

CHAPTER 9

Finance And Growth

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1 INTRODUCTION

In this chapter, we apply mathematical skills to everyday financial situations.

If you had **R1 000**, you could either keep it in your piggy bank, or deposit it into a bank account. If you deposit the money into a bank account, you are effectively lending money to the bank. Because you are lending the bank money, you can expect some extra money back. This is known as interest. Similarly, if you borrow money from a bank, then you can expect to pay interest on the loan. Interest is charged at a percentage of the money owed over the period of time it takes to pay back the loan. This means that the longer the loan exists, the more interest will have to be paid on it.



The entrance to the Johannesburg Stock Exchange (JSE) located in Sandton, Johannesburg - the financial centre of South Africa. The JSE is Africa's largest stock exchange and the **19th** largest in the world. Each month, more than 60 billion rand worth of shares are traded on the JSE.

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

Definition: Interest

In finance, interest is the money charged for borrowing money. It is usually expressed as a percentage of the borrowed amount.

2 SIMPLE INTEREST

Definition: Simple interest

Simple interest is interest calculated only on the initial amount that you invested.

As an easy example of simple interest, consider how much we will get by investing **R1 000** for **1** year with a bank that pays **5%** p.a. simple interest.

At the end of the year we have

$$\begin{aligned}\text{Interest} &= \text{R } 1\,000 \times 5\% \\ &= \text{R } 1\,000 \times \frac{5}{100} \\ &= \text{R } 1\,000 \times 0,05 \\ &= \text{R } 50\end{aligned}$$

With an opening balance of **R1 000** at the start of the year, the closing balance at the end of the year will therefore be

$$\begin{aligned}\text{Closing balance} &= \text{Opening balance} + \text{Interest} \\ &= \text{R } 1\,000 + \text{R } 50 \\ &= \text{R } 1\,050\end{aligned}$$

The opening balance in financial calculations is often called the principal, denoted as **P** (**R1 000** in the example). The interest rate is usually labelled **i** (**5%** p.a. in the example and “p.a.” means per annum or per year). The interest amount is labelled **I** (**R50** in the example).

So we can see that

$$I = P \times i$$

and

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

The above calculations give a good idea of what the simple interest formula looks like. However, the example shows an investment that lasts for only one year. If the investment or loan is over a longer period, we need to take this into account. We use the symbol n to indicate time period, which must be given in years.

The general formula for calculating simple interest is

$$A = P(1 + in)$$

Where:

A = accumulated amount (final)

P = principal amount (initial)

i = interest written as decimal

n = number of years

WORKED EXAMPLE 1: CALCULATING INTEREST ON A DEPOSIT

QUESTION

Carine deposits **R1 000** into a special bank account which pays a simple interest rate of **7%** p.a. for **3** years. How much will be in her account at the end of the investment term?

SOLUTION

Step 1: Write down the known variables

$$P = 1\ 000$$

$$i = 0,07$$

$$n = 3$$

Step 2: Write down the formula

$$A = P(1 + in)$$

Step 3: Substitute the values

$$\begin{aligned} A &= 1000(1 + 0,07 \times 3) \\ &= 1\ 210 \end{aligned}$$

Step 4: Write the final answer

At the end of **3** years, Carine will have **R1 210** in her bank account.

WORKED EXAMPLE 2: CALCULATING INTEREST ON A LOAN

QUESTION

Sarah borrows **R5 000** from her neighbour at an agreed simple interest rate of **12,5%** p.a. She will pay back the loan in one lump sum at the end of **2** years. How much will she have to pay her neighbour?

SOLUTION

Step 1: Write down the known variables

$$P = 5\,000$$

$$i = 0,125$$

$$n = 2$$

Step 2: Write down the formula

$$A = P(1 + in)$$

Step 3: Substitute the values

$$\begin{aligned} A &= 5\,000(1 + 0,125 \times 2) \\ &= 6\,250 \end{aligned}$$

Step 4: Write the final answer

At the end of **2** years, Sarah will pay her neighbour **R6 250**

We can use the simple interest formula to find pieces of missing information. For example, if we have an amount of money that we want to invest for a set amount of time to achieve a goal amount, we can rearrange the variables to solve for the required interest rate. The same principles apply to finding the length of time we would need to invest the money, if we knew the principal and accumulated amounts and the interest rate.

Important: to get a more accurate answer, try to do all your calculations on the calculator in one go. This will prevent rounding off errors from influencing your final answer.

