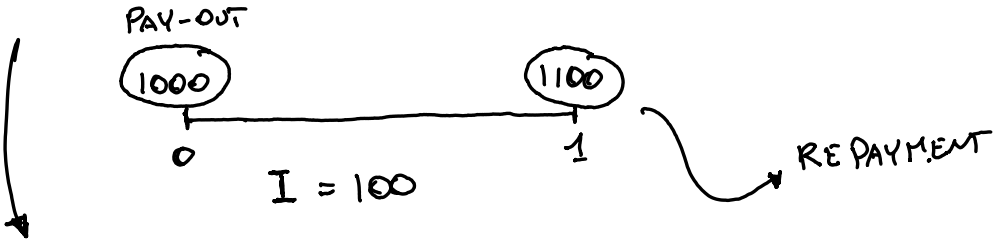
- **FINANCIAL TRANSACTION**

AGREEMENT BETWEEN 2 PARTIES EXCHANGING MONEY IN 2 DIFFERENT TIMES.

- **INTEREST**

CHARGE UPON THE AMOUNT → BORROWER / LENDER



WHY CHARGING INTEREST ?

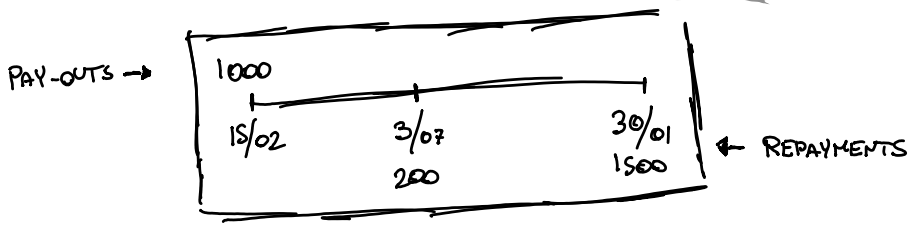
- **TIME PREFERENCE THEORY**

INHABITANTS PREFER TO HAVE CASH NOW, INSTEAD OF WAITING, BECAUSE THEY ARE **IMPATIENT**

TRANSACTION ELEMENTS

- PERSONAL → ACTIVE PARTY → LENDER
  PASSIVE PARTY → BORROWER
- FORMAL → DEALS
  1. WHEN ?
  2. HOW ?
  3. CAUTION ?
- MATERIAL → THE AMOUNT OF MONEY INVOLVED.

TIME DIAGRAM



1. COMMON OPERATION
2. COMPLEX OPERATION

BASICALLY, THE DIFFERENCE IS JUST // THE AMOUNTS OF OPERATION ON A TIME DIAGRAM.

FINANCIAL CAPITAL → (C, T) ← TIME EXPRESSED IN YEARS

USING AN ACCUMULATION FUNCTION

$$\varphi(T, T') = 1 + 0{,}03(T' - T)$$

- LET'S SUPPOSE YOU LEND 1000 $ IN $T = 2$ WHAT WILL BE THE AMOUNT AT $T' = 5$?

$$\varphi(T, T') = \frac{C'}{C}$$

$$\downarrow$$

$$C' = \varphi(T; T')\, C$$

$$\downarrow$$

$$= 1000 \cdot (1 + 0{,}03(5 - 2))$$

$$= 1000 \cdot (1{,}09)$$

$$= 1090$$

- THE FUNCTION DEPENDS ONLY ON THE LENGTH T

INTEREST

$$C' - C = IT$$

KEEP IN MIND THAT THIS FORMULA DOESN'T GET INTO ACCOUNT THE LENGTH. ⚠

INTEREST RATE

$$(I) = \frac{C' - C}{C}$$

UNIT PRICE

THIS TOOL IS MORE EFFECTIVE THAN THE PREVIOUS ONE.

NOMINAL INTEREST RATE

$$i(T, T') = \frac{C' - C}{C \cdot t}$$

LENGTH OF A TRANSACTION ⚠

$(T' - T)$

EXERCISE 1

$C = 2500 \qquad C' = 2750 \qquad t = 2$

FORMULAS ARE IN THE PREVIOUS PAGE

$I = 250$

INTEREST RATE = 0,1 %

NOMINAL IR = 0,05 %

FINANCIAL REGIMES

1. SIMPLE INTEREST
2. COMPOUND INTEREST WITH CONSTANT RATES
3. COMPOUND INTEREST WITH DIFFERENT RATES
4. DISCOUNT INTEREST

SIMPLE INTEREST

$$C' = C \cdot (1 + i\,t)$$

1. $IT = C \cdot i \cdot t$
2. INTEREST RATE $= i \cdot t$
3. NOMINAL INTEREST RATE $= i$

EXERCISE 3

$C = 2200 \quad C' = 2265 \quad t = 5$

$2265 = 2200 \cdot (1 + 5i)$

$0,02954 = 5i \rightarrow i = 0,0059\,\%$

EXERCISE 4

$C = 1500 \quad C' = 1620 \quad i = 0,06$

$1620 = 1500 \cdot (1 + 0,06\,t)$

$1.08 = 1 + 0,06\,t$

$0.08 = 0,06\,t \rightarrow t = 1\frac{1}{3}\,y$

EXERCISE 6

$$C + 50 = C \cdot (1 + 0.04 \cdot 6)$$

$$C + 50 = 1.24 \cdot C$$

$$1.24C - C = 50 \quad \rightarrow \quad C(1.24 - 1) = 50$$

$$0.24\,C = 50 \rightarrow C = 208.33$$

EXERCISE 7

$t = \not{\emptyset}$ $\quad i = 4.25\,\%$ $\quad 2C = ?$

$$100 = 50 \cdot (1 + 0,0425 \cdot t)$$

$$2 = 1 + 0,0425\,t$$

$$t = \frac{1}{0,0425} \rightarrow t = 23\tfrac{1}{2}\ y_s$$

EXERCISE 9

1) $C' = C(1+it)$

$2480 = 2400(1+it)$

2) $C' = 1000(1+i2t)$

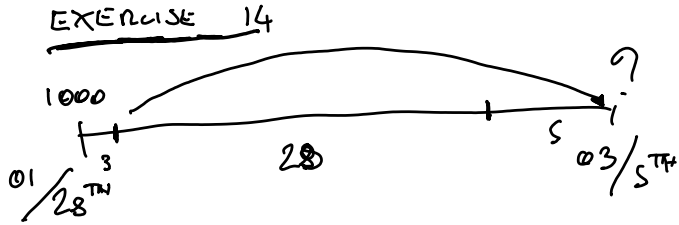
$it = \frac{2480}{2400} - 1$

$it = 0,033$

$C' = 1000(1+2 \cdot 0,033)$

$C' = 1000 \cdot 1,066 \rightarrow C' = 1066.66$

EXERCISE 14



$i = 0.15$ $\quad \frac{37}{366} = 0.10109$

$C' = 1000 \cdot (1+0.15 \cdot$)

$C' = 1015.16$

EXAMPLE 16

$C = 2000 \quad C' = ? \quad i = 0,08$

JUNE = 30
JULY = 31
AUGUST = 31
SEPT = 10

a) TIME → $\frac{13 + 31 + 31 + 10}{365}$

$t = 0.23287671 \rightarrow C' = 2000 \cdot (1 + 0,08 \cdot t)$

$C' = 2037.26$

b) $t = \frac{13 + 30 + 30 + 10}{360} \rightarrow 0.23055556$

$C' = 2036.88$

c) $t = \frac{13 + 31 + 31 + 10}{360} \rightarrow 0.23611111$

$C' = 2037.77$

EXAMPLE 17

$C = 3500 \quad i = 0.08$

SEPTEMBER	30
OCT	31
NOV	30
DEC	31
JAN	20

a) $t = \frac{105}{366} + \frac{20}{365}$

0.34213386

$C^1 = 3595.797$

b) $t = \frac{13 + 30 + 30 + 30 + 20}{360} \rightarrow 0.34166667$

$C^1 = 3595.66$

c) $t = \frac{13 + 31 + 30 + 31 + 20}{360} \rightarrow 0.34722222$

$C^1 = 3597.22$

COMPOUND INTEREST

- THE INTEREST EARNED AT THE END OF ONE PERIOD IS AUTOMATICALLY REINVESTED TO EARN AN ADDITIONAL INTEREST.

ACCUMULATION FUNCTION $\rightarrow$ $\int(T, T') = \frac{C'}{C}$

$\downarrow$

$$\frac{C(1+ip)^h}{C} = (1+ip)^h$$

1. INTEREST $\rightarrow$ $C \cdot i \cdot p$
2. INTEREST RATE $\rightarrow$ $i \cdot p$
3. NOMINAL INTEREST RATE $\rightarrow$ i

$m \rightarrow \frac{1}{p}$ = FREQUENCY OF CAPITALIZATION IN 1 YEAR.

EXAMPLE 18

- $P = 1/2 \quad T = \phi \quad T' = 4$

$$m = \frac{1}{1/2} = 2 \qquad t = 4 \qquad h = m \cdot t = 8$$

- $P = 1/4 \quad T = \phi \quad T' = 2$

$m = 4 \qquad t = 2 \qquad h = 8$

- $P = 1/3 \quad T = \phi \quad T' = 5$

$m = 3 \qquad t = 5 \qquad h = 15$

$$m = \frac{1}{p} \qquad i = I \cdot m \qquad h = m \cdot t$$

$$I = \frac{i}{m}$$

SO, IN COMPOUND INTEREST THE FUNCTION IS

$$C' = C(1 + I)^h$$

EXERCISE 20

$C = 1800 \qquad C' = 1823,78 \qquad I = 0.03$

$$1823.78 = 1800(1 + 0.03)^n$$

$$\frac{1823.78}{1800} = 1.03^n \rightarrow \ln 1.03^n = \ln \frac{1823.78}{1800}$$

$$n \ln 1.03 = \ln \frac{1823.78}{1800}$$

$n = 2.25$ YEARS

EXERCISE 21

$C' = 32.168 \quad t = 18 \quad I = 6.2\% \quad C = ?$

$$C' = C(1 + 0.062)^{13}$$

$$\rightarrow \frac{32.168}{1.062^{13}} = C$$

$$\rightarrow 14716.527$$

EXERCISE 22

$$2C = C \cdot (1 + I)^{10}$$

$$2 = (1 + I)^{10} \rightarrow (2)^{1/10} = \left((1 + I)^{10}\right)^{1/10}$$

$$\rightarrow \sqrt[10]{2} = 1 + I$$

$$1.07177 - 1 = I$$

$$0.07177 = I$$

EXERCISE 23

$$C' = 1000 \cdot (1 + 0.05)^{4}$$

$$\rightarrow 1215.50$$

$$I = 215.5$$

EXERCISE 25

$C = 1750 \qquad t = 6\frac{1}{2}$

- MONTH 0.01

$$C' = 1750 \cdot (1 + 0.01)^{78} \rightarrow C' = 3802.81$$

- SEASONS 0.02

$$C' = 1750 \cdot (1 + 0.02)^{26} \rightarrow C' = 2928.43$$

- BIANNUAL 0.01

$$C' = 1750 \cdot (1 + 0.01)^{3/4} \rightarrow C' = 1807.51$$

- ANNUAL 0.01

$$C' = 1750 \cdot (1 + 0.01)^{6\frac{1}{2}} \rightarrow C' = 1866.92$$

- TRIANNUAL / FOUR MONTH

$$C' = 1750 \cdot (1 + 0.01)^{11/6} \rightarrow C' = 1782.21$$

EXERCISE 26

$C = 3000 \qquad t = 8 \qquad i = 0.05$

- ANNUAL

  ↳ $3000 \cdot (1.05)^{8} \rightarrow C' = 4432.26$

- QUARTER → $0.05 / 4 \rightarrow 0.0125$

  ↳ $3000 \cdot (1.0125)^{32} \rightarrow C' = 4464.39$

- MONTH → $0.05 / 12 \rightarrow 0.00416$

  ↳ $3000 \cdot (1.00416)^{96} \rightarrow C' = 4468.9$

DISCOUNT FUNCTION

THAT'S TO SAY → $C' = C \cdot (1+i)^t$

SO ⇒ $C = \dfrac{C'}{(1+i)^t}$

THEREFORE, $\nu = (1+i)^{-t}$

ν — DISCOUNT FUNCTION

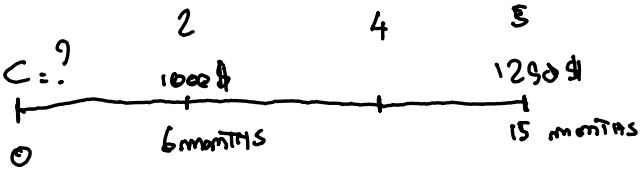
QUESTION 6

PV = ?

