

CS118 Programming Assignment

Simple Interest

Borrowing money on a simple interest loan has a fairly complex formula for computing interest. But from a programmer's standpoint, it's actually rather simple. You start with a certain amount of money (the "principal"), an interest rate (usually per year), and a payment. If we know how often the borrower will make payments, then for each one of those payments we can compute the remaining principle: add to the principle the interest earned since the last payment, subtract this new payment and voila! You have a new principle. Repeat this until the new principle becomes less than the payment amount. The resulting record of payments and remaining principal is called the "repayment schedule".

The repayment schedule will usually show for each payment: the original principal; the payment amount; the amount of the payment applied as interest; and the remaining principal after the payment. At the bottom of the repayment schedule, the total interest paid is reported.

Month	Princ	Int	Pmt	Remain
1	\$50000.00	\$ 250.00	299.78	49950.22
2	\$49950.22	\$ 249.75	299.78	49900.20
3	\$49900.20	\$ 249.50	299.78	49849.93
4	\$49849.93	\$ 249.25	299.78	49799.40
5	\$49799.40	\$ 249.00	299.78	49748.62
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356	\$ 1476.65	\$ 7.38	299.78	1184.26
357	\$ 1184.26	\$ 5.92	299.78	890.41
358	\$ 890.41	\$ 4.45	299.78	595.08
359	\$ 595.08	\$ 2.98	299.78	298.28
360	\$ 298.28	\$ 1.49	299.78	0.00

\$50000.00 principal paid over 360 months with \$57916.04 interest

More typically, the payment is not provided by the user - it is adjusted to fit the desired "repayment period". The payment must cover all of the interest for each month the money is borrowed, plus some amount of the principle. Unfortunately, both of these will change with each payment and the resulting formula is pretty complex:

$$pmt = \frac{pr}{\left(k - k \left(1 + \frac{r}{k}\right)^{-n}\right)}$$

where:

p = principal amount (e.g. \$50,000)

r = yearly interest rate - as a fractional value (e.g. 0.06 for 6% per year)

k = number of payments per year (typically 12)

n = number of payments over the life of the loan (e.g. 360 payments for a 30 year loan)

Write a Python program that will collect from the user a principal amount in dollars, an annual interest rate (as percent, not a fractional value), and a length of the loan in years. Compute the monthly payment and produce a repayment schedule. Be sure to show how much total interest is paid. Then produce a second payment schedule for weekly payments. How much total interest is saved?

Week	Princ	Int	Pmt	Remain
1	\$50000.00	\$ 57.69	69.13	49988.56
2	\$49988.56	\$ 57.68	69.13	49977.11
3	\$49977.11	\$ 57.67	69.13	49965.64
4	\$49965.64	\$ 57.65	69.13	49954.16
5	\$49954.16	\$ 57.64	69.13	49942.67
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1556	\$ 344.46	\$ 0.40	69.13	275.73
1557	\$ 275.73	\$ 0.32	69.13	206.92
1558	\$ 206.92	\$ 0.24	69.13	138.02
1559	\$ 138.02	\$ 0.16	69.13	69.05
1560	\$ 69.05	\$ 0.08	69.13	0.00

\$50000.00 principal paid over 1560 weeks with \$57845.20 interest