

HW1 作業說明

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變數解釋

Loan 借貸的總金額，Loan_period 償還貸款的總期數，Grace_period 寬限期，rate 利率，remain_loan 剩餘未償還的本金，principal 該期支付的本金，interest 該期支付的利息，payment 該期支付的本息

1. 本金攤還法

此法擁有**固定**的本金支付額，因此我只需要知道剩餘多少未繳納的本金就可以求算出該期繳納的利息。以 if 判斷是否在寬限期內，一旦脫離寬限期就開始繳納本金，並且以 remain_loan 紀錄剩餘本金，當下一次迴圈的時候，即可用此變數求算出 interest 的數值($\text{interest} = \text{remain_loan} * \text{rate}$)

```
1 Loan = int(input('loan(ten thousands):'))*10000
2 Loan_period = int(input('Loan_period(years):'))*12
3 Grace_period = int(input('Grace_period(years):'))*12
4 rate = 0.013/12
5 print('本金攤還法')
6 report_1 = list()
7 principal_period = Loan_period - Grace_period
8 remain_loan = Loan
9 for i in range(1, Loan_period+1):
10     interest = remain_loan * rate
11     if i <= Grace_period: #只還利息
12         principal = 0
13     else:
14         principal = Loan/principal_period
15     payment = interest + principal
16     remain_loan = remain_loan - principal
17     report_1.append([i, int(principal), int(interest), int(payment)])
18     print('{:08} {:08} {:08} {:08}'.format(i, principal, interest, payment))
19 for a in report_1:
20     date, principal, interest, payment = a
21     print('{:~12} {:~12} {:~12} {:~12}'.format(date, principal, interest, payment))
22 report_2 = list()
```

期數	應付本金	應付利息	應付本息
1	0	11083	11083
2	0	11083	11083
3	0	11083	11083
4	0	11083	11083
5	0	11083	11083
6	0	11083	11083
7	0	11083	11083
8	0	11083	11083
9	0	11083	11083
10	0	11083	11083
11	0	11083	11083
12	0	11083	11083
13	0	11083	11083
14	0	11083	11083
15	0	11083	11083
16	0	11083	11083
17	0	11083	11083
18	0	11083	11083
19	0	11083	11083
20	0	11083	11083
21	0	11083	11083
22	0	11083	11083

2. 本息平均攤還法

本息平均攤還法的基本概念為現金流的折現。先以此公式作為基礎:

$$\text{Present value} = C * \left(\frac{1}{r} - \frac{1}{r*(1+r)^n} \right)$$

其中 C 為每期應付的現金流量(也就是**固定**的「應付本息」)，r 為利率，n 為此款項償還的期數。

已知 present value 為前借貸的總金額，以及利率和償還期數，即可求出 C:

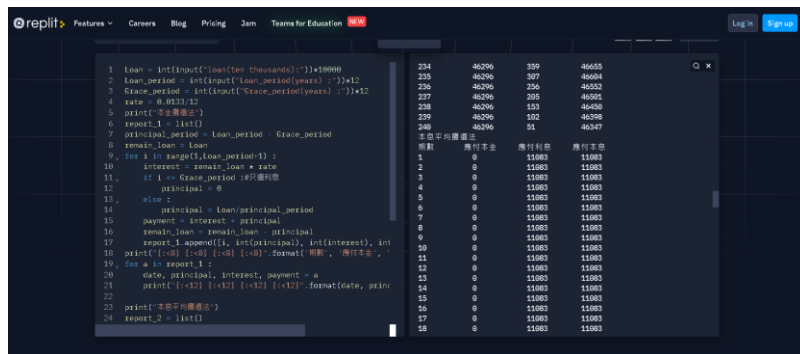
$C = \text{Loan} / (1/\text{rate} - 1/(\text{rate}*(1+\text{rate})**\text{principal_period}))$ 。

知道 C 之後，即可在每一期付款的時候利用 $C - \text{interest}$ 求算出應該繳納的本

金。

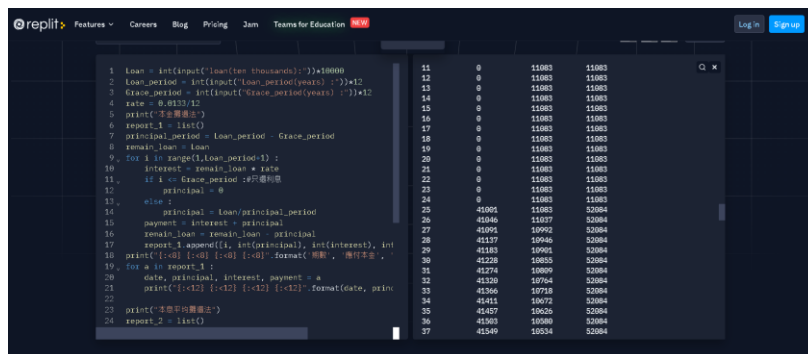
考慮到寬限期的影響，加設一個 if 判斷式判斷是否為寬限期內。

如果是的話，自動將本金 principal 償還設為 0 元，只需要持續支付利息。一旦脫離寬限期，就執行 $\text{principal} = c - \text{interest}$ 求出該期的本金支付額。在迴圈的一開始，以 $\text{remain_loan} = \text{remain_loan} - \text{principal}$ (上一期繳納的本金支付額)來記錄到底還有多少本金尚未繳納，下一行計算利息金額的時候需要知道此數值 $\text{interest} = \text{remain_loan} * \text{rate}$ 。



```
1 loan = int(input('loan(ten thousands):'))*10000
2 loan_period = int(input('loan_period(years):'))*12
3 Grace_period = int(input('Grace_period(years):'))*12
4 rate = 0.011/12
5 print('本金寬限:')
6 report_1 = list()
7 principal_period = loan_period - Grace_period
8 remain_loan = loan
9 for i in range(1,loan_period+1):
10     interest = remain_loan * rate
11     if i <= Grace_period :#只還利息
12         principal = 0
13     else:
14         principal = loan/principal_period
15         payment = interest + principal
16         remain_loan = remain_loan - principal
17         report_1.append((i, int(principal), int(interest), int(payment)))
18     print('{<8}<8}<8}<8}'.format('期數', '應付本金',
19     for a in report_1:
20         date, principal, interest, payment = a
21         print('{<12}<12}<12}<12}'.format(date, prin
22
23 print('本息平均攤還法')
24 report_2 = list()
```

期數	應付本金	應付利息	應付本息
1	0	11083	11083
2	0	11083	11083
3	0	11083	11083
4	0	11083	11083
5	0	11083	11083
6	0	11083	11083
7	0	11083	11083
8	0	11083	11083
9	0	11083	11083
10	0	11083	11083
11	0	11083	11083
12	0	11083	11083
13	0	11083	11083
14	0	11083	11083
15	0	11083	11083
16	0	11083	11083
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18	0	11083	11083



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```

期數	應付本金	應付利息	應付本息
11	0	11083	11083
12	0	11083	11083
13	0	11083	11083
14	0	11083	11083
15	0	11083	11083
16	0	11083	11083
17	0	11083	11083
18	0	11083	11083
19	0	11083	11083
20	0	11083	11083
21	0	11083	11083
22	0	11083	11083
23	0	11083	11083
24	0	11083	11083
25	41995	11083	52084
26	40946	11087	52084
27	40095	10992	52084
28	41137	10946	52084
29	41183	10901	52084
30	41228	10855	52084
31	41274	10809	52084
32	41320	10764	52084
33	41366	10718	52084
34	41411	10672	52084
35	41457	10626	52084
36	41503	10580	52084
37	41549	10534	52084