1000 $ = 6 months

1250 $ = 15 months

a) $i_{1/4} = 0.5\%$ (3 months)



$$\frac{1250}{1.005^5} + \frac{1000}{1.005^2} = \underline{2209.29}$$

b) $i_1 = 1\%$

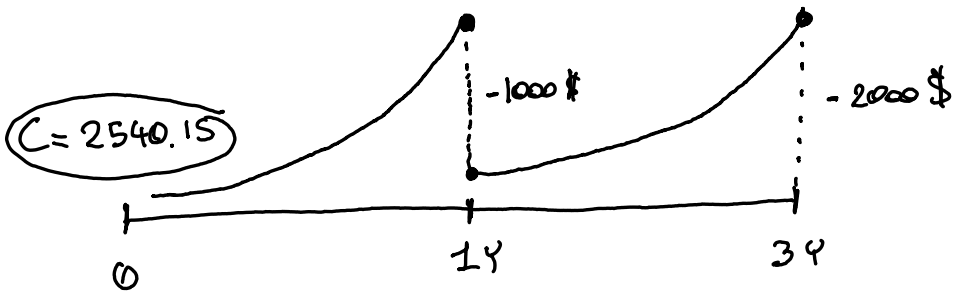
$$\frac{1250}{1.01^{5/4}} + \frac{1000}{1.01^{0.5}} = \underline{2229.58}$$

EXERCISE 31

$C = ?$ 1ST YEAR = 1000 $ 3RD YEAR = 2000 $

$i_1 = 7.5\%$

$$C = \frac{1000}{1.075^1} + \frac{2000}{1.075^3} = 2540,15\ \$$$



$$\left[2540.15 \cdot (1.075)^1 - 1000\right] \cdot (1 + 0.075)^3 - 2000 = 0$$

EXERCISE 32

$C = 500\$ \rightarrow C' = 4000\$$ IN 30 YEARS

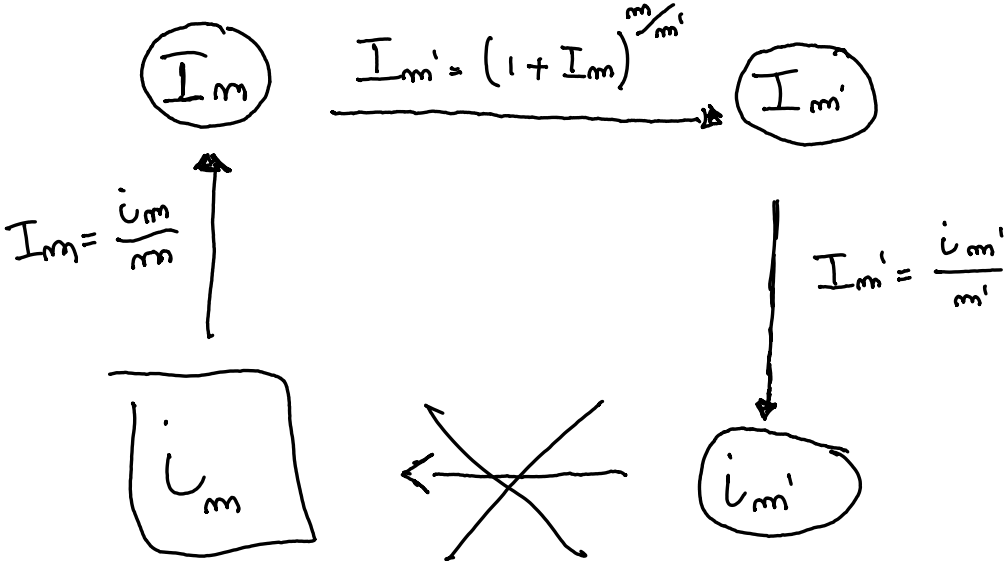
? FIND PV OF 3 10.000$ IN 20, 40, 60 years

$$4000 = 500 \cdot (1+i)^{30}$$

$$8^{1/30} = (1+i) \rightarrow i = 0.0717$$

SO,

$$C = \frac{10.000}{1.0717^{60}} + \frac{10000}{1.0717^{40}} + \frac{10000}{1.0717^{20}} = \underline{3287.04}$$



EXERCISE 37

a)

$i_4 = 8\%$ → $I_4 = \frac{i_4}{4}$ → $I_4 = \frac{0.08}{4}$ → 0.02

$I_1 = ?$

$I_1 = (1 + 0.02)^4 - 1 = \underline{0.08243}$

b) $i_2 = ?$ $I_1 = 0.08$

$I_2 = (1 + I_1)^{1/2} - 1 = (1 + 0.08)^{1/2} - 1 =$ 0.03923

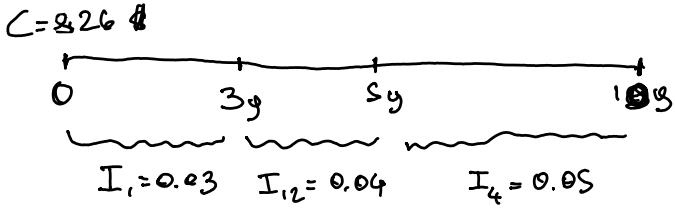
$i_2 = 2 \cdot 0{,}03923$ → 0.07846

c) $i_2 = 0.08$ $i_4 = ?$ → $I_2 = \frac{i_2}{2} = 0.04$

$I_4 = (1 + 0{,}04)^{1/2} - 1$ → 0.019803

$\underline{i_4 = 0.0792136}$

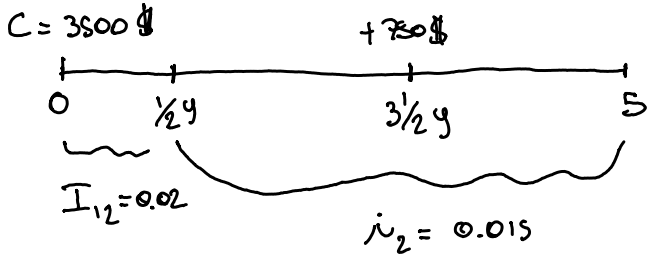
EXERCISE 45



$$C' = 826 \cdot (1+0.03)^3 \cdot (1+0.04)^{24} \cdot (1+0.05)^{20}$$

↳ 6138,72 $

EXAMPLE 46

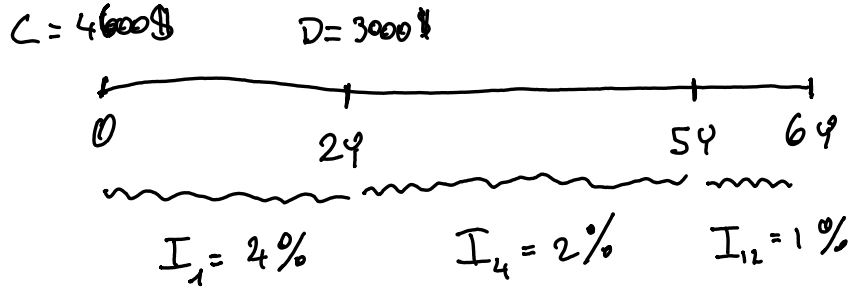


$$I_2 = \frac{0.015}{2} = 0.0075$$

$$AV = 3500 \cdot (1+0.02)^6 \cdot (1+0.0075)^8 + 750 \cdot (1+0.0075)^3$$

↳ 4382.74 $

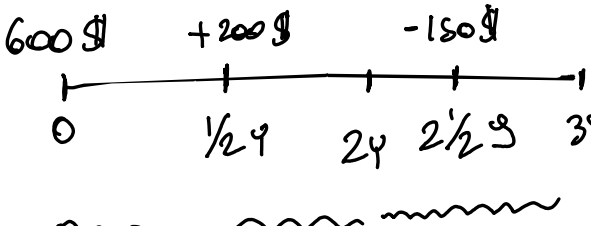
EXERCISE 47



$$C' = \left[4600 \cdot (1.04)^2 + 3000\right] \cdot (1.02)^{12} \cdot (1.01)^{12}$$

$$\hookrightarrow 11397.48\ \$$$

QUESTION 9



$I_2 = 1\%$ $\quad i_{12} = 0.5\%$

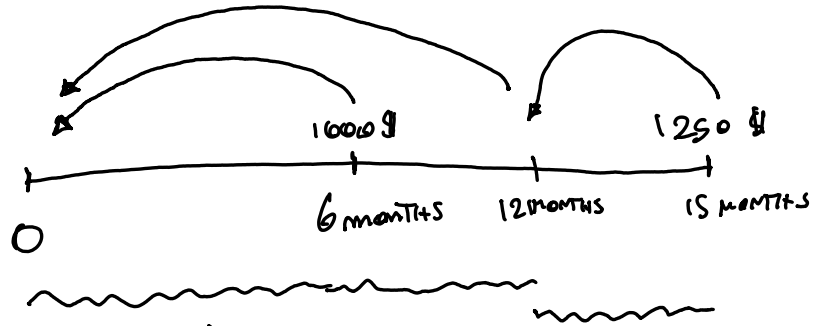
$$I_{12} = \frac{0.005}{12} = 0.000416\overline{6}$$

$$C' = 600.(1+0.01)^4.(1+0.000416)^{12} + 200.(1+0.01)^3.(1+0.0004166)^{12} - 150(1+0.000416)^6$$

$$\hookrightarrow \boxed{684.2\ \$}$$

QUESTION 10

b)



$i_4 = 0.01$

$I_1 = 0.03$

$\downarrow$

$I_4 = 0.0025$

$$PV = 1000 \cdot (1.01)^{-2} + 1250 \cdot (1.03)^{-1/4} \cdot (1.0.0025)^{-4}$$

$\hookrightarrow$ 223,48 $

EXERCISE 50

$$(1+i)^3 = (1{,}08)^1 \cdot (1{,}07)^1 \cdot (1{,}06)^1$$

$$(1+i)^3 = 1{,}08 \cdot 1{,}07 \cdot 1{,}06$$

$$\hookrightarrow \underline{i = 0{,}06996}$$

EXERCISE 53

$$C = 2560 \cdot \left(1 - 0{,}03 \cdot \frac{7}{12}\right)$$

$$\underline{C = 2518{,}2}$$

EXERCISE 54

$$C' = \frac{1000}{1 - 0{,}05 \cdot \frac{5}{12}} = \underline{1008{,}4}$$

EXERCISE 55

$$725 = 775 \cdot \left(1 - d \cdot \frac{1}{4}\right)$$

$$725 = 775 - 193{,}75\, d \qquad \boxed{d = 0.26}$$

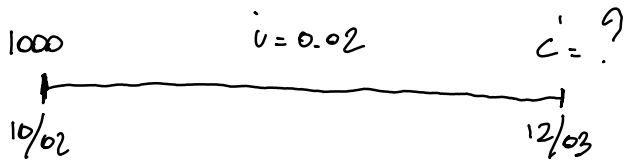
EXERCISES 59

$$C = 1040 \cdot \left(1.025 \cdot \frac{1}{2}\right) + 1560 \cdot \left(1.015 \cdot \frac{3}{4}\right) - 0.002 \cdot 2600$$

$$\hookrightarrow 2569,45\ \$$$

PRACTICE TEST

(1)



OCTOB. = 31
NOVEM = 30
DECEM = 3

a) • IF $\frac{30}{360} \rightarrow t = \frac{61}{360}$

↳ $C' = 1000\left(1 + 0.02 \cdot \frac{61}{360}\right)$

↳ $C' = 1003.38\overline{8}$

• IF $\frac{ACT}{ACT} \rightarrow t = \frac{62}{365}$

↳ $C' = 1000 \cdot \left(1 + 0.02 \cdot \frac{62}{365}\right) \rightarrow C' = 1003.397$

• IF $\frac{ACT}{360} \rightarrow t = \frac{62}{360}$

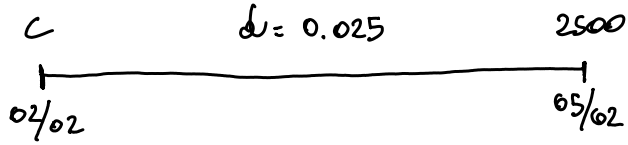
↳ $C' = 1000 \cdot \left(1 + 0.02 \cdot \frac{62}{360}\right) \rightarrow C' = 1003.\overline{44}$

