Name: .... Date ....

GAYAZA HIGH SCHOOL

S.4 MATH WORKSHEET SEVEN

Percentages, Discounts, Commissions,
Interest, Profit and Loss

PART III

INTEREST
Simple interest

If you borrow money from a bank or other financial institution, then you will have to pay interest (the charge paid for borrowing) in addition to your repayments.

The money borrowed or lent is called **the principal** (P). When interest is paid at fixed intervals, yearly, half-yearly, quarterly or monthly, the principal is said to be lent (or borrowed) at **simple interest** (I).

The interest is calculated on the original principal only. The investor receives interest at regular periods, the principal remains the same. Simple interest is calculated using the following formula

$$\text{Interest}, I = \frac{PTR}{100}$$

Where, P = principal, R = rate of interest per annum (%); T = time (in years).

Note that the units for R and T must be consistent, i.e. **If R is per annum, T must be in years**, **If R is per month, T must be in months,** e.t.c.

When the simple interest for any given time is added to the principal, the sum is called the amount at simple interest for that time. **Amount = Principal + Interest, i.e. A = P + I**.

Example 1

Find the simple interest on sh. 25 000 for 3.5 years at 18% per annum. Solution

$$I = \frac{PTR}{100}$$

$$I = \frac{25000 \times 3.5 \times 18}{100}$$

$$= \text{sh. } 15\ 750.$$

Example 2

Find the simple interest on sh. 20 000 for $1\frac{3}{4}$ years at $1\frac{1}{2}$ % per month. Find also, the amount after $1\frac{3}{4}$ years.

Time $= 1\frac{3}{4}$ years $\times 12 = 21$ months; P = sh. 20 000; R $= 1\frac{1}{2}$ % per month
Therefore,

$$I = \frac{PTR}{100}$$

$$I = \frac{20000 \times 21 \times 1\frac{1}{2}}{100}$$
$$= \text{shs. } 6,300.$$
$$Amount = Principal + Interest$$
$$= 20\ 000 + 6\ 300$$
$$= sh.\ 26\ 300.$$

COMPOUND INTEREST

In most financial institutions, **interest is added to the money borrowed or lent** and then **the interest is calculated on this total amount for the next period**. Adding the interest is known as compounding the interest, or just compound interest.

Compound interest = Final amount – original principal.

Note: Simple interest is the same for each period, compound interest becomes greater for successive periods.

Example 1
Calculate the compound interest on sh. 2 000 for 2 years at 8% per annum.
Solution

$$\text{First year: Principal} = 2\,000$$
$$\text{Interest is calculated as} \quad I = \frac{PTR}{100}$$
$$I_1 = \frac{PTR}{100}$$
$$I_1 = \frac{2000 \times 8 \times 1}{100}$$
$$I_1 = \text{shs. } 160$$
$$\text{Amount by end of year 1} = 2000 + 160 = \text{shs. } 2\,160$$
$$\text{Second year: Principal} = 2\,160$$
$$\text{Interest is calculated as} \quad I = \frac{PTR}{100}$$
$$I_2 = \frac{PTR}{100}$$
$$I_2 = \frac{2160 \times 8 \times 1}{100}$$
$$I_2 = 172.8$$

$$\text{Amoun} = 2\,160 + 172.80 = 2\,332.80$$
$$\text{Compound interest} = \text{Amount – Principal} = 2\,332.80 – 2\,000 = \text{sh. } 332.80.$$

Alternatively, the compound interest can be calculated using the following formula: $A = P\left(1 + \frac{R}{100}\right)^n$ where, A is the amount after n years; P = principal; R is the rate % p.a. and n is the number of years.

Example 1
Calculate the compound interest on sh. 2 000 for 2 years at 8% per annum

$$A = P\left(1 + \frac{R}{100}\right)^n$$
$$A = 2000\left(1 + \frac{8}{100}\right)^2$$
$$A = 2000(1 + 0.08)^2$$
$$A = 2000(1.08)^2$$
$$A = 2000 \times 1.1664$$
$$A = \text{shs. } 2,332.8$$
$$\text{Compound interest} = \text{Amount – Principal}$$
$$\text{Compound interest} = 2,332.8 – 2000$$
$$\text{Compound interest} = \text{Shs. } 332.8$$

EXERCISE
1. Peter deposited shs. 2,500,000 in a bank which offers a compound interest of 15% per annum. How much money did he have in the bank at the end of two years?

2. Paul and Mary invested Shs. 600,000 each in a savings society for 2 years. Paul opted for simple interest while Mary opted for compound interest. Both interest rates were 12% per annum.
   (a) Find the interest earned by each of them.

   (b) Who earned more interest and by how much?

3. Mukasa wants to buy a house which is priced at shs. 56,000,000. A deposit of 25% of the value of the house is required. A bank will lend him the rest of the money at a compound interest of 15% per annum and payable after two years. Calculate the:
   (i) deposit Mukasa must make

   (ii) amount of the money Mukasa will have to pay the bank after two years.

   (iii) total money which Mukasa will spend to buy the house.

END.