WORKED EXAMPLE 3: DETERMINING THE INVESTMENT PERIOD TO ACHIEVE A GOAL AMOUNT

QUESTION

Prashant deposits **R30 000** into a bank account that pays a simple interest rate of **7,5%** p.a.. How many years must he invest for to generate **R45 000** ?

SOLUTION

Step 1: Write down the known variables

$$A = 45\,000$$

$$P = 30\,000$$

$$i = 0,075$$

Step 2: Write down the formula

$$A = P(1 + in)$$

Step 3: Substitute the values

$$45\,000 = 30\,000(1 + 0,075 \times n)$$

$$\frac{45\,000}{30\,000} = 1 + 0,075 \times n$$

$$\frac{45\,000}{30\,000} - 1 = 0,075 \times n$$

$$\frac{\left(\frac{45\,000}{30\,000}\right) - 1}{0,075} = n$$

$$n = 6\frac{2}{3}$$

Step 4: Write the final answer

It will take **6** years and **8** months to make **R45 000** from **R30 000** at a simple interest rate of **7,5%** p.a.

WORKED EXAMPLE 4: CALCULATING THE SIMPLE INTEREST RATE TO ACHIEVE THE DESIRED GROWTH

QUESTION

At what simple interest rate should Fritha invest if she wants to grow **R2 500** to **R4 000** in **5** years?

SOLUTION

Step 1: Write down the known variables

$$A = 4\,000$$

$$P = 2\,500$$

$$n = 5$$

Step 2: Write down the formula

$$A = P(1 + in)$$

Step 3: Substitute the values and solve for i

$$4\,000 = 2\,500(1 + i \times 5)$$

$$\frac{4\,000}{2\,500} = 1 + i \times 5$$

$$\frac{4\,000}{2\,500} - 1 = i \times 5$$

$$\frac{\left(\frac{4\,000}{2\,500}\right) - 1}{5} = i$$

$$i = 0,12$$

Step 4: Write the final answer

A simple interest rate of **12%** p.a. will be needed when investing **R2 500** for **5** years to become **R4 000**.

3 COMPOUND INTEREST

Compound interest allows interest to be earned on interest. With simple interest, only the original investment earns interest, but with compound interest, the original investment and the interest earned on it, both earn interest.

Compound interest is advantageous for investing money but not for taking out a loan.

Definition: Compound interest

Compound interest is the interest earned on the principal amount and on its accumulated interest.

Consider the example of **R1 000** invested for **3** years with a bank that pays **5%** p.a. compound interest.

At the end of the first year, the accumulated amount is

$$\begin{aligned}A_1 &= P(1 + i) \\ &= 1\,000(1 + 0,05) \\ &= 1\,050\end{aligned}$$

The amount **A1** becomes the new principal amount for calculating the accumulated amount at the end of the second year.

$$\begin{aligned}A_2 &= P(1 + i) \\ &= 1\,050(1 + 0,05) \\ &= 1\,000(1 + 0,05)(1 + 0,05) \\ &= 1\,000(1 + 0,05)^2\end{aligned}$$

Similarly, we use the amount **A2** as the new principal amount for calculating the accumulated amount at the end of the third year.

$$\begin{aligned}A_3 &= P(1 + i) \\ &= 1\,000(1 + 0,05)^2(1 + 0,05) \\ &= 1\,000(1 + 0,05)^3\end{aligned}$$

Do you see a pattern?

Using the formula for simple interest, we can develop a similar formula for compound interest.

With an opening balance **P** and an interest rate of **i**, 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. This closing balance becomes the opening balance for the second year of investment.

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

And similarly, for the third year

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

We see that the power of the term **(1 + i)** is the same as the number of years. Therefore the general formula for calculating compound interest is:

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

Where:

A = accumulated amount

P = principal amount

i = interest written as a decimal

n = number of years

WORKED EXAMPLE 5: COMPOUND INTEREST

QUESTION

Mpho wants to invest **R30 000** into an account that offers a compound interest rate of **6%** p.a. How much money will be in the account at the end of **4** years?

SOLUTION

Step 1: Write down the known variables

$$P = 30\,000$$

$$i = 0,06$$

$$n = 4$$

Step 2: Write down the formula

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

Step 3: Substitute the values

$$\begin{aligned} A &= 30\,000(1 + 0,06)^4 \\ &= 37\,874,31 \end{aligned}$$

Step 4: Write the final answer

Mpho will have **R37 874,31** in the account at the end of **4** years.

WORKED EXAMPLE 6: CALCULATING THE COMPOUND INTEREST RATE TO ACHIEVE THE DESIRED GROWTH

QUESTION

Charlie has been given **R5 000** for his sixteenth birthday. Rather than spending it, he has decided to invest it so that he can put down a deposit of **R10 000** on a car on his eighteenth birthday. What compound interest rate does he need to achieve this growth? Comment on your answer.