• IF $\frac{ACT}{365}$ = IF $\frac{ACT}{ACT}$ = $C' = 1003.397$

b) $1.005 = 1000\left(1 + i \cdot \frac{62}{365}\right)$

$i = 0.02943$

(2)



$$\frac{ACT}{360} \rightarrow \frac{27+31+30+2}{360} = \frac{90}{360} = \frac{1}{4}$$

a) $C = 2500\left(1 - 0.025 \cdot \frac{1}{4}\right)$

↳ $\underline{C = 2484.375}$

b) $DT = 2500 - 2484.375 = \underline{15,625}$

$D(T,T') = 15,625 / 2500 = \underline{0.00625}$

$d(T,T') = 0.00625 / t = \underline{0.025}$

c) $i = \frac{d}{1-d \cdot t} = \frac{0.025}{1-0.00625} = \underline{i = 0.025157}$

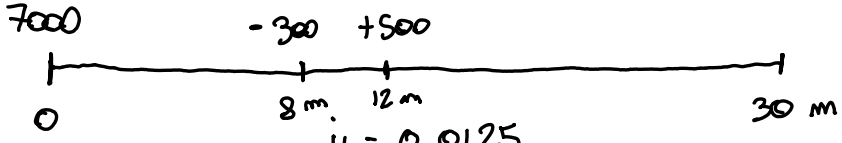
d) $C = 2500 \cdot \left(1 - 0.025 \cdot \frac{1}{4}\right) - 2500 \cdot 0.005$

↳ $\underline{C = 2471.875}$

$2500 = 2471.875\left(1 + i \cdot \frac{1}{4}\right)$

↳ $\underline{i = 0.04551}$

(3)



$U = 0.0125$

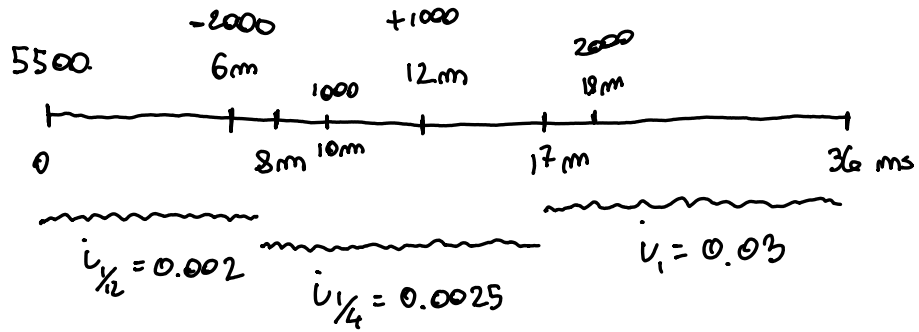
$\parallel$

$I = 0.001$

$$C' = 7000 \cdot (1.001)^{30} - 300 \cdot (1.001)^{22} + 500 \cdot (1.001)^{18}$$

↳ $\underline{C' = 7415.48}$

④



a)

① $C' = 5500(1.002)^8 \cdot (1.0025)^3 \cdot (1.03)^{19/12}$

↳ $C' = 5800.42$

② $5800.42 = 5500(1+i)^3$

↳ $i = 0.0237$

b)

① $C' = 5500(1.002)^8 \cdot (1.0025)^3 \cdot (1.03)^{19/12} -$
$2000(1.002)^2 \cdot (1.0025)^3 \cdot (1.03)^{13/12} +$
$1000(1.0025)^{5/3} \cdot (1.03)^{19/12}$

② $c' = c(1+i)^3$

c)

$$\frac{2000}{(1.03)^{1/12} \cdot (1.0025)^3 \cdot (1.002)^8} + \frac{1000}{(1.0025)^{2/3} \cdot (1.002)^8} -$$

(5)

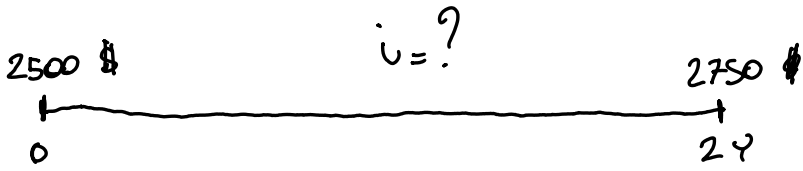
2) $i_{1/6}$?

$$17980 = 9800(1+i)^3 + 3300(1+i)^2 + 4500(1+i)^{1/3}$$

ON

SPARE TIME PRACTICE

(1)



$$2750 = 2500\,(1 + i \cdot 2)$$

$$\hookrightarrow \underline{i = 0.05}$$

INTEREST $= 2750 - 2500 =$ **250**

$I = 250 / 2500 =$ **0.1**

$i =$ **0.05**

(2)

$$C' = 3500\,(1 + 0.02 \cdot 3)$$

$$\hookrightarrow C' = 3710$$

(3)

$$2265 = 2200\,(1 + i \cdot 5)$$

$$\hookrightarrow i = 0.0053$$

④ $1620 = 1500\left(1 + 0.06 \cdot t\right)$

↳ $t = 1.\overline{33}$ → 1 YEAR AND 4 MONTHS

⑤ $220 = 200\left(1 + i \cdot 3\tfrac{1}{2}\right)$

↳ $i = 0.028$

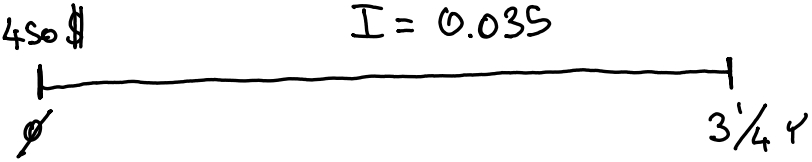
⑥ $C + 50 = C\left(1 + 0.04 \cdot 6\right)$

$50 = 0.24\,C \rightarrow C = 208.\overline{33}$

⑦ $2C = C\left(1 + 0.0425 \cdot t\right)$

$2 = 1 + 0.0425t \rightarrow t = 23.52$

(11)



$C' = 450\,(1 + 0.035 \cdot 13/4)$

$\hookrightarrow C' = 501,18$

INTEREST → $501,18 - 450 = \boxed{51.18}$

I → $51,18 / 450 = \boxed{0.11371}$

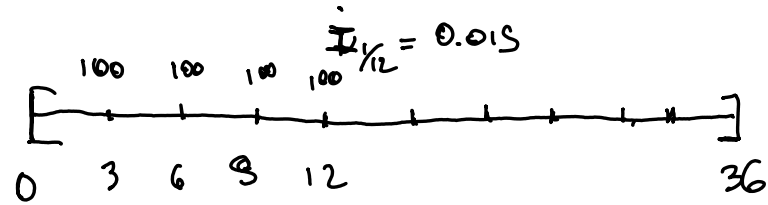
i → 0.035

ANNUITY → SAME CONCEPT OF RENTS ⚠

- TEMPORAL ANNUITY :
  - ↳ THERE'S A DEADLINE.
- PERPETUITY :
  - ↳ ENDLESS
- CONSTANT ANNUITY :
  - ↳ TERMS ARE EQUAL
- NON-LEVEL ANNUITY :
  - ↳ TERMS ARE NOT EQUAL
- IMMEDIATE :
  - ↳ AT THE BEGINNING
- DUE :
  - ↳ AT THE END

$$V_0 = C \cdot \frac{1-(1+I)^{-h}}{I}$$

EXERCISE 71

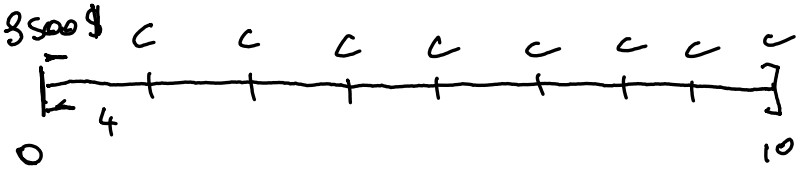


$I_{1/4} = 0.045$

$$V_0 = 100 \cdot \frac{1-(1+0.045)^{-12}}{0.045}$$

↳ 911.86 $

EXERCISE 8



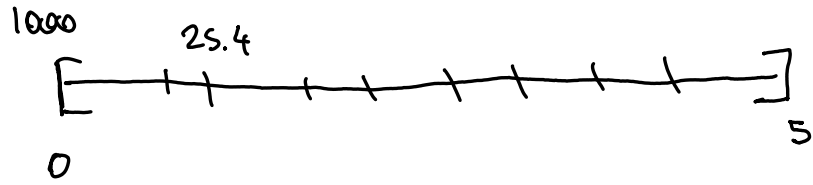
$I_{1/4} = 0.025$

↳ $I_1 = (1+0.025)^4 - 1$

↳ 0.1038

$$8500 = C \frac{1-(1+I)^{-10}}{I}$$

EXERCISE 9



$I_{12} = ?$

$$1000 = 25.4 \cdot \frac{1 - (1 + I_{12})^{-60}}{I_{12}}$$

$$\hookrightarrow I_{12} = 0.015$$

EXERCISE 10

NEED IN MIND THAT THE PRICE OF THE CAR IS $P_{CAR} = DP + V_0$

EXERCISE 12.1

$i_{12} = 0.18$

$\downarrow$

0.015

$P_{CAPL} = DP + V_0$

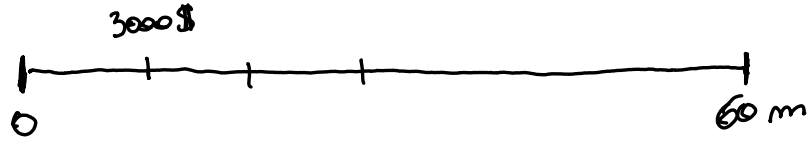
$10000 = DP + (V_0)$

$L \rightarrow 250 \cdot \frac{1-(1.015)^{-48}}{0.015}$

$V_0 = 8510.64$ ✓

$DP = 1489.36$ ✓

EXERCISE 15



a) $I_1 = 0.03$

$\hookrightarrow I_{12} = (1 + 0.03)^{1/12} - 1$

$\hookrightarrow I_{12} = 0.002466$

$V_0 = 167.127'44$

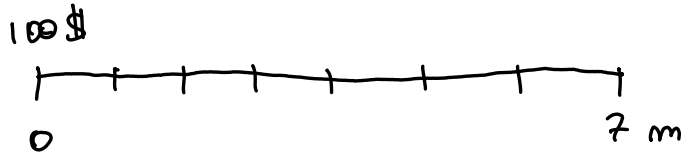
b) $i_{12} = 0.03 \rightarrow I_{12} = 0.0025$

$V_0 = 166957'02$

a.) $V_f = 167127'44 \left(1 + 0.002466\right)^{60}$

b.) $V_f = 166957'07 \left(1 + 0.0025\right)^{60}$

PROBLEM 1



$i_{12} = 0.12$

↳ $I_{12} = 0.01$

→ PV

↳ $100 \cdot \dfrac{1 - (1+0.01)^{-7}}{0.01} \cdot (1+0.01)$

↳ 679.55 $

→ AV

↳ $679.55 \cdot (1.01)^{7}$

↳ 728.57 $

EXERCISE 24

$I_{\cdot} = 0.08 \qquad C = 1000$

$$\therefore V_3 = \left(1000 \cdot \frac{1-(1+0.08)^{-25}}{0.08}\right) \cdot (1.08) \cdot (1.08)^{25}$$

$$\hookrightarrow 78.954'41 \ \$$$

EXERCISE 25

$$78\,954'4 = C \cdot \frac{1-(1+0.08)^{-15}}{0.08}$$

$$\hookrightarrow C = 9224'2 \ \$$$

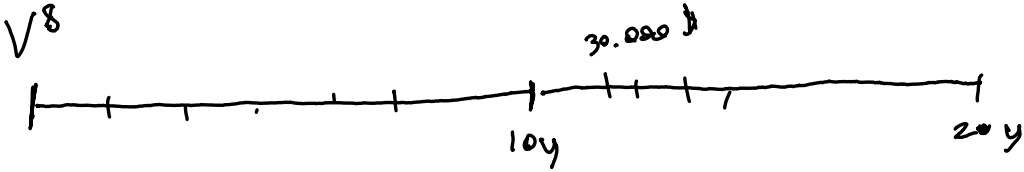
REFERRED ANNUITY

$$V_0^{\circ U} = \boxed{V_0} \cdot (1+I)^{-oU}$$

$$\downarrow$$

$$C \cdot \frac{1-(1+I)^{-n}}{I}$$

- QUESTION 7



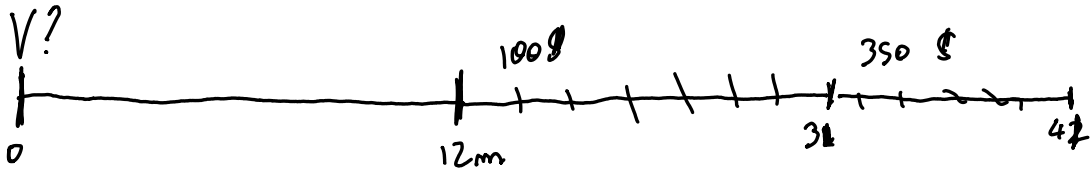
$i = 0.03$

↳ $0.03/12 = 0.0025$ → $(1+0.0025)^{12} - 1 =$ 0.03041

$$V^8 = 25000 \cdot \frac{1-(1+0.03041)^{-10}}{0.03041} +$$

$$30000 \cdot \frac{1-(1+0.03041)^{-10}}{0.03041} \cdot (1+0.03041) \cdot (1+0.03041)^{-9}$$

