave your money with them for 1 year, then they will pay you, at the end of the year, interest of:

$$\begin{aligned} \text{Interest} &= \text{R1 000} \times 5\% \\ &= \text{R1 000} \times (5/100) \\ &= \text{R1 000} \times 0{,}05 \\ &= \text{R50} \end{aligned}$$

So, with an "opening balance" of R1 000 at the start of the year, your "closing balance" at the end of the year will therefore be:

$$\begin{aligned} \text{Closing Balance} &= \text{Opening Balance} + \text{Interest} \\ &= \text{R1 000} + \text{R50} \\ &= \text{R1 050} \end{aligned}$$

We sometimes call the opening balance in financial calculations *Principal*, which is abbreviated as P (R1 000 in the example). The interest rate is usually labelled i (5% in the example), and the interest amount (in Rand terms) is labelled I (R50 in the example).

So we can see that:

$$I = P \times i \tag{1.1}$$

and

$$\begin{aligned} \text{Closing Balance} &= \text{Opening Balance} + \text{Interest} \\ &= P + I \\ &= P + (P \times i) \\ &= P(1 + i) \end{aligned}$$

This is how you calculate simple interest. It is not a complicated formula, which is just as well because you are going to see a lot of it!

Not Just One

You might be wondering to yourself:

1. how much interest will you be paid if you only leave the money in the account for 3 months, or
2. what if you leave it there for 3 years?

It is actually quite simple - which is why they call it Simple Interest.

1. Three months is 1/4 of a year, so you would only get 1/4 of a full year's interest, which is: $1/4 \times (P \times i)$. The closing balance would therefore be:

$$\begin{aligned}\text{Closing Balance} &= P + 1/4 \times (P \times i) \\ &= P(1 + (1/4)i)\end{aligned}$$

2. For three years, you would get three years' worth of interest, being: $3(P \times i)$. The closing balance at the end of the three year period would be:

$$\begin{aligned}\text{Closing Balance} &= P + 3(P \times i) \\ &= P(1 + (3)i)\end{aligned}$$

If you look carefully at the similarities between the two answers above, we can generalise the result. In other words, if you invest your money (P) in an account which pays a rate of interest (i) for a period of time (n years), then:

$$\text{Closing Balance} = P(1 + i \cdot n) \qquad (1.2)$$

As we have seen, this works when n is a fraction of a year and also when n covers several years.

Tip: Interest Calculation
The trick is to always keep the interest and the time period in the same units (e.g. both in years, or both in months). We usually work in years, as interest rates are usually specified as annual rates, but sometimes it makes more sense to work in other time periods as we will see later.

Worked Example 2: **Simple Interest**

Question: If I deposit R1 000 into a special bank account which pays a Simple Interest of 7% for 3 years, how much will I get back at the end?
Answer
Step 1: Determine what is given and what is required

- opening balance, $P =$ R1 000
- interest rate, $i = 7\%$
- period of time, $n = 3$ years

We are required to find the closing balance.
Step 2: Determine how to approach the problem
We know that:

$$\text{Closing Balance} = P(1 + i \cdot n)$$

Step 3: Solve the problem

$$\begin{aligned}\text{Closing Balance} &= P(1+i\cdot n)\\ &= R1\ 000(1+3\times 7\%)\\ &= R1\ 210\end{aligned}$$

Step 4: Write the final answer
The closing balance after 3 years of saving R1 000 at an interest rate of 7% is R1 210.

(NOTE: Another example calculating e.g. n would be nice.)

1.6.2 Other Applications of the Simple Interest Formula

(NOTE: Include some applications of the simple interest formula to hire-purchase, inflation, population growth and other real-life problems.)

1.6.3 Exercises - Simple Interest

1. An amount of R3 500 is invested in a savings account which pays simple interest at a rate of 7,5% per annum. The balance accumulated by the end of 2 years is:
   (a) R3 762,50
   (b) R3 519,69
   (c) R4 025,00
   (d) R4 044,69
2. (NOTE: More exercises are needed.)

1.7 Compound Interest

The syllabus requires:

- Use a compound growth formula ($A = P(1+i)^n$) to solve problems, including interest, hire-purchase, inflation, population growth and other real-life problems.

