ŧŏƧǴǆƛƘƪŨƒ ƴŏƧǴƬǆ!ƒ ƧǴŏƘƤƒĂ ƴŏĂǆƘ : ƘǁƑƘǁƐ ĬǅĭǉƑƻǅǁƐ ǅƐƍĭǅǁƐ
ŧƕŧƧǆ ƖƥƑǴƽƕ ŧƘƕǴƛ ƘǴƺƥ ĬǈƵ ƖƥƥƪǆƵ!ƒ ŧŏƥǴƵ!ƒ ƯĂƧ!!ƒ :(12) ƔƍƟǈǁƐ

:ƕƺƍǈŧƨǅǁƐ ƖƐƅƑƻƖǁƐ
.ŧƪƪƌǆ!ƒ ƧƘǴƺƥ Ŏƺ ŧŏƕƪǴơǆ!ƒ ƘǴŏǁǆƵ!ƒ ƴƞƪŏĂ ĭƥǴƵ!ƒ ƯƧ!!ƒ ǁŭǌƘƪƒ ƴĂƥƞ ƨƞǈŏ
ŧƵǴƪ 15 : ƕǅƦǘǁƐ ƔƍǅǁƐ
. ƖƧƧǀǆ!ƒ ŧŏƪƧƥǆ!ƒ ƔƘŧ!ƒ :ƲƜƐƥǅǁƐ
:ĬŧƐƤǁƐ !ĭǈƫŧǁƐ ƖƐƥƪǅǅ
.ŧƕŧƧǆ ƖƥƑǴƽƕ Ʃǈƕǆ! ŧŏ!ǴƠ!ƒ ŧǆŏ!!ƒĂ ŧƕƪƘŧǆ!ƒ ŧǆŏ!!ƒ ƥƥơŏ –
.ŧƵƺƥ ƴŧ ƖƥƑǴƺĂ ǁŭǌƘƪƒ ƥƥơŏ –
. ĭƥǴƵ!ƒ ƯƧ!!ƒ ƧƬǴǉƵ ǇŏƕŧƤŭƵ!ƒ ƥƥơŏ –
. ĭƥǴƵ!ƒ ƯƧ!!ƒ ǁŭǌƘƪƒ ƴĂƥƞ ƨƞǈŏ –
.ŧǉƪ ƴŧ ŧƵƺƥ ƥŏƥƪƘĂ ƯƧ!!ƒ ĬǈƵ ƴĂƬơ!ƒ ǴŏƕƪǴơǆ ƴƞƪŏ –

Ƨ ƥƍǁƐ !ĭǅƬŧ

.1 ƕƯĭƨǴǁƐ ƔƍƏƑƻǁƑǴ ƥĭƖƤŧ
.2 .ƕǴƖƥǅǁƐ ƔƍƏƑƻǁƐ
.3 .ƕŧǴƑƘǁƐ ƖƑƴƺƍǁƐ
.4 .ƕĭƍƑƴǁƐ ƒ ǈƥƫǁƐ ƥǘǈŧƨƐ
.5 .ƕǆƨ ǘƖ ƕƴƺƍ ƍĭƍƨŧǈ ƒ ƥƫǁƐ ĂŧƳ ǘǈƬƟŧǁ ĬǴƨƑƟǅǁƐ ǘĭƜƨŧǁƐ
. .ƑǈǁǈŧƟǈ ĬǁŎǁ !ǘƳǕǁ ƕƯƪǆƈ
. .ĬŧƐƤǁƐ !ĭǈƫŧǁƐ ƕŧƏƨƈ
. .ĬŧƐƤǁƐ !ĭǈƫŧǁƐ ƕǴǈƜƈ

[illegible]

1- [illegible]:

[illegible]

[illegible].

2- [illegible]

[illegible]

[illegible]

3- [illegible]

مدة التوظيف بالسنوات	مدة التوظيف بالأشهر	مدة التوظيف بالأيام
$I = \frac{k \times t \times n}{100}$	$I = \frac{k \times t \times n}{1200}$	$I = \frac{k \times t \times n}{36000}$

[illegible] :

I : [illegible]

k: [illegible].

t : [illegible] 100 [illegible] .

n : [illegible]

4- [illegible]

[illegible]

[illegible] .

$$VA = k + I$$

:1üƒƙDž

ýþzdžŀ ƧnjTƊ 8 þzŀ þþʅŏ ǁ ǉŀ!ƒ ǈdž Ɯþ 300000 ƸǊŀdž ƗʅʅƋdž Ƙư ƧƙþƒĂ

.ǦŏĂǉʅ %7 ƗƱŏʅŀ ƖþƑǦ5

ƔηƒĂ!ƒ ƸǊŀdž!ƒ ƔʅơƒǱƛ ƖþdžƬ!ƒ ƗŏǦnjǉ Ŏ5 ƗlơƙʅdžƬ!ƒ ƖþƑǦ5!ƒ ƔʅơƒĿ : ƒǋǂƗƯDŽǁƐ

. ƯƧl!ƒ þŏþʅƙ! ǊzƼþ

:üϴǁƐ

- ƖþƑǦ5!ƒ ƗlơƙʅdžƬ!ƒ þzŀ 7ƧnjTƊ:

$$I = \frac{k \times t \times n}{1200} = \frac{300000 \times 8 \times 7}{1200} = 14000 \text{دج}$$

- ƸǊŀdž!ƒ ƔηƒĂ!ƒ ǉþŏþʅƙ ǊƤƙǋ! ƒ ǈdž ƯƧl!ƒ :

$$VA = k + I = 300000 + 14000 = 314000 \text{دج}$$

ǈǂdžŏ ƔǦʅơ ƗdžŏƖ!ƒ ƗŀʅƙǂdžƬ!ƒ Ɨpǚz!Ǧŀ ƗŏǦƙ!ƒ:

$$VA = k + I = k + \frac{k \times t \times n}{1200} = k \times \left[1 + \frac{t \times n}{1200}\right]$$

$$VA = k \times \left[1 + \frac{t \times n}{1200}\right] = 300000 \times \left[1 + \frac{8 \times 7}{1200}\right]$$

1-

2- la valeur acquise

200000 … 10% … 4 .

السنوات	رأس المال في بداية المدة	الفائدة الناتجة خلال السنة	رأس المال في نهاية المدة
1	200.000	200.000× 0,1 = 20.000	200.000 + 20.000 = 220.000
2	220.000	220.000× 0,1 = 22.000	220.000 + 22.000 = 242.000
3	242.000	242.000× 0,1 = 24.200	242.000 + 24.200 = 266.200
4	266.200	266.200× 0,1 = 26.620	266.200 + 26.620 = 292.820

[illegible]

[illegible] (1) [illegible]

[illegible] (1) [illegible]

[illegible] (2) [illegible] (2) [illegible]

[illegible] (2) [illegible]

[illegible] (3) [illegible] (3) [illegible]

[illegible] (3) [illegible]

[illegible] (4) [illegible] (4) [illegible]

[illegible] (4) [illegible]

[illegible]

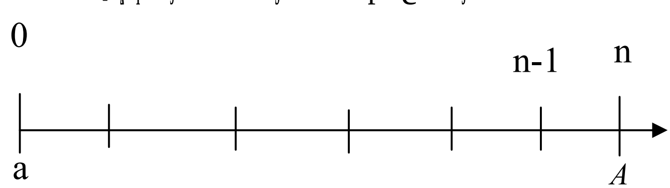
3- [illegible]

a : [illegible]

i : [illegible] **1** [illegible]

n : [illegible]

A : [illegible] **n** [illegible]



[illegible]	[illegible]	[illegible]	[illegible]
$A_1 = a + a.i = a(1+i)$	$a.i$	a	1
$A_2 = a(1+i) + a(1+i).i$ $= a(1+i)(1+i) = a(1+i)^2$	$a(1+i).i$	$a(1+i)$	2
$A_3 = a(1+i)^2 + a(1+i)^2.i$ $= a(1+i)^2(1+i) = a(1+i)^3$	$a(1+i)^2.i$	$a(1+i)^2$	3
$A_{n-1} = a(1+i)^{n-2} + a(1+i)^{n-2}.i$ $= a(1+i)^{n-2}(1+i) = a(1+i)^{n-1}$	$a(1+i)^{n-2}.i$	$a(1+i)^{n-2}$	n-1
$A_n = a(1+i)^{n-1} + a(1+i)^{n-1}.i$ $= a(1+i)^{n-1}(1+i) = a(1+i)^n$	$a(1+i)^{n-1}.i$	$a(1+i)^{n-1}$	n

[illegible]:

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

[illegible]:

$$A = 200.000(1+0,10)^4$$

$$A = 200.000 \times 1,4641 = 292.820$$

ƕưΘűǅ

.1 ǈǂǆǒ ƍǤƪơ ƥơ!ƒ $(1+i)^n$ ǅƒƥƤƙùƪǤ ǂù!Ǔƒ ǂƕùƪǤơ!ƒ
y^x ǂǒǆǌƶƙ!ƒ ýŭƤ ǈǆ ǂǆǒǌƶ!ƒ

.2 ƥǦǤƼ!ƒ ýƮơǆ!ƒ ǈǆ Ǥnjǒǌ Ƶ ƻǒƱǍƙ ƻƸ Σ ýǤǆ!ƒ a ƥǆ! n
: ǐǍǤƪƙ ǈǆƨ!ƒ Ƙƒƥơ Ǎ ǈǆ

$$I = A - a$$

$$I = a(1+i)^n - a$$

$$\boxed{I = a\left[(1-i)^n - 1\right]}$$

: ǂǀơǆ!ƒ ƥǦǤƼ!ƒ ǈǆƼ ǑǌƵ ƨƞǤƙǌ! ǂƕƪǀ!ǤƕƜ

$$I = 200.000[(1,10)^4 - 1] = 92.820$$

-4 ƒǦƨΘ ƕǤƨǂǀǆǀǅ ƕǆǐƾǀǅ ǏƷ ƕǀƑΘ ǜNjǆƪ ǀƐǢΘǋ ǅǆǅƦǾǀǅ ǍǾǂǛ ǢǢǿǛ
.ǅǆǅƦǀǅ ǀƐǢΘǋ ǅǆ ƥǋƨǀǋ ƞǐΘƬ

:ǜǦƙǅ

ǂùƕǂƸǆ ƥǦǤƼ ýƥƶǆƕ Ƿƥ 100000 ǋƙǆǒƿ ýǤǆ Σ ƻǒƱ ǀǋƕ!ƒ ǑƼ ƒ ƤƬ ƻƱǍ
.ƸǌƬǅ 4Ǎ Ƙƒǅǋƪ 5 ƥǆ! ƪǋǍǋƪ 6%

:ǦǆǐǢǀ

$$n = 5\frac{4}{12}$$

:ǈǒǌơ!ƒ ǅƒƥƤƙƪǤ $A_{5\frac{4}{12}}$ ǂƕƪƙǂǆ!ƒ ǂǆǒǀ!ƒ ƥǒƥơƙ ǅƙǒ

- ĬǆŰʂyǁ üϴǁ :üNjŬ üϴǁ

Ŧù lőƧƱĂ n ǇùǆǑőơȚ!ƒ Ƈƨɳǉ! ŦŀŧƧǆ!ƒ ɭƥƑǤ!ƒ ýǤǆȥƙʅƒ ΣǤʅD ĬǉƵ ǅĂlő

.n Ǉǆ ĭƧʅŧ!ƒ Ƈƨɳǉ! ŦƱőʅŀ!ƒ ɭƥƑǤ!ƒ

: ɭƐNjǆƨ **5** ƔơDž ŀĭƑNjǆ Ĭʓ ŀǤƨŧlDžǁ ŀDžĭʂǁ ƒƑƨϴ ø

$$A_5 = a(1+i)^5$$

$$A_5 = 100.000(1{,}06)^5$$

$$A_5 = 100.000 \times 1{,}338225578$$

$$A_5 = 133.822{,}55$$

:ƥNJʅƈ **4** øǁ ŀƱĭƨǤǁ Ɣơəƒƨǁ ƒƑƨϴ ø

$$I_{\frac{4}{12}} = 133.822{,}5578 \times \frac{4}{12} \times \frac{6}{100} = 2.676{,}45$$

$$A_{(5\frac{4}{12})} = 133.822{,}55 + 2.676{,}45$$

$$A_{(5\frac{4}{12})} = 136.499{,}00$$

:Ŏ!Ǥƙ!ƒ ýŧȚ!ƒ ĬǉƵ n ƔưǉǇ :ǅǤƵ ýŧȚŀĂ

$$n = k + \frac{p}{q}$$

: ŧőơ

($\mathcal{K}$ƒĂǉʅ!ƒ) ƠőơȚ!ƒ Ƈƨɳ!ƒ ýƛǆő : k

(ƧǌȚŰƒ) ĭƧʅŧ!ƒ Ƈƨɳ!ƒ ýƛǆő : $\frac{p}{q}$

ù ƔǤʅơ Ŧǆől!ƒ Ŧŀʅƙŧǆ!ƒ ǑŐ Ŧőǥnjǉ Ŧǉʅ!ƒ (k) : $A_k = a(1+i)^k$

ù ƔǤʅơ ɭƥƑǤ!ƒ ŦƱőʅŀ!ƒ Ŧǆőlǉ! Ŧŀʅƙŧǆ!ƒ A_k Pǔý ɭƥǆ!ƒ ($\frac{p}{q}$) :

$$I_{\frac{p}{q}} = A_k \times i \times \frac{p}{q}$$

[illegible] : (n)

$$A_n = A_k + I_{\frac{p}{q}}$$

$$A_n = A_k + \times A_k \, i \times \frac{p}{q}$$

$$A_n = A_k \left(1 + i \times \frac{p}{q}\right)$$

$$A_n = a(1+i)^k . \left(1 + \frac{p}{q} i\right)$$

[illegible]

[illegible] .n [illegible] n

[illegible] $5\frac{4}{12}$ [illegible]

$$A_{5\frac{4}{12}} = 100.000(1+0,06)^5 (1+0,06)^{\frac{4}{12}}$$

$$A_{5\frac{4}{12}} = 100.000 \times 1,338225578 \times 1,019612822$$

$$A_{5\frac{4}{12}} = 136.447,19$$

[illegible] :

[illegible]

[illegible]

5 - [illegible]

1-5 [illegible]

[illegible]

[illegible] (i_a) [illegible] 1^{DA} [illegible]

[illegible] (i_j) [illegible] (q) [illegible]

[illegible] $(i_j),(i_a)$ [illegible]:

$$\frac{i_a}{i_j} = \frac{q}{1}$$

[illegible]:

$$\boxed{i_j = \frac{i_a}{q}}$$

[illegible] 10% [illegible]:

- [illegible]:

$$1 \rightarrow 10\%$$
$$½ \rightarrow i_s$$
$$i_s = \frac{1}{2} \times 10\% = 5\%$$

- [illegible]:

$$1 \rightarrow 10\%$$
$$¼ \rightarrow i_t$$
$$i_t = \frac{1}{4} \times 10\% = 2,5\%$$

• [illegible]:

$$1 \rightarrow 10\%$$

$$\tfrac{1}{12} \rightarrow i_m$$

$$i_m = \frac{1}{12} \times 10\% = 0,833\%$$

[illegible] i_a [illegible]:

• [illegible]: $i_s = \dfrac{i_a}{2}$

• [illegible]: $i_t = \dfrac{i_a}{4}$

• [illegible]: $i_m = \dfrac{i_a}{12}$

[illegible]

[illegible]

2-5 [illegible]:

[illegible]

- [illegible] 1 [illegible] i_a [illegible]: $(1+i_a)$.

