25SCHOOLS

FREE LEARNING NOTES FOR ZAMBIA

FORM 2

Mathematics

# Financial interest: simple and compound interest

Lesson notes for learners · Competence-Based Curriculum

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People save money in banks and borrow money for needs, and in both cases interest is involved. Interest is the money earned on savings or charged on a loan. Knowing how it is worked out helps you compare savings plans and understand how a debt can grow.

**AFTER THESE NOTES YOU SHOULD BE ABLE TO**

- Explain what interest, principal and interest rate mean
- Calculate simple interest with the formula
- Build up compound interest year by year
- Explain why compound interest is larger than simple interest over the same time

**KEY WORDS**

| | |
|---|---|
| **principal** | the original amount that is saved or borrowed |
| **interest** | money earned on savings or charged for borrowing |
| **interest rate** | the percentage of money paid as interest for each year |
| **simple interest** | interest always worked out on the original principal |
| **compound interest** | interest worked out on the balance at the start of each year, so earlier interest earns more interest |
| **amount** | the principal plus the interest added to it |

## 1 Interest and simple interest

Interest is the money a bank adds to your savings, or the extra money a borrower must pay back. The original sum is the principal. The interest rate says how much interest is paid for each year, as a percentage.

Under simple interest the bank always uses the original principal. So the interest is the same every year. The formula is I = (P × R × T) / 100, where P is the principal, R is the rate per year and T is the time in years. The amount is the principal plus the interest.

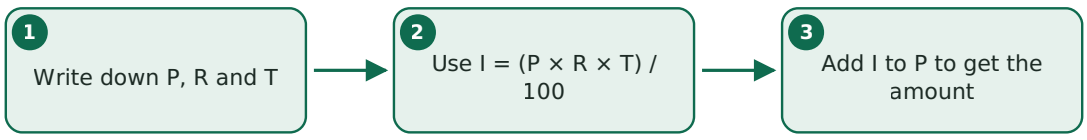


**Figure 1.** Finding simple interest

**WORKED EXAMPLE**

Ruth saves K5,000 for 3 years at 10% simple interest per year. Find the interest each year and the amount after 3 years.

Interest for one year = (5,000 × 10 × 1) / 100 = K500

Interest for 3 years = 3 × 500 = K1,500

Amount = 5,000 + 1,500 = K6,500

## 2 Compound interest, year by year

Under compound interest the bank works out each year's interest on the balance at the start of that year. The amount at the end of one year becomes the starting balance for the next year. So interest that was added earlier also earns interest. This is sometimes called earning interest on interest.

To build it up, take 10% of the starting balance, add it, and use the new total as the next starting balance. Do not use a general formula at this stage; first notice the repeated percentage increase.

| Year | Starting balance (K) | Interest 10% (K) | End of year (K) |
|---|---|---|---|
| 1 | 5,000 | 500 | 5,500 |
| 2 | 5,500 | 550 | 6,050 |
| 3 | 6,050 | 605 | 6,655 |

**Figure 2.** K5,000 at 10% compound interest

**WORKED EXAMPLE**

Find the amount after 3 years when K5,000 earns 10% compound interest per year.

Year 1: 10% of 5,000 = 500, so the balance is K5,500

Year 2: 10% of 5,500 = 550, so the balance is K6,050

Year 3: 10% of 6,050 = 605, so the balance is K6,655

## 3 Comparing the two plans

Take the same principal of K5,000, the same rate of 10% and the same time of 3 years. Under simple interest the amount is K6,500. Under compound interest it is K6,655. The rate did not change; only the amount used to work out interest changed.

After one year both plans give K5,500, because in year 1 the starting balance is the original principal. From year 2 the compound plan pulls ahead: the difference is K50 after year 2 and K155 after year 3.

Compound interest helps a saver because earlier interest earns more interest. It hurts a borrower who makes no repayments, because interest is also charged on earlier interest. A borrower who owes K5,000 at 10% compound interest owes K6,655 after three years.

| Year | Simple interest amount (K) | Compound interest amount (K) | Difference (K) |
|---|---|---|---|
| 1 | 5,500 | 5,500 | 0 |
| 2 | 6,000 | 6,050 | 50 |
| 3 | 6,500 | 6,655 | 155 |

**Figure 3.** Simple and compound interest compared

### TRY THIS

Work in a small group. Choose a principal of K2,000 and a rate of 10% for three years. Build one table for simple interest and one for compound interest. Compare the final amounts, then explain to another group why they differ although the principal, rate and time are the same.

### REMEMBER

- Interest is money earned on savings or charged on a loan.
- Principal is the original amount.
- Simple interest: $I = (P \times R \times T) / 100$, the same every year.
- Compound interest uses the starting balance of each year.
- Compound interest gives a larger amount than simple interest after more than one year.
- For a borrower, compound interest makes unpaid debt grow faster.

## ? Check yourself

1. What is the principal?
2. Find the simple interest on K2,000 at 5% per year for 3 years.
3. Why do simple and compound interest give the same amount after one year?
4. Find the amount after 2 years when K4,000 earns 10% compound interest per year.
5. What does it mean to say compound interest earns interest on interest?

6. Mulenga saves K2,000 at 10% interest per year for 3 years in a bank that pays compound interest. His friend Natasha saves K2,000 for 3 years at 10% simple interest. (a) Find Natasha's amount after 3 years. (b) Find Mulenga's amount after 3 years. (c) Who earns more and why?
7. A trader borrows K5,000 from a lender who charges 10% compound interest per year and makes no repayments for 3 years. (a) How much interest is charged in year 2? (b) How much does the trader owe after 3 years? (c) Explain why the debt grows faster each year.

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## ANSWERS

1. The original amount saved or borrowed.
2. I = (2,000 × 5 × 3) / 100 = K300.
3. In the first year both use the original principal as the starting balance.
4. Year 1: 10% of 4,000 = 400, balance K4,400. Year 2: 10% of 4,400 = 440, balance K4,840.
5. Interest added in earlier years becomes part of the balance, so it is included when later interest is worked out.
6. (a) Natasha: interest = (2,000 × 10 × 3) / 100 = K600, so the amount is K2,600. (b) Mulenga: Year 1 interest K200, balance K2,200; Year 2 interest K220, balance K2,420; Year 3 interest K242, balance K2,662. (c) Mulenga earns more, K662 against K600, because each year's interest is worked out on a la
7. (a) Year 2 interest = 10% of K5,500 = K550. (b) After 3 years the trader owes K6,655. (c) Each year's interest is worked out on a larger balance that already includes earlier interest, so the yearly interest rises: K500, K550, K605.

Written by 25Schools to follow the Form 2 Mathematics syllabus of the Zambian competence-based curriculum. Free for learners to read, download and share. More notes and quizzes at 25schools.com.