SOLUTION

Step 1: Write down the known variables

$$A = 10\,000$$

$$P = 5\,000$$

$$n = 2$$

Step 2: Write down the formula

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

Step 3: Substitute the values

$$\begin{aligned} 10\,000 &= 5\,000(1 + i)^2 \\ \frac{10\,000}{5\,000} &= (1 + i)^2 \\ \sqrt{\frac{10\,000}{5\,000}} &= 1 + i \\ \sqrt{\frac{10\,000}{5\,000}} - 1 &= i \\ i &= 0,4142 \\ r &= 41,42\% \end{aligned}$$

Step 4: Write the final answer and comment

Charlie needs to find an account that offers a compound interest rate of **41,42%** p.a. to achieve the desired growth. A typical savings account gives a return of approximately **2%** p.a. and an aggressive investment portfolio gives a return of approximately **13%** p.a. It therefore seems unlikely that Charlie will be able to invest his money at an interest rate of **41,42%** p.a.

The power of compound interest

To illustrate how important “interest on interest” is, we compare the difference in closing balances for an investment earning simple interest and an investment earning compound interest. Consider an amount of **R10 000** invested for **10** years, at an interest rate of **9% p.a.**

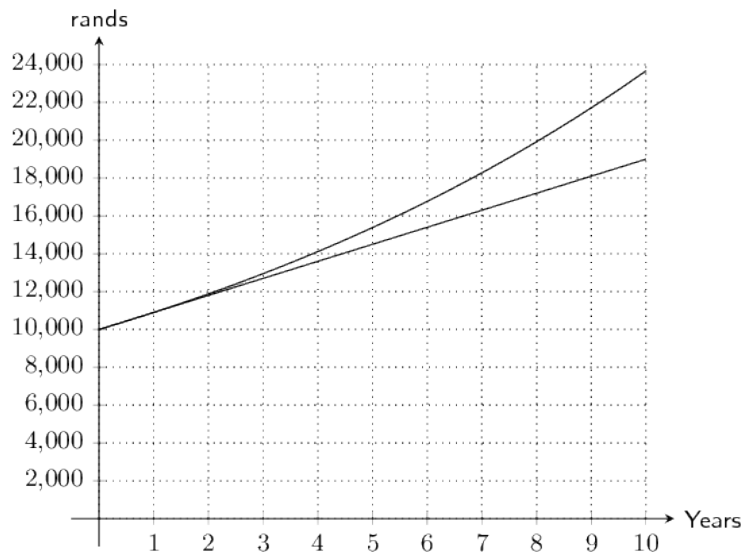
The closing balance for the investment earning simple interest is

$$\begin{aligned}A &= P(1 + in) \\ &= 10\,000(1 + 0,09 \times 10) \\ &= R\,19\,000\end{aligned}$$

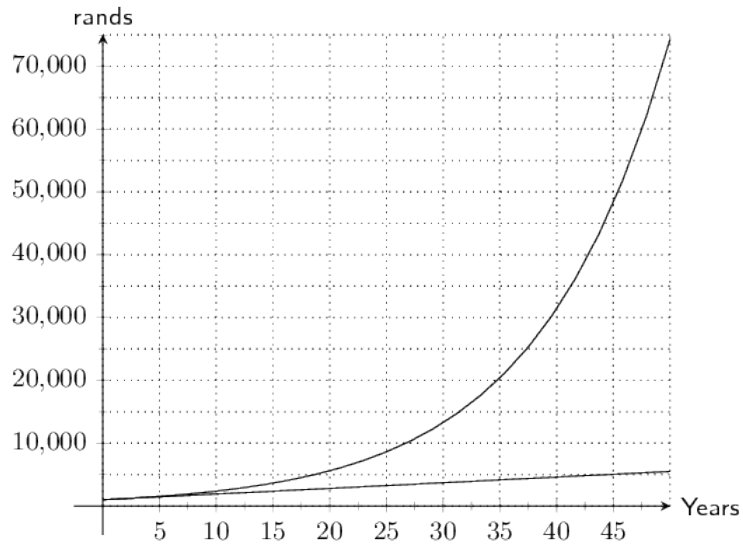
The closing balance for the investment earning compound interest is

$$\begin{aligned}A &= P(1 + i)^n \\ &= 10\,000(1 + 0,09)^{10} \\ &= R\,23\,673,64\end{aligned}$$

We plot the growth of the two investments on the same set of axes and note the significant difference in their rate of change: simple interest is a straight line graph and compound interest is an exponential graph.