ƗǖùƮ lþùǆ! ƗƜƮƙǂǆ!ƒ ǋƙǆǒƿ ǇƎ5 i_s ǑƮƒþƮ ýþƶǆƜ Ɯþ 1 ƸǆƜǆ ƻUĂ ƒƦ -

. $(1+i_s)^2$:ĭĂƓƮƙ (ǇǒǒƮƒþƮ)

:ƗƜƮƙǂǆ!ƒ Ɠǆǌǖƙǆǒƿ ƘĂƓƮƙ ƒƦ ǇǒƑ5Ɠǂƙǆ i_s Ă i_a Ǉǒ!þƶǆ!ƒ ǇƉ ýĂlǖ

$$(1+i_a)=(1+i_s)^2$$

ƗùǒǖǆƨlƧùƙ5! Ă Ɯþ1 ù! ĭĂǖƮ!ƒ ýþƶǆ!ƒ ĂǋǗ (i_a) ǇƓǂ ƒƦ ƗǆƓƵ Ɨ5ƮƜ Ă

ƗǒǖǆƨƒǀƧƙ5!ƒ ǇǆƓƨƞ ǑǋǗ Ă (q) lƧƙ5! ƽ5ƒĂǆ!ƒ ýþƶǆ!ƒ ĂǋǗ (i_j) Ă lþơƒĂ

:Ɠǖǒþ! Ǉƌǂ ƒƦ ǇǒƑ5Ɠǂƙǆ ƓǖĂǂǒ $(i_j),(i_a)$ ǇƎ5 .lþơƒĂ!ƒ

$$\boxed{(1+i_j)^q=(1+i_a)}$$

:ǇƎ5 i_a ĭĂǖƮ!ƒ ýþƶǆ!ƒ Ɠǖǒþ! Ǉƌǂ ƒƦ ýƓǆǆ!ƒ ýǒƜƮ Ĭƶ5

- :ĂǋǗ i_s Ƹ5Ɠǂǆ!ƒ ǑƮƒþƮ!ƒ ýþƶǆ!ƒ

$$(1+i_s)^2=(1+i_a)$$

$$1+i_s=\sqrt[2]{(1+i_a)}$$

$$1+i_s=\sqrt[2]{(1+i_a)}$$

$$1+i_s=(1+i_a)^{\frac{1}{2}}$$

$$\boxed{i_s=(1+i_a)^{\frac{1}{2}}-1}$$

- :Ăǌǖ5 i_t Ƹ5Ɠǂǆ!ƒ ǑƛǔƛƮ!ƒ ýþƶǆ!ƒ

$$(1+i_t)^4=(1+i_a)$$

$$1+i_t=\sqrt[4]{(1+i_a)}$$

$$i_t=\sqrt[4]{(1+i_a)}-1$$

$$\boxed{i_t=(1+i_a)^{\frac{1}{4}}-1}$$

- :Ănj5 i_m ƐƼǴǂdž!ƒ ĭƧnjT!ƒ ýþƶdž!ƒ

$$(1+i_m)^{12} = (1+i_a)$$
$$1+i_m = \sqrt[12]{(1+i_a)}$$
$$i_s = \sqrt[12]{(1+i_a)} - 1$$
$$i_m = (1+i_a)^{\frac{1}{12}} - 1$$

:LJƼ5 10% ĭĂǉʅ!ƒ ýþƶdž!ƒ Ǵǉǒþ! LJǴǂ ƒƦ

- :ĂNj i_s ƐƼǴǂdž!ƒ Ǒʅƒþʅǃƒýþƶdž!ƒ

$$1+i_s = (1+0,1)^{\frac{1}{2}}$$
$$1+i_s = 1,0488088$$
$$i_s = 1,048808 - 1 = 0,0488088$$
$$i_s = 4,88\%$$

- :Ănj5 i_t ƐƼǴǂdž!ƒ Ǒƛǖƛƒýþƶdžƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒ

$$i_t = (1+0,1)^{\frac{1}{4}} - 1$$
$$i_t = 1,024112 - 1$$
$$i_t = 0,024112$$
$$i_t = 2,412\%$$

- :Ănj5 i_m ƐƼǴǂdž!ƒ ĭƧnjT!ƒ ýþƶdž!ƒ

$$i_m = (1+0,1)^{\frac{1}{12}} - 1$$
$$i_m = 1,00798 - 1$$
$$i_m = 0,00798$$
$$i_m = 0,798\%$$

-6 ƕŨǁƑϴǁǀ ƕƲǇŤşǁǀ la valeur actuelle

1-6 ƸǏƥƴŧ ƕƲǇŤşǁǀ ƕŨǁƑϴǁǀ

ǇƒǀƳǀƒǀ a ƔƞƒǍ!ƒ ƝƼǀǍƯ ƖƥƑƓ ƫƼŧƨ ƖƥǇ! n ǇƒƥƖǍ ƐǀƗƔ ǇƒƦúǇ
.ƖƥǇ!ƒ ƫƼƓƞ Ǒ5 A ǇƒƓ ƩƉƨ ǏƮƵ ǇǍƬƠ! i ǇƥƶƒƔ

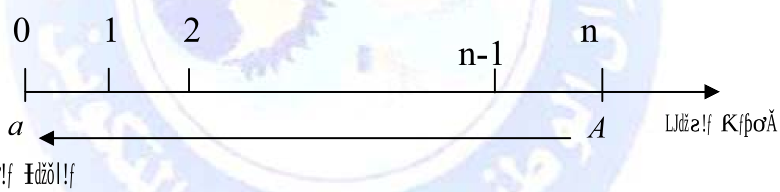
ƫƒƶƨƱ ƓƒƑǇ ǏƮƵ ƓƞƓƥ ƫǇǉƫ!ƒ ƫǀƮƬŰƒ ƩƉƨ! ǇƓǇ ƔƨǍƵ ƐƞƒǀƳǀ Ǒ5 ƫǇƓƞƼ ǇúƥƖ
.ƔƞƒǍ!ƒ ƒǇƞ ƖƥǇ ƫƐƨǇ!ƒ ƖƥƑƓ!ƒ ϴƨƱƕ ƥƥƠǀ ƫǇ!ƓƠ!ƒ ƫǇǉ!ƒ ƓƞƼ ƝƼǀǍƯ ƝƼǀǍƯ

.2-6 ƕƸǏƬǁǀ ƕƲǇƑƴǁǀ ƒƑƨϴǁ ƕƲǇŤşǁǀ ƕŨǁƑϴǁǀ

:ƓƞǉƥƉ

A : ǇƒƖǇ ƩƉƨ ǇƓǇ ƴǀƥǉ Ǒ5 ƫǇƓƞƼ ƖƥǇ!ƒ n.

a : ǇƒƖǇ ƩƉƨ ǏƉƨ ǇƓǇ!ƒ ƐǀƗ! ƨƥǀǇ Ǒ5 ƫǇƒƥƔ ƖƥǇ!ƒ n .



:ƓƞǉƥƉ

$$A = a(1+i)^{n}$$

$$\frac{A}{(1+i)^{n}} = \frac{a(1+i)^{n}}{(1+i)^{n}}$$

$$a = \frac{A}{(1+i)^{n}}$$

$$\boxed{a = A(1+i)^{-n}}$$

ƕưƟűǅ

.y^x ƚdžŏǌzƙ!Ǥƕ ƚŏdžǌz!ƒ ƚƕʅǤơ!ƒ ƚ!Ǔƒ ýǤdžzƙʅǤƕ $(1+i)^{-n}$ ƥơ!ƒ Ɣʅơŏ

Ǒù5 yƽƥù!ƒ ƾơƙʅŏ Ɯƥ 300000 ǋƙdžŏp ǇŏƥƕǇŏƥdž ǑǌƵ ƧƞǤƙ!ƒ

.2012/03/01

Ǒù5 ǇŏƥùǃƒƦùǋ ƚdžŏp ǑǊ Ǥdž5 Ü 7% ƚƕǂƧdž!ƒ ǉƥƑǤ5!ƒ ýƥzdž ǇǤǂ ƒƦ

(Ǉŏƥ!ƒ ǉdTǉ ơŏƧǤƙ) 2009/03/01

Ɖ ǇŏƥǌǃƚŏǃǤơ!ƒ ƚdžŏǃ!ƒ ǑǊ Ǥdž

: üƟǁ ƔǤʅơ ƚdžŏǃ!ƒ ƚŏ!Ǥơ!ƒ Ǉŏƥ! ƧƞǤƙ!ƒ ǑǌƵ Ǒ5 2009/03/01:

.ƘƒǍǉʅ 03 ĭǍǤʅƙ 2012/03/01 Ǐ!ƍ 2009/03/01 Ǉdž :n ǉƥdž!ƒ

$$a = A(1+i)^{-n}$$

$$a = 300.000(1,07)^{-3}$$

$$a = 300.000 \times 0,816297$$

$$a = 244.889,36$$

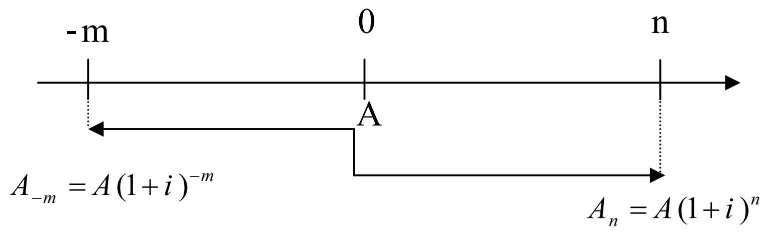
Ǆǂǀ ơĭƥǂ ăƈ Ǐƺ Ǚzơĭ üƑǅ Ƨƈƥ !ĩĩƨǂ -7

:Ǥǉŏƥ! ǇǤǂ ƒƦ

.(0) ƧƽƮ ơŏƧǤƙ!ƒ Ǒ5 yƽƥŏ ýǤdž ƩǅƧ :A

.n ơŏƧǤƙ!ƒ Ǒ5 (A_n) ǋƙdžŏp ǑǊ Ǥdž ù

–m ơŏƧǤƙ!ƒ Ǒ5 (A_{-m}) ǋƙdžŏp ǑǊ Ǥdž ù



: ƚƑƚdžƚƨƐ

$$A_n = A_{-m}(1+i)^{m+n}$$

Ǒù5 ƴ5þù!ƒ ƨơƙù1ŏ Ɯþ 150.000 ƚŏdžù1Ǔƒ ǋƙdžŏþ ǇŏþƂ ǇŏþǆǇ ƒ PT

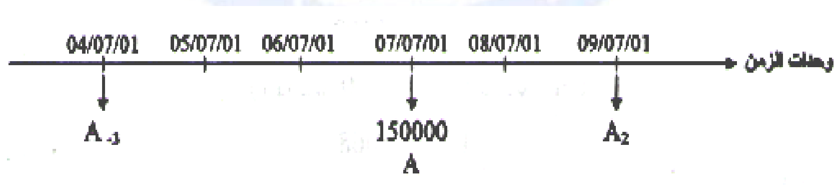
.ǇŏþƂƒ þŏþ1ƙ! ǇŏƙŏǇǴƚdžƺ þǀƶ!ƒ Ǉdžư ƙ 2007/07/01

1. ƒƙ1þŏþ ƒ!ǆ1Ƃƨ Ǒ5 2004/07/01

2. ƙǆŋŏý ƒ!ƙ1þŏþ ƺ!Ǐ 2009/07/01

.ǇŏƙǴơ!ƒ Ǒ5 Ƹǆdž!ƒ Ɣ1ơǂ .ǴǍǅ1 6% ƚƂƚƧdž!ƒ ƪþǴ5!ƒ ýþƶdž Ǉǵƚ ƒƦ

Ǒ5 Ǉŏƶƙ1ǈ 2009/07/01Ǎ 2004/07/01 ǇŏƤŏƧǴƙ!ƒ Ǒ5 ǇŏþƂƒ ƚdžŏþ þŏþơƙ!
:Ǒ!Ǵƙ!ƒ ǇdžƨƂƒ ƧǍơdžƂ ǁ!Ʀ Ơŏư Ǎƙ



1. ƚdžŏþ ǇŏþƂƒ Ǒ5 ƣŏƧǴƙ!ƒ 2004/07/01:

$$A_{-3} = A(1+i)^{-3}$$

$$A_{-3} = 150.000(1,06)^{-3} = 125.942,89$$

2. ƚďžŏp ǇŏƥƗ!ƒ Ŏ5 ϭŏƨƓǩ!ƒ 2009/07/01:

ǇƚďžŏǇ ǉƥŏƥơǩ ƕƨƱŏǩǇ:

Ɗ ù ǉǇƓǔƱŭƥƓ ǇďžǇ A_{-3}:

$$A_2 = A_{-3}(1+i)^5$$

$$A_2 = 125.942,89(1,06)^5 = 168.539,99$$

Ɗ ù ǉǇƓǔƱŭƥƓ ǇďžǇ A:

$$A_2 = A(1+i)^2$$

$$A_2 = 150.000(1,06)^2 = 168.539,99$$

8- ƹƨƚƴǇƞƏ ƴƗǇƛ !ƒƴƏ ƴƾƨƷƹ ƥƴƓƕ

ŏǇƏƓƕ ƕƱ!ƏǇǇ ǉƱƓƗ!ǉƥƓ ƚƓƨƚƕ! ǇƱƚƳǇ ƚƓƨƚƕǇ ƱƖƨ ǇƏƓƕ ǇƚďžǇ ƚƨƱƨƚƕ ƕƓǉƱƚƨ ƴƓƗ ƕƓƚƕǅ.
ƒ!ƨƚƓǇ ƴƒƨƚ ƚƴ!ƕ ƨƚƓƞƗ!ƒ ƚőƚƓƾƚƓ ƴƓƨ!ƒ ƨƚƓƞƗ!ƒ ƚǔƴƨ ƨƚǋƨ.

ƹƚƘƢǅƴ

ƕƓƗ!ƒ ǉƗǇ ƒƓƥƚ!ƒ ƚƴƚƓ ƚƓƱ ƞƓƗ!ƒ ƥƚƐ!ƒ ƚƓ!ƚ.

8-1. ƴƞƚƣ ƹƴƺƗǇ ƹƏƴƓƚƖƹ (A):

:ƹƓƗƒ

ƴƥƓ ƹƨ ƒƓǉƓƚƗ ƏƓ Ŏ5 ƒƗǇ!ƒ ǇƚƕƕƓ 30000 ƥƚ ǉƥƓƨƴƓ Ǉƨ5 ƚƓƚƨƓ 4,3% ƕƚƓƚƕ !ƚƥù ǉƥ
10 ƕƓƒƚƓ.

ƚƓƒ!ƒ ƚƓƚƚ!ƒ ƞƓƗ!ƒ ǉƗǇƚƚƒ :ƹƴƚƹǅƹ.

!ƥƓǇƚ :

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

$$A = 30.000(1,043)^{10}$$

$$A = 30.000 \times 1,5235022$$

$$A = 45.705,06$$

:(i) üqyĎǁƐ ƒƑƨΘ .2-8

4 lþùdž! Щþ 60000 Ƹǁdž ƱĜǒƙơŮƒĂ ƨǒ5Ăƙ!ƒ ƾĂþǉƬ Ŏ5 ƨɳĜƙ ƻƲĂ :üƑƙĎ

.Щþ 78061,38 lþdž!ƒ ƗǒĜǌǉ Ŏ5 ƗɷƖƙǂdž!ƒ ǋƙdžǒþ ƘƺǁƷ5 ƘƒĂǉƖ

Þ i ýþƶdž!ƒ ƔƖơĎ

$a = A(1+i)^{-n}$ ĂĎ $A = a(1+i)^{n}$: Ɨþǚƶ!ƒ ǇdžǴþǚƱǉƒ ýþƶdž!ƒ þǒþơƙ ǇǂdžǒĎ

:ɷĜƨƑΘǁƐ ɷǁŎƐ !ƐqƟǂƨƑĜ ø

$A = a(1+i)^{n}$:Ɨþǚƶ!ƒ ǇdžǴǚƱǉƒ ýþƶdž!ƒ ƔƖơǉ

$$(1+i)^{n} = \frac{A}{a}$$

$$(1+i) = \sqrt[n]{\frac{A}{a}}$$

$$(1+i) = \left(\frac{A}{a}\right)^{\frac{1}{n}}$$

$$(1+i) = \left(\frac{78.061,38657}{60.000}\right)^{\frac{1}{4}}$$

$$(1+i) = (1,30102311)^{\frac{1}{4}}$$

$$1+i = 1,068$$

$$i = 1,068 - 1 = 0,068$$

$$i = 6,8\%$$

$a = A(1+i)^{-n}$:Ɨþǚƶ!ƒ ǇdžǴǚƱǉƒ ù

$$(1+i)^{-n} = \frac{a}{A}$$

$$(1+i)^{-4} = \frac{60.000}{78.061,38657} = 0,768625855$$

$$(1+i) = (0,768625855)^{-1/4} = \frac{1}{(0,768625855)^{1/4}} = 1,068$$

$$i = 1,068 - 1 = 0,068 = 6,8\%$$

8-3. [illegible] (n):

[illegible]: [illegible] 80.000 [illegible] 5% [illegible] 108.523,33 [illegible] n.

[illegible] n [illegible]

يمكن تحديد n انطلاقًا من العلاقة : $A = a(1+i)^n$

- باستخدام اللوغاريتم (Log) والآلة الحاسبة:

[illegible] (n) [illegible]:

[illegible]: $a = b^n$ [illegible]

[illegible]: $\log(a) = \log(b)^n$.

[illegible]: $\log(a) = n.\log(b)$

[illegible]:

$$n = \frac{\log(a)}{\log(b)}$$

[illegible] (n) [illegible]:

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

$$\frac{A}{a} = (1+i)^n$$

$$\log(\frac{A}{a}) = \log(1+i)^n$$

$$\log(\frac{A}{a}) = n.\log(1+i)$$

$$n = \frac{\log(\frac{A}{a})}{\log(1+i)}$$

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

$$108.523,3287 = 80.000(1+0,05)^n$$

$$108.523,3287 = 80.000(1.05)^n$$

$$\frac{108.523,3287}{80.000} = (1,05)^n$$

$$\log(1,356541609) = \log(1,05)^n$$

$$\log(1,356541609) = n.\log(1,05)$$

$$n = \frac{\log(1,356541609)}{\log(1,05)}$$

$$n = \frac{0,132433116}{0,021189299} = 6,25$$

ƧnjTD ƚƛǖƛǍ ƘƒǍǖlj 6 ǐD n=6,25

hıırƟíiDž

ƘƒǍùƱP!ƒ Σ5lj YǴhkƷh $a = A(1+i)^{-n}$ ƚpǖz!ƒ LJdž Ǵþǖ ƱLjƒ n ƥőƥơk LJǂdžő ĞǔǍ ƚDž lƥdžkƶdž!ƒ . $A = a(1+i)^n$ ƚpǖz!ƒ LJdž n ƥőƥơk Ŏ5 lƥdžkƶdž!ƒ

-9 ƚƺƑlƚ ƸNjDƥ ǚƐNjDžǕƐ ƣƏƐNjƷǁƑǴ ƾǴlƥDžǁƐ

9-1. Ʒǐƥyƚ ƐƷlƚǁƐ:

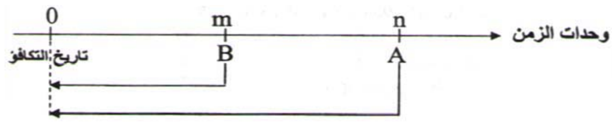
ǍD ƧùPc LJőƥh LJőƶdž LJőƥ ýƒƥhkʅƒ ǏǁƵ LJőƥdž!ƒǍ LJFƒƥ!ƒ LJőh ƽǴ5kǕǴh ƧdžǕƒ ƽǁzkő ƻǍƧùU!ƒ Ɣʅǵljk ăƧPD ƥőƵƒǍdžh LJǍőƥ!ƒ LJdž ƚƵǍdžŋdž ƽǴlơkʅƒ ƥőƵƒǍdž ýőƥzkh LJùdž LJő5ƧƱ!ƒ ǏǁƵ ƧƒƧ ưD YǍpǍ DžƥƵ lǴƵƒƧdž ƱƧTh ǕLJőƥdžǁ! ƚő!Ǵdž!ƒǍ ƚőƧǴŋk!ƒ ƣőƧǴùk Ŏù5 Dǆől!ƒ ƌ5ǴǂkΣǴʅD ǏǁƵ Džkő LJǍőƥ!ƒ ýƒƥhkʅƒ LJǫ .ƚőǍʅk!ƒ ljRNj ƇƒƧŋ ƽǁƱő LJőƶdž ƣőƧǴk Ŏ5 lƥőƥŋ!ƒ LJǍőƥ!ƒ Džőp LJdž ƚdžőƥl!ƒ LJǍőƥ!ƒ Džőp ƌ5ǴǂkǏD LJőƶdž NJőǁƵ ƣőƧǴk ƌ5Ǵǂk!ƒ.

