

Examples 4.3

Example 1

Determine the total interest owed on a 5-year \$10,000 loan at 6% APR.

Solution

Use the monthly payment formula.

How to enter in your calculator $(10000(0.06/12)(1+0.06/12)^{60})/((1+0.06/12)^{60}-1)$

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( 28716 ( .0512/12 )  
( 1+.0512/12 ) ^48 )  
/ ( ( 1+.0512/12 ) ^4  
8-1 )
```

This is an example but not the same numbers

$$M = \frac{p \left(\frac{r}{12} \right) \left(1 + \frac{r}{12} \right)^{12t}}{\left(1 + \frac{r}{12} \right)^{12t} - 1}$$

Substitute $p = 10,000$, $r = 0.06$, and $t = 5$.

$$M = \frac{10,000 \left(\frac{0.06}{12} \right) \left(1 + \frac{0.06}{12} \right)^{12(5)}}{\left(1 + \frac{0.06}{12} \right)^{12(5)} - 1}$$

Use your calculator. Enter in one keystroke sequence. Think about the order of operations to determine where parentheses are needed.

$$M = 193.3280$$

The monthly payment is approximately \$193.33.

Multiply the amount of the monthly payments by the number of monthly payments to find the total of the monthly payments.

$$193.33 \times 60 = 11,599.80$$

The total of the monthly payments is \$11,599.80.

Keep in mind that this is not the exact amount. The amount of the monthly payment was rounded to the nearest cent, or two decimal places, but in reality, banks keep decimal amounts when performing calculations.

To find the interest you must pay, subtract the loan principal from the total payback.

$$11,599.80 - 10,000 = 1,599.80$$

The interest on a \$10,000 loan at 6% APR taken out for 5 years is approximately \$1,599.80.

Example 2

Claude wants to borrow \$25,000 to purchase a car. After looking at his monthly budget, he realizes that all he can afford to pay per month is \$300. The bank is offering a 5.9% loan. What would the length of his loan need to be so that he can stay within his budget?

M = monthly payment
 P = principal
 R = interest rate
 T = number of years

$$t = \frac{\ln\left(\frac{M}{P}\right) - \left(\ln\left(\frac{M}{P} - \frac{r}{12}\right)\right)}{12\ln\left(1 + \frac{r}{12}\right)}$$

$$t = \frac{\ln\left(\frac{300}{25,000}\right) - \left(\ln\left(\frac{300}{25,000} - \frac{0.059}{12}\right)\right)}{12\ln\left(1 + \frac{0.059}{12}\right)}$$

How to enter on calculator

$$(1n(300/25000)-(1n(300/25000-0.059/12)))/(121n(1+0.059/12))$$

Calculate to the nearest hundredth of a year.

$$t \approx 8.96$$

Claude would need to take out a loan for about 9 years.