• QUESTION 8



t = 3½ years

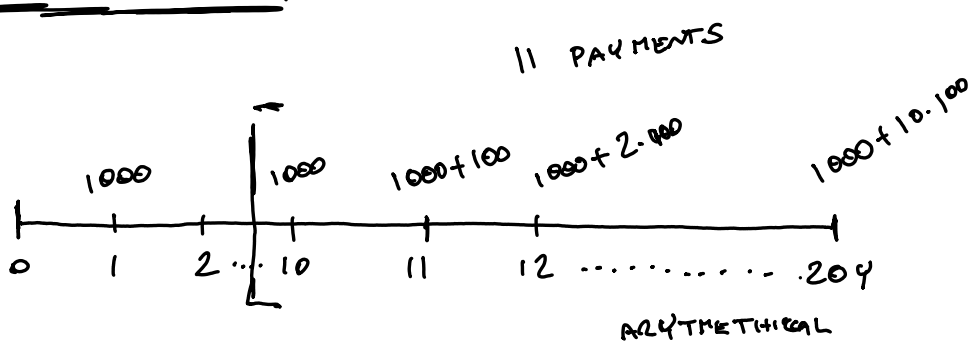
$I_1 = 0.03$

↳ $I_{12} = (1+I)^{1/2} - 1$

↳ 0.002466

$$V^{(d)} = 100 \cdot \frac{1-(1+I_{12})^{-20}}{I_{12}} \cdot (1+I_{12})^{-11} + 350 \cdot \frac{1-(1+I_{12})^{-10}}{I_{12}} \cdot (1+I_{12})^{-31}$$

EXAMPLE 53



$I_1 = 0.03$

- **A1**

$$V_0 = 1000 \cdot \frac{1-(1+0.03)^{-9}}{0.03}$$

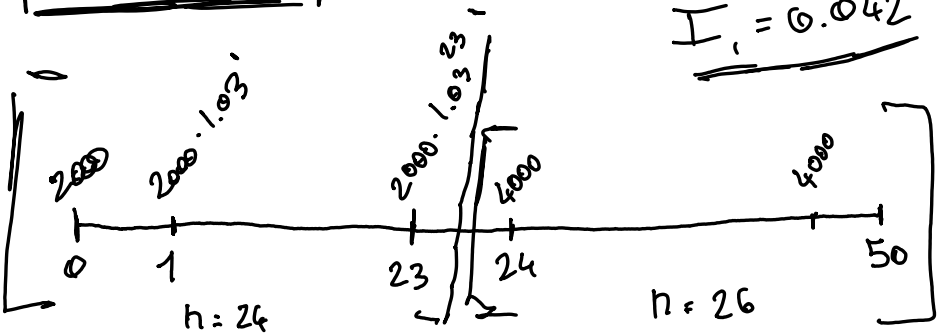
- **A2** $C_1 = 1000 \quad H = 100 \quad n = 11$

$$V_0 = \left[\left(1000 + 11 \cdot 100 + \frac{100}{0.03}\right) \cdot \frac{1-(1+0.03)^{-11}}{0.03} - \frac{11 \cdot 100}{0.03}\right] \cdot (1+0.03)^{-9}$$

- ADD $\overline{A1} + \overline{A2}$

EXAMPLE 50

$I_1 = 0.042$



GEOMETRICAL

- A1

$$V_0 = \left[\frac{2000 \cdot \left[1 - (1+0.042)^{-24} \right] \cdot 1.03^{24}}{1 + 0.042 - 1.03} \right] \cdot (1+0.042)$$

- A2

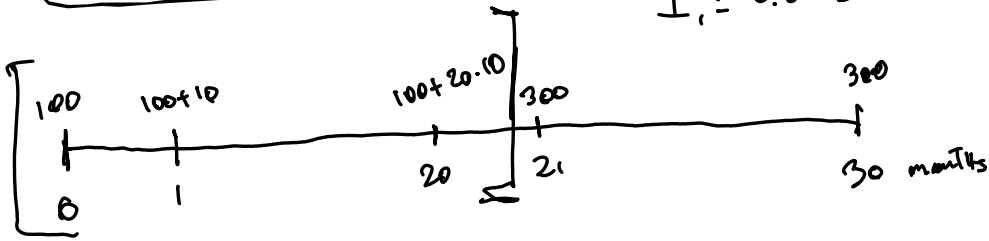
$$V_0 = 4000 \cdot \frac{1 - (1+0.042)^{-26}}{0.042} \cdot (1+0.042)^{-23}$$

- ADD UP (A1 AND A2) $= \ddot{V}_0$

- CAPITALIZE $\rightarrow \ddot{V}_0 \cdot (1+0.042)^{50}$

QUESTION 12

$I_1 = 0.025$



$n = 21 \quad H = 10 \quad C = 100$

$$I_{12} = (1 + 0.025)^{1/12} - 1$$

$$\hookrightarrow 0.002059$$

(A)

A1

$$V_0 = \left[\left(100 + \frac{10}{I_{12}} + 10 \cdot 21 \right) \cdot \frac{1 - (1 + I_{12})^{-21}}{I_{12}} - \frac{10 \cdot 21}{I_{12}} \right] \cdot \left(\frac{1}{} + I_{12} \right)$$

A2

$$V_0 = 300 \cdot \frac{1 - (1 + I_{12})^{-10}}{I_{12}} \cdot (1 + I_{12})^{-20}$$

(B)

- A1

$$V_0 = \left(\left[100 + \frac{10}{0.004} + 10.21 \right] \cdot \frac{1 - (1+0.004)^{-21}}{0.004} - \frac{10 \cdot 21}{0.004} \right) \cdot (1+0.004)$$

- A2

$$V_0 = 300 \cdot \frac{1 - (1+0.005)^{-10}}{0.005} \cdot (1+0.004)^{-20}$$

- ADD A1 AND A2

- $$\frac{\ddot{V}_0 \cdot (1+0.004)^{20} \cdot (1+0.005)^{10}}{}$$

YOU WILL FIND THE ACCUMULATED VALUE.

PERPETUITY

ANNUITY WITH AN INFINITE TERM.

- CONSTANT ANNUITY $= \frac{C}{I_m}$
- GEOMETRIC PROGRESSION $= \frac{C}{1 + I_m - g}$
- ARITHMETIC PROGRESSION $= \left(C + \frac{H}{I_m}\right) \cdot \frac{1}{I_m}$

EXAMPLE 41

$$V = 10 \cdot \frac{1-(1+0.06)^{-\infty}}{0.06} = 166.66\ \$$$

EXAMPLE 42

$I_{12} = 0.015$

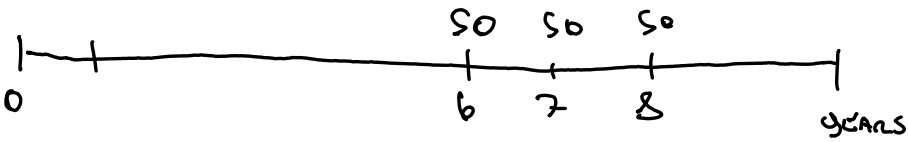
$\rightarrow I_1 = (1+0.015)^{12} - 1 = 0.195618$

$$V_0^{\infty} = \frac{C}{I_1} \cdot (1+I_1) = 226.13\ \$$$

EXAMPLE 43

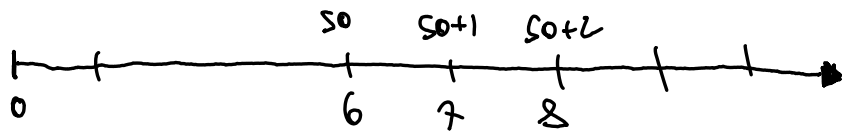
$I_1 = 0.1$

(a)



$$V_0^{\infty} = \frac{C}{I_1} \cdot (1 + I_1)^{-5}$$

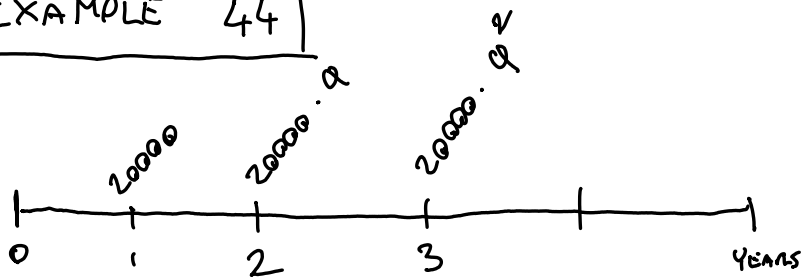
(b)



$C = 50 \qquad H = 1$

$$V_0^{\infty} = \left[\left(50 + \frac{1}{0.1} \right) \cdot \frac{1}{0.1} \right] \cdot (1 + 0.1)^{-5}$$

EXAMPLE 44

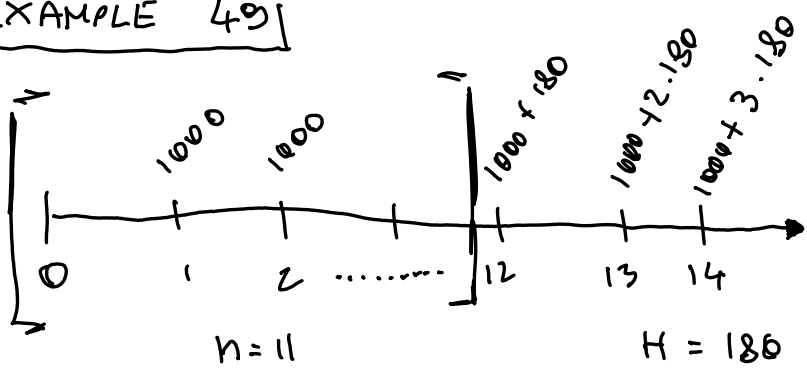


$$I_4 = 0.01 \rightarrow I_1 = (1 + 0.01)^4 - 1 = \boxed{0.04060401}$$

$$q = \boxed{1.03}$$

$$V_0^{(d)} = 20000 \cdot \frac{1}{1 + I_1 - 1.03}$$

EXAMPLE 49



A1

$$V_0^{\infty} = 1000 \cdot \frac{1-(1+I_1)^{-11}}{I_1}$$

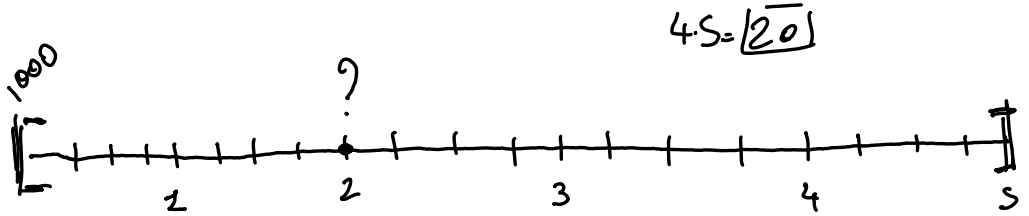
A2

$$V_0^{\infty} = \left[\left(1180 + \frac{180}{I_1}\right) \cdot \frac{1}{I_1}\right] \cdot (1+I_1)^{-11}$$