:DžǐǁFDŽ ƨ cђ DǆFlǂ ƕǁǋFyDŽ .2-9

:Ǵǈǒƥ! LJǴǂ ƒƦ

.i ýƥzdžƕĂ n lƥdž!ƒ ǂǒǴnjǉ Ǒ5 ƽơƙ ǐ A ǂǒdž ǐ Ǖƒ NJkdžǒp ýǴdž Σ DŽƧ ù

.i ýƥzdžƕĂ m lƥdž!ƒ ǂǒǴnjǉ Ǒ5 ƽơƙ ǐ B ǂǒdž ǐ Ǖƒ NJkdžǒp ýǴdž Σ DŽƧ ù



ǂùǒ!Ǵơ!ƒ Ǵdžnjǒkdžǒp ƘĂǴ ǐƙ ƒƦ ǂƕǂƧdž lƥFǴ5ƕ LJǒF5Ǵǂkdž BĂ A LJǒ!Ǵdž ǐ DŽƧ!ƒ LJĂǂǒ .ƌ5Ǵǂƙ!ƒ ơǒƧǴƙ Ǒ5

ǂùdžǒl!ƒ ǐĂǴù ǐƙ A ù! ǂǒ!Ǵơ!ƒ ǂdžǒl!ƒ (ƌ5Ǵǂƙ!ƒ ơǒƧǴƙ) Ƨ5Ʈ LJdžƨ!ƒ Ǒ5 Ǵǈǒƥ! :ýǂT!ƒ ǏDŽƵ LJĂǂƙ ƌ5Ǵǂƙ!ƒ ǂ!ƥǴzdž LJƎ5 NJǒDŽƵĂ Bù! ǂǒ!Ǵơ!ƒ

$$a = A(1+i)^{-n}$$

$$b = B(1+i)^{-m}$$

$$\boxed{A(1+i)^{-n} = B(1+i)^{-m}}$$

ơǒƧǴƙ ǐD Ǒ5 ƌ5Ǵǂƙ!ƒ ƽlơƙǒ LJD LJǂdžǒ : ƕǴlƥDŽ ƔơǝFƨǴǋ !ƑY ül ǐǴ .Ʊl5 Ƨ5Ʈ LJdžƨ!ƒ Ǒ5 lƧĂƧư!ǴƕΣ ǒ!Ă LJǴǂ

:ǂ!ƥǴzdž!Ǵƕ (ƌ5Ǵǂƙ!ƒ ơǒƧǴƙ) Ƨ5Ʈ LJdžƨ!ƒ Ǒ5 ƌ5Ǵǂƙ!ƒ LJƵ ƧƕzǒǑ

$$A(1+i)^{-n} = B(1+i)^{-m}$$

[illegible] p [illegible] $(1+i)^p$ [illegible]
.[illegible]

$$A(1+i)^{-n}(1+i)^p = B(1+i)^{-m}(1+i)^p$$

:[illegible]

$$A(1+i)^{-n+p} = B(1+i)^{-m+p}$$

$$\boxed{A(1+i)^{-(n-p)} = B(1+i)^{-(m-p)}}$$

.p [illegible]

[illegible] 2005/03/01 [illegible] 300000 [illegible] 2006/03/01 [illegible] B [illegible] 7% [illegible] 2008/03/01.

[illegible]

[illegible] :[illegible]
.[illegible]

:[illegible]

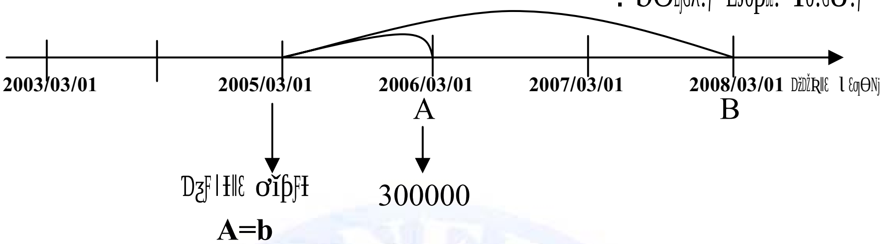
[illegible] 300000 [illegible] 2006/03/01.

[illegible] B [illegible] 2008/03/01.

[illegible] 2005/03/01.

Ŧùdžŏl!ƒ ĭĂƓùƪƙ a ýĂǕƒ ǈŏƥùǁ! Ŧŏ!Ɠơ!ƒ Ŧdžŏl!ƒ :ƋƼƓǂƙ!ƒ ơǭŏƧƓƙ Ŏƽ

. ƅŎǉƓƛ!ƒ ǈŏƥǁ! Ŧŏ!Ɠơ!ƒ



ƾƓlơƙƪǕƒ ơǭŏƧƓƙ Ĭ!ƺ ƋƼƓǂƙ!ƒ ơǭŏƧƓƙ ǈdž ƚƥdž!ƒ Ɣƪơƙ

- 2006/03/01 Ĭ!ƺ 2005/03/01 ǈdž :ýĂǕƒ ǈŏƥ!ƒ ƚƥdž .Ŧǉƪ 1 ĭĂƓƪƙ
- 2008/03/01 Ĭ!ƺ 2005/03/01 ǈdž :ŎǉƓƛ!ƒ ǈŏƥ!ƒ ƚƥdž .ƘƒĂǉƪ 3 ĭĂƓƪƙ

:ýǂT!ƒ ĬǁƵ ƋƼƓǂƙ!ƒ Ŧ!ƥƓƶdž ǈĂǂƙ

.2005/03/01 Ŏƽ (b) Ŧŏ!Ɠơ!ƒ Ŧdžŏl!ƒ = (a) Ŧŏ!Ɠơ!ƒ Ŧdžŏl!ƒ

$$A(1+i)^{-n} = B(1+i)^{-m}$$

$$300.000(1,07)^{-1} = B(1,07)^{-3}$$

$$280.373,83 = B \times 0,8162978$$

$$B = \frac{280.373,83}{0,8162978}$$

$$B = 343.470,03$$

ƹ ĭƥƴƗ -1 hɯƗǴƒǩǁɛ hɯƴʒƣǁɛ

ƘǴƶ5ƥ!ƒ ƗǩƞǴƛ!ƒ ŎǋǊ Ƹ!Ǵƞǆ ƗŏĂǴʅǩǆ ƗƵĂ5ƥǆ ǅǴƱǩǉǴƞ ýŭƤ Ƙƒƥùơ Ă Ɨùŏǉǆƨ

:ǇĂƗǩ Ɨ ŏơ .ƗŏĂǴʅǩǆĂ ƗƶƞǴǩǩǆ

- ƗǌɳĂǆ ǇŏĂƗǩ! Ʃ ǅƨ ýǴǆ " ƘǴƶ5ƥ ƨǴǆƛǩʅƒ " ƴ5ƥǩĂ Ŏ5 Ɨùŏƒƥƞ ýù Ɨ
.(ɭƥǆ!ƒ Ɨŏƒƥƞ ƘǴƶ5ƥ) Ɨŏǉǆƨ ɭƥơĂ
- ƗǌɳĂǆ ƥƒƥʅ! ǇĂŏƥ!ƒ " ƘǴƶ5ƥ ƥƒƥʅ " ƴ5ƥǩĂ Ŏ5 ƗŏǴǌǉ ýù Ɨ ɭƥùơĂ
.(ɭƥǆ!ƒ ƗŏǴǌǉ ƘǴƶ5ƥ) Ɨŏǉǆƨ

-2 hɯǅĭʈǁɛ hɯǅǅƨƗǀǅǁɛ ɭƒƴʒƣƗǁ hɯƗǴƒǩǁɛ

2-1. ƱøʒƣȹǁƒѲ Ĭʒ hɯƗǴƒǩ ɭƒƴʒƣ hɯĭǁƒĦǅǁ hɯǴƨƗǀǅǁɛ hɯǅĭʈƗǁ hɯǅƒƴǁɛ hɯƸĭƬǁɛ
(Ɣƣǅǁɛhɯĭƒǈǆɭƒƴʒƣ)ƔƥĭƢǛɛ hɯĭǆǅƦǁɛ ƔƣѲǋǁɛ hɯĭƒǈǆ Ĭʒ ƔƥĭƢǛɛ hɯƴʒƣǁɛ

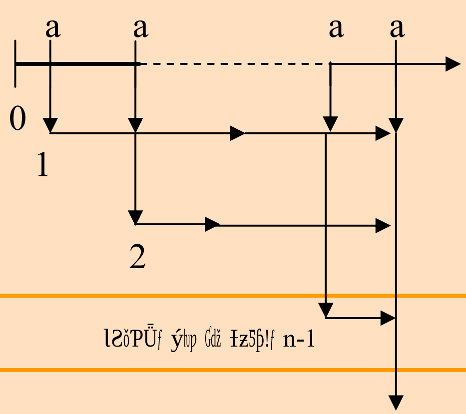
:ǴǉŏƥǨ

a : Ɨǆŏƥ Ɨƶ5ƥ!ƒ ƗǩƞǴƛ!ƒ

n : ƥƥƵ ƘǴƶ5ƥ!ƒ

i : ýƥƶǆ ɭƥƒǴ5 Ɯƥ1 (ýƥƶǆ ɭƥƒǴ5!ƒ ƗƞƗƨǆ!ƒ)

A_n : Ɨǆŏǀ!ƒ ƗƞʅǩƗǆ!ƒ ƗƱơ! ƴ5ƥ Ɨƶ5ƥ!ƒ ɭƨŏƤǕƒ.

ƕƴƺƣǁǀ ƒĭŀƥŀ !ƽƥ	Ʃ ĭƗǋŀ ƔƣǇ ƕƴƺƣǁǀ (ǀ ǀǋǆ ƨ ǁƓ)	ƕǴ ƨ ŀ ǀǇǁǀ ƕǇĭƨǁǀ ƕƴƺƣ ü ǀ ǀ
	ƔƣѲǋ **n-1** ƕĭǆǇƦ ƔƣѲǋ **n-2** ƕĭǆǇƦ	$a(1+i)^{n-1}$ $a(1+i)^{n-2}$
ǀƧŏƤǕƒ ýƕƥ Ǵǆ ŀƶƽƥ!ƒ n-1		$a(1+i)^{1}$
ǀƧŏƤǕƒ ŀƶƽƥ!ƒ n		$a(1+i)^{0}=a$
		ƱǋǇǇǇ $=A_n$ ƣǋƣѲǁǀ

ÜĬ ùǀƵǅ Ĭ!ǫ ýƽƪǅ Ǉǆ ŀƶƽƥ ý‡! ŀƕƪƙ‡ǆ!ƒ ŀǆŏǀ!ƒ ƥĂǆƵ Ŏƽ ƥĂƥơ!ƒ ǀƇƒƧƿ ƥǉƵ a ýĂǕƒ ǴǋƥơĂ (1+i) ǴǌƪǴƪǅ ŀŏƪƥǈǋ ŀŏ!ǴƙƙǆǇ ý‡Ƭƙ ƥĂƥơ!ƒ ǉƦǋ ǇǅǇƙǈƪǈ .n ǴǋƥĂƥơ ƥƥƵĂ

.ŀŏ!ǴƙƙǆǇ!ƒ ǉƦǋ ƥĂƥơ ƳĂǆƞǆ ýǅǆƙ Ŏƙ!ƒĂ ƘǴƶƽƥ!ƒ ŀŏ!ǴƙƙǆǇ! ŀƕƪƙ‡ǆ!ƒ ŀǆŏǀ!ƒ A_n

$$A_n = a + a(1+i) + \dots\dots + a(1+i)^{n-3} + a(1+i)^{n-2} + a(1+i)^{n-1}$$

:ƥĭǀƤŀ

n ƑǉƣǋƣѲ ƣƣƳǋ **q** ƑǋƨƑƨǋ **a** üǋǙǀ ƑǉƣѲ ƕĭƨƣǆǉ ƕĭǀƑŀǇ ƣǋƣѲ ƱǋǇǇǇ

:ƕƽǘƴǀƓ ĂǕƴŀ $S = a \times \dfrac{q^n - 1}{q - 1}$

: ĭ ĂǴʅǨ A_n Ɨƕʅǩǂǆ!ƒ Ɨǆǒǀ!ƒ ǇƎ5 ǊǉǆǎĂ

$$A_n = a\frac{(1+i)^n - 1}{(1+i)-1} = a\frac{(1+i)^n - 1}{i}$$

$$\boxed{A_n = a \times \frac{(1+i)^n - 1}{i}}$$

.Ɨƕʅ Ǵơ!ƒ Ɨ!Ǔƒ ýǴǆžǩʅǴƕ $\frac{(1+i)^n - 1}{i}$ ƥơ!ƒ Ɣʅơŏ

2-2. ƕǴƨƗǀǅǁ ƕǅǏŧǂ ƕǅǏƴǁ ƕƩĭƬǁ üƑǅǏyƗƨƐ

.ƈ ƒƑƨƟ ƕǅǏŧǁ ƕǴƨƗǀǅǁ:

. ƒ

- ǴǌǨǆǒƿ Ɨƺ5ƥ Ɨǉʅ ý‡ ƗǒǴǌǉ Ŏ5 " ƇƒĂ ưƊ " Ɨʅʅƌǆ y5ƥǨ 20.000 ǀƥùƑǴ5!ƒ ýƥùzǆĂ 10 ƘǴz5ƥù!ƒ ƥƥùƷ . Ưƨǀ! ƒƥǒƥʅǨ ǁĂǉƕ!ƒ ƥơǕ Ɯƥ .ǴƥĂǉʅ 8% Ɨƕ‡ƨǆ!ƒ

. Ɨz5ƥ ƨƤƈ ƥǒƥʅǨ ƥǉƷ Ɨƕʅǩ‡ǆ!ƒ Ɨǆǒǀ!ƒ Ɣʅơƨ

✱ üƟǁǁ

0	1	2	3	4	5	6	7	8	9	10	ǇǆƨƑ Ƙƒƥơ (Ɨǉʅ)
	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	

$$A_n = a \times \frac{(1+i)^n - 1}{i}$$

$$A_{10} = 20.000 \times \frac{(1+0,08)^{10} - 1}{0,08}$$

$$A_{10} = 20.000 \times \frac{2,158924 - 1}{0,08}$$

$$A_{10} = 20.000 \times 14,48655$$

$$A_{10} = 289.731$$

" **a** " ƙyƺǫǁǁ ƙǷǨǐǓ ƒƑƨƟ .ƒ

:ǈǅ ǋǨǈǩƪǉ ƗǆǴƶ!ƒ ƗƷǒƮ!ƒ ǈǆ

$$a = A_n \times \frac{i}{(1+i)^n - 1}$$

- ƥǒƥùƪǩ Ĭùǁƶ ǊǈƑƒƥ yǆ ƾƽǩƒ Ü Ɯƥ 280000 ƸǄǅǆ ǈǑƥǆ ƒ PT .Ĭ!ǍǕƒ ƗǈƪƒƗǑǴǌ Ǒƽ Ĭ!ǍǕƒ ƗƶƽƥƒyƽƥǩƘǴƶƽƥƧTƶƙǊǑǁƶ ĭŖ!ƒ ǈǑƥ!ƒ .ǴƾǍǈƪ 6% ƖƥƑƽ!ƒ ýƥƶǆ

ƗǩƙǴƛ!ƒ Ɨƶƽƥ!ƒ ǄǒƤ Ɣƪơǅ

:ƗǩƙǴƛ!ƒ Ɨƶƽƥ!ƒ ƗǆǒƤ : üƟǁǁ ✱

$$a = A_n \times \frac{i}{(1+i)^n - 1}$$

$$a = 280.000 \times \frac{0,06}{(1,06)^{10} - 1}$$

$$a = 280.000 \frac{0,06}{1,7980847 - 1}$$

$$a = 280.000 \times 0,0758679$$

a=21.243,012

ɭƑy̸ƺqʬƐ ɋɋƳ ƒƑƨΘ .øƜ

ƚdžƓƶ!ƒ ƚƺŏƮ!ƒ ǈǆdž Ǵþŭƀǉƒ n ƘƓƶƼþ!ƒ þþƵ ƔƓɩơ ǈǂƚdžŏ

$$A_n = a \times \frac{(1+i)^n - 1}{i}$$

$$\frac{(1+i)^n - 1}{i} = \frac{A_n}{a}$$

$$(1+i)^n - 1 = \frac{i.A_n}{a}$$

$$(1+i)^n = \frac{i.A_n}{a} + 1$$

:Ǒǈŏ ǴdžƚƚǊɩƓơ!ƒ ƚ!Ŭƒ " Log " ǅǩŏƧƓƩǍ! ǅþƤǩɩŏ ƘƓƶƼþ!ƒ þþƵ n þƓηŏǗ

:ǈǄ5 (b) ǈƚŏ! Ǎ ǴdžǍǅƶdž ǈǍƚŏ $\frac{i.A_n}{a} + 1$ ƧƒþǀdžƓ!ƒ ǈǄ Ǵdžǈ

$$(1+i)^n = b$$

$$\log(1+i)^n = \log(b)$$

$$n.\log(1+i) = \log(b)$$

$$n = \frac{\log(b)}{\log(1+i)}$$

- Ü Ɯþ 30.000 Ǵùǌǩdžŏp ƚùǨǈǅ ƚƶ5þ ƚǉɩ ýƚ ƚŏǴǌǉ Ǒ5 ƧηǴǩ y5þŏ ɭþùƑƓƺ!ƒ ýþƶdž .Ɯþ 267.684,10 ɭþdž!ƒ ƚŏǴǌǉ Ǒ5 ƚǈɩǩƚdž!ƒ ƚdžŏǀ!ƒ Ƙƺǅǈ5 .8% ƫǈƀdž!ƒ ƚǈƚƧdž!ƒ