It is easier to see the vast difference in growth if we extend the time period to **50** years:



Keep in mind that this is good news and bad news. When earning interest on money invested, compound interest helps that amount to grow exponentially. But if money is borrowed the accumulated amount of money owed will increase exponentially too.

4 CALCULATIONS USING SIMPLE AND COMPOUND INTEREST

Hire purchase

As a general rule, it is not wise to buy items on credit. When buying on credit you have to borrow money to pay for the object, meaning you will have to pay more for it due to the interest on the loan. That being said, occasionally there are appliances, such as a fridge, that are very difficult to live without. Most people don't have the cash up front to purchase such items, so they buy it on a hire purchase agreement.

A hire purchase agreement is a financial agreement between the shop and the customer about how the customer will pay for the desired product. The interest on a hire purchase loan is always charged at a simple interest rate and only charged on the amount owing. Most agreements require that a deposit is paid before the product can be taken by the customer. The principal amount of the loan is therefore the cash price minus the deposit. The accumulated loan will be worked out using the number of years the loan is needed for. The total loan amount is then divided into monthly payments over the period of the loan.

IMPORTANT

Hire purchase is charged at a simple interest rate. When you are asked a hire purchase question, don't forget to always use the simple interest formula.

WORKED EXAMPLE 7: HIRE PURCHASE

QUESTION

Troy wants to buy an additional screen for his computer which he saw advertised for **R2 500** on the internet. There is an option of paying a **10%** deposit and then making **24** monthly payments using a hire purchase agreement, where interest is calculated at **7,5%** p.a. simple interest. Calculate what Troy's monthly payments will be.

SOLUTION

Step 1: Write down the known variables

A new opening balance is required, as the **10%** deposit is paid in cash

$$10\% \text{ of } 2\,500 = 250$$

$$\therefore P = 2\,500 - 250 = 2\,250$$

$$i = 0,075$$

$$n = \frac{24}{12} = 2$$

Step 2: Write down the formula

$$A = P(1 + in)$$

Step 3: Substitute the values

$$\begin{aligned} A &= 2\,250(1 + 0,075 \times 2) \\ &= 2\,587,50 \end{aligned}$$

Step 4: Calculate the monthly repayments on the hire purchase agreement

$$\begin{aligned} \text{Monthly payment} &= \frac{2\,587,50}{24} \\ &= 107,81 \end{aligned}$$

Step 5: Write the final answer

Troy's monthly payment is **R107,81**.

A shop can also add a monthly insurance premium to the monthly instalments. This insurance premium will be an amount of money paid monthly and gives the customer more time between a missed payment and possible repossession of the product.

NOTE

The monthly payment is also called the monthly instalment.

WORKED EXAMPLE 8: HIRE PURCHASE WITH EXTRA CONDITIONS

QUESTION

Cassidy wants to buy a TV and decides to buy one on a hire purchase agreement. The TV's cash price is **R5 500**. She will pay it off over **54** months at an interest rate of **21% p.a.** An insurance premium of **R12,50** is added to every monthly payment. How much are her monthly payments?

SOLUTION

Step 1: Write down the known variables

$$P = 5\,500$$

$$i = 0,21$$

$$n = \frac{54}{12} = 4,5$$

The question does not mention a deposit, therefore we assume that Cassidy did not pay one.

Step 2: Write down the formula

$$A = P(1 + in)$$

Step 3: Substitute the values

$$\begin{aligned} A &= 5\,500(1 + 0,21 \times 4,5) \\ &= 10\,697,50 \end{aligned}$$

Step 4: Calculate the monthly repayments on the hire purchase agreement

$$\begin{aligned} \text{Monthly payment} &= \frac{10\,697,50}{54} \\ &= 198,10 \end{aligned}$$

Step 5: Add the insurance premium

$$198,10 + 12,50 = 210,60$$

Step 6: Write the final answer

Cassidy will pay **R210,60** per month for **54** months until her TV is paid off.

Inflation

There are many factors that influence the change in price of an item, one of them is inflation. Inflation is the average increase in the price of goods each year and is given as a percentage. Since the rate of inflation increases year on year, it is calculated using the compound interest formula.

WORKED EXAMPLE 9: CALCULATING FUTURE COST BASED ON INFLATION

QUESTION

Milk costs **R14** for two litres. How much will it cost in **4** years time if the inflation rate is **9%** p.a.?