OUTSTANDING LOAN BALANCE

CHECK ON SLIDES

EXERCISE



$i_4 : 0.06 \rightarrow \boxed{I_4 = 0.015}$

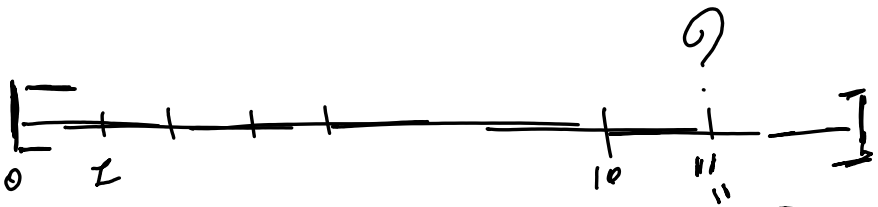
$$1000 = \boxed{a} \cdot \frac{1 - (1 + I_4)^{-20}}{I_4}$$

$$\boxed{58.24\ \$}$$

$$OLB_8 = 58.24 \cdot \frac{1 - (1 + I_4)^{-(20-8)}}{I_4}$$

$$\boxed{635.25\ \$}$$

EXERCISE 2

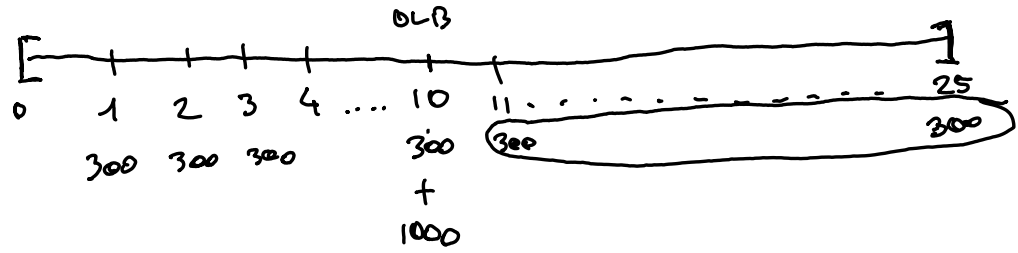


$I_1 = 0.03$

$$Y_{1n} = OLB \cdot I_{nn}$$

$$Y_{11} = OLB \cdot I_1 = 1000 \cdot 0.03 = 30\ \$$$

EXTRA REPAYMENTS



$I_1 = 0.08$

(1)

$$OLB = 300 \cdot \frac{1-(1+0.03)^{-(25-10)}}{0.03}$$

↳ 2567.84 $

(2) $(OLB - X = C')$

$2567.84 - 1000 = \boxed{1567.84\ \$}$

(3)

$$1567.84 = \boxed{a} \cdot \frac{1-(1+0.03)^{-15}}{0.03}$$

↳ $a = \boxed{233.66\ \$}$

EXERCISE

$I_1 = 0.07$

① $$OLB = 400 \cdot \frac{1-(1+0.07)^{-(20-4)}}{0.07}$$

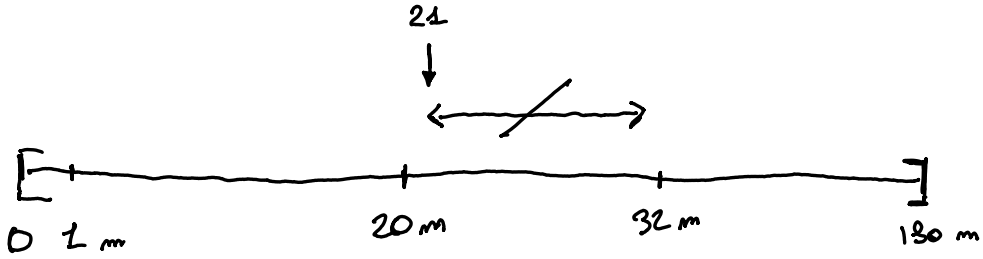
↳ 3778.66 $

② $3778.66 - 200 =$ **3578.66 $**

③ $$3578.66 = X \cdot \frac{1-(1+0.07)^{-10}}{0.07}$$

↳ 495 $

EXERCISE 46



$C = 2000\ \$$

$i_1 = 0.06 \rightarrow I_1 = \frac{0.06}{12} = 0.005$

$I_{12} = (1 + 0.005)^{1/12} - 1 = 0.000416$

1

$$2000 \cdot \frac{1 - (1 + I_{12})^{-160}}{I_{12}} = 221951.53\ \$$$

2

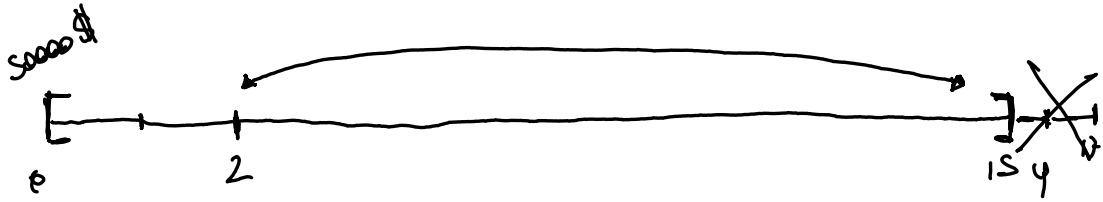
$$221951.53 \cdot (1 + I_{12}) = 235268.30\ \$$$

3

$$235268.30 = (X) \cdot \frac{1 - (1 + I_{12})^{-148}}{I_{12}}$$

$$\rightarrow \boxed{2234.10\ \$}$$

EXERCISE 48



$I_1 = 0.03$

$$50000 = X \cdot \frac{1-(1+I_1)^{-14}}{I_1} \cdot (1+I_1)^{-1}$$

EXERCISE 50

- $Y = 50000 \cdot 0.03 = 1500\ \$$
- $50000 = (X) \cdot \frac{1-(1+I_1)^{-15}}{I_1}$

  ↳ $4188.32\ \$$

PROBLEM SET UNIT 4

Q.2

$I_4 = 0.01$

$$= 2500 \cdot (1 + 0.01)^{20}$$

$$= C' = 3050.47\ \$$$

- $AF = 0.5\% \times 2500 = 12.5\ \$$
- $ME = 400\ \$$

$$2500 = 12.5 + 400 + 3050.47 (1 + I_1)^{-5}$$

$$TAE = I_1 = \boxed{0.07381}$$

Q.5

(a)

$i_4 = 0.015$

$\hookrightarrow I_4 = 0.00375$

$$\boxed{\Sigma y} = 138000 \cdot 0.00375 = 517.5 \ \$$$

(b)

$$138000 = 517.5 \cdot \frac{1-(1+I_4)^{-12}}{I_4} + 138000 \cdot (1+I_4)^{-12}$$

(c)

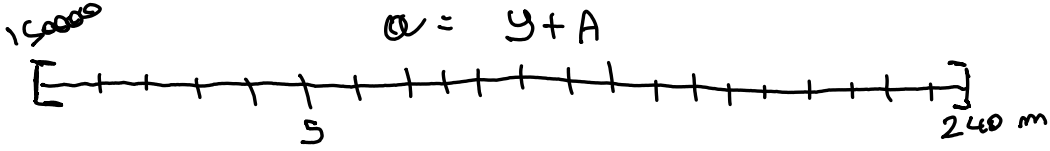
$AF = 0.25\% \cdot 138000\$ = 345 \ \$$

$ME = 400 \ \$$

TOTAL ARRANG. EXP. → ALWAYS AN ANNUAL EFFECTIVE INTEREST RATE

$$138000 = 345 + 400 + 517.5 \cdot \frac{1-(1+I_4)^{-12}}{I_4} + 138000 \cdot (1+I_4)^{-12}$$

Q3



$I_1 = 0.048$

↳ $I_{12} = (1 + 0.048)^{\frac{1}{12}} = \boxed{0.003814}$

(a) $150000 = a \cdot \dfrac{1 - (1 + I_{12})^{-240}}{I_{12}}$

↳ 965,04 $

(b) $OLB^{PAID} = 965,04 \cdot \dfrac{1 - (1 + I_{12})^{-235}}{I_{12}}$

↳ 143035,9 $

$OLB^{RESTO} = 150000 \cdot (1 + I_{12})^{5} - 965,04 \cdot \dfrac{1 - (1 + I_{12})^{-5}}{I_{12}} \cdot (1 + I_{12})^{5}$

$OLB_{5^-} = 143035,9 + 965,04 = 144060,94$ $

(c)

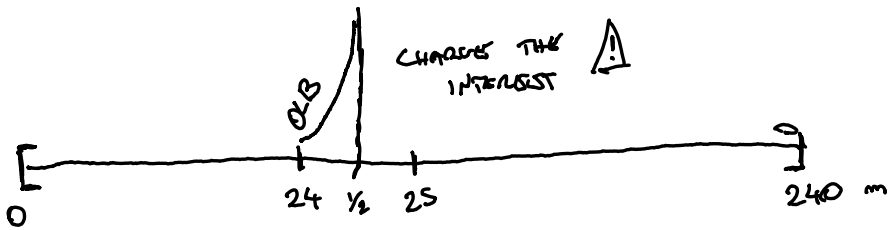
$$A_6 + y_6 = 965,04\ \$$$

$$y_t = OLB_{n-1} \cdot I_n$$

$$y_6 = 148095,9 \cdot I_{12} = 579,64\ \$$$

$$A_6 = 385,39\ \$$$

(d)



$$OLB_{24} = 965,04 \cdot \frac{1-(1+I_{12})^{-216}}{I_{12}} = 140511,27\ \$$$

$$140511,27\ (1+I_{12})^{0.5} = 140786,08\ \$$$

(8)

$AF = 0.01 \cdot 150000 = 1500\ \$$

$ME = 150\ \$$

$$150000 = 1500 + 150 + 965{,}04 \cdot \frac{1-(1+I_{12})^{-240}}{I_{12}}$$

$$TAE = (1+I_{12})^{12} - 1$$

(8)

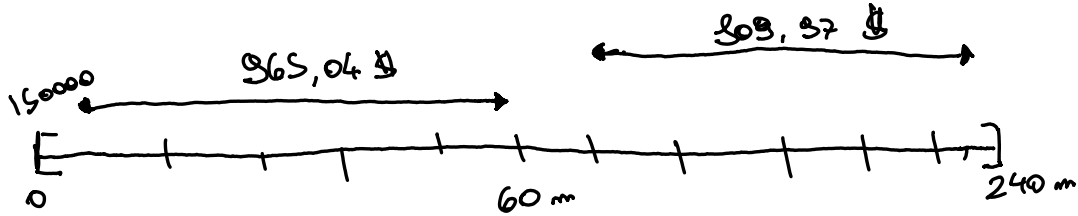
$$OLB = 965{,}04 \cdot \frac{1-(1+I_{12})^{-180}}{I_{12}} = 124501{,}16\ \$$$

$124501{,}16 - 20000 = 104501{,}16\ \$$

$$104501{,}16 = (a) \cdot \frac{1-(1+I_{12})^{-180}}{I_{12}}$$

$\rightarrow 809{,}87\ \$$

BEIR



AF = 1500

MF = 150

a
+
20000$

$$150000 = 1500 + 150 + 965{,}04 \cdot \frac{1-(1+I_{12})^{-60}}{I_{12}} + 20000\,(1+I_{12})^{-60} + 809{,}97 \cdot \frac{1-(1+I_{12})^{-180}}{I_{12}} \cdot (1+I_{12})^{-60}$$

BEIR

TOTAL COST BUT IT'S NOT AN ANNUAL INTEREST RATE.