ƘƓƶƼþ!ƒ þþƵ ƔɩơǄ

✱ üΘǁɛ :

$$A_n = a \times \frac{(1+i)^n - 1}{i}$$

$$\frac{(1+0,08)^n - 1}{0,08} = \frac{267.684,10}{30.000}$$

$$(1+0,08)^n = \frac{267.684,10 \times 0,08}{30.000} + 1$$

$$(1,08)^n = 1,713824266$$

$$\log(1,08)^n = \log 1,713824266$$

$$n\log 1,08 = \log 1,713824266$$

$$n = \frac{\log 1,713824266}{\log 1,08} = \frac{0,233966288}{0,033423755}$$

$$n = 7$$

ƘƒĂǈʅ 7 ĭĂǤʅƙ n ĭ𝔇

ɥǤƖ ƥDžǁɛ ƔɖəƑƺǁɛ üɖƴDž ƒƑƨΘ .ɖ

ƥǈƵ Ɯƥ 35000 ƚdžǒlɥ ƚƙɥǤʎ ƚƺƼƥ 12 ƴƼƥ ǇDž ƚɥʅƙǂdž!ƒ ƚdžǒl!ƒ Ƙʓɥ .Ɯƥ 684223,74 ƚƺƼƥ ƧƤƈ ƴƼƥ

ʂɥƱdž!ƒ ƚɥǂƧdž!ƒ lƥƑǤ5!ƒ ýƥƶdž Ɣʅơ𝔇

:üΘǁɛ

نعلم أن صيغة القيمة المكتسبة عند آخر دفعة هي :

$$A_n = a\frac{(1+i)^n - 1}{i}$$

$$\frac{A_n}{a} = \frac{(1+i)^n - 1}{i}$$

$$\frac{(1+i)^{12} - 1}{i} = \frac{A_n}{a} = \frac{684223{,}74}{35000} = 19{,}549249$$

ǈdž ƾǀǂƉ ǂƞǛǨǰ ƽǀơǨ ǁƥơƒĂ ǋ! ǈǓǨǀƾǴǀǨdž ǈǓǨdžǓǪ Ư ƾƸǰ i ýƥƶdž!ƒ ǅǓǪ ƥǴƞǓǗ
.ǴǌǈǰDž ýƿƉ ǂƞǛǨǰ ƽǀơǨ ăƾƤǕƒĂ 19,549249

بفرض i=7% نجد :

$$\frac{(1{,}07)^{12} - 1}{0{,}07} = 17{,}888451$$

بفرض i=9% نجد

$$\frac{(1{,}09)^{12} - 1}{0{,}08} = 20{,}140719$$

ǂǆǓǀ!ƒ ǧƸǨƾǨ Ǒǂ! %7 ýƥƶǆǀ! ǋǨƸǴưǫ ƔƞƒĂ!ƒ ýƥƶdž!ƒ ǇƵ ǂ ơǀǰ
ƔƞƒĂ!ƒ ýƥƶdž!ƒ ǇƵ ǂ ơǀǰ ĂƉ 19,549249 ǂǆǓǀ!ƒ Ǐ!ǫ 17,888451
.ǂǆǓǀ!ƒ Ǐ!ǫ 20,140719 ǂǆǓǀ!ƒ Ư ƸƤǰǨ Ǒǂ! %9 ýƥƶdž!ƒ ǈdž ǋƮǴǀǰƒ
. 19,549249

9%	20,140719
7%	17,888451
2%	2,252268
Δ i	(19,549249-17,888451)
	1,660798

$$\Delta i = \frac{1,660798 \times 2}{2,252268} = 1,47 \simeq 1,50\%$$

ومنه المعدل المطبق : $i = 7\% + 1,50\% = 8,50\%$

3-

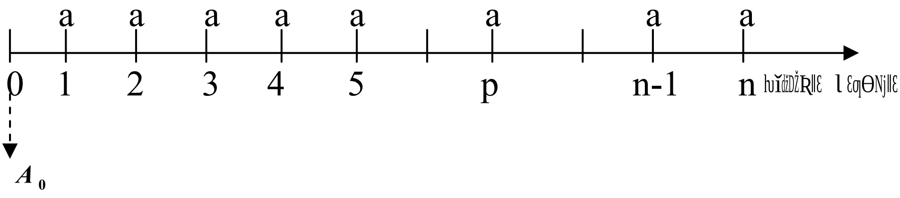
3-1.

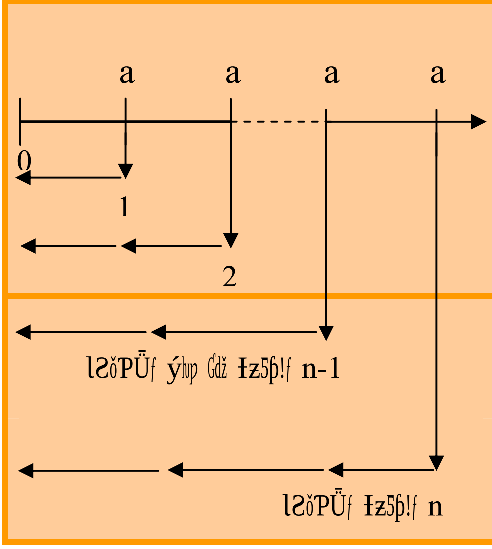
a

n

i 1

A_0





Ɨzƽþ!ƒ Ɣőǩƨǩ ǅŀƨ	Ɨzƽþ!ƒ ǀþdž	Ɨő!Ǵơ!ƒ Ɨdžől! Ɨzƽþ ý‡!
	Ɨőǉdžƨ ǀþơǍ 1	$(1+i)^{-1}$
	Ɨőǉdžƨ ǀþơǍ 2	$(1+i)^{-2}$
	Ɨőǉdžƨ ǀþơǍ n-1	$(1+i)^{-(n-1)}$
	Ɨőǉdžƨ ǀþơǍ n	$(1+i)^{-n}$
		Σǅǀdž $= A_0$ Ʊ ƨl!ƒ

Ǐ ùǉƵD Ǐ ù!ǫ ýƨƪD ǈdž Ɨzƽþ ý‡! Ɨő!Ǵơ!ƒ Ɨdžől!ƒ þǍdžƵ Ǒƽ þǍþơ!ƒ ǀǴƒƨþ ǈdž ýǍǕƒ ǴǋþùơǍ (1+i) ǴǌƪǴƪD Ɨőƪþǈǋ Ɨő!ǴǩǩdžǈȒǋ ý‡Tǩ þǍþơ!ƒ ǉȒǋ ǈD ǋǩǉǩƪǉ Ǐ ùǉƵ ǈǍù‡ǩ A_0 Ɨùő!Ǵơ!ƒ Ɨdžől!ƒ ǈƷƽ ǊőǉƵǍ n ǴǋþǍþơ þþƵǍ $a(1+i)^{-n}$:ý‡T!ƒ

$$A_0 = a(1+i)^{-n}\,\frac{(1+i)^n - 1}{(1+i)-1}$$

$$A_0 = \frac{a(1+i)^{-1}(1+i) - a(1+i)^{-n}}{(1+i)-1}$$

$$A_0 = a \times \frac{1-(1+i)^{-n}}{i}$$

ŧù!Ǔƒ ǅƒƥƤƙù ʅǴ ǍƊ (4) ǅƥƧ Ǒ!Ǵdž!ƒ ýǍƥƞ!ƒ Ǉdž $\frac{1-(1+i)^{-n}}{i}$ ƥơ!ƒ Ɣʅơǒ

.ŧƾʅǴơ!ƒ

.1-3 üƑǅýŧ ƨƐ ƾƩƮ ƾǅƑƴ ƾǅǏƪ ƾǐƑѲ

.c ƒƒƨѲ ƾǅǏƪ ƾǐƑѲ

ŧùƶƼƥ 15 ùƾ ƥƥʅǒ ƯƧƥ Ǐƶ " ŧǒƥƒƧ!ƒ ŧʅƾ!Ǖƒ " ŧʅʅƌdž ƘǏƮơƙ

ŧƶƼƥ!ƒ ŧdžǒƥ .ƥlƶ!ƒ ýǒƥǍƙ Ǉdž Ǐ!ǍǕƒ ŧǈʅ!ƒ ŧǒǴnjǈ Ǒ5 Ǐ!ǍǕƒ ŧƶƼƥ!ƒ ýƼƥƙ ŧǒǍǈʅ

.ǴǍǈʅ 10% ǍNj ƽƾƱdž!ƒ ŧƾǂƧdž!ƒ lƥƑǴ!ƒ ýƥƶdžǍ Ɯƥ 78.884,266 ŧƙƾǴǍ!ƒ

.(ƯƧl!ƒ Ƹdžƾdž) lƥdž!ƒ ŧǒǴnjǈ ƘǴƶƼƥ ŧǒ!Ǵƙdž! ŧǒ!Ǵơ!ƒ ŧdžǒl!ƒ Ɣʅơƙ ƺǒǂ

:Ǒǒǒ Ǵdžǂ ƯƧl!ƒ Ƹdžƾdž Ɣʅơǒ

$$A_0 = a \times \frac{1-(1+i)^{-n}}{i}$$

$$A_0 = 78.884,266 \times \frac{1-(1+0,1)^{-15}}{0,1}$$

$$A_0 = 78.884,266 \times 7,6060795 = 600.000$$

.ƒ ƒƒƨѲ ƾǅǏƪ ƾƴƺǋ

150.000 ǐǍǴùʅƙ lƥdž!ƒ ŧǒǴnjǈ ƘǴƶƼƥ 5 ù! ŧǒ!Ǵơ!ƒ ŧdžǒl!ƒ ƘǈǴǂ ƒƦ

4% ǐǍǈʅ!ƒ ýƥƶdž!ƒǍ Ǖƥ

ŧƙƾǴǍ!ƒ ŧƶƼƥ!ƒ ŧdžǒƥ Ɣʅơƌ

:üΘǁε

:Ǵǉǒƥǃǃǃǃǃǃǃǃǃǃǃǃǃǃǃǃǃǃǃǃǃǃ!

$$A_0 = a \times \frac{1-(1+i)^{-n}}{i}$$

$$a = A_0 \times \frac{i}{1-(1+i)^{-n}}$$

$$a = 150.000 \times \frac{0{,}04}{1-(1{,}04)^{-5}}$$

$$a = 33.694{,}0846 DA$$

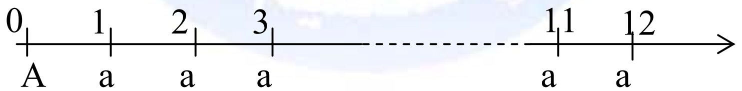
üǫȳǷǅǁε ƒƑƨΘ . øШ

Ɨʑƽƥ 12 ƗƱʅƒǍƕ ƥƥʅǒ Шƥ 5000000 ƸǅƕǆƗʅʅȡǆ Ꮶư ƧƙƥƒƒƗǉʅ ǇǍƗƙ Ï!ǍǕƒ Ɨʑƽƥ!ƒ Ɨ ǒơ Ü Ɨʑƽƥǅ! Шƥ 612840,85 ƗǆǒƖƕ ƗƙƕǴ ƗǒǍǉʅ

. Ư ƒƧƙƥǛƒ ƥʑƕ

ƨƕƱǆ!ƒ Ɨƕ ƗƧǆ!ƒ ƖƥǴƽ!ƒ ýƥʑǆ ƔʅơƉ

:üΘǁε



$$A_0 = a\frac{1-(1+i)^{-n}}{i} \Leftrightarrow \frac{A_0}{a} = \frac{1-(1+i)^{-n}}{i}$$

$$\frac{1-(1+i)^{-12}}{i} = \frac{5000000}{612840{,}85} = 8{,}158725$$

ǇǏǀƧƾǀƽ ǇǏ!ƥƵƽ ƥƥƠǈ ƔǏƧƞƙ!ƒ ƽǏƧƱ ǇƵǍ ƗǏƽƽ!ƒ ƗǀƪƾƠ!ƒ Ɨ!Ǔƒ ƴƾƽƵƙƪƾǀ
Ü ƾǌǈƽ ƴǒƊ ƗƽǏǒ ǑƱƵǏ ƧƤǓƒǍ 8,158725 Ǉƽ ƧǀǂƊ ƗƽǏǒ ǑƱƵǏ ƾƽǋƥƠƊ
. ǇǏ!ƥƵƽ!ƒ ǇǏƦǊ ǇǏǀ ƧǍƮƠƽ ǇǍǂǏ ƔǍƪƱƽ!ƒ ƴƥƵƽ!ƾ5 Ǒ!ƾƙ!ƾǀǍ
: ǇƎ5 i= 6% Ɨ!ƾƠ Ǒ5

$$\frac{1-(1,06)^{-12}}{0,06} = 8,383843$$

في حالة i= 7% فإن :

$$\frac{1-(1,07)^{-12}}{0,07} = 7,942686$$

Ɨƽǒǈ!ƒ ƯƼƤǈƙ ǏƙƠ %6 ƴƥƵƽƪ! ǊƙƼƾƯǅ ƔƞƒǍ!ƒ ƴƥƵƽ!ƒ ǇƵ ƗƠǀǈ
8,158725 Ɨƽǒǈ!ƒ Ǐ!ǅ 8,383843

7,942686 Ɨƽǒǈ!ƒ ƴƼƙƧƙ ǏƙƠ %7 ƴƥƵƽ!ƒ Ǉƽ ǊƮƾǈǈ ƔƞƒǍ!ƒ ƴƥƵƽ!ƒ ǍƊ
8,158725 Ɨƽǒǈ!ƒ Ǐ!ǅ

6%	→	8,383843
7%	→	7,942686
1%	→	0,441157
Δ i	→	$\underbrace{(8,383843-8,158725)}_{0,225118}$

$$\Delta i = \frac{0,225118 \times 1\%}{0,441157} \simeq 0,5\%$$

المعدل المطبق هو: $i = 6\% + \Delta i = 6\% + 0,5\% = \mathbf{6,50\%}$

ǫ. ϴɀƑƒ ƳǫǫǮ ǁǫƷƑǀ

ǀɀǀ ƑǄǋ n ù! ƑǊǫ!ƒ ƑǆǊ!ƒ ƘǉǴ ƒƦ ƘǴɀǯǀǀ 140.000 ƖǀǆƑǊǋƖǆ ǁǀ

5% ƖǀƑǴ!ƒ ǀǆǀǀ ǁǀ 21.661,05391 ƑǉǴǮ!ƒ Ƒɀǀ!ƒ ƑǆǊǀ ǋǊǀǉ

ƑǉǴǮ!ƒ ƘǴɀǯǀ!ƒ ǀǀƸ ƔǀǴ

:üϴǁ

$$A_0 = a \times \frac{1-(1+i)^{-n}}{i}$$

$$140.000 = 21.661,05391 \times \frac{1-(1,05)^{-n}}{0,05}$$

$$\frac{1-(1,05)^{-n}}{0,05} = \frac{140.000}{21.661,05391}$$

$$\frac{1-(1,05)^{-n}}{0,05} = 6,463212758$$

$$1-(1,05)^{-n} = 0,05 \times 6,463212758$$

$$1-(1,05)^{-n} = 0,3231606379$$

$$-(1,05)^{-n} = -0,6768393621$$

$$(1,05)^{-n} = 0,6768393621$$

ǊǀǋǀǊ! ǀǀǀǊ ǀ n ǉǀ ǀƦǀ ƑǊǫ!ƒ Log ƑǊǫ!ƒ ƑǊǫǀ:

$$(1,05)^{-n} = 0,6768393621$$

$$\log(1,05)^{-n} = \log 0,6768393621$$

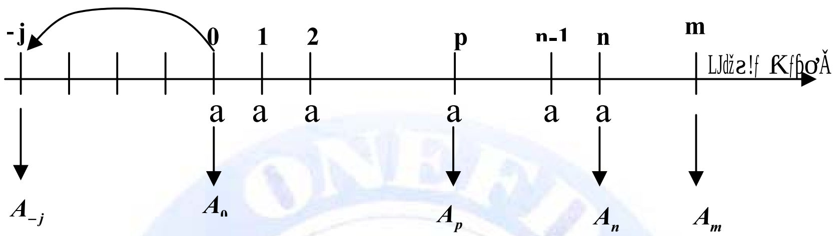
$$-n = \frac{\log 0,6768393621}{\log 1,05} = -\ 8$$

ǋǆǋǀ ǉǀ ǀǀƸ ƘǴɀǯǀ!ƒ ǀǉǫǀ 8 ƘǴɀǯǀ

DžƑǀ ơĭþƑǂ ăǉ Ĭʒ ŀǂƓƑƙ ǀƑƴʒƣ ŀĭǁƑǂǂǅ !ĭĭƨǂ -4

ƨǍơdž!Ɠùŀ ǂǉƓʑƙù ʅǕƓŀ ǇƓǂ ƣǒƨƓƙ ĭɒ Ǒƽ ƘƓʑƽþ ǂǒ!ƓƙƙǆǅDžǒǒǀƙ Ơǒ ư Ǎƙ Ǉǂdžǒ

:Ǒ!Ɠƙ!ƒ Ǒǉdžƨ!ƒ



(0)þƨƬ ơĭþƑǂǁƐǊ n ơĭþƑǂǁ Ĭʒ ǀƑƴʒƣ ŀĭǁƑǂǂǅ !ĭĭƨǂ .1-4

(0) ơĭþƑǂǁƐǊ **n** ơĭþƑǂǁ Ĭʒ DžDžǏƦǁ ǀƐƣƟǊ ŀĭƑǇdžǁ ǀƑƴʒƣ ŀĭǁƑǂǂǅ !ĭĭƨǂ Džǉ !ǂƴdž

:Ǌǉ

- Ǒƽ ƣǒƨƓƙ!ƒ :n $$A_n = a\frac{(1+i)^n - 1}{i}$$
- Ǒƽ ƣǒƨƓƙ!ƒ ƨƽƮ :(0) $$A_0 = a\frac{1-(1+i)^{-n}}{i}$$