SOLUTION

Step 1: Write down the known variables

$$P = 14$$

$$i = 0,09$$

$$n = 4$$

Step 2: Write down the formula

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

Step 3: Substitute the values

$$\begin{aligned} A &= 14(1 + 0,09)^4 \\ &= R19,76 \end{aligned}$$

Step 4: Write the final answer

In four years time, two litres of milk will cost **R19,76**

WORKED EXAMPLE 10: CALCULATING PAST COST BASED ON INFLATION

QUESTION

A box of chocolates costs **R55** today. How much did it cost **3** years ago if the average rate of inflation was **11%** p.a.?

SOLUTION

Step 1: Write down the known variables

$$A = 55$$

$$i = 0,11$$

$$n = 3$$

Step 2: Write down the formula

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

Step 3: Substitute the values and solve for P

$$55 = P(1 + 0,11)^3$$

$$\frac{55}{(1 + 0,11)^3} = P$$

$$\therefore P = R40,22$$

Step 4: Write the final answer

Three years ago, the box of chocolates would have cost **R40,22**.

Population growth

Family trees increase exponentially as every person born has the ability to start another family. For this reason we calculate population growth using the compound interest formula.

WORKED EXAMPLE 11: POPULATION GROWTH

QUESTION

If the current population of Johannesburg is **3 888 180**, and the average rate of population growth in South Africa is **2,1% p.a.**, what can city planners expect the population of Johannesburg to be in **10** years?

SOLUTION

Step 1: Write down the known variables

$$P = 3\,888\,180$$

$$i = 0,021$$

$$n = 10$$

Step 2: Write down the formula

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

Step 3: Substitute the values

$$\begin{aligned} A &= 3\,888\,180(1 + 0,021)^{10} \\ &= R4\,786\,343 \end{aligned}$$

Step 4: Write the final answer

City planners can expect Johannesburg's population to be **4 786 343** in **10** years time.

5 FOREIGN EXCHANGE RATES

Different countries have their own currencies. In England, a Big Mac from McDonald's costs **£4**, in South Africa it costs **R20** and in Norway it costs **48 kr**. The meal is the same in all three countries but in some places it costs more than in others. If **£1 = R12,41** and **1 kr = R1,37**, this means that a Big Mac in England costs **R49,64** and a Big Mac in Norway costs **R65,76**.

Exchange rates affect a lot more than just the price of a Big Mac. The price of oil increases when the South African rand weakens. This is because when the rand is weaker, we can buy less of other currencies with the same amount of money.

A currency gets stronger when money is invested in the country. When we buy products that are made in South Africa, we are investing in South African business and keeping the money in the country. When we buy products imported from other countries, we are investing money in those countries and as a result, the rand will weaken. The more South African products we buy, the greater the demand for them will be and more jobs will become available for South Africans. Local is lekker!

NOTE

The three currencies you are most likely to see are the British pound (£), the American dollar (\$) and the euro (€).

WORKED EXAMPLE 12: FOREIGN EXCHANGE RATES

QUESTION

Saba wants to travel to see her family in Spain. She has been given **R10 000** spending money. How many euros can she buy if the exchange rate is currently **€ 1 = R10,68**?

SOLUTION

Step 1: Write down the equation

Let the equivalent amount in euros be x

$$\begin{aligned}x &= \frac{10\,000}{10,68} \\ &= 936,33\end{aligned}$$

Step 2: Write the final answer

Saba can buy **€ 936,33** with **R10 000**.

6 CHAPTER SUMMARY

- There are two types of interest rates:

Simple interest	Compound interest
$A = P(1 + in)$	$A = P(1 + i)^n$

Where:

A = accumulated amount

P = principal amount

i = interest written as decimal

n = number of years

- Hire purchase loan repayments are calculated using the simple interest formula on the cash price minus the deposit. Monthly repayments are calculated by dividing the accumulated amount by the number of months for the repayment.
- Population growth and inflation are calculated using the compound interest formula.
- Foreign exchange rate is the price of one currency in terms of another.