BONDS

13)

$N = 10000\,\$$ $\quad t = 20\,y$ $\quad C_p = 400\,\$$

$P = ?$ $\quad$ YIELD $= 6\%$ $\quad C_{RATE} = ?$

$$YIELD_2 = (1 + 0.06)^{1/2} - 1 = \boxed{0.02956}$$

$$P = 400 \cdot \frac{1 - (1 + I_2)^{-40}}{I_2} + 10000 \cdot (1 + I_2)^{-40} = 12429,62\,\$$$

$$C_{RATE} = \frac{400}{10000} = \boxed{0.04}$$

5

PAR = 1000 $ $t = 20$ RED = 1050 $

YIELD = 8.25% $C = 75\$ \rightarrow 3\%$

$$P = 75 \cdot \frac{1 - 1.03^{20} \cdot (1 + I_1^*)^{-20}}{1 + I_1^* - 1.03} + 1050 \cdot (1 + I_1^*)^{-20}$$

$\rightarrow$ **1115.11 $**

6

PAR = 1000 $ $i_2 = 0.09 \rightarrow I_2 = \frac{i_2}{2} = 0.045$

RED = 1125 $ YIELD = 0.05

COUPON = $1000 \cdot 0.045 = 45\$$

$$P = 45 \cdot \frac{1 - (1 + 0.05)^{-n}}{0.05} + \boxed{1125 \cdot (1 + 0.05)^{-n}}$$

$\downarrow$ 214,14

BY SOLVING IT, I GET $n = 34$

$\rightarrow$ **942,82 $**

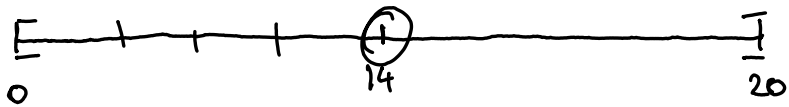
BOOK VALUE

TOTAL OUTSTANDING FUTURE PAYMENTS.

13

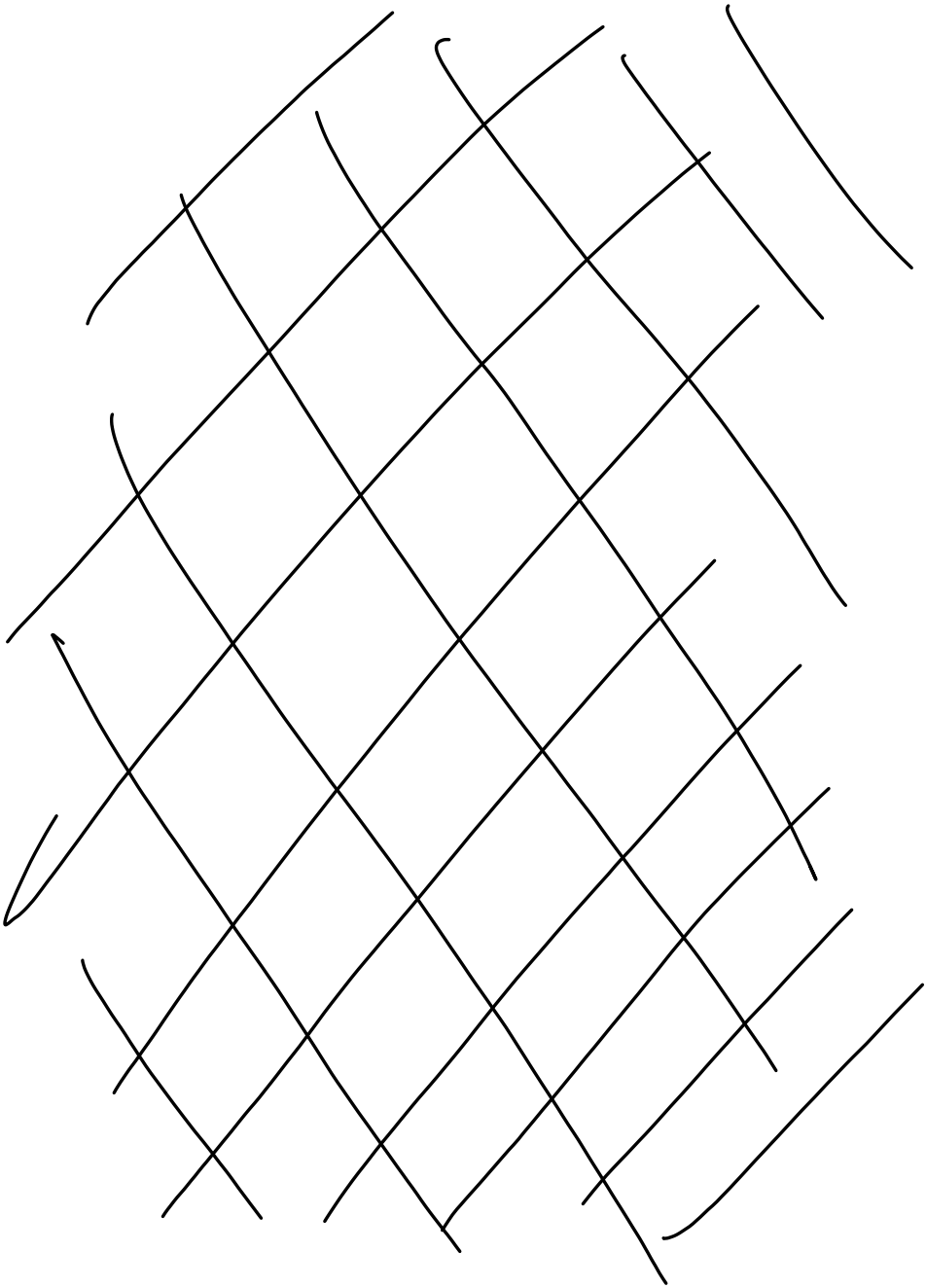
PAR = 1000 $ $t = 10y$ $C_{RATE} = 0.025$

YIELD = 0.06 $c = 2S$



$$B_{14} = 25 \cdot \frac{1-(1+0.06)^{-6}}{0.06} + 1000 \cdot (1+0.06)^{-6}$$

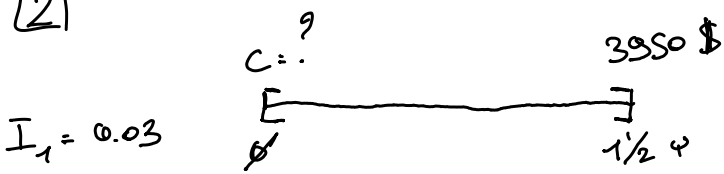
$$\rightarrow \boxed{827,33\ \$}$$



FINAL EXAM BOOT-CAMP

$$\boxed{\alpha = A + Y}$$

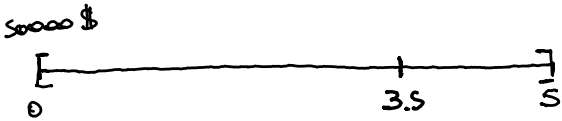
[2]



$$3950 = \boxed{C} \cdot (1 + 0.03)^{3/2}$$

$$\hookrightarrow \boxed{3778.7\ \$}$$

[7]



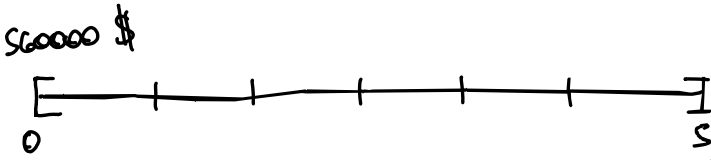
$i_4 = 0.01 \rightarrow I_4 = 0.0025 \rightarrow I_2 = (1 + 0.0025)^2 - 1$

$\hookrightarrow 0.005006$

- $C' = 50000 \cdot (1 + 0.005006)^{10} = \boxed{52560.27\ \$}$

- $OLB^{PRO} = 52560.27 \cdot (1 + 0.005006)^{-3} = 51778.69\ \$$

10



$i_{12} = 0.06 \rightarrow I_{12} = 0.005 \rightarrow I_4 = (1+0.005)^3 - 1$

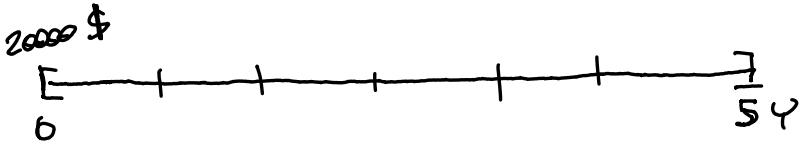
$\hookrightarrow 0.015075$

$Y = 8442.07$

LAST PAYMENT

$560000 + 8442.07 = \underline{568442.07\ \$}$

20



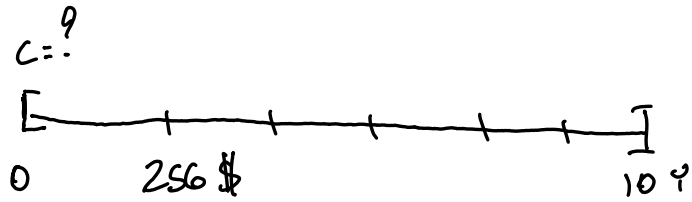
$I_1 = 0.048 \rightarrow I_4 = (1+0.048)^{1/4} - 1$

$\hookrightarrow 0.011739$

$$20000 = (a) \cdot \frac{1-(1+I_4)^{-20}}{I_4}$$

$\hookrightarrow 1128.37\ \$$

21



$I_1 = 0.05$

$$256 \cdot \frac{1-(1+0.05)^{-10}}{0.05} = 1976.76\ \$$$

23

- 15 YEARS → $150000 = (a) \cdot \frac{1-(1+0.00083)^{-180}}{0.00083}$

  ↳ 838.03 $

- 20 YEARS → $150000 = (a) \cdot \frac{1-(1+0.000625)^{-240}}{0.000625}$

  ↳ 673.24 $

25

$I_1 = 0.05 \rightarrow I_{12} = (1+0.05)^{\frac{1}{12}} - 1$

$\hookrightarrow 0.004074$

- $200000 = a \cdot \dfrac{1-(1+0.004074)^{-120}}{0.004074}$

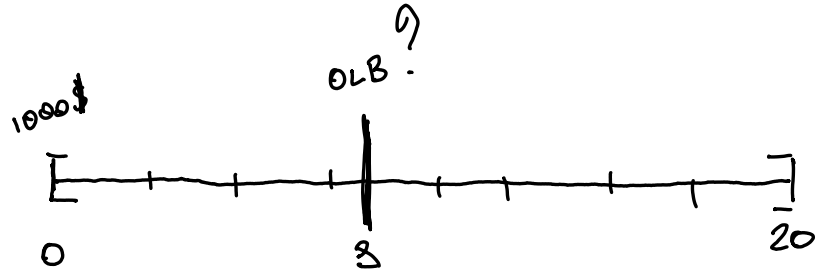
$\hookrightarrow$ **2110.45 $**

- $200000 \cdot (1+I_{12}) - 2110.45 =$ **183704.35 $**

- $2110.45 \cdot \dfrac{1-(1+0.004074)^{-110}}{0.004074} = 186802.76\ \$$

$\hookrightarrow 186802.76 + 2110.45 =$ **188913.21 $**

26)



$$i_4 = 0.06 \rightarrow I_4 = \frac{0.06}{4} = \boxed{0.015}$$

- $$1000 = (a) \cdot \frac{1-(1+0.015)^{-20}}{0.015}$$

$$\rightarrow \underline{58.24\ \$}$$

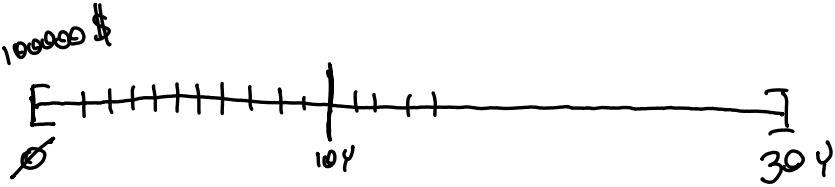
$$OLB^{PDE} = 58.24 \cdot \frac{1-(1+0.015)^{-12}}{0.015}$$

$$\rightarrow 635.25\ \$$$

$$OLB^{RETRO} = 1000 \cdot (1+0.015)^{8} - 58.24 \cdot \frac{1-(1+0.015)^{-8}}{0.015} \cdot (1+0.015)^{8}$$

$$\rightarrow 635.25\ \$$$

27



$i_{12} = 0.08 \rightarrow I_{12} = \frac{0.08}{12} = \boxed{0.00666}$

$$100000 = (a) \cdot \frac{1-(1+0.00666)^{-360}}{0.00666}$$

$$\boxed{733.21\ \$}$$

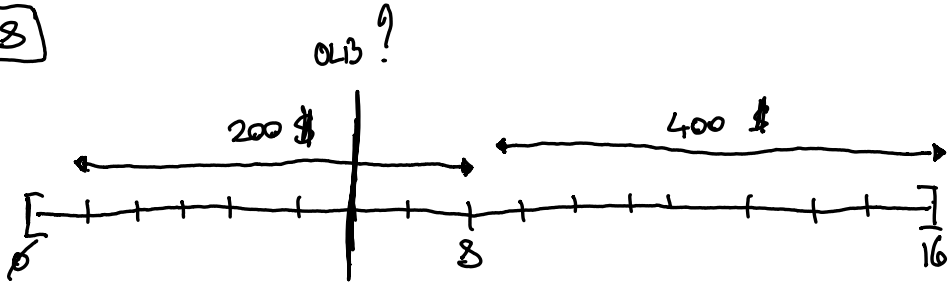
$$OLB^{Pro} = 733.21 \cdot \frac{1-(1+0.00666)^{-240}}{0.00666}$$

$$87710.66\ \$$$

$$OLB^{Retro} = 100000\,(1+0.00666)^{120} - 733.21 \cdot \frac{1-(1+0.00666)^{-120}}{0.00666} \cdot (1.00666)^{120}$$

$$221737.7 - 134073.01 = 87710\ \$$$

28



$i_4 = 0.1 \rightarrow I_4 = 0.025$

$$C = 400 \cdot \frac{1-(1+0.025)^{-16}}{0.025} - 200 \cdot \frac{1-(1+0.025)^{-8}}{0.025}$$