:pǙ jǙ m ơĭþƐǊǂǁ Ĭʒ !ĭĭƨǂǁ .2-4

ǇǂdžǒǗƴƒǍdž!ƒ ƩƋǍƨ ƋƽƓǂƙ þƵƒǍƿ ƾǒŀƱƙŀǍ ǂǀŀƓʅ!ƒ ƘƓƿǔʑ!ƒ ĬǅƵ þƓdžƙƵǕƓŀ

.ǇƓǂ ƣǒƨƓƙ ĭɒ Ǒƽ (ǀþdž!ƒ ǂǒƓǌǉ) ƘƓʑƽþ ǂǒ!ƓƙƙǆǅDžǒǒǀƙ

ǉ. !ĭĭƨǂǁ Ĭʒ ơĭþƑǂǁ **(m)** ƘĭƟ $n < m$

:A_m ǇǍǂƙ (m) ƣǒƨƓƙ!ƒ Ǒƽ ǂŀʅƙǂdž!ƒ ǂdžǒǀ!ƒ

$$A_m = A_n(1+i)^{(m-n)}$$

:ĂĐ

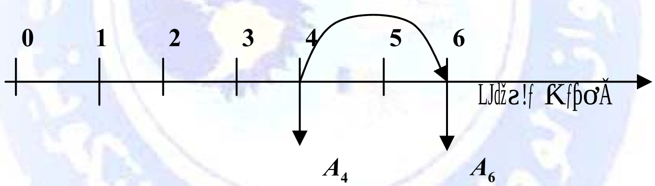
$$A_m = A_0(1+i)^m$$

بـــــــالتعويض

$$A_m = a\frac{1-(1+i)^{-n}}{i}(1+i)^m$$

ýùǂ ǂŏǤǌǰ Ŏ5 ƴ5ƥŏ ǈǰ ĭƧƙTǆ!ƒ Ĭ ǅƵ ǈǤǂ ƘƒƨŏǌǊƙ ǈǆǋ ƥŏƥɩƙ! ƦƍĬùǅƵ ѲƧùƙpƒ ǊǈǰƧŏƸ .ƘƒĂǰɩ 4 ƪƥǆ! Ɯƥ 300.000 ùǃ ƧƥƖƙ ǂƶ5ƥ ǂǰɩ .ǂɩƥǤɩ!ƒ ǂǰɩ!ƒ ǂŏǤǌǰ Ŏ5 ƥŏơĂ ƴ5ƥǃ ƘƒƨŏǌǊƙ!ƒ ǈǆǋ ƥŏƥɩƙ ƴƑǃ!ƒ

ýƥƶǆǃ ĭĂǰɩ 10% ما هو مقدار الدفع الوحيد ؟



ø ƒ5űƯǆ ǅǅ ǃƸĭT ǃǅǏĭƨǁ ǃĭǁƑѲǁ:

$$A_6 = A_4(1+i)^m$$

$$A_6 = 300.000\frac{1-(1,1)^{-4}}{0,1}(1,1)^6$$

$$A_6 = 300.000 \times 3,169865 \times 1,771561$$

$$A_6 = 1.684.683$$

ø ƒ5űƯǆ ǅǅ ǃƸĭT ǃǅǏĭƨǁ ǃǤƧǂǀǅǁ:

$$A_m = A_n(1+i)^{(m-n)}$$

$$A_6 = 300.000 \times \frac{(1,1)^4 - 1}{0,1}(1,1)^{(6-2)}$$

$$A_6 = 300.000 \times \frac{(1,1)^4 - 1}{0,1}(1,1)^2$$

$$A_6 = 300.000 \times 4,641 \times 1,21$$

$$A_6 = 1.684.683$$

: $0 < p < n$ ꓘĭϴ **(p)** ơĭþǷŧǁǁ Ĭȝ !ĭĭƨŧǁǁ . ƒ

:ƕĭǁǷϴǁǁ ƕDŽĭƨǁǁ ƕƩĭT DŽDŽ ǷƽűƯǁǁ ø ƈ

LJdžƨ!ƒ ꓘƒþơǍ LJdž p lþdž! A_0 ƻƱǍŏ

$$A_p = A_0(1+i)^p$$

$$A_p = a\frac{1-(1+i)^{-n}}{i}(1+i)^p$$

:ƕǴƨŧlDŽǁǁ ƕDŽĭƨǁǁ ƕƩĭT DŽDŽ ǷƽűƯǁǁ ø ƒ

LJdžƨ!ƒ ꓘƒþơǍ LJdž (n-p) lþdž! A_n LJŏŏơk Džŏ

$$A_p = A_n(1+i)^{-(n-p)}$$

$$A_p = a\frac{(1+i)^n - 1}{i}(1+i)^{-(n-p)}$$

ŧƕù ʅkŧdž!ƒ ŧùdžŏl!ƒ ƴdžɳ ƨŏƧƱ LJƵ A_p ŧdžŏp ĬǁƵ ýǍƮơ!ƒ LJŧdžŏ ù ùɳ
þùƶƕ ŧùŏlƕkdž!ƒ ꓘǴƶƽþùǁ! ŧŏ!Ǵơ!ƒ ŧdžŏl!ƒ Ǎ (p) LJdžƨ!ƒ ŧŏǴȝ! lþþʅdž!ƒ ꓘǴƶƽþǁ!
:Ǒǁŏ Ǵdžŧ (p) LJdžƨ!ƒ

$$A_p = a\frac{(1+i)^p - 1}{i} + a\frac{1-(1+i)^{-(n-p)}}{i}$$

yƑǴǀ!ƒ ǴnjǒǚƵ ϴƧƙƥƒ ƥƥǍ ƨǒnjƞƙ ƇƒƧƬ Ǒ5 ƘǴʅʅƋǆ!ƒ ǎƥơǫ ƔƩƧƙ .ƥǒƥʅƙǚ! ǇǑƙǀǒƧƱ

ù ƗǀǒƧƱ!ƒ (1): ƥǒƥʅƙ 12 ƗƺƼƥ ƗǆǒƤ ƗƺƼƥ!ƒ 300.000 Ɯƥ Ǐ!ǍǛƒ yƼƥƙ ǛƇƒƧƬ!ƒ ơǒƧǴƙ ƥƺǀ Ɨǉʅ

ù ƗǀǒƧƱ!ƒ (2): ƥǒƥʅƙ ǵƺǚǀǆ ǻƥǒơǍ Ǒ5 ƗǒǴnjǉ Ɨǉʅ!ƒ 4 ǇǆǇ ơǒƧǴƙ ƇƒƧƬ!ƒ.

ƒƦ ǇǴǂ ýƥƺǆ ƥƑƒǍƼ!ƒ ƗǀǂƧǆ!ƒ %4 ʅǍǒǻ Ǵǆ ǑǊ ƗǆǒƤ yƼƥ!ƒ ƥǒơǍ!ƒ Þ

ù ơʅǴƔ ƗǆǒƤ yƼƥ!ƒ ƥǒơǍ!ƒ ǀǴʅƙƤƥǆƌ ƬǒƺƗ ƗǆǒǀǇ!ƒ ƗǇ!ǴơǇ!ƒ:

$$A_p = A_0(1+i)^p$$

$$A_4 = 300.000\,\frac{1-(1,04)^{-12}}{0,04}(1,04)^4$$

$$A_4 = 300.000 \times 9,385074 \times 1,169859$$

$$A_4 = 3.293.762,4$$

ù ǉƼƩ ƗƞǒǉǇ!ƒ ǀǴʅƙƤƥǆƌ ƬǒƺƗ ƗǆǒǀǇ!ƒ ƗǀʅǂƗǆ!ƒ:

$$A_p = A_n(1+i)^{-(n-p)}$$

$$A_4 = 300.000\,\frac{(1,04)^{12}-1}{0,04}(1,04)^{-(12-4)}$$

$$A_4 = 300.000\,\frac{(1,04)^{12}-1}{0,04}(1,04)^{-8}$$

$$A_4 = 300.000 \times 15,025805 \times 0,7306902$$

$$A_4 = 3.293.762,4$$

ƘƓƺƼƥù⁞! Ɨƕù ƪƙǂƊž!ƒ ƗƊžŏ|!ƒ ƓǉƺƊžƞ ƒƦ ƗƞŏƙǉƛƒΣ ƼǉǇ Ǐ⁞Ƶ ýƮơǇ ǇƊ ǇǂƊžŏ ù

:Ŏ⁞ŏ ƓƊžǂ 4 ƗǉƪƒƼ ƥƺƕ Ɨŏ|ƕƙƊž!ƒ ƘƓƺƼƥ⁞! Ɨŏ!Ɠơ!ƒ ƗƊžŏ|!ƒĂ 4 ƗǉƪƒƼ ƗŏƓƷ! ƖƥƥƪƊž!ƒ

$$A_4 = 300.000 \frac{(1,04)^4 - 1}{0,04} + 300.000 \frac{1-(1,04)^{-(12-4)}}{0,04}$$

$$A_4 = 300.000 \frac{(1,04)^4 - 1}{0,04} + 300.000 \frac{1-(1,04)^{-8}}{0,04}$$

$$A_4 = (300.000 \times 4,246464) + (300.000 \times 6,732744)$$

$$A_4 = 3.293.762,4$$

$j < 0$ ƘǏƟ j ơǏƥƑǁ Ǐƺ !ǐǐƨǁ . øШ

. j ǇƊžƨ!ƒ Ŏ5 ƘƓƺƼƥ!ƒ Ɨŏ!ƓƙƙƊž ƗƊžŏƥ A_{-j} ýƯǉ

:Ŏ⁞ŏ ƓƊžǂ A_{-j} ƗƊžŏƥ ƥŏƥơƙ ǇǂƊžŏ

:ƕǐǁƑƟǁ ƕƊžǐƨǁ ƕƸǐT ǄǄ ƒƼűƯƊǁ ø ¢

$$A_{-j} = A_0 (1+i)^{-j}$$

$$A_{-j} = a \frac{1-(1+i)^{-n}}{i} (1+i)^{-j}$$

:ƕƓƨƗ|Ǆǁ ƕƊžǐƨǁ ƕƸǐT ǄǄ ƒƼűƯƊǁ ø f

$$A_{-j} = A_n (1+i)^{-(n+j)}$$

$$A_{-j} = a \frac{(1+i)^n - 1}{i} (1+i)^{-n} (1+i)^{-j}$$

$$A_{-j} = a \frac{1-(1+i)^{-n}}{i} (1+i)^{-j}$$

ϸϸʅŏ ýƓdž!ƒ ǈdž Ǵǯǁdž 2003/07/01 Ǒ5 ƧǍƺ!ƒ ϸƜƵ ƧƞƓ!ƒ Ư Ƨkpƒ
yŏpǍk ǈdž ƗƛƓƛ!ƒ Ɨljʅ!ƒ ƗŏǴnjlj Ǒ5 Ǐ!ǍǕƒ Ɨƺϸ!ƒ yϧϸk ǕƗŏǍljʅ Ƙƺϸ 5 ǏǁƵ
.Ɯϸ 30.000 Ɨƺϸ!ƒ ƗdžŏpǍ Ǵ̑ǍljʅƐ 10% ƖϸƑƓ!ƒ ýϸƺdž ǈǴƗ ƒƦ5 .ϸlƺ!ƒ

: Ư Ƨl!ƒ Ɨdžŏp ϸ̑ϸơ

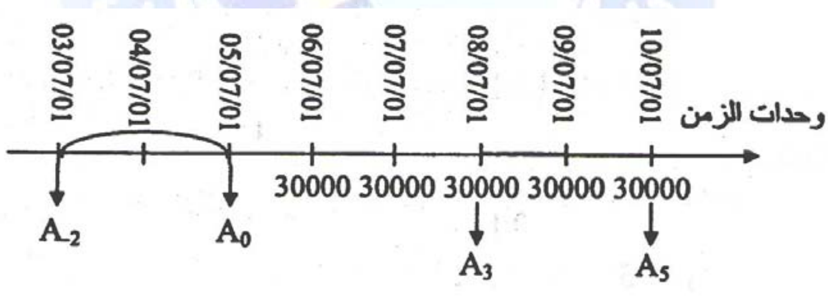
1- ϸljƵ ƣŏƧǴk yŏpǍk ϸlƵ Ư Ƨl!ƒ Ǒ5 2003/07/01

2- Ǒ5 ƣŏƧǴk 2005/07/01

3- Ǒ5 ƣŏƧǴk 2010/07/01

4- Ǒ5 ƣŏƧǴk 2008/07/01

:ϸNjƺƸǁƐ ƣǴƳ ϸƜƑƗǁƐ ƒ ϸ5 !ǐǐƽƗ



1. ǐǐƽƗ! ƺƗǴDž ƒ ϸƽǁƐ ƺǏ ơǐϸƑƗ ƯǐƺNjƗ ƣƽƳ ϸƽǁƐ ƒ :

ƣŏƧǴk!ƒ Ǒ5 ǏD ƗŏljdžƧ ƘƒϸơǍ Ɨ ǖƛ Ɨƺϸ ýǍD ϸŏϸʅk ýƜp Ƙǁƺϸ!ƒ Džŏŏlk Džkŏ

. A_0 ǈdž Ǵ̑ǖƱlj A_{-2} Ɨdžŏp ƳǴʅơ ǈƗdžŏ Ǖ(-2)

$$A_{-2} = A_0 (1+i)^{-2}$$

$$A_{-2} = 30.000 \frac{1-(1+0,1)^{-5}}{i} (1+0,1)^{-2}$$

$$A_{-2} = 93.986,45$$

:2005/07/01 Ǐʒ ƒ ƥŝŀľ ƕĐǐĩŝ !ĩĩŝł .2

.łʑ5ƥ ýĂĐ ƴ5ƥ! Ǐ!ĂǕƒ łŏƚǆƨ!ƒ ƚƥơĂ!ƒ łŏƒƥƕ Ǒ5 Đŏŏŀƙ!ƒ Đƙŏ

$$A_0 = a \frac{1-(1+i)^{-n}}{i}$$

$$A_0 = 30.000 \frac{1-(1+0,1)^{-5}}{i}$$

$$A_0 = 113.723,61$$

:2010/07/01 Ǐʒ ƒ ƥŝŀľ ƕĐǐĩŝ !ĩĩŝł .3

$$A_n = a \frac{(1+i)^n - 1}{i}$$

$$A_n = 30.000 \frac{(1+0,1)^5 - 1}{0,1}$$

$$A_n = 183.153,00$$

:2008/07/01 Ǐʒ ƒ ƥŝŀľ ƕĐǐĩŝ !ĩĩŝł .4

- ǅǆǆ Ǵƥǚʊƚƒ A_0 :

$$A_p = A_0 (1+i)^p$$

$$A_3 = 113.723,61(1,1)^3$$

:ĂĐ

$$A_3 = 30.000\frac{1-(1,1)^{-5}}{0,04}(1,1)^3$$

$$A_3 = 151.366,13$$

- ǴþűƧǈƒ LJdž LJõõơķ A_5 :

$$A_p = A_n(1+i)^{-(n-p)}$$

$$A_3 = 183.153(1,04)^{-2} = 151366,13$$

:ĂĐ

$$A_3 = 30.000\frac{(1,1)^5 - 1}{0,1}(1,1)^{-2}$$

$$A_3 = 151.366,13$$

ǋƐ ƥűNJƗƨ ǁþȿǁǁ ƒ ǁƴǆ ǁǁ

ăǫƑƴǁǁ ƒ þȿǁǁ ƸïþƴƗ -1

ƒþùơƒĂ ǴǉưƧlǆ Ǚç LJdž ưķõ Ǚ ï Ʀ!ƒ ƱƧl!ƒ ǁ!Ʀ NJLjǆ ïþǴƶ!ƒ ƱƧl!ƒ ƻƧƶõ ƗùǆƨǄǆ ƗõLjĂLjǴþ ƗlõƛĂ ƗƱʅƒĂǆ ƱƧl!ƒ ƘǴǆƛç Ǆķõ .(... Ɨõ!Ǵǆ Ɨʅʅƌǆ Ǚǁ Ljǆ) lþǴùƵ LJdžù ưķõ ïƦ!ƒ ÜƱƧl!ƒ þlƵ Ŏ5 ýƛǆķķ Ǒķ!ƒĂ ƱƧķldž!ƒĂ ƱƧldžǆ!