Worked Example 3: **Simple Interest 2**

Question: If I deposit R1 000 into a special bank account which pays a Simple Interest of 7%. What if I empty the bank account after a year, and then take the principal and the interest and invest it back into the same account again. Then I take it all out at the end of the second year, and then put it all back in again? And then I take it all out at the end of 3 years?
Answer
Step 1: Determine what is given and what is required

- opening balance, $P = \text{R}1\ 000$

- interest rate, $i = 7\%$
- period of time, 1 year at a time, for 3 years

We are required to find the closing balance at the end of three years.
Step 2: Determine how to approach the problem
We know that:

$$\text{Closing Balance} = P(1 + i \cdot n)$$

Step 3: Determine the closing balance at the end of the first year

$$\begin{aligned}\text{Closing Balance} &= P(1 + i \cdot n)\\ &= \text{R1 000}(1 + 1 \times 7\%)\\ &= \text{R1 070}\end{aligned}$$

Step 4: Determine the closing balance at the end of the second year
After the first year, we withdraw all the money and re-deposit it. The opening balance for the second year is therefore R1 070, because this is the balance after the first year.

$$\begin{aligned}\text{Closing Balance} &= P(1 + i \cdot n)\\ &= \text{R1 070}(1 + 1 \times 7\%)\\ &= \text{R1 144,90}\end{aligned}$$

Step 5: Determine the closing balance at the end of the third year
After the second year, we withdraw all the money and re-deposit it. The opening balance for the third year is therefore R1 144,90, because this is the balance after the first year.

$$\begin{aligned}\text{Closing Balance} &= P(1 + i \cdot n)\\ &= \text{R1 144,90}(1 + 1 \times 7\%)\\ &= \text{R1 225,04}\end{aligned}$$

Step 6: Write the final answer
The closing balance after withdrawing the all the money and re-depositing each year for 3 years of saving R1 000 at an interest rate of 7% is R1 225,04.

If we look at the two worked examples, we see that we end up with R1 225,04 in the second situation which is more than R1 210 from first example. What has changed?

In the first example I earned R70 interest each year - the same in the first, second and third year. But in the second situation, when I took the money out and then re-invested it, I was actually earning interest in the second year on my interest from the first year. (And interest on the interest on my interest in the third year!)

This more realistically reflects what happens in the real world, and is known as Compound Interest. It is this concept which underlies just about everything we do - so we will look at more closely next.

Definition: Compound Interest
Compound interest is the interest calculated on interest.

It is a double edged sword, though - great if you are earning it on cash you have invested, but crippling if you are stuck having to pay it on money you have borrowed!

In the same way that we developed a formula for Simple Interest, let us find one for Compound Interest.

If our opening balance is P and we have an interest rate of i then, the closing balance at the end of the first year is:

$$\text{Closing Balance after 1 year} = P(1+i)$$

This is the same as Simple Interest because it only covers a single year. Then, if we take that out and re-invest it for another year - just as you saw us doing in the worked example above - then the balance after the second year will be:

$$\begin{aligned}\text{Closing Balance after 2 years} &= [P(1+i)] \times (1+i) \\ &= P(1+i)^2\end{aligned}$$

And if we take that money out, then invest it for another year, the balance becomes:

$$\begin{aligned}\text{Closing Balance after 3 years} &= [P(1+i)^2] \times (1+i) \\ &= P(1+i)^3\end{aligned}$$

We can see that the power of the term $(1+i)$ is the same as the number of years. Therefore,

$$\text{Closing Balance after } n \text{ years} = P(1+i)^n \tag{1.3}$$

1.7.1 Fractions add up to the Whole

It is easy to show that this formula works even when n is a fraction of a year. For example, let us invest the money for 1 month, then for 4 months, then for 7 months.

$$\begin{aligned}\text{Closing Balance after 12 months} &= [P(1+i)^{1/12}] \times (1+i)^{4/12} \times (1+i)^{7/12} \\ &= P(1+i)^{1/12+4/12+7/12} \\ &= P(1+i)^1\end{aligned}$$

which is the same as investing the money for a year.

Look carefully at the long equation above. It is not as complicated as it looks! All we are doing is taking the opening amount (P), then adding interest for just 1 month. Then we are taking that new balance and adding interest for a further 4 months, and then finally we are taking the new balance after a total of 5 months, and adding interest for 7 more months. Take a look again, and check how easy it really is.