6.1 Exercise 1

1. An amount of R3500 is invested in a savings account which pays simple interest at a rate of 7,5% per annum. Calculate the balance accumulated by the end of 2 years.
2. An amount of R4090 is invested in a savings account which pays simple interest at a rate of 8% per annum. Calculate the balance accumulated by the end of 4 years.
3. An amount of R1250 is invested in a savings account which pays simple interest at a rate of 6% per annum. Calculate the balance accumulated by the end of 6 years.
4. An amount of R5 670 is invested in a savings account which pays simple interest at a rate of 8% per annum. Calculate the balance accumulated by the end of 3 years.
5. Calculate the accumulated amount in the following situations:
 - 5.1 A loan of R300 at a rate of 8% for 1 year.
 - 5.2 An investment of R2 250 at a rate of 12,5% p.a. for 6 years.
6. A bank offers a savings account which pays simple interest at a rate of 6% per annum. If you want to accumulate R15 000 in 5 years, how much should you invest now?
7. Sally wanted to calculate the number of years she needed to invest R1 000 for in order to accumulate R2 500. She has been offered a simple interest rate of 8,2% p.a. How many years will it take for the money to grow to R2500?
8. Joseph deposited R5 000 into a savings account on his son's fifth birthday. When his son turned 21, the balance in the account had grown to R18 000. If simple interest was used, calculate the rate at which the money was invested.
9. When his son was 6 years old, Methuli made a deposit of R6 610 in the bank. The investment grew at a simple interest rate and when Methuli's son was 18 years old, the value of the investment was R11 131,24. At what rate was the money invested?
10. When his son was 6 years old, Phillip made a deposit of R5 040 in the bank. The investment grew at a simple interest rate and when Phillip's son was 18 years old, the value of the investment was R7 338,24. At what rate was the money invested? Give your answer correct to one decimal place.
11. When his son was 10 years old, Lefu made a deposit of R2 580 in the bank. The investment grew at a simple interest rate and when Lefu's son was 20 years old, the value of the investment was R3 689,40. At what rate was the money invested?
12. Abdoul wants to invest R1 080 at a simple interest rate of 10,9% p.a. How many years will it take for the money to grow to R3 348? Round up your answer to the nearest year.
13. Andrew wants to invest R3 010 at a simple interest rate of 11,9% p.a. How many years will it take for the money to grow to R14 448? Round up your answer to the nearest year.

6.2 Exercise 2

1. An amount of R3 500 is invested in a savings account which pays a compound interest rate of 7,5% p.a. Calculate the balance accumulated by the end of 2 years.
2. An amount of R3 070 is invested in a savings account which pays a compound interest rate of 11,6% p.a. Calculate the balance accumulated by the end of 6 years. As usual with financial calculations, round your answer to two decimal places, but do not round off until you have reached the solution.
3. An amount of R6 970 is invested in a savings account which pays a compound interest rate of 10,2% p.a. Calculate the balance accumulated by the end of 3 years. As usual with financial calculations, round your answer to two decimal places, but do not round off until you have reached the solution.
4. Nicola wants to invest some money at a compound interest rate of 11% p.a. How much money (to the nearest rand) should be invested if she wants to reach a sum of R100 000 in five years time?
5. Thobeka wants to invest some money at a compound interest rate of 11,8% p.a. How much money should be invested if she wants to reach a sum of R30 000 in 2 years time? Round up your answer to the nearest rand.
6. Likengkeng wants to invest some money at a compound interest rate of 11,4% p.a. How much money should be invested if she wants to reach a sum of R38 200 in 7 years' time? Round up your answer to the nearest rand.
7. Morgan invests R5 000 into an account which pays out a lump sum at the end of 5 years. If he gets R7 500 at the end of the period, what compound interest rate did the bank offer him?
8. Kabir invests R1790 into an account which pays out a lump sum at the end of 9 years. If he gets R2 613,40 at the end of the period, what compound interest rate did the bank offer him? Give the answer correct to one decimal place.
9. Bongani invests R6 110 into an account which pays out a lump sum at the end of 7 years. If he gets R6 904,30 at the end of the period, what compound interest rate did the bank offer him? Give the answer correct to one decimal place.

6.3 Exercise 3

1. Angelique wants to buy a microwave on a hire purchase agreement. The cash price of the microwave is R4 400. She is required to pay a deposit of 10% and pay the remaining loan amount off over 12 months at an interest rate of 9% p.a.
 - 1.1 What is the principal loan amount?
 - 1.2 What is the accumulated loan amount?