:Ɨõ!Ǵķ!ƒ ƘǴLjǴõǆ!ƒ

ǁ űnjķùʅƒ ƗlõƧƱ ÜǴnjƵĂLjĂ lþƑǴƽ!ƒ ýþƶǆ ÜƱƧl!ƒ þlƵ ơõƧǴķ ÜƱƧl!ƒ ƸǆǆǆǄ ...ÜLJǴǆưƒ! ƗǆõpĂ ƳĂLj ÜƱƧl!ƒ

(Emprunts Indivis)

2-

3-

: V_0

$a_1, a_2, a_3, ..., a_n$: [illegible]

[illegible]

$A_1, A_2, A_3, ..., A_n$: [illegible]

[illegible]

$V_1, V_2, V_3, ..., V_n$: [illegible]

[illegible]

i : [illegible]

n : [illegible]

[illegible]:

الوحدات الزمنية	رأس المال المتبقي في بداية الوحدة الزمنية	الفائدة	الاستهلاك	الدفعة	رأس المال المتبقي في نهاية الوحدة الزمنية
1	V_0	$I_1 = V_0\, i$	A_1	$a_1 = A_1 + I_1$	$V_1 = V_0 - A_1$
2	V_1	$I_2 = V_1\, i$	A_2	$a_2 = A_2 + I_2$	$V_2 = V_1 - A_2$
3	V_2	$I_3 = V_2\, i$	A_3	$a_3 = A_3 + I_3$	$V_3 = V_2 - A_3$
p	V_{p-1}	$I_p = V_{p-1}\, i$	A_p	$a_p = A_p + I_p$	$V_p = V_{p-1} - A_p$
n-1	V_{n-2}	$I_{n-1} = V_{n-2}\, i$	A_{n-1}	$a_{n-1} = A_{n-1} + I_{n-1}$	$V_{n-1} = V_{n-2} - A_{n-1}$
n	V_{n-1}	$I_n = V_{n-1}\, i$	A_n	$a_n = A_n + I_n$	$V_n = V_{n-1} - A_n = 0$
مج	/	$\sum I$	$\sum A = V_0$	$\sum a = \sum A + \sum I$	/

: Ǉǅ ǋǨǰǨǈǉ ýǍϸƞ!ƒ Ǉǆ

$$\boxed{V_{n-1} = A_n} \qquad \boxed{V_n = 0} \qquad \boxed{a_n = A_n(1+i)}$$

.ǊǨϸƑǤ5 ǊǑ!ǫ ǤƷǤ ư ǆ ƧǑƤǕƒ ǁ ǖǌǨǈǕƒ ǏǍǤǈǨ ƗǨǤǨ!ƒ Ɨƶ5ϸ!ƒ ǇǅǏ ǅ

ƕưΘǘǄ

1. $a_n = \ldots = a_3 = a_2 = a_1$ ǏǅƗǨǤǨ ƘǤƶ5ϸ!ƒ

2. :ǏǅƘǤǂǖǌǨǈǕƒ ƳǍǆƞǆ ǏǍǤǈǑ ƠƧǀ!ƒ ýƮǅ

$$V_0 = A_1 + A_2 + A_3 + \ldots + A_n$$

$$V_0 = \sum_{p=1}^{n} A_p$$

3. ƳǍùǆƞǆ ƒϸùƑƒƨ ϸùƑǍ5!ƒ ƳǍùǆƞǆ ǏǍǤùǈǨ ƘǤƶ5ϸù!ƒ ƳǍǆƞǆ

$$\sum_{p=1}^{n} a_p = \sum_{p=1}^{n} A_p + \sum_{p=1}^{n} I_p$$

:ƘǤǂǖǌǨǈǕƒ

ƧƤƒǍǄ ƜǤǨǉǕ " ϸƒƒƧ!ƒ " ƗǈǈǆǆƘǅƮơǨ ǉϸǑϸƞ ƘƒƨǑǌƞǨ ýǑǍǆǨ ýƞǅ Ǉǆ

ƧǌǕǑ ƚǑơ N/01/01 ǫǑƧǤǨǄ ƗǑǅơǆ!ƒ ƗǑǆǉǨ!ƒ ǁǉǄ ǇǆƠƧƿ ǏǅƵ ϸǑƮ!ƒ

:ǑǅǑ Ǥǆ ǤǆǌǉǑǄ ǄƧǄǆ!ƒ ϸǀƶ!ƒ

- .Ɯϸ 3000000 ƠƧǀ!ƒ ƗǆǑƿ

- . ƗǨǤǨ ƗǑǍǉǈ ƘǤƶ5ϸ 5 ƗƱǈƒǍǄ ϸǑϸǈǨ!ƒ

- . ǤǑǍǉǈ %8 ƗǄǂƧǆ!ƒ ǉϸƑǤ5!ƒ ýϸƶǆ

- .ϸǀƶ!ƒ ǇǤư ǆǫ ǇǆƏ!ǍǕƒ ƗǉǈƒǨ!ƒ ƗǑǤǌǉǉ Ǒ5 ƨơǨǈǨ ƏƒǍǕƒ Ɨƶ5ϸ!ƒ

ƠƧǀ!ƒ ǁǖǌǨǈƒ ýǍϸƞ ƨƞǉǅ

ƗǙǕǕ! ƗŏǃƓơ!ƒ ƗdžŏlǙ! ƗdžƓz!ƒ ƗʒŏƮ!ƒ ýƓdžžƙǕƓƕ Ɨzƀ!ƒ Ɨdžŏp ƔƓǕơ ǇƗdžŏ
.ƗƙƕƓƛ ƘƓzƀ

$$A_0 = a\frac{1-(1+i)^{-n}}{i} \Leftrightarrow a = A_0\frac{i}{1-(1+i)^{-n}}$$

$$a = 3000000\frac{0,1}{1-(1,1)^{-5}} = 791392,6$$

الوحدات الزمنية	رأس المال المتبقي في بداية الوحدة الزمنية	الفائدة	الاستهلاك	الدفعة	رأس المال المتبقي في نهاية الوحدة الزمنية
1	3000000,00	300000,00	491392,60	791392,6	2508607,40
2	2508607,40	250860,74	540531,86	791392,6	1968075,54
3	1968075,54	196807,55	594585,05	791392,6	1373490,49
4	1373490,49	137349,05	654043,55	791392,6	719446,94
5	719446,94	71944,69	719446,94	791392,6	0

ƔĂdžŋdžĂ ɭƥŏƒʑƙdž ƘƓǂŭǌƙǕŬĂ ǂƮpƓǉƙdž ƥFƒĂƽ!ƒ ǇD ýĂƥŋ!ƒ Ǉdž Ʊơŭǉ
.ƯƧǃ!ƒ ýƮD ĭĂƓǕŏ ƘƓǂŭǌƙǕŬƒ

4- العلاقات بين عناصر القرض

من جدول استهلاك قرض عادي يمكن استخراج العلاقات الأساسية التالية:

4-1 العلاقة بين الفوائد والاستهلاكات

من السطر الثالث لجدول الاستهلاك لدينا: $a_3 = A_3 + I_3$

من السطر الثاني لجدول الاستهلاك لدينا : $a_2 = A_2 + I_2$

بما أن الدفعات ثابتة فإنّ : $A_3 - A_2 = I_2 - I_3$

الفرق بين فائدتين متتاليتين يساوي الفرق بين استهلاكين متتالين لنفس الأسطر

بشكل عام : $A_m - A_j = I_j - I_m$

مثال : من جدول استهلاك القرض لمؤسسة "الرائد" نجد :

$$A_4 - A_3 = 654043{,}55 - 594585{,}05 = 59458{,}50$$
$$I_3 - I_4 = 196807{,}55 - 137349{,}05 = 59458{,}50$$

ǀƑǀǘǈǂƨǛƸ ǄǉƓ ǊƽǘǇǋ 2-4

:Ɠǉǒƥ! ƥƑƒĂƽ!ƒĂ ƘƓǂǘǌǩǀǛƒ ǈǒǊ ǂǀǊƓǀ!ƒ ǂǏǘƶ!ƒ ǈǆ

$$A_3 - A_2 = I_2 - I_3$$

:ǈǅ ǅǉƶǈ $I_2 = V_1 . i$ Ă $I_3 = V_2 . i$ Ă $V_1 - V_2 = A_2$

: ǊǀǈǌǀǉǇ ǈǃ

$$A_3 - A_2 = V_1 . i - V_2 . i = (V_1 - V_2) . i = A_2 . i$$

$$A_3 = A_2 + A_2 . i = A_2(1 + i)$$

ǂǃǀƬ ǂƽƬ ǀǘ ǀǈǘƒ ǀĂƓǀǒ ǀǘǌǩǀǛƒ ǀƦ!ƒ ǊǆǊǉǅ ƲƳǆ ƓǀĂƧ Ǖ5 (1+i)

$A_j = A_{j-1}(1 + i)$

ǀǘǈƓ ǀĂƥƞ ǀǘǌǩǀƒ ƧǀǇƦ ǂǀǀǂǆ! ǈǒƽ!ƥ!ƒ ƥƞǉ

$$A_2(1 + i) = 540531{,}86(1{,}1) = 594585{,}05 = A_3$$

ǊǉǈƎ5 *(1+i)* Ǖ5 ƓǀĂƧ ƲƳǆ ǊǆǊǉǅ ǀƦ!ƒ ǀǘǌǩǀǛƒ ǀĂƓǀǒ ǀǘǌǩǀƒ ǀǘǂ ǈǅ ƓǆǀĂ

: ǂǒ!Ɠƙ!ƒ ǂƺǒƬ!ƒ ƽ5Ă ƧƤƈ ǀǘǌǩǀƒ ǀǀ ǂ!ǛƥǀǛ ǀǘǌǩǀƒ ǀǀ ƥǒƥơǩ ǈǂǆǒ

$A_j = A_m(1 + i)^{j-m}$

Ŭ $$A_5 = A_2(1+i)^{5-2} = A_2(1+i)^3$$: ǘǩǲ

$$A_2 = A_4(1+i)^{2-4} = A_4(1+i)^{-2}$$

ƒ ƥƨǁǀ üƬǆǈ ǀƑǀǘǋǂƨǛ ǄǐƓ ǶƾǘyǁǛ 3-4

: ĭǅ ƘƓǂŭǌǩƪŬƒ YǍǆƞǆ ĭǍƓƪǒ ƯƧǀƒ ýƬǅ ǇǅǄǆǈ

$$V_0 = A_1 + A_2 + A_3 + \cdots + A_{n-1} + A_n$$

ǂ!Ŭƥǌ ƘƓǂŭǌǩƪŬƒ ýǂ ǂǌƓǂ ǇǂǆǑ ƘƓǂŭǌǩƪŬƒ ǇǑǌ ǀƥǍƞǍǆ!ƒ ǂƿŭƨ!ƒ ǇǆǍ

ýǍǕƒ ǁŭǌǩƪŬƒ

$$V_0 = A_1 + A_1(1+i)^1 + A_1(1+i)^2 + \cdots + A_1(1+i)^{n-2} + A_1(1+i)^{n-1}$$

ƓǌƪƓƪǅ A_1 ýǍǕƒ ƓǋƥƠ ǂǒƪƥǉǋ ǂǒ!ƓǩǆǄ ýƛǆǑ ǀƒǍƓƪǆ!ƒ ǇǆǄ ǇǆǑǕƒ ƻƸƱ!ƒ

ƒƥƠ n ƓǋƥǍƥƠ ƥƥƵ (1+i)

: ƥƞǇ ǂǒƪƥǇǋ ǂ!Ɠǩǆ! ǄƓƨ!ƒ YǍǆƞǆ!ƒ ƹǑƬ ƾǒǌƱǩǌ

$$V_0 = A_1 \frac{(1+i)^n - 1}{i}$$

ǀƥƠǍ!ƒ ǂǑƓǌǇ Ǒ5 ƘƓǂŭǌǩƪŬƒ ǂǅƪǅƪ! ǂǌƪǩǂǆ!ƒ ǂǆǑǀ!ƒ Ǎǋ ƯƧǀ!ƒ ýƬǅ

ǀƧǑƤǕƒ ǂǑǇǆƨ!ƒ

:Ǒ!Ɠǩ!Ɠǂ ýǍǕƒ ǁŭǌǩƪŬƒ ƥǑƥƠǩ ǇǂǆǑ Ǎ

$$A_1 = V_0 \frac{i}{(1+i)^n - 1}$$

: üƑǩǲ

:ýǍǕƒ ǁŭǌǩƪŬƒ ǂ!Ŭƥǌ ƯƧǀ!ƒ ǂǆǑƿ "ƥƑƒƧ!ƒ" ǂƪƪƌǆ! ǂǌƪǇ!Ɠǌ

$$V_0 = 491392,60 \frac{(1,1)^5 \quad 1}{0,1} = 491392,60 \times 6,1051 = 3000000$$

[illegible]

[illegible]

$$V_0 = A_j(1+i)^{1-j}\,\frac{(1+i)^n - 1}{i}$$

[illegible] 4-4

[illegible] : $a = A_n(1+i)$

[illegible]

$$A_n = A_1(1+i)^{n-1}$$

[illegible] :

$$a = A_1(1+i)^{n-1}(1+i)$$

$$a = A_1(1+i)^n$$

[illegible] (n) [illegible]

[illegible] :

$$a = A_1(1+i)^n = 491392{,}60(1{,}1)^5 = 491392{,}6 \times 1{,}61051 = 791392{,}6$$

[illegible]

[illegible]

[illegible]

$$a = A_1(1+i)^n$$

[illegible]

$$A_1 = A_p(1+i)^{1-p}$$

[illegible]عويض نجد

$$a = A_p(1+i)^{1-p}(1+i)^n$$

$$a = A_p(1+i)^{n-p+1}$$

الدفعة هي القيمة المكتسبة لاستهلاك السنة (p) للمدة (n-p+1)

[illegible]: [illegible]
" [illegible] " [illegible]

$$a = A_2(1+i)^{5-2+1} = A_2(1+i)^{5-2+1} = A_2(1+i)^4$$

$$a = 540531{,}86(1{,}1)^4 = 540531{,}86 \times 1{,}4641 = 791392{,}6$$

5-4 العلاقة بين أصل القرض والدفعات

[illegible]

[illegible]

$$\boxed{V_0(1+i)^n = a\frac{(1+i)^n - 1}{i}}$$

وبضرب طرفي المساواة بالعدد $(1+i)^{-n}$ نجد

$$V_0(1+i)^n(1+i)^{-n} = a\frac{(1+i)^n}{i}(1+i)^{-n}$$

ومنه

$$\boxed{V_0 = a\frac{1-(1+i)^{-n}}{i}}$$

[illegible]: [illegible].

6-4 [illegible] p

[illegible] A_1 [illegible] p [illegible]
. [illegible] A_p

R_p ... p

$$R_p = A_1 + A_2 + A_3 + \cdots + A_p$$

$$R_p = A_1 + A_1(1+i) + A_1(1+i)^2 + \cdots + A_1(1+i)^{p-1}$$

A_1 ... $(1+i)$ ... p

$$R_p = A_1 \frac{(1+i)^p - 1}{i}$$

$$R_4 = A_1 \frac{(1+i)^4 - 1}{i}$$

$$R_4 = 491392{,}60 \frac{(1{,}1)^4 - 1}{0{,}1} = 491392{,}60 \times 4{,}641$$
$$= \mathbf{2280553{,}05}$$

4-7 ... p

... p ...

... $p+1$ ... n

$$V_p = A_{p+1} + A_{p+2} + A_{p+2} + \cdots + A_n$$

A_{p+1} ...

... $(1+i)$ ... $(n-p)$ ...

$$V_p = A_{p+1}\frac{(1+i)^{n-p}-1}{i}$$

$$V_2 = A_{2+1}\frac{(1+i)^{5-2}-1}{i} = A_3\frac{(1+i)^3-1}{i}$$

$$V_2 = 594585{,}05\frac{(1{,}1)^3-1}{0{,}1} = \mathbf{1968076{,}5}$$

$$V_p = a\frac{1-(1+i)^{-(n-p)}}{i}$$

$$V_2 = a\frac{1-(1+i)^{-(5-2)}}{i} = a\frac{1-(1+i)^{-3}}{i}$$

$$V_2 = 791392{,}6\frac{1-(1{,}1)^{-3}}{0{,}1} = \mathbf{1968076{,}5}$$

[illegible]

-1 [illegible]

[illegible] 164 [illegible] 512 [illegible] 627 [illegible]

512		[illegible]	[illegible]
627		[illegible]	[illegible]
	164	[illegible] (....[illegible])	[illegible]

[illegible] N/01/01 [illegible] 1500000 [illegible] 6 [illegible] N/12/31 [illegible] %9 . [illegible] 20000 [illegible] . 0245 [illegible]

[illegible]

		N/01/01		
	1480000	ƚŏƧǤƞ!ƒ ƘǤƕǤƪơ!ƒ ǁĂǉƕ!ƒ		512
	20000	ǤǌǈƕǤƿ ǤǆĂ ƚŏ5ƧƮǆ!ƒ ƘǤǆƥƤ!ƒ		627
1500000		ƯƧ!!ƒ ƘǤƪƪƋǆ ăƥ! ƘǤưƒƧƙƿǕƒ		
		(0245ǅƿƧ ƧǤƶƮǫ) ƯƧƿ ǅǘƙƪƒ	164	

2- ƕǐǋǆƨǁ ƖǫǐǭƨƚǁƗ ǏǤƨƑƟǅǁ üǐǛƨƚǁ

ƯƧ!!ƒ ǁǚǌƙƪƒ ƱƪƿǈǆǇĂƚƙƙ ƚƶ5ƥ ýƚ ƚŏơ ƚŏĂǉƪ ƘǤƶ5ƥƕ ƥƥƪŏ ƯƧ!!ƒ
.ǑƖƕƙǆ!ƒ ƯƧ!!ƒ ǏǅƵ ƚŏĂǉƪ ƖƥƑǤ5Ă

ƘǤưƒƧƙƿǕƒ 164 ƔǤƪơǃ! ǇǒƥǆƔǉǤƞ!ƒ Ǒ5 ƯƧ!!ƒ ǁǚǌƙƪƒ Ʊƪƿ ýƞƪŏ

ǤǄƕƵǅ 661 ƔǤƪơǃ! ǇǒƥǆƔǉǤƞ!ƒ Ǒ5 ýƞƪƙ ƖƥƑǤ5!ƒ Ă ƯƧ!!ƒ ƘǤƪƪƋǆ ăƥ!

