7.1 Simple and Compound Interest

Simple Interest: interest is earned only on the original investment

Simple Interest Formulas:

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

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 ($)

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Ex. 1 Norma invests $900 (P) at 5%/a for 7 years.

a) How much interest does she earn?

b) What is the total amount in the account?

a) $I = Prt$
$= 900(0.05)(7)$
$= 315$
∴ She earns $315

b) $A = P + I$
$= 900 + 315$
$= 1215$
∴ She has $1215

Ex. 2 Bahar invests $100 at 7%/ a for 5 years.

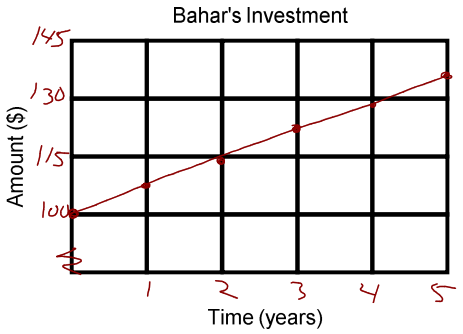
a) Complete the table to examine what happens to her investment.

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 seq.
- linear

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



What type of growth does this represent?

interest is constant: $ 7 / yr

slope is 7

Simple Interest:

- increases by the same amount of money for each time interval.
- creates an arithmetic sequence.
- represents linear growth.

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Compound Interest:

- interest is added to the principal for the next compound period
- has the effect of paying/earning interest on interest

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

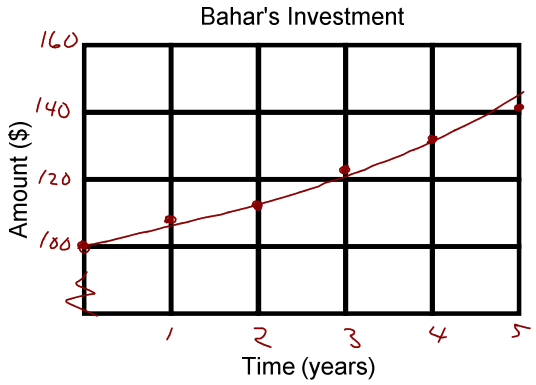
a) Complete the table to examine what happens to her investment.

Year	Interest	Amount
0		100
1	7	107
2	0.07(107) = 7.49	114.49
3	8.01	122.50
4	8.58	131.08
5	9.18	140.26

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

Compound Interest:

- increases by a constant multipier for each compound period.
- creates a geometric sequence.
- represents exponential growth.

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Compound Interest Formulas:

note that this is just the formula for exponential growth....the growth factor is (1 + i)

$$A = P(1 + i)^n \qquad I = A - P$$

where P= principal or amount invested/borrowed ($)

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

i = interest rate per compound period (decimal)

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

n = # of compound periods

$$n = \text{\# of years} \times \text{\# of periods per year}$$

Compounding Periods (how often interest is compounded)

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

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

$P = 1500$

$A = ?$

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

$n = 5 \times 4 = 20$

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

$\doteq 1899.45$

∴ She will have $1899.45

Ex. 3 Sarah needs to borrow $4500 to buy her first car.
(She is not making payments...she will pay it off in one lump sum in 5 years.)
She has 2 options:

a) 3.4 %/a for 5 years compounded monthly OR

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

Which option is better for Sarah ?

$P = 4500$

a) $i = \frac{0.034}{12}$

$n = 5 \times 12 = 60$

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

$= 5332.59$

b) $i = \frac{0.039}{2}$

$n = 5 \times 2 = 10$

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

$= 5458.64$

∴ Sarah should choose option A (less to payback)

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

$P = 24000$

$A = 30000$

$i = ?\left(\frac{i}{4}\right)$

$n = 3 \times 4$

$= 12$

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

$30000 = 24000\left(1+\frac{i}{4}\right)^{12}$

$1.25 = \left(1+\frac{i}{4}\right)^{12}$

$\sqrt[12]{1.25} = 1+\frac{i}{4}$

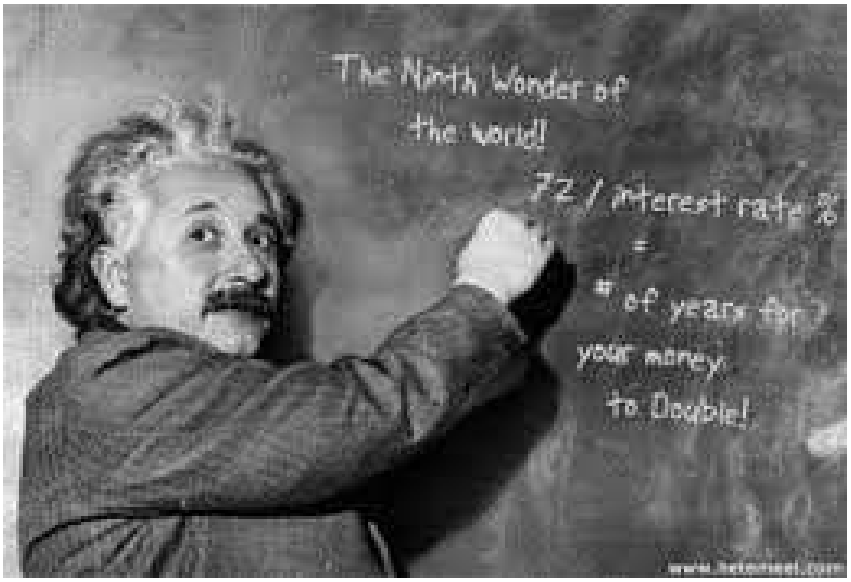
$1.01877 = 1+\frac{i}{4}$

$0.01877 = \frac{i}{4}$

$i = 0.075$

∴ He needs 7.5%/a interest

Simple Interest: Handout "7.1 Simple Interest"
Compound Interest: p. 508 #4, 8-14, 17, 22



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