$\hookrightarrow$ 5222 $ - 1434.027 $ = **3787.97 $**

$$OLB^{PDO} = 200 \cdot \frac{1-(1+0.025)^{-2}}{0.025} + 400 \cdot \frac{1-(1+0.025)^{-8}}{0.025} \cdot (1+0.025)^{-2}$$

$\hookrightarrow$ 385.48 + 2729.86 = **3115.33 $**

$$OLB^{RETRO} = 1000 \cdot (1+0.025)^{6} - 200 \cdot \frac{1-(1+0.025)^{-6}}{0.025} \cdot (1+0.025)^{6}$$

3115.33 $

25

$I_1 = 0.03$

$A_{10} = A_1 \cdot (1+0.03)^{10-1}$

$\vdots$

$100 = A_1 \cdot (1.03)^9$

$\vdots$

$A_1 = 50.02\ \$$

$A_5 = 50.02\ (1.03)^4$

$\vdots$

$A_5 = 53.05\ \$$

30

$Y_{11^{TH}} = 1000 \cdot 0.03 = 30\ \$$

31

$i_4 = 0.12 \rightarrow \boxed{I_4 = 0.03}$

$$C = 1000 \cdot \frac{1-(1+0.03)^{-20}}{0.03}$$

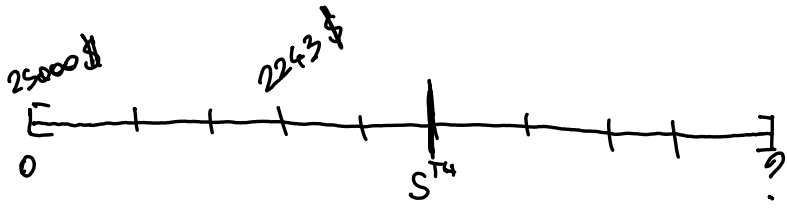
$\hookrightarrow$ 14877.47 $

14877.47 $	1000 $	446.3 $	553.7
14323.77 $	1000 $	429.7 $	570.3
	1000 $		
	⋮		

6 TH

$$553.7\left(1+0.03\right)^{5} = 641.89\ \$$$

32



$I_1 = 0.075$

25000 || 2243 || 1875 || 368

24632 || 2243 || 1847.4 || 395.6

24236.4 || 2243 || 1817.73 || 425.27 ON

23811.13 || 2243 || 1787.83 || 455.17

23355.86 || 2243 || 1751.69 || .....

OM

$$OLB_4^{ROTTO} = 25000\left(1+0.075\right)^4 - 2243 \cdot \frac{1-(1+0.075)^{-4}}{0.075} \cdot (1+0.075)^4$$

$$\hookrightarrow 23355.86 \cdot (1+0.025) = \boxed{1751.69\ \$}$$

33

$$1000 = (x) \cdot \frac{1-(1+0.08)^{-4}}{0.08}$$

$\hookrightarrow$ 301.92 $

1000	301.92	80	221.92
778.08	301.92	62.25	239.67
538.41	301.92	43.07	258.85
279.56	301.92	22.36	279.56

34

$$8500 = (x) \cdot \frac{1-(1+0.05)^{-3}}{0.05}$$

$\hookrightarrow$ 3121.27 $

8500	3121.27	425	2696.27
5803.73	3121.27	290.19	2831.08
2972.65	3121.27	148.63	2972.64

35

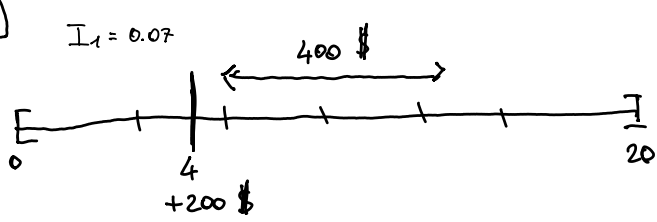
$i_{12} = 0.08 \rightarrow I_{12} = 0.0066$

$$800 = \textcircled{x} \cdot \frac{1-(1+0.0066)^{-6}}{0.0066}$$

$\textcircled{x} = 136.43\ \$$

800	136.43	5.28	131.15
668.85	136.43	4.41	132.02
536.83	136.43	3.54	132.89
403.94	136.43	2.66	133.77
270.17	136.43	1.78	134.65
135.52	136.43	0.89	135.52

37



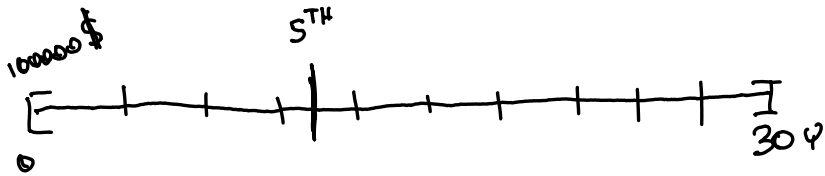
$$OLB^{PRO} = 400 \cdot \frac{1-(1+0.07)^{-16}}{0.07} = 3778.66\ \$$$

$$3778.66 - 200 = 3578.66\ \$$$

$$3578.66 = (a) \cdot \frac{1-(1+0.07)^{-10}}{0.07}$$

$$\hookrightarrow \boxed{509.52\ \$}$$

38



$$I_{12} = 0.005 \rightarrow I_1 = (1+0.005)^{12} - 1 = \boxed{0.06167}$$

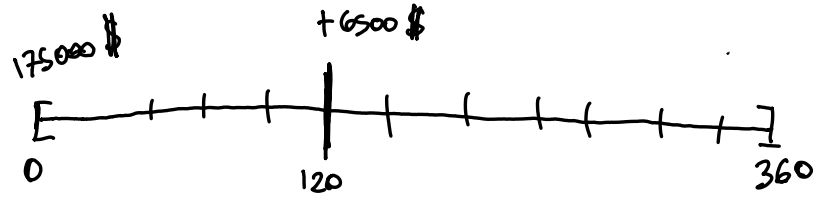
$$100000 = (a)\ \frac{1-(1+0.06167)^{-30}}{0.06167}$$

$$\hookrightarrow 7395.13\ \$ \cdot \frac{1-(1+0.06167)^{-25}}{0.06167}$$

$$\hookrightarrow 93053.49 - 4500 = 88553.49\ \$$$

$$88553.49 = (a) \cdot \frac{1-(1+0.06167)^{-25}}{0.06167} \rightarrow \boxed{7037.55\ \$}$$

39



$$I_1 = 0.05 \rightarrow I_{12} = (1+0.05)^{1/12} - 1 = \boxed{0.004074}$$

$$175000 = \textcircled{a} \cdot \frac{1-(1+0.004074)^{-360}}{0.004074}$$

$$\hookrightarrow 927.58\ \$$$

$$OLB^{PRO} = 927.58 \cdot \frac{1-(1+0.004074)^{-240}}{0.004074}$$

$$\hookrightarrow 141869.05 - 6500\ \$ = \boxed{135369.05\ \$}$$

$$135369.05 = \textcircled{a} \cdot \frac{1-(1+0.004074)^{-240}}{0.004074}$$

$$\hookrightarrow \boxed{885.08\ \$}$$

40

$$i_4 = 0.03 \rightarrow \boxed{I_4 = 0.02}$$

$$VLB_{10}^{PAD} = \omega \cdot \frac{1-(1+0.02)^{-30}}{0.02}$$

$$\hookrightarrow \omega \cdot 22.39645$$

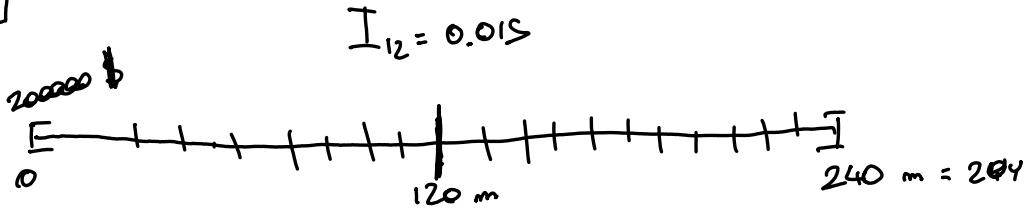
$$22.39645\,\omega - X = \omega' \cdot \frac{1-(1+0.02)^{-30}}{0.02}$$

$$X = 22.39645\,\omega - 22.39645\,\omega'$$

$$\hookrightarrow 22.39645\,(\omega - 0.9\omega)$$

$$\boxed{X = 2.239645\,\omega}$$

42



- $200000 = (\omega) \cdot \dfrac{1-(1+0.015)^{-240}}{0.015}$

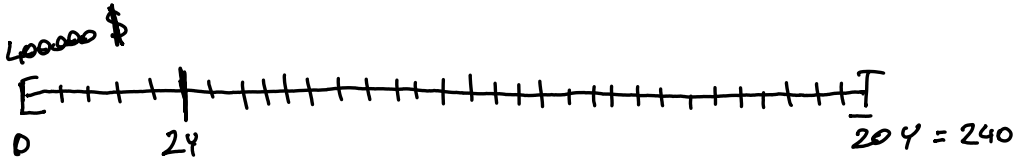
↳ 3086.62 $

- $3086.62 \cdot \dfrac{1-(1+0.015)^{-120}}{0.015} = 171302.63$

- $3086.62 \cdot \dfrac{1-(1+0.015)^{-60}}{0.015} = 121551.82$

- 49750.71 $

44



$i_1 \Rightarrow I_1 = 0.00416 \rightarrow (1+0.00416)^{1/12} - 1 = \underline{0.00034656}$

- $400000 = a \cdot \frac{1-(1+0.00034656)^{-240}}{0.00034656}$

$\rightarrow$ **1737.23 $**

- $OLB^{Pno}_{24} = 1737.23 \cdot \frac{1-(1+0.00034656)^{-216}}{0.00034656}$

$\rightarrow 361480.62$

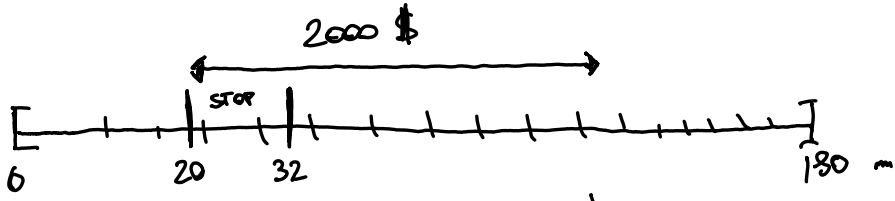
$i_1 \Rightarrow I_1 = 0.004583 \rightarrow (1+0.004583)^{1/12} - 1 = \underline{0.00038114}$

- $361480.62 = a \cdot \frac{1-(1+0.00038114)^{-216}}{0.00038114}$

$\rightarrow$ **1743.67 $**

- $400000 = 1743.67 \cdot \frac{1-(1+0.00038114)^{-t}}{0.00038114}$

46



$i_1 \rightarrow I_1 = 0.005 \rightarrow I_{12} = (1+0.005)^{1/12} - 1 = \underline{0.0004157}$

