GRADE 12
Financial Maths

Simple and Compound Interest

FINANCIAL MATHS REVISION

Simple Interest:

$$A = P\,(1 + ni)$$

Compound Interest:

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

A = total amount (End Amount)
P = principle amount (Beginning Amount)
n = number of time periods
i = interest rate

Note! Principle is a ONCE-OFF event!

Examples

Example 1

If you borrow R300 at 9% p.a **simple interest**, how much will you owe after 7 years?

A= ?
P= R300
i= 9% = $\frac{9}{100} = 0.09$
n= 7

$$A = P(1 + i.n)$$
$$A = 300(1 + 0.09 \times 7)$$
$$A = 489$$
$$\therefore You\ owe\ R489\ after\ 7\ years$$

Example 2

If you borrow R300 at 9% p.a **compound interest**, how much will you owe after 7 years?

A= ?
P= R300
i= 9% = $\frac{9}{100} = 0.09$
n= 7

$$A = P(1 + i)^n$$
$$A = 300(1 + 0.09)^7$$
$$A = 548{,}411736\ldots.$$
$$\therefore You\ owe\ R548{,}41\ after\ 7\ years$$

REMEMBER TO ROUND OFF TO TWO DECIMAL PLACES WHEN WORKING WITH MONEY

Examples

Example 3

You invest R1 570 at 11% p.a. compounded monthly.

a) How much will you receive after 7 years?

A= ?

P= R1570

i= 11% = $\frac{11}{100} = 0.11$. Compounde monthly $\frac{0.11}{12}$

n= 7 years compounded monthly means n = 7 X 12 =84

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

$$A = 1570.(1+\frac{0.11}{12})^{84}$$

$$A = 3378.959680888$$

$$\therefore You\ will\ receive\ R3378{,}96\ after\ 7\ years$$

b) How much interest have you earned after 7 years?

R3378,96 – R1570 = R1808,96 Interest Received

Interest per annum compounded:

monthly → $\frac{i}{12}$	*n* years × 12 months
quarterly → $\frac{i}{4}$	*n* years × 4 quarters in the year
semi-annually or half-yearly, (every 6 months) → $\frac{i}{2}$	*n* years × 2

Examples

Example 4

You invest R1 700 at an interest rate of 10% **compounded quarterly**. Calculate how much your investment is worth after 6 years.

A= ?

P= R1700

i= 10% = $\frac{10}{100} = 0.10$ Compounde quarterly $\frac{0.10}{4}$

n= 6 years compounded quarterly means n = 6 X 4 =24

$$A = P(1+i)^n$$
$$A = 1700.(1+\frac{0.10}{4})^{24}$$
$$A = 3074.83$$
$$\therefore You\ will\ receive\ R3074.83\ after\ 6\ years$$

Example 5

R25 000 is invested into a savings account. Calculate the value of the investment of the savings after 5 years if interest rate is 11% **compounded semi-annually.**

A= ?

P= R25000

i= 11% = $\frac{11}{100} = 0.11$ Compounded semi $-$ annually $\frac{0.11}{2}$

n= 5 years compounded semi $-$ annually means n = 5 X 2 =10

$$A = P(1+i)^n$$
$$A = 25000.(1+\frac{0.11}{2})^{10}$$
$$A = 42703.61$$
$$\therefore You\ will\ receive\ R42\ 703.61\ after\ 5\ years$$

Calculating the value of P, *i* and *n*

We can also use the formulae for compound and simple interest to calculate the principal P, the rate of interest *i*, or the time period *n*.

Example 6

How much must John invest now so that after 5 years at 8% **simple interest**, he will have R4 200?

A= R4 200

P= ?

i= 8% = $\frac{8}{100} = 0.08$

n= 5 years

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

$4200 = P(1 + 0.08 \times 5)$

$\frac{4200}{1.4} = P$

$3000 = P$

$\therefore John\ must\ invest\ R3000$

Example 7

A population increases from 12 000 to 214 000 in 10 years. At what annual **(compound)** rate does the population grow? (Give your answer correct to one decimal place.)

A= 12000

P= 214000

i= ?

n= 10

NEED TO MULTIPLY BY 100 TO GET INTEREST RATE

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

$12000 = 214000.(1 + i)^{10}$

$\frac{12000}{214000} = (1 + i)^{10}$

$\sqrt[10]{\frac{12000}{214000}} = 1 + i$

$1.333899939 - 1 = i$

$0.333899939 = i$

$33{,}4\% = interest\ rate$

Calculating the value of P, *i* and *n*

We can also use the formulae for compound and simple interest to calculate the principal P, the rate of interest *i*, or the time period *n*.

Example 8

How many months will it take Justin to save for his motorbike, if he is able to invest R800, at an interest rate of 14% p.a. **compounded monthly**; and the motorbike costs R42 000?

A= R42000

P= R800

i= $\frac{14\%}{12} = \frac{\frac{14}{100}}{12} = \frac{0.14}{12}$

n= ?

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

$42000 = 800(1+\frac{0.14}{12})^n$

$\frac{42000}{800} = (1+\frac{0.14}{12})^n$

$52.5 = (\frac{12}{12}+\frac{0.14}{12})^n$

$52.5 = (\frac{12,14}{12})^n$

$n = \log_{\frac{12.14}{12}} 52.5$

$n = 341.47$

$\therefore n = 342\ months$ ROUND UP

Make the right hand side one fraction in the brackets. So 1 becomes $\frac{12}{12}$. (LCD)

Make use of LOGS as previously shown.
$y = a^x$ becomes $x = \log_a y$