7.1 Simple and Compound Interest

Simple Interest: Interest is earned only on the original investment.

Simple Interest Formulas:

$I = Prt$ $\quad$ $A = P + I$

where

A = Amount at the end of investment ($)
P = Principal or original amount ($)
r = Rate of interest per year (decimal)
t = Time invested (years)
I = Total interest earned ($)

"per annum" per year

Ex. 1 Veeta invests $900 at 5%/a for 7 years.

a) How much interest does she earn?

b) What is the total amount in the account?

a) $I = Prt$
$= 900(0.05)(7)$
$= \$315$

b) $A = P + I$
$= 900 + 315$
$= \$1215$

Ex. 2 Margot invests $100 at 7%/ a for 5 years. Simple Interest earned on $100

a) Complete the table to examine what happens to her investment.

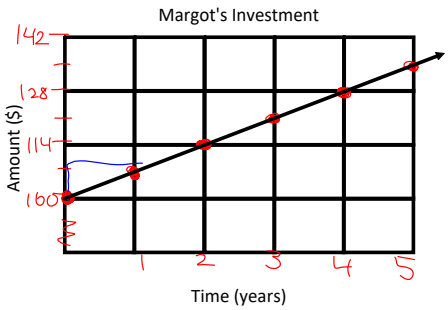
$I = 100(0.07)(1)$

Year	Interest ($)	Amount ($)
0	\	100
1	7	$107
2	7	114
3	7	121
4	7	128
5	7	135

What type of sequence does this represent? Arithmetic

Linear

b) Sketch the growth of her money over the 5 years.



What type of growth does this represent? Linear

Interest is constant: $7 / yr

Slope is 7

$y = 7x + 100$
$A = 7t + 100$
$A = 100 + 7t$
$P + I$

Simple Interest:

- Increases by the same amount of money for each time interval.
- Creates an arithmetic sequence.
- Represents linear growth.

Compound Interest: http://time.com/money/4343323/compound-interest-returns

- **Interest is added to the principal for the next compound period.**
- **Has the effect of paying/earning interest on interest.**

Ex. 1 Consider Margot's investment of $100 at 7% if the interest is compounded yearly.

a) Complete the table to examine what happens to her investment.

$I = 100(0.07)(1)$

Year	Interest ($)	Amount ($)
0		100
1	7	107
2	7.49	114.49
3	8.01	122.50
4	8.58	131.08
5	9.18	140.26

$\times 1.07$ $\times 1.07$ $\times 1.07$

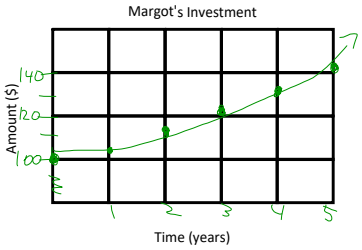
$I = 107(0.07)(1)$

$I = 114.49(0.07)(1)$

$I = 122.50(0.07)(1)$

What type of sequence does this represent? geometric

b) Sketch the growth of her money over the 5 years.



What type of growth does this represent? exponential growth

Amount has a constant ratio

r = 1.07

$A = a_0(b)^x$

$= 100(1.07)^x$

Compound Interest:

- Increases by a constant multipier for each compound period.
- Creates a geometric sequence.
- Represents exponential growth.

Compound Interest Formulas:

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

This is the formula for exponential growth. The growth factor is $(1 + i)$.

$I = A - P$

where

P = Principal or amount invested/borrowed ($)

A = Amount at the end of the investment ($)

i = Interest rate per compound period (decimal) → not per year

$i = \frac{\text{annual rate}}{\text{\# of compounding periods per year}}$

n = Number of compound periods → not number of years

n = (# of years) x (# of periods per year)

Compounding Periods --> How often interest is compounded.

Typical compound periods	# of compounds / year
annually	1
semi-annually	2
quarterly	4
monthly	12
bi-monthly (2x every month)	24
weekly	52
bi-weekly (every other week)	26
daily	365

Ex. 2 Myla invests $1500 in an account paying 4.75%/a compounded quarterly. How much money will she have at the end of 5 years?

$A =$

$P = 1500$

$i = \frac{0.0475}{4}$

$n = 5 \times 4$
$= 20$

$A = P(1+i)^n$
$= 1500\left(1 + \frac{0.0475}{4}\right)^{20}$
$= \$1899.45$

leave as decimal so exact answer

÷4 4.75% → 1.18%

Interest $394.45

Ex. 3 Sarah needs to borrow $4500 to buy her first car.
(She will not be making payments but will pay it off in one lump sum in 5 years.)

She has 2 options:

a) 3.4 %/a for 5 years compounded monthly
b) 3.9%/a for 5 years compounded semi-annually.

OR $4500 NOW → Repay after 5 years

Which option is better?

① $P = 4500$
$i = \frac{0.034}{12}$
$n = 5 \times 12$

$A = P(1+i)^n$
$= 4500\left(1 + \frac{0.034}{12}\right)^{60}$

$A = 5332.59$

less interest

② $P = 4500$
$i = \frac{0.039}{2}$
$n = 5 \times 2$

$A = P(1+i)^n$
$= 4500\left(1 + \frac{0.039}{2}\right)^{10}$

$A = 5458.64$

Ex. 4 Don has $24 000 invested in a University fund that he hopes will grow to $30 000 in 3 years. What interest rate, annual compounded quarterly will he need to invest at in order to achieve his goal?

$A = 30000$

$P = 24000$

$i = \frac{r}{4}$

$n = 3 \times 4$
$= 12$

HOMEWORK

Pg. 423 # C2,C3,1ad,3,5,8

p. 433 #1, 3d, 5c, 6, 9, 11, 14