Does the final formula look familiar? Correct - it is the same result as you would get for simply investing P for one full year. This is exactly what we would expect, because 1 month + 4 months + 7 months = 12 months, which is a year. Can you see that? do not move on until you have understood this point.

1.7.2 The Power of Compound Interest

To see how important this "interest on interest" is, we shall compare the difference in closing balances for money earning simple interest and money earning compound interest. Consider an amount of R10 000 that you have to invest for 10 years, and assume we can earn interest of 9%. How much would that be worth after 10 years?

The closing balance for the money earning simple interest is:

$$\begin{aligned}\text{Closing Balance} &= P(1+i\cdot n) \\ &= \text{R10 000}(1+9\% \times 10) \\ &= \text{R19 000}\end{aligned}$$

The closing balance for the money earning compound interest is:

$$\begin{aligned} \text{Closing Balance} &= P(1+i)^n) \\ &= \text{R10 000}(1+9\%)^{10} \\ &= \text{R23 673,64} \end{aligned}$$

So next time someone talks about the "magic of compound interest", not only will you know what they mean - but you will be able to prove it mathematically yourself!

Again, keep in mind that this is good news and bad news. When you are earning interest on money you have invested, compound interest helps that amount to increase exponentially. But if you have borrowed money, the build up of the amount you owe will grow exponentially too.

Worked Example 4: **Credit Card Interest**

Question: (NOTE: Need a Question)
Answer
Step 1: Determine what has been provided and what is required
Step 2: Determine how to approach the problem
Step 3: Solve the problem
Step 4: Write the final answer

1.7.3 Other Applications of Compound Growth

(NOTE: Include some applications of the compound growth formula to solve problems in hire-purchase, inflation, population growth and other real-life problems.)

1.7.4 Exercises - Compound Interest

1. An amount of R3 500 is invested in a savings account which pays compound interest at a rate of 7,5% per annum. The balance accumulated by the end of 2 years is:
   (a) R3 762,50
   (b) R3 519,69
   (c) R4 025,00
   (d) R4 044,69
2. (NOTE: More exercises are needed.)

1.8 Formulae Sheet

As an easy reference, here are the key formulae that we derived and used during this chapter. While memorising them is nice (there are not many), it is the application that is useful. Financial experts are not paid a salary in order to recite formulae, they are paid a salary to use the right methods to solve financial problems.

1.8.1 Definitions

P	Principal (the amount of money at the starting point of the calculation)
i	interest rate, normally the effective rate per annum
n	period for which the investment is made
A	the interest rate paid T times per annum, i.e. $iT = \frac{\text{Nominal Interest Rate}}{T}$

1.8.2 Equations

Exchange Rates: [something]

$$\left.\begin{array}{l}\text{Closing Balance - simple interest}\\ \text{Solve for } i\\ \text{Solve for } n\end{array}\right\} A = P(1 + i \cdot n)$$

$$\left.\begin{array}{l}\text{Closing Balance - compound interest}\\ \text{Solve for } i\\ \text{Solve for } n\end{array}\right\} A = P(1 + i)^n$$

Tip: Always keep the interest and the time period in the same units of time (e.g. both in years, or both in months etc.).

1.9 Exercises

1. Greg enters into a 5-year hire-purchase agreement to buy a computer for R8 900. The interest rate is quoted as 11% per annum based on simple interest. The required monthly payment for this contract is:
   (a) R229,92
   (b) R2 759,00
   (c) R249,95
   (d) R2 999,40
2. Bianca has R1 450 to invest for 3 years. Bank A offers a savings account which pays simple interest at a rate of 11% per annum, whereas Bank B offers a savings account paying compound interest at a rate of 10,5% per annum. Which account would leave Bianca with the highest accumulated balance at the end of the 3 year period?
   (a) Bank A
   (b) Bank B
   (c) Both give exactly the same accumulated balance at the end of the period
   (d) It is not possible to determine the accumulated balance from the information given.
3. (NOTE: Ensure that exercises help the learner demonstrate an understanding of the implications of fluctuating foreign exchange rates (e.g. on the petrol price, imports, exports, overseas travel).)
4. (NOTE: More exercises are needed.)