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- 1.3 What are Angelique's monthly repayments?
 - 1.4 What is the total amount she has paid for the microwave?
 2. Nyakallo wants to buy a television on a hire purchase agreement. The cash price of the television is R5 600. She is required to pay a deposit of 15% and pay the remaining loan amount off over 24 months at an interest rate of 14% p.a.
 - 2.1 What is the principal loan amount?
 - 2.2 What is the accumulated loan amount?
 - 2.3 What are Nyakallo's monthly repayments?
 - 2.4 What is the total amount she has paid for the television?
 3. A company wants to purchase a printer. The cash price of the printer is R4500. A deposit of 15% is required on the printer. The remaining loan amount will be paid off over 24 months at an interest rate of 12% p.a.
 - 3.1 What is the principal loan amount?
 - 3.2 What is the accumulated loan amount?
 - 3.3 How much will the company pay each month?
 - 3.4 What is the total amount the company paid for the printer?
 4. Sandile buys a dining room table costing R8 500 on a hire purchase agreement. He is charged an interest rate of 17,5% p.a. over 3 years.
 - 4.1 How much will Sandile pay in total?
 - 4.2 How much interest does he pay?
 - 4.3 What is his monthly instalment?
 5. Mike buys a table costing R6 400 on a hire purchase agreement. He is charged an interest rate of 15% p.a. over 4 years.
 - 5.1 How much will Mike pay in total?
 - 5.2 How much interest does he pay?
 - 5.3 What is his monthly instalment?
 6. Talwar buys a cupboard costing R5 100 on a hire purchase agreement. He is charged an interest rate of 12% p.a. over 2 years.
 - 6.1 How much will Talwar pay in total?
 - 6.2 How much interest does he pay?
 - 6.3 What is his monthly instalment?
 7. A lounge suite is advertised for sale on TV, to be paid off over 36 months at R150 per month.

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- 7.1 Assuming that no deposit is needed, how much will the buyer pay for the lounge suite once it has been paid off?
- 7.2 If the interest rate is 9% p.a., what is the cash price of the suite?
8. Two stores are offering a fridge and washing machine combo package. Store A offers a monthly payment of R350 over 24 months. Store B offers a monthly payment of R175 over 48 months. If both stores offer 7,5% interest, which store should you purchase the fridge and washing machine from if you want to pay the least amount of interest?
9. Tlali wants to buy a new computer and decides to buy one on a hire purchase agreement. The computers cash price is R4 250. He will pay it off over 30 months at an interest rate of 9,5% p.a. An insurance premium of R10,75 is added to every monthly payment. How much are his monthly payments?
10. Richard is planning to buy a new stove on hire purchase. The cash price of the stove is R6 420. He has to pay a 10% deposit and then pay the remaining amount off over 36 months at an interest rate of 8% p.a.. An insurance premium of R11,20 is added to every monthly payment. Calculate Richard's monthly payments.

6.4 Exercise 4

1. The price of a bag of apples is R12. How much will it cost in 9 years time if the inflation rate is 12% p.a.?
2. The price of a bag of potatoes is R15. How much will it cost in 6 years time if the inflation rate is 12% p.a.?
3. The price of a box of popcorn is R15. How much will it cost in 4 years time if the inflation rate is 11% p.a.?
4. A box of raisins costs R24 today. How much did it cost 4 years ago if the average rate of inflation was 13% p.a.? Round your answer to 2 decimal places.
5. A box of biscuits costs R24 today. How much did it cost 5 years ago if the average rate of inflation was 11% p.a.? Round your answer to 2 decimal places.
6. If the average rate of inflation for the past few years was 7,3% p.a. and your water and electricity account is R1 425 on average, what would you expect to pay in 6 years time?
7. The price of popcorn and a cooldrink at the movies is now R60. If the average rate of inflation is 9,2% p.a. what was the price of popcorn and cooldrink 5 years ago?

6.5 Exercise 5

1. The current population of Durban is 3 879 090 and the average rate of population growth in South Africa is 1,1% p.a. What can city planners expect the population of Durban to be in 6 years time? Round your answer to the nearest integer.
2. Bridget wants to buy an iPod that costs £100, with the exchange rate currently at £1 = R14. She estimates that the exchange rate will drop to R12 in a month.
 - 2.1 How much will the iPod cost in rands, if she buys it now?
 - 2.2 How much will she save if the exchange rate drops to R12?
 - 2.3 How much will she lose if the exchange rate moves to R15?
3. The current population of Polokwane is 3 878 970 and the average rate of population growth in South Africa is 0,7% p.a. What can city planners expect the population of Polokwane to be in 12 years time? Round your answer to the nearest integer.
4. Mthuli wants to buy a television that costs £130, with the exchange rate currently at £1 = R11. He estimates that the exchange rate will drop to R9 in a month.
 - 4.1 How much will the television cost in rands, if he buys it now?
 - 4.2 How much will he save if the exchange rate drops to R9?
 - 4.3 How much will he lose if the exchange rate moves to R19?
5. A small town in Ohio, USA is experiencing a huge increase in births. If the average growth rate of the population is 16% p.a., how many babies will be born to the 1 600 residents in the next 2 years?
6. Nthabiseng wants to buy an iPad that costs £120, with the exchange rate currently at £1 = R14. She estimates that the exchange rate will drop to R9 in a month.
 - 6.1 How much will the iPad cost, in rands, if she buys it now?
 - 6.2 How much will she save if the exchange rate drops to R9?
 - 6.3 How much will he lose if the exchange rate moves to R18?
7. Study the following exchange rate table:

Country	Currency	Exchange Rate
United Kingdom (UK)	Pounds (£)	R14, 13
United States (USA)	Dollars(\$)	R7, 04

- 7.1 In South Africa the cost of a new Honda Civic is R173 400. In England the same vehicle costs £12 200 and in the USA 21 900\$. In which country is the car the cheapest?