.ƚƶ5ƥ!ƒ ƚǆŏƖƕ ǤǉƑƒƥ ƚŏƧǤƞ!ƒ ƘǤƕǤƪơ!ƒ ǁĂǉƕ!ƒ ƔǤƪơ ýƶƞƕ ǁ!ƦĂ ƥƒĂ5!ƒ

		ƚƶ5ƥ!ƒ ƥŏƥƪƙ ƍŏƧǤƙ			
	ǁǚǌƪǕƒ	ƯƧ!!ƒ ƘǤƪƪƋǆ ăƥ! ƘǤưƒƧƙƿǕƒ		164	
	ƖƥƑǤ5!ƒ	ƥƒĂ5!ƒ ǤǄƕƵǅ		661	
ƚƶ5ƥ!ƒ		ƚŏƧǤƞ!ƒ ƘǤƕǤƪơ!ƒ ǁĂǉƕ!ƒ	512		
		ƚƶ5ƥ!ƒ ƥŏƥƪƙ			

ǤƒĂù ưǅ ƚùƪƪƋǆ ǊƙǆǇƙƪƒ ǐƦ!ƒ ǐƥǤƶ!ƒ ƯƧ!!ƒ ǁǚǌƙƪƒ ýĂƥƞ ǇǆƼ

ǑǉǤƛ!ƒ Ă ýĂǕƒ ǇŏƧƱƪ!ƒ ǤǉƞƧƤƙƪƒ ƔĂǉƞ!ƒ

ǁǚǌƪǕƒ	ǐƦ!ƒ ǐƥǤƶ!ƒ	ǊƙǆǇƙƪƒ	ǁǛǌƪǕƒ	ƯƧ!!ƒ ǁǚǌƙƪƒ	ƔǤƪơ
1300620,33	334379,67	199379,67	135000,00	1500000,00	1
1083296,48	334379,67	217323,85	117055,83	1300620,33	2

Ĭ!ĂŰf Łž5þ!f þőþʅķ Łőǉďž Ƨőƀ‡!f Ƨķ5þ!fĂ ŎďžĂő!f Ƨķ5þ!f Ŏ5 ýηʅ

			N/12/31		
	199379,67	Ư Ƨ!!f ƘĜʅʅƌďž ăþ! ƘĜư fƧķpŬf		164
	135000,00	þFfĂ5!f ČĜhŽD		661
334379,67		ƘĜhĜʅơ!f ǁĂŀjb!f	512	
		ŁőƧĜη!f		
		Łž5þ!f þőþʅķ		

د 512	م
334379,67	

د 661	م
	135000

د 164	م
1500000	199379,67

ƀưƟőíǅ

1- يسجل قيد التسديد في السنوات الخمسة الموالية بنفس الطريقة مع تغيير قيمة الاستهلاك والفائدة حسب كل سطر من جدول استهلاك القرض .

2- رصيد الحساب 164 بعد تسديد كل دفعة يمثل المبلغ الباقي تسديده من أصل القرض .

3- عند تسديد آخر دفعة يكون رصيد الحساب 164 معدوما.

[illegible]

1. [illegible] . Excel

: [illegible]

[illegible]

F	E	D	C	B	A	
جدول استهلاك قرض عادي						1
			مدة القرض		أصل القرض	2
					معدل القرض	3
رأس المال المتبقي في نهاية المدة	الدفعة	الاستهلاك	الفائدة	رأس المال المتبقي في بداية المدة	المدة	4
						5
						6
						7
						8
						9

2. [illegible] :

- [illegible] 500.000 [illegible].
- [illegible] : 8%
- [illegible] : 5 [illegible]

[illegible]

1. [illegible].

2. [illegible].

3. [illegible].

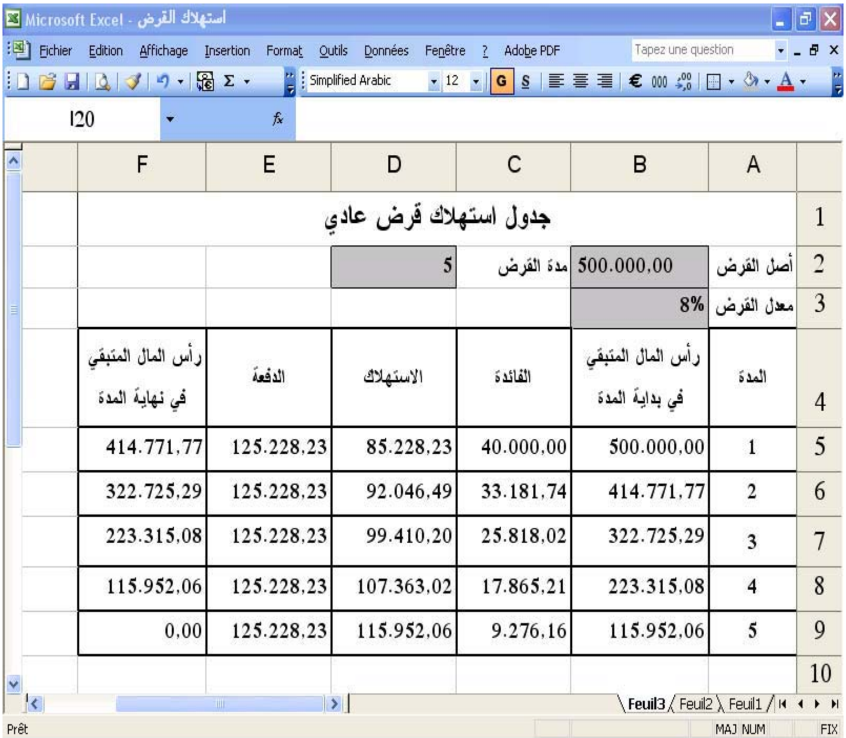
F	E	D	C	B	A	
جدول استهلاك قرض عادي						1
			مدة القرض		أصل القرض	2
					معدل القرض	3
رأس المال المتبقي في نهاية المدة	الدفعة	الاستهلاك	الفائدة	رأس المال المتبقي في بداية المدة	المدة	4
=B5-D5	=C5+D5	=B2*($B$3/((1+$B$3)^(D 2)-1))	=B5*$B$3	=B2	1	5
=B6-D6	=C6+D6	=D5*(1+$B$3)	=B6*$B$3	=F5	=A5+1	6
=B7-D7	=C7+D7	=D6*(1+$B$3)	=B7*$B$3	=F6	=A6+1	7
=B8-D8	=C8+D8	=D7*(1+$B$3)	=B8*$B$3	=F7	=A7+1	8
=B9-D9	=C9+D9	=D8*(1+$B$3)	=B9*$B$3	=F8	A8+1=	9

[illegible] :D5

=B2*($B$3/((1+$B$3)^($D$2)-1))

[illegible] (B3) [illegible] **($B$3)** [illegible] Excel [illegible].

3. [illegible]



جدول استهلاك قرض عادي

أصل القرض	500.000,00	مدة القرض	5		
معدل القرض	8%				
المدة	رأس المال المتبقي في بداية المدة	الفائدة	الاستهلاك	الدفعة	رأس المال المتبقي في نهاية المدة
1	500.000,00	40.000,00	85.228,23	125.228,23	414.771,77
2	414.771,77	33.181,74	92.046,49	125.228,23	322.725,29
3	322.725,29	25.818,02	99.410,20	125.228,23	223.315,08
4	223.315,08	17.865,21	107.363,02	125.228,23	115.952,06
5	115.952,06	9.276,16	115.952,06	125.228,23	0,00

Ĭ ŀƐPŀƐ !ĭNjƫŀƐ ŀƲƏ ƨ ƈ

:1 DžĭþDŽŀƐ

lþƑƓ5 ýþƶǆƖ ƱƓõkơŬƒĂ ƧõƼĂk!ƒ ƾĂþǈƮ Ŏ5 Ɯþ 30.000 ƸƖǆ ƧƞƓk ƳþĂĐ
.ƘƒĂǈƪ 5 lþǆ! ƓĂǈƪ 8% ŀƖǂƧǆ

: ƒ NjǂƯDŽŀƐ üDžƴŀƐ

ŀõ!Ɠk!ƒ ƘŬƓơ!ƒ Ŏ5 ŀƖƪkǂǆ!ƒ ŀǆõl!ƒ Ɣƪơ

.1 ƒƦ ƘǈƓǂ ŀĂǈƪ ŀǆƪƧ!ƒ (ƨ Ɠ ư k) lþƑƓƼ!ƒ Ŏ5 ŀõƓnjǈ ýǂ ŀǈƪ).

.2 ƒƦ ƘǈƓǂ ŀǆƪƧ!ƒ ýǂ! Ŏƪƒþƪ (ƨ Ɠ ư k) lþƑƓƼ!ƒ Ŏ5 ŀõƓnjǈ ýǂ Ŏƪƒþƪ).

ù ýþƶǆƖ Ŏƪƒþƪ ƔƪƓǈkǆ.

ù ýþƶǆƖ Ŏƪƒþƪ Ɛ5ƓǂkǆƐ.

:2 DžĭþDŽŀƐ

Ĭ Ƶ "ƨ .Dž" ŀƪƪƋǆ ƘƮơk Ɯþ 1.000.000 ƸƖǆ ƨõƱĂk ƨþnjƖ ƓǆǂLJõƪ5ƓǈkǆLJõǂǈƖŎ5ŀlƖƱǆ!ƒ ƨõƱĂk!ƒ ƸõƮ ƨkPǆƖ ŀƮƓP!ƒ ƘƓǆĂƶǆ!ƒ
:Ŏõ

ø ƳþŦ ƒ pǆƓŀƐ üNjŬƐ:

lþƑƓ5 ýþƶǆƖĂ ƨõƱĂk!ƒ LJǆ (n) ŀǈõƶǆ lþǆ ŀõƓnjǈ Ŏ5 ŀƪƪƋǆ!ƒ ýĂƮơ
.Ɯþ 2.158.924,997 ŀƖƪkǂǆ ŀǆõp ĬƵ ƓĂǈƪ 8% ŀƖǂƧǆ

ø ƳþŦ ƒ pǆƓŀƐ: Ĭ ǆƑkŀƐ

(i) ŀƖǂƧǆ lþƑƓ5 ýþƶǆƖĂ ƨõƱĂk!ƒ LJǆ ƘƒĂǈƪ 10 lþǆ Ŏ5 ŀƪƪƋǆ!ƒ ýĂƮơ
.Ɯþ 1.967.151,357 ŀƖƪkǂǆ ŀǆõp ĬƵ

: ƒ ŃǰŧƯƊǁǁǁ üƊǅyǁǁ

.ýĂǕƒ ǁ Ǉǉ!ƒ Ư ƨƶǀ Ŧ Ʈ ƓƤ!ƒ (n) ƻ ǒƯĂǩ!ƒ ǉƥǆ ƥ̆ơ.1

.ǑǇƓƛ!ƒ ǁ Ǉǉ!ƒ Ư ƨƶǀ ƒ ƓƤ!ƒ (i) ƻ ǒƯĂǩ!ƒ ýƥƶǆ ƥ̆ơ .2

ŦǒƓǌǇ Ǒ5 .ýĂǕƒ ǁ Ǉǉ!ƒ Ư ƨƵ ýĂǚƿ ǅǩ ǇǑǉ ư ƨƶ!ƒ ǇǑǉ Ŧǈ ư Ɠƻǆ!ƒ ƥƶǀ .3

ƒƦǋĂ Ɠǌ!ƒĂǆǅ ƔƓƞƨǩ Ʈ ƒ Ŧ Ʈ Ʈ ƌǆ!ƒ ƘƨƨƤ ƻ ǒƯĂǩ!ƒ ǇǆǄ ƘƒĂǇ Ʈ 6 ǉƥǆ

ƸǈǀǆǄ ƱƖ5 Ɠǌ! ƴƼƥǒ ǇƉ ƱƨƬǀ ǁ !Ʀ Ǐǈƶ ǁ Ǉǉ!ƒ ƽ 5ƒĂ5 Ŧǒ!Ɠǆ ƔƓǀ Ʈ Ǖ

.Ɯƥ 1.543.301,526

Þ Ŧ!Ɠơ!ƒ ǉƦǋ Ǒ5 ǁ Ǉǉ!ƒ ǉƥǆǩƵƉ ǐ Ʀ!ƒ Ŧǀ ŧ ƨǆ!ƒ ǉƥƑƓƼ!ƒ ýƥƶǆ Ăǋ Ɠǆ

:3 ǅǆǐƥǅŦǁǁ

Ɠǌǒǈƶ Ư ƨƶ Ŧ ǒơ ǕǑ!Ǔƒ ǅǚƶǘ! ƘƒƨǒǌǋƞǨ " ƘƓǒǆǚƶǫ " Ŧ Ʈ Ʈ ƌǆ ƘǇǨƿƒ

:Ŧǒ!Ɠǩ!ƒ Ư Ăƨƶ!ƒ ƥơǀ ƓǌǨǆǒƿ ƥǒƥ Ʈ ǩ ƘƓǑǇƓŧǆǫ

- ƒ ǃ ǅ ƴǁǁ :üǋǓǁǁ ǩ Ʈ ƥǒƥ ƸǈǀǆǄ 485.000 Ɯƥ ƒƦĂ5.
- ƒ ǃ ǅ ƴǁǁ : Ǐǆ ǅǩǁǁ ǩ Ʈ ƥǒƥ ƸǈǀǆǄ 200.000 Ɯƥ ƒƦĂ5 6Ă ƘƓƶ5ƥ ŦǩǀƓƛ Ǒ5
ŦǒƓǌǇ ŧ ý Ʈ Ǉ Ŧ ƇƒƥǩǀƒǇǆǄ ŦǒƓǌǇ Ʈ !Ǉ Ŧ ǕĂ! Ǐ ƥǒǆǅ Ŧ !ƥ5ƶ Ŧ 60.000 Ɯƥ.
- ƒ ǃ ǅ ƴǁǁ :ƘǁǅǩǁǁǇ ƥ5ƴ ƸǈǀǆǄ 520.000 Ɯƥ Ǒ5 ŦǒƓǌǇ Ʈ !Ǉ Ŧ ǕĂ! ǏǄǆǅ
.Ƙƒƨǒǌǋƞǩ!ƒ ƇƓǇǨƿƒ ơǒƨƓǩ
- ƒ ǃ ǅ ƴǁǁ :ƯƓƐƥǁǁ ǩ Ʈ ƥǒƥ 4 ƘƓƶ5ƥ Ʈ ǇĂǒŦ ƛƓǀǩŦÜ ǩƥ5ƴ ǕĂ! Ǐ Ǒ5 ŦǒƓǌǇ
.Ɯƥ 150.000 Ŧ !ƥ5ƶ Ŧ ƥǒǆǅ Ǐ ǕĂ! Ʈ ǇŦ !ƒ

: ƒ ŃǰŧƯƊǁǁǁ üƊǅyǁǁ

ƨƨǀ Þ Ŧ Ʈ Ʈ ƌǆ!ƒ ǉƨƓǩƤǩ Ư ƨƶ ý ư 5Ɖ Ăǋ Ɠǆ Ü5% ƥǆǩƶǆ!ƒ ýƥƶǆ!ƒ ǇƓŧ ƒƦǫ

. ǁ ǩǀƓƞǫ

:4 DžĭþDŽŧǁɛ

ǴnjŏǏƵ ϴƧkpf þpĂ .2000/01/01 ơŏƧǴkh Ɯþ 1.000.000 ŧʅʅƋdž ƘưƧkpf

:þŏþʅkǏ! ƽƧƱ ŧƛǖƛ ǁǉh!f

.ƘfĂǈʅ 10 þƶh ǻþŏơĂ ŧƶ5þ þŏþʅk :(1) hƽĭþƯǁɛ ø

ơŏƧǴùkh Ĭù!ĂǕf ƽơkʅk ŧkhǴƛ ƘǴƶ5þ 5 ŧƱʅfĂh þŏþʅk!f :(2) høƽĭþƯǁɛ ø

.2001/01/01

þùƶh ǴnjǈǆǅŧƶǄþ ýǂ ƽơkʅk ŧkhǴƛ ƘǴƶ5þ 5 ŧƱʅĂh þŏþʅk!f :(3) hƽĭþƯǁɛ ø

Ŏù5 ŧùŏǈǴƛ!f ŧùƶ5þ!fĂ 2002/01/01 Ŏù5 Ĭù!ĂǕf ŧùƶ5þ!f :ĭD ǇŏƘǈʅ

.ơ!f....... 2004/01/01

: f NjŧƯDŽǁɛ üDŽyǁɛ

. ł ǖƛ!f ƽƧƱ!f ƽ5Ă ŧƶ5þ ýǂ ŧdžŏp Ɣʅơ ǴŏĂǈʅ 7% ŧhǂƧdž lþƑǴ5 ýþƶdžh

:5 DžĭþDŽŧǁɛ

ÜƜþ 900.000 ƸǏhdž ŧŏǏơdž!f ŧŏdžǈk!f ǁǉh ǇdžĦ " ý.Y " ŧʅʅƋdž Ƙư Ƨkpf

ŧǈʅ!f ŧŏǴnjǈ Ŏ5 ǴnjǈdžĬ!ĂǕf ŧƶ5þ!f y5þk ÜŧkhǴƛ ƘǴƶ5þ 5 ŧƱʅfĂh þþʅŏ

.ǴþĂǈʅ 8,5% ýþƶdž!f ǇǴǂ fƦ5 . Ư Ƨl!f þlƵ yŏpĂk Ǉdž Ĭ!ĂǕf

: f NjŧƯDŽǁɛ üDŽyǁɛ

ýĂþƞ Ǉdž ƧŏPǕfĂ ł !Ǵƛ!fÜ ŎǈǴƛ!f ÜýĂǕf :ƧƱʅǕf Ǉdž ƧƱʅ ýǂ ƨƞǈD

. Ư Ƨl!f ǁǖnjkʅf

:6 DžĭþDžŧǁɛ

Ĭ!ĂǕƒ ŧǉʅ!ƒ ŧŏǤǌǉ Ŏ5 Ĭ!ĂǕƒ ɥ5þƙ ÜŧƙƕǤƛ ƘǤƶ5þ 10 ŧƱʅƒĂƕ ǁǌǌƙʅŏ ƯƧp

ĬǁƵ ŧ!Ǥƛ!ƒĂ ýĂǕƒ ǇŏŧǚǌƙʅǛƒ ŎƙǆžŏpƘǉǤŧ ƒȐ5 .ƯƧl!ƒ þlƵ ɥŏpĂƙ Ǉǆž

ĭĂǤʅƙ ŧƛ!Ǥƛ!ƒ ŧǉʅ!ƒ ƖþƑǤ5 ǇȡĂ Üɰþ 18.420,34Ă ɰþ 14.950,36 :Ŏ!ƒĂƙ!ƒ

.ɰþ 24.030,02

: ƒ ǋŧƯDžǁɛ üDžɏǁɛ

1. ýþƶǆž!ƒ Ɣʅơ (i).

2. ýȚ Ɣʅơ ƯƧl!ƒ (V_0).

