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Fourth Class

Lecture (3)

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4-1 The simple interest equation, and the equation for the total amount after n periods:

Simple interest = $P^* n * i$

F = (P*n * i) + P

Ex: A person deposited 500,000 dinars with a bank that depends on an interest rate of 6% annually. What is the interest that this person will get after 5 years?

Write an equation for calculating the total amount after 5 years

Solve:

Simple interest = P* n * i = 500000 * 5 * 0.06= 150000 ID.

F = (P* n * i) + P = 150000 + 500000 = 650000 ID.

Ex: When does a person receive interest equivalent to a quarter of the amount deposited by him with a bank that adopts an interest rate of 5% annually?

Solve:

Simple interest (S.i) = P*n*i

since it is $: S.i = \frac{1}{4} P$

So: $\frac{1}{4}$ P = P *n * 0.05

So
$$n = \frac{0.25}{0.05} = 5$$
 years.

H.W.1:

What is the interest rate approved by a bank, if you know that a person has received interest equivalent to half of the amount he deposited 10 years ago with the bank?

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Ex: A person invested 750,000 Iraqi dinars at an interest rate of 6% annually for a certain period, while he invested 600,000 Iraqi dinars at an interest rate of 8% annually for a period less than the first two years.

The total benefits achieved by both investments were: 257,000 dinars. What is the duration of each of the two investments?

Solve:

(S.i)1 = P1* n1 * i1 (S.i)2 = P2* n1 * i2since it is: (S.i)1 + (S.i)2 = (P1* n1 * i1) + (P2* n1 * i2)since it is: (S.i)1 + (S.i)2 = 257,000since it is: $n_2 = n_1 - 2$ So : 257,000 = (750,000 * n1 * 0.06) + (600,000 * (n_1 - 2) * 0.08) n = 3.795 years.

H.W.2: A person invested an amount of 300,000 dinars at a certain interest rate for a period of five years, while he invested an amount of 400,000 dinars for a period of 3 years at an interest rate less than the first by 2%. If you know that the total interest that this person obtained from both investments is 138000 dinars, what is the interest rate for both investments?

4-2 Compound Interest rates:

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

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Ex: What is the total amount that a person will get from investing 800,000 dinars for a period of 3 years and 5 months at an interest rate of 7%?

Solve:

3*12 + 5 = 41 months 41/12 = 3.4167

 $F = P (1+i)^n = 800000(1+0.07)^{3.4167} = 1008058 \text{ ID.}$

Ex: What is the outcome of one dinar with a compound interest rate of 4% for a period of 4 years?

And What is the interest of one dinar?

Solve:

 $F = P (1+i)^n = 1 (1+0.04)^4 = 1.169858 \text{ ID.}$

interest of one dinar = 1.169858 - 1 = 0.169858

Ex: What is the amount that a person invests at a compound interest rate of 7% for a period of 5 years to obtain a balance of 701250 dinars?

Solve:

F = P (1+i)ⁿ

$$701250 = P (1+0.07)^5$$

P = $\frac{701250}{1.40255}$ = 499982.1753 ID.

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4-3 Annuity and annual installment:

A series of consecutive equal values (uniform amounts) in an equal period of time.





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Ex: A man bought a car whose current value is \$45,000. He bought it in installments, with a compound interest rate of 0.06, and repays its value over 6 years. What is the annual premium paid by the company?

Solve:

A = P
$$\left[\frac{i(1+i)n}{(1+i)n-1}\right] = 45000 \frac{0.06(1+0.06)6}{(1+0.06)6-1} = 9151.3183$$

H.W.4:

- An Investor (owner) has an option to purchase a tract of land that will be worth \$10,000 in six years.
- If the value of the land increases at 8% each year,
- How much should the investor be willing to pay now for this property?

H.W.4:

- Suppose you make <u>15</u> equal deposit of <u>\$1,000</u> each into a bank account paying <u>9%</u> interest per year.
- The first deposit will be made one year from today.
- How much money can be withdrawn from this bank account immediately after the 15th deposit?

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H.W.5:

- An enterprising student is planning to have personal savings totaling \$1,000,000 when he retires at age 65.
- She is now 20 years old.
- If the annual interest rate will average 7% over the next 45 years on his savings account,
- What equal end-of-year amount must he save to accomplish his goal?

H.W.6:

- An engineer find a very desirable car, but its price was \$18,000.
- The dealer gives a chance to buy the car and pay monthly payments with interest rate 1 % per month and 60 months.
- What is the monthly payment?

4-4 Gradient amount: It is a constant annual increase

Interest formulas relating a uniform gradient of cash flows to its annual and present equivalents.

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Ex: man can pay every year \$10000 as a car premium for 5 years at a interest rate of 0.05. What is the current car price? If he wants to buy a more expensive car and pay in installments for the same period and interest rate; He must increase the amount of the annual premium, if the premium increases by (G = 100), what will be the price of the current car that he can buy?

Solve:

$$P_{A} = A \left[\frac{(1+i)^{n}-1}{i(1+i)^{n}}\right] = 10000 \left[\frac{(1+0.05)^{5}-1}{0.05(1+0.05)^{5}}\right] = 43294.766$$

$$P_{G} = G \left[\frac{(1+i)^{n}n-in-1}{i^{2}(1+i)^{n}}\right] = 100 \frac{(1+0.05)^{5}-0.05*5-1}{0.05^{2}(1+0.05)^{5}} = 8658.95$$

$$P = P_{A} + P_{G} = 43294.766 + 8658.95 = 51953.716$$

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H.W.7:

Suppose that certain end-of-year cash flows are expected to be \$1,000 for the second year, \$2,000 for the third year, and \$3,000 for the fourth year, and that if interest rate is 15% per year, it is desired to find the:

- a) Present equivalent value at the beginning of the first year,
- b) Uniform annual equivalent value at the end of each of the four year.