7.2 Sollie and Arinda are waiters in a South African restaurant attracting many tourists from abroad. Sollie gets a £6 tip from a tourist and Arinda gets 12\$. Who got the better tip?

8. Yaseen wants to buy a book online. He finds a publisher in London selling the book for £7, 19 . This publisher is offering free shipping on the product. He then finds the same book from a publisher in New York for 8, 49\$ with a shipping fee of 2\$. Next he looks up the exchange rates to see which publisher has the better deal. If 1\$ = R11, 48 and £1 = R17, 36, which publisher should he buy the book from?

9. Mathe is saving up to go visit her friend in Germany. She estimates the total cost of her trip to be R50 000. The exchange rate is currently €1 = R13, 22. Her friend decides to help Mathe out by giving her €1 000. How much (in rand) does Mathe now need to save up?

10. Lulamile and Jacob give tours over the weekends. They do not charge for these tours but instead accept tips from the group. The table below shows the total amount of tips they receive from various tour groups. The current exchange rates are:

Group	Total Tips
British tourists	£5, 50
Japanese tourists	¥85, 50
American tourists	\$7, 00
Dutch tourists	€9, 70
Brazilian tourists	40, 50BRL
Australian tourists	9, 20AUD
South African tourists	R55, 00

10.1 Which group of tourists tipped the most? How much did they tip (give your answer in rand)?

10.2 The Japanese tourists tipped the least. The rand value of their tip was R8, 55.

11. Kayla is planning a trip to visit her family in Malawi followed by spending some time in Tanzania at the Serengeti. She will first need to convert her South African rands into the Malawian kwacha. After that she will convert her remaining Malawian kwacha into Tanzanian shilling. She looks up the current exchange rates and finds the following information:

R1 = 39, 46MWK

1MWK = 4, 01TZS

She starts off with R5000 in South Africa. In Malawi she spends 65000MWK. When she converts the remaining Malawian kwacha to Tanzanian shilling, how much money does she have (in Tanzanian shilling)?

7 ANSWERS FOR EXERCISES

7.1 Exercise 1

1. R4 025
2. R5 398, 80
3. R1 700, 00
4. R7030, 80
5. 5.1 R324
5.2 R3 937, 50
6. R11 538, 46
7. 19
8. 16, 25%
9. 5, 7%
10. 3, 8%
11. 4, 3%
12. 20 years
13. 32 years

7.2 Exercise 2

1. R4 044, 69
2. R5 930, 94
3. R9 327, 76
4. R59 345, 13
5. R24 002, 00
6. R17 942, 00
7. 8, 45%
8. 4, 3%
9. 1, 8%

7.3 Exercise 3

1. 1.1 R3 960,00
1.2 R4 316,40
1.3 R359,70
1.4 R4 756,40
2. 2.1 R4 760,00
2.2 R6 092,80
2.3 R253,87
2.4 R6 932,80
3. 3.1 R3 825
3.2 R4 743
3.3 R197,63
3.4 R5 418
4. 4.1 R12 962,50
4.2 R4 462,50
4.3 R360,07
5. 5.1 R10 240
5.2 R3 840
5.3 R213,33
6. 6.1 R6 324
6.2 R1 224
6.3 R263,50
7. 7.1 R5 400
7.2 R4 251,97
8. Store A
9. R156,84
10. R210,22

7.4 Exercise 4

1. R33, 28
2. R29, 61
3. R22, 77
4. R14, 72
5. R14, 24
6. R2174, 77
7. R38, 64

7.5 Exercise 5

1. 4 142 255
2. 2.1 R1 400
2.2 R200
2.3 R100
3. 4 217 645
4. 4.1 R1 430
4.2 R260
4.3 R1 040
5. 553
6. 6.1 R1 680
6.2 R600
6.3 R480
7. 7.1 USA
7.2 Sollie
8. New York
9. R36 780
10. 10.1 Brazilian tourists
10.2 Japanese tourists
11. 530 523 TZS