3. ƨȠǉ ƧƱʅǕƒ ŧƛǚƛ!ƒ Ĭ!ĂǕƒ Ǉǆž ýĂþȠ ǁǚǌƙʅƒ ƯƧl!ƒ.

4. ƨȠǉ ǇŏƧƱʅ!ƒ ǇŏƧŏƤǕƒ Ǉǆž ýĂþȠ ǁǚǌƙʅƒ ƯƧl!ƒ.

1: ǅǎĭþǅǎŧǁǃ üΘ

:ƕĭǸǰǆƨ ƕŧǅǎƨþǁǃ ƕǁƑΘ Ĭʓ ƕǤƨŧǀǅǎǁǃ ƕǅǎĭŝǁǃ ƒƑƨΘ .1

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

$$A = 30.000(1+0{,}08)^5$$

$$A = 30.000(1{,}08)^5$$

$$A = 30.000 \times 1{,}469328$$

$$A = 44.079{,}84 \text{ دج}$$

:ƕĭƨƐƣƨ ƕŧǅǎƨþǁǃ ƕǁƑΘ Ĭʓ ƕǤƨŧǀǅǎǁǃ ƕǅǎĭŝǁǃ ƒƑƨΘ .2

ĸǤǒʅƒþʅ 10 ĭǅ ĸƒǍǉʅ 5 :Ǥǉǒþǃ

:ƒ ƨƑǆŧǅǎǁǃ Ĭ ƨƐƣƨǁǃ üƣƴǅǎǁƑǤ ƕǤƨŧǀǅǎǁǃ ƕǅǎĭŝǁǃ ƒƑƨΘ ø ǁ

.Ɣʅǉǆǆ Ŏʅƒþʅ ýþƶǆ $4\% = \dfrac{8\%}{2} \longleftarrow 8\%$ ĭǍǉʅ ýþƶǆ

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

$$A = 30.000(1+0{,}04)^{10}$$

$$A = 30.000(1{,}04)^{10}$$

$$A = 30.000 \times 1{,}480244$$

$$A = 44.407{,}32 \text{ دج}$$

:ƎʓƑǀǅǎǁǃ Ĭ ƨƐƣƨǁǃ üƣƴǅǎǁƑǤ ƕǤƨŧǀǅǎǁǃ ƕǅǎĭŝǁǃ ƒƑƨΘ ø ƒ

$$\mathbf{1 + i_s = (1 + i_a)^{\frac{1}{2}}}$$

$$1+i_s=(1+0,08)^{\frac{1}{2}}$$

$$i_s=(1,08)^{\frac{1}{2}}-1$$

$$i_s=1,03923-1=0,03923$$

$$i_s=3,923\%$$

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

$$A=30.000(1+0,03923)^{10}$$

$$A=30.000(1,03923)^{10}$$

$$A=30.000\times 1,469321226$$

$A =$ د ج 44.079,63

2: ǅǏþǅǐƗǁǁ üϴ

:üǋǕǁ þǅǤǁǁ ƒ þyǤ ƕTƒǬǁǁ n ƹïưǋǂǁ ɣǬǅǐ ƒƑƨϴ .1

ǐ ƧTƶ!ƒ ǅǩöƧǤƹǍǅ!ƒ ǅƒþƤƙʅǤǚ

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

$$2.158.924,997=1.000.000(1+0,08)^n$$

$$2.158.924,997=1.000.000(1,08)^n$$

$$\frac{2.158.924,997}{1.000.000}=(1,05)^n$$

$$(1,05)^n=2,158924997$$

$$\log(1,05)^n=\log 2,158924997$$

$$n\log 1,05=\log 2,158924997$$

$$n=\frac{\log 2,158924997}{\log 1,05}=10$$ ســــــــــنوات

:Ĭ ǆǐǫǁǃ ƿǆǐǴǁǃ ƒ ƥǆǠƴ ƫ ƑǫǁǄ Ƹ ǐǆǞƿǁǄ ǜǫǋǄ ǫǐǫƟƗ .2

$$A = a(1+i)^{n}$$

$$1.967.151{,}357 = 1.000.000(1+i)^{10}$$

$$\frac{1.967.151{,}357}{1.000.000} = (1+i)^{6}$$

$$\sqrt[10]{\frac{1.967.151{,}357}{1.000.000}} = (1+i)$$

$$i = \sqrt[10]{\frac{1.967.151{,}357}{1.000.000}} - 1$$

$$i = \sqrt[10]{1{,}967151357} - 1$$

$$i = (1{,}967151357)^{\frac{1}{10}} - 1$$

$$i = 1{,}07 - 1$$

$$i = 0{,}07$$

$$i = 7\ \%$$

ǅǿǅ Ɩ ǆǐǋø ƨ **6** ǫøǜǠ ǜǋǓǃ ƿøǆǐǴǁǃ ǇǫǅƗǓ ǎǁǃ ǫǫƏƺǁǃ ǜǫǋǄ ǫǐǫƟƗ .3

ƸǐǆǞƿǁǄ

$$i = \sqrt[6]{\frac{1.543301{,}526}{1.000.000}} - 1$$

$$i = \sqrt[6]{1{,}543301526} - 1$$

$$i = (1{,}543301526)^{\frac{1}{6}} - 1$$

$$i = 1{,}075 - 1$$

$$i = 0{,}075$$

$$i = 7{,}5\,\%$$

[illegible] :3

[illegible] :

[illegible]

[illegible].

1. [illegible]:

$$A_{0/1} = 485.000 \text{ دج}$$

2. [illegible]:

$$A_{0/2} = 200.000 + 60.000\left[\frac{1-(1{,}05)^{-6}}{0{,}05}\right]$$

$$A_{0/2} = 504.541{,}542 \text{ دج}$$

3. [illegible]:

$$A_{0/3} = 520.000(1{,}05)^{-1} = 495.238{,}09 \text{ دج}$$

4. [illegible]:

$$A_{0/4} = 150.000\left[\frac{1-(1{,}05)^{-4}}{0{,}05}\right]$$

$$A_{0/4} = 531.892{,}57 \text{ دج}$$

-ƅĭǁƑƟǁǀ ƅƊžĭƨǁƑƓ – ƶƗƓƊž üƨƈ Ʋƺƍƚ ƑǉƥƑƓƗƳƑƓ üǊǓǀ ƒ ƥƴǁǀ ƅƨ ƨƊƊžǁǀ ƥƑƗƍƚ
.ǌƥƍǓǀ ƒ ǋƥƴǁǀ ƅĭƨƓ ƊžƊž

:4 ƊžĭƥƊžƗǁǀ üƟ

.1 ƑƑƨƟ ƅƊžĭƨ ƅƴƺƍǁǀ ƔƍĭƟǋǁǀ Ĭƺ ƅƨĭƥƲǁǀ ǍǁǋǓǀ

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

$$A = 1.000.000(1+0,07)^{10}$$

$$A = 1.000.000 \times 1{,}967151$$

A= دج1.967 151

.2 ƑƑƨƟ ƅƊžĭƨ ƅƴƺƍǁǀ ƅƗƓƑǁǀ Ĭƺ ƅƨĭƥƲǁǀ ƅĭǆƑǁǀ

$$A_0 = a \frac{1-(1+i)^{-n}}{i}$$

$$a = A_0 \frac{i}{1-(1+i)^{-n}}$$

$$a = 1.000.000 \times \frac{0,07}{1-(1,07)^{-5}}$$

$$a = 1.000.000 \times 0{,}24389$$

a= دج 243.890

.3 ƑƑƨƟ ƅƊžĭƨ ƅƴƺƍǁǀ ƅƗƓƑǁǀ Ĭƺ ƅƨĭƥƲǁǀ ƅǃǁƑǁǀ

0 1 2 3 4 5 6 7 8 9 10

a a a a a

$$A_0 = a(1+i)^{-2} + a(1+i)^{-4} + a(1+i)^{-6} + \\ + a(1+i)^{-8} + a(1+i)^{-10}$$

$$A_0 = a\begin{bmatrix}(1+i)^{-2} + (1+i)^{-4} + (1+i)^{-6} + \\ +(1+i)^{-8} + (1+i)^{-10}\end{bmatrix}\text{...........(1)}$$

ýĂÜƒ ǴŇjþùơ Ŧŏù ƪþLjŇj Ŧùŏ!Ǵǩǩdž LJƵ lƧǴhƵ LJŏ!Ǵƞdž!ƒ LJŏh ƧƒþIdž!ƒ LJD Ươǚ Lj

Ŧùþǚ Ƶ Ɣùƪơ NJLjdžĂ 5 ǴŇjþĂþơ þþƵ Ă $(1+i)^{-2}$ ǴnjƪǴƪD Ă $(1+i)^{-2}$

:LJƎ5 Ŧŏƪþ Ljnj!ƒ Ŧŏ!Ǵǩǩdž!ƒ ƳĂdžƞdž

$$A_0 = a\left[(1+i)^{-2} \times \frac{((1+i)^{-2})^{-5} - 1}{(1+i)^{-2} - 1}\right]$$

$$A_0 = a\left[(1+i)^{-2} \times \frac{(1+i)^{-10} - 1}{(1+i)^{-2} - 1}\right]$$

:þƞLj Ư ŏĂƶķ!Ǵh NJLjdž Ă

$$A_0 = a \times \left[(1+i)^{-2} \times \frac{(1+i)^{-10} - 1}{(1+i)^{-2} - 1}\right]$$

$$1.000.000 = a \times \left[(1{,}07)^{-2} \times \frac{(1{,}07)^{-10} - 1}{(1{,}07)^{-2} - 1}\right]$$

$$1.000.000 = a \times 3{,}393034$$

$$a = \frac{1.000.000}{3{,}393034}$$

$a =$ دج $294.721{,}48$

:Ĭǂĭ ƑDžǀ (1) ƱƼǻƴǁƸ ǍǂƳ ǢƑDžǂƳǗƑǦ ƱƴƷǢǁƸ ƱDžǏƼ ƒƑƨƟ DžǀDžǏ :ƱƯƟǻDž

$$A_0 = a\begin{bmatrix}(1+i)^{-2}+(1+i)^{-4}+(1+i)^{-6}+\\ +(1+i)^{-8}+(1+i)^{-10}\end{bmatrix}$$

$$1.000.000 = a\begin{bmatrix}(1,07)^{-2}+(1,07)^{-4}+(1,07)^{-6}+\\ +(1,07)^{-8}+(1,07)^{-10}\end{bmatrix}$$

$$1.000.000 = a \times 3,3930345608$$

$$a = \frac{1.000.000}{3,3930345608} = 294.721,43 \text{ دج}$$

5: DžǏƥDžǂǁƸ üƟ

:(a) ƱǂǦƑǁƸ ƱƴƷǢǁƸ ǢǏǢƟǂ .1

$$a = V_0\frac{i}{1-(1+i)^{-n}}$$

$$a = 900.000\frac{0,085}{1-(1,085)^{-5}}$$

$$a = 228.389,18 \text{ دج}$$

:(I_1) ǍǁǋǓƸ ƱǎƨǁƸ ƳǢƏƷ ǢǏǢƟǂ .2

$$I_1 = V_0.i$$

$$I_1 = 900.000 \times 0,085$$

$$I_1 = 76.500 \text{ دج}$$

: (A_1) üNjŬε pŰNJ‡ƨŰε qĭqΘ‡ .3

$$V_0 = A_1 \frac{(1+i)^n - 1}{i}$$

$$A_1 = V_0 \frac{i}{(1+i)^n - 1}$$

$$A_1 = 900.000 \frac{0,085}{(1,085)^5 - 1}$$

$$A_1 = 151.889,18 \text{ دج}$$

ĂD

$$A_1 = a - I_1$$

$$A_1 = 228.389,18 - 76.500 = 151.889,18 \text{ دج}$$

:(V_1) ĂllNjŬε hıdžƨllε hıĭƑNJdž Ĭƺ ƒ βsllε qĭTβ qĭqΘ‡ .4

$$V_1 = V_0 - A_1$$

$$V_1 = 900.000 - 151.889,18 = 748.110,82 \text{ دج}$$

: ƒ βsllε pŰNJ‡ƨε üNjqШ 5

Ĭ sĜĐĎllε ƒ βsllε ŲqĎllε hıĭƑNJdž Ĭƺ	hıyƺqllε hı‡ĜƑkllε	pŰNJ‡ƨŰε	ŲqƋƑƺllε	Ĭ sĜĐĎllε ƒ βsllε ŲqĎllε hıĭεqĜ Ĭƺ	ŲqĎllε
748.110,82	228.389,18	151.889,18	76.500,00	900.000,00	1
583.311,07	228.389,18	164.799,76	63.589,42	748.110,82	2
404.503,33	228.389,18	178.807,74	49.581,44	583.311,07	3
………..	228.389,18	………..	………..	………..	4
0,00	228.389,18	210.496,94	17.892,24	210.496,94	5

6: DžĭβĎžllε üΘ

:(i) üqyĎllε ƒƑƨΘ.1

$$A_n = A_1 (1+i)^{n-1}$$

$$A_3 = A_1 (1+i)^2$$

$$(1+i)^2 = \frac{A_3}{A_1}$$

$$(1+i)^2 = \frac{18.420,34}{14.950,36}$$

$$(1+i)^2 = 1,2321$$

$$(1+i) = \sqrt{1,2321}$$

$$i = 1,11 - 1 = 0,11$$

$$i = 11\%$$

:(V₀) ƒ ƥƨǁƐ üTƈ ƒƑƨϴ .2

- :(a) ƕƗƓƑƘǁƐ ƕƴƺǫǁƐ ƒƑƨϴ

$$a = A_3 + I_3$$

$$a = 18.420,34 + 24.030,02 = \text{دج } 42.450,36$$

- :(I_1) ĂǁǋǰǗƐ ƕǆƨǁƐ ƔǫƏƑƺ ƒƑƨϴ

$$I_1 = a - A_1 = 42.450,36 - 14.950,36 = \text{دج } 27.500$$

- : ƒ ƥƨǁƐ üTƈ ƒƑƨϴ

$$I_1 = V_0 . i \Rightarrow V_0 = \frac{I_1}{i} = \frac{27.500}{0,11} = \text{دج } 250.000$$

.3 ҚҒШǆ þƯƨǓǀ ћkűkǁǀ ĂǁNJǓǀ DžDž üNJǫШ pűNJƗƨǀ þsǁǀ f :

ç þ ƯƨǁǀþƯǓǀ ü NJǓǀ:

$$V_0 = 250.000 \text{ دج}$$

$$I_1 = 27.500 \text{ دج}$$

$$A_1 = 14.950,36 \text{ دج}$$

$$a = 42.450,36 \text{ دج}$$

$$V_1 = 250.000 - 14.950,36 = \mathbf{235049,64} \text{ دج}$$

f ø þƯƨǁǀ ĬǆҒkǁǀ:

$$V_1 = 235.049,64$$

$$I_2 = V_1 . i = 235.049,64 \times 0,11 = 25.855,46$$

$$A_2 = A_1(1+i) = 14.950,36(1,11) = 16.594,90$$

$$a = 42.450,36$$

$$V_2 = V_1 - A_2 = 235.049,64 - 16.594,90 = 218.454,75$$

øШ ø þƯƨǁǀ ҜǁҒkǁǀ:

$$V_2 = 218.454,75$$

$$I_3 = V_2 . i = 218.454,75 \times 0,11 = 24.030,02$$

$$A_3 = A_1(1+i)^2 = 14.950,36(1,11)^2 = 18.420,34$$

$$a = 42.450,36 DA$$

$$V_3 = V_2 - A_3 = 218.454,75 - 18.420,34 = 200.034,41$$

ƒ ƫsǁƨ ƥǘǋƗƨƸ ǖǋǫǁ ǅǎǅ ǅǐƫǐǫǗƸ ǅǐƫƯƨǁƸ ƦƑǁǅ .4 :

ƈ ø ƫƯƨǁƸ ƯƨƒǁƸ:

$$a = 42.450,36.$$
$$A_9 = A_1(1+i)^8 = 14.950,36(1,11)^8 = 34.453,66.$$
$$I_9 = a - A_9 = 42.450,36 - 34.453,66 = 7.996,69$$
$$V_8 = \frac{I_9}{i} = \frac{7.996,69}{0,11} = 72.697,23.$$
$$V_9 = V_8 - A_9 = 72.697,23 - 34.453,66 = 38.243,56$$

ǅǎǅǐ ƟƨƑƒ ƥǘǋƗƨǗ ƯƨƒǁƸ ǅǐǗǫǁ ǅƴǫǁ ƑǅǎǏ ǏƗǐ:

$$a = A_p(1+i)^{n-p+1}$$
$$A_p = a(1+i)^{-(n-p+1)}$$
$$A_9 = a(1+i)^{-(10-9+1)}$$
$$A_9 = 42.450,36(1,11)^{-2} = 34453,66$$

ƒ ø ƫƯƨǁƸ ƫǆƑƴǁ ǅǐǗǫǍ:

$$V_9 = 38.243,56. \qquad , \qquad a = 42.450,36$$
$$A_{10} = a(1+i) = V_9 = 38.243,56.$$
$$I_{10} = a - A_{10} = 42.450,36 - 38.243,56 = 4.206,79$$
$$V_{10} = 0$$

Ŏlǁkdž!f ƯƧl!f lɓdž!f Ɨŏƃnjǉ Ŏ5	Ɨƶ5ɓ!f	ǁ ǚnjǩƪǗf	lɓƑƃ5!f	Ŏlǁkdž!f ƯƧl!f lɓdž!f Ɨŏfɓǀ Ŏ5	lɓdž!f
235.049,64	42.450,36	14.950,36	27.500,00	250.000,00	1
218.454,75	42.450,36	16.594,90	25.855,46	235.049,64	2
200.034,41	42.450,36	18.420,33	24.030,02	218.454,75	3
……..	……..	……..	……..	……..	……..
38.243,56	42.450,36	34.453,66	7.996,69	72.697,23	9
0,00	42.450,36	38.243,56	4.206,79	38.243,56	10