- $2000 \cdot \dfrac{1-(1+0.0004157)^{-180}}{0.0004157} = \boxed{346791.65\ \$}$

- $OLB_{20}^{Pro} = 2000 \cdot \dfrac{1-(1+0.0004157)^{-160}}{0.0004157}$

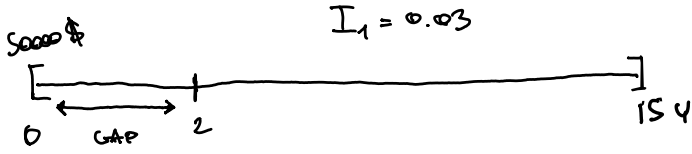
  ↳ $309527.93\ \$$

- $309527.93 \cdot (1+0.0004157)^{12} = 311075.52\ \$$

- $311075.52 = (\text{@}) \cdot \dfrac{1-(1+0.0004157)^{-148}}{0.0004157}$

  ↳ $\boxed{2167.62\ \$}$

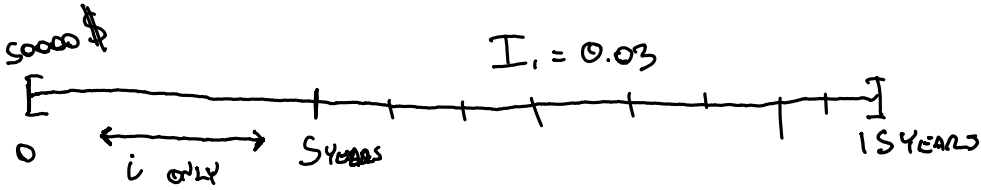
49



- $50000 \cdot (1 + 0.03) = 51500\ \$$
- $51500 = (a) \cdot \frac{1 - (1+0.03)^{-14}}{0.03}$

$\rightarrow$ **14313.38 $**

50



- $Y = 50000 \cdot 0.03 = 1500\ \$$
- $50000 = 1500 \cdot \frac{1 - (1+0.03)^{-5}}{0.03} + (a) \cdot \frac{1 - (1+0.03)^{-10}}{0.03} \cdot (1+0.03)^{-5}$

$\rightarrow$ ~~~~

BEIR BORROWER EFFECTIVE INTEREST RATE

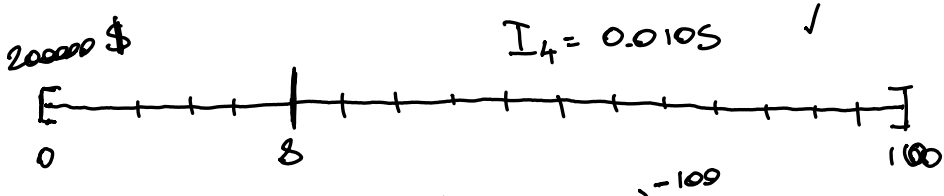
EXPRESSED AS ANNUAL INTEREST, IT REPRESENTS THE ACTUAL COST OF A LOAN.

- ARRANGEMENT FEES;
- VALUATION FEE;
- LIFE INSURANCE;
- BANK CHARGES;

→ ALL INCLUDED

EAR EFFECTIVE ANNUAL RATE (TAE)

QUESTION 5



✓

- $200000 = \boxed{\omega} \cdot \dfrac{1-(1+0.0105)^{-100}}{0.0105}$ ✓

  ↳ 3240.03 $

- $OLB_8^{PRO} = 3240.03 \cdot \dfrac{1-(1+0.0105)^{-92}}{0.0105}$ ✓

  ↳ 190537.19 $ − 15000 $ = 175537.19 $

- $175537.19 = (\omega) \cdot \dfrac{1-(1+0.0105)^{-92}}{0.0105}$ ✓

  ↳ 2884.96 $

- $175537.19 = 3240.03 \cdot \dfrac{1-(1+0.0105)^{-t}}{0.0105}$ ✓

- $OLB_8^{PRO} = 3240.03 \cdot \frac{1-(1+0.0105)^{-92}}{0.0105}$

  ↳ 190537.19 $

$$190537.18 = \textcircled{w}^{II} \cdot \frac{1-(1+0.01175)^{-92}}{0.01175}$$ ✓

↳ 3395.35 $

- $190537.18 \cdot (1+0.0105)^{4} = 198666.6769$ $

$$198666.6769 = \textcircled{w}^{III} \cdot \frac{1-(1+0.0105)^{-88}}{0.0105}$$ ✓

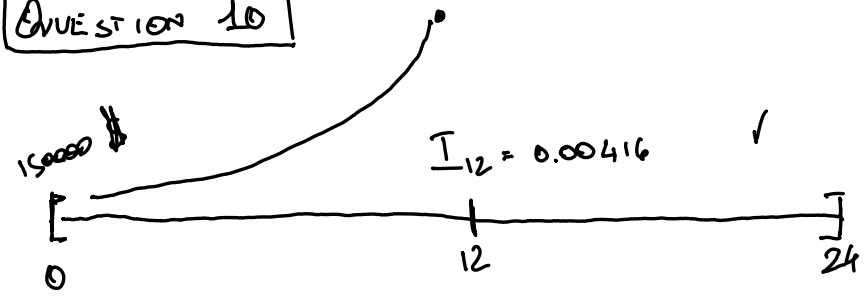
↳ 3465.99 $

- $190537.18 \cdot 0.0105 = 2000.6$ $

$$190537.18 = 2000.6 \cdot \frac{1-(1+0.0105)^{-4}}{0.0105} + \textcircled{w} \cdot \frac{1-(1+0.0105)^{-88}}{0.0105}$$ ✓

THIS IS WHAT SHE WAS LOOKING FOR

QUESTION 10



- $Y = 150000 \cdot 0.00416 = 625\ \$$

$$150000 = \textcircled{w} \cdot \frac{1-(1+0.00416)^{-12}}{0.00416}$$

$$\hookrightarrow 12840.57236\ \$$$

IEE

$$150000 = 625 \cdot \frac{1-(1+I_{12})^{-12}}{I_{12}} + 12840.57 \cdot \frac{1-(1+I_{12})^{-12}}{I_{12}} \cdot (1+I_{12})^{-12}$$

- $AF = 300\ \$$

$$150000 = 300 + 625 \cdot \frac{1-(1+I_{12})^{-12}}{I_{12}} + 12840.57 \cdot \frac{1-(1+I_{12})^{-12}}{I_{12}} \cdot (1+I_{12})^{-12}$$

$$EAR = (1+I_{12})^{12} - 1$$

INTRODUCTION TO BONDS

1. COUPON AMOUNT → FACE VALUE × COUPON RATE

2. REDEMPTION
   - → PREMIUM → RED AM > PAR
   - → DISCOUNT → RED AM < PAR

3. YIELD TO MATURITY → INTEREST EARNED BY THE INVESTOR

$$P = \text{COUPON AMOUNT} \cdot \frac{1-(1+\text{YIELD})^{-h}}{\text{YIELD}} + \text{REDEMPTION AMOUNT} \cdot (1+\text{YIELD})^{-h}$$

EXAMPLE 2

$t = 8\,y \rightarrow (16)$

COUPON RATE = 0.05

COUPON AMOUNT = 150 $

$$\text{YIELD} = (1+0.12)^{1/2} - 1 \Rightarrow 0.0583$$

$$P = 150 \cdot \frac{1-(1+0.0583)^{-16}}{0.0583} + 2000\,(1+0.0583)^{-16}$$

EXAMPLE 3

$t = 20\,y \rightarrow (40)$

- $\text{COUPON RATE} = \frac{400}{10000} \cdot 100 = 4\%$
- $\text{YIELD} = (1+0.06)^{1/2} - 1 = 0.02956$

$$P = 400 \cdot \frac{1-(1+0.02956)^{-40}}{0.02956} + 10000 \cdot (1+0.02956)^{-40}$$

EXAMPLE 4

$t = 10Y \rightarrow (20)$

- COUPON AMOUNT = 10 $
- REDEMPTION AMOUNT = 105 $
- YIELD = 0.04

$$P = 10 \cdot \frac{1-(1+0.04)^{-20}}{0.04} + 105 \cdot (1+0.04)^{-20}$$

EXAMPLE 5

RECALL THE GEOMETRICAL FORMULA ⚠

$$P = 75 \cdot \frac{1-1.03^{20} \cdot (1+I^*)^{-20}}{1+I^*-1.03} + 1050 \cdot (1+I^*)^{-20}$$

EXAMPLE 10

$t = 10Y \rightarrow (20)$

- COUPON RATE = 0.005
- COUPON AMOUNT = 20 $
- REDEMPTION AMOUNT = 4120 $

$$3900 = 20 \cdot \frac{1-(1+I_{12})^{-120}}{I_{12}} + 4120 \cdot (1+I_{12})^{-120}$$

$$\text{YIELD} = (1+I_{12})^{12} - 1$$

EXAMPLE 11

$t = 5Y \rightarrow (20)$

- COUPON RATE = 0.01
- COUPON AMOUNT = 10 $
- YIELD $\rightarrow (1+0.05)^{1/4} - 1 \rightarrow 0.012272$

$$1075 = 10 \cdot \frac{1-(1+I_4)^{-20}}{I_4} + R \cdot (1+I_4)^{-20}$$

EXAMPLE 12

$t = 74 \rightarrow (14)$

- COUPON RATE = 0.05
- YIELD = 0.03
- COUPON AMOUNT = 150 $

$$P = 150 \cdot \frac{1-(1+0.03)^{-14}}{0.03} + 3000 \cdot (1+0.03)^{-14}$$

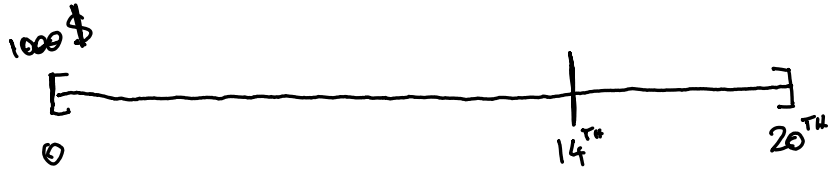
$\rightarrow 3677.76 - 3000 = \boxed{677.76}$

PREMIUM

BOOK VALUE

IT IS THE EQUIVALENT OF (OLB) BUT FOR BONDS.

EXAMPLE 13



- COUPON RATE = 0.025
- YIELD = 0.12 / 2 → 0.06

$$BV = 25 \cdot \frac{1-(1+0.06)^{-6}}{0.06} + 1000\left(1+0.06\right)^{-6}$$

↳ AMOUNT $

EXAMPLE 14

$t = 5y \rightarrow (10)$

- COUPON RATE = 0.035
- REDEMPTION AMOUNT = 2120 $
- COUPON AMOUNT = 70 $
- $YIELD = (1+0.05)^{1/2} - 1 \Rightarrow 0.02469$

$$BV = 70 \cdot \frac{1-(1+0.02469)^{-6}}{0.02469} + 2120 \cdot (1+0.02469)^{-6}$$

→ AMOUNT $

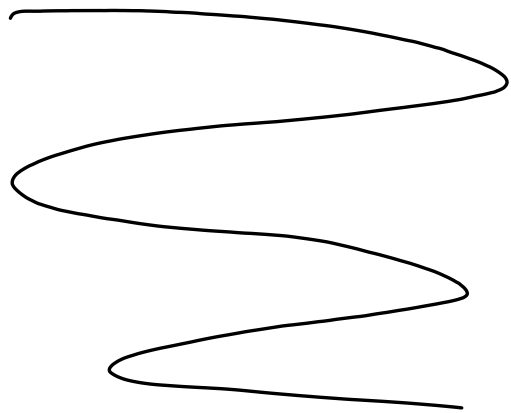
EXAMPLE 15

$t = 10Y \rightarrow 120$

- COUPON RATE = 0.0033
- REDEMPTION AMOUNT = 1030 $
- COUPON AMOUNT = 3.3 $
- G = 10 $

$$990 + 10 = 3.3 \cdot \frac{1-(1+I_{12})^{-120}}{I_{12}} + 1030\,(1+I_{12})^{-120}$$

$$\text{YIELD} = (1+I_{12})^{12} - 1$$



② $C = 2500 \quad i_1 = 0.025 \quad T = \frac{90}{360} = \frac{1}{4}$

a) $2500 \cdot \left(1 + 0.025 \cdot \frac{1}{4}\right) = 2515.625\ \$$

b) $DT = 2515.625 - 2500 = 15.625\ \$$

$D(T, T') =$

c) $d = 0.025 \rightarrow i = \frac{d}{1 - dt}$

$\hookrightarrow i = 0.\overline{33}$