Lesson no. 8: Financial Function in Excel

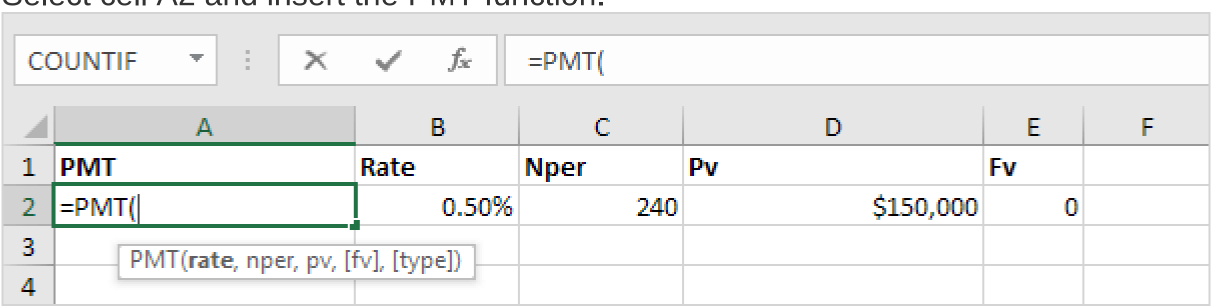
Financial Functions

To illustrate Excel's most popular financial functions, we consider a loan with monthly payments, an annual interest rate of 6%, a 20-year duration, a present value of $150,000 (amount borrowed) and a future value of 0 (that's what you hope to achieve when you pay off a loan).

We make monthly payments, so we use 6%/12 = 0.5% for Rate and 20*12 = 240 for Nper (total number of periods). If we make annual payments on the same loan, we use 6% for Rate and 20 for Nper.

PMT

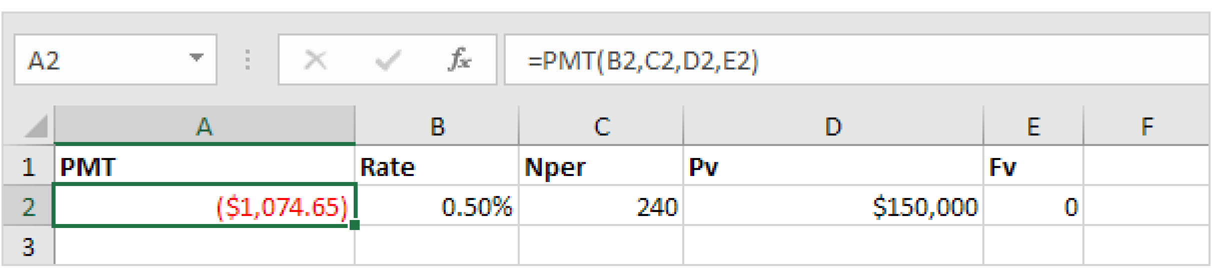
Select cell A2 and insert the PMT function.



	A	B	C	D	E	F
1	PMT	Rate	Nper	Pv	Fv	
2	=PMT(	0.50%	240	$150,000	0	
3						
4						

Note: the last two arguments are optional. For loans, Fv can be omitted (the future value of a loan equals 0, however, it's included here for clarification). If Type is omitted, it is assumed that payments are due at the end of the period.

Result. The monthly payment equals $1,074.65.



	A	B	C	D	E	F
1	PMT	Rate	Nper	Pv	Fv	
2	($1,074.65)	0.50%	240	$150,000	0	
3						

Tip: when working with financial functions in Excel, always ask yourself the question, am I making a payment (negative) or am I receiving money (positive)? We pay off a loan of $150,000 (positive, we received that amount) and we make monthly payments of $1,074.65 (negative, we pay). Visit our page about the **PMT function** for many more examples.

RATE

If Rate is the only unknown variable, we can use the RATE function to calculate the interest rate.

B2 =RATE(C2,A2,D2,E2)

	A	B	C	D	E	F
1	Pmt	RATE	Nper	Pv	Fv	
2	($1,074.65)	0.50%	240	$150,000	0	
3						

NPER

Or the NPER function. If we make monthly payments of $1,074.65 on a 20-year loan, with an annual interest rate of 6%, it takes 240 months to pay off this loan.

C2 =NPER(B2,A2,D2,E2)

	A	B	C	D	E	F
1	Pmt	Rate	NPER	Pv	Fv	
2	($1,074.65)	0.50%	240	$150,000	0	
3						

We already knew this, but we can change the monthly payment now to see how this affects the total number of periods.

C2 =NPER(B2,A2,D2,E2)

	A	B	C	D	E	F
1	Pmt	Rate	NPER	Pv	Fv	
2	($2,074.65)	0.50%	89.95316057	$150,000	0	
3						

Conclusion: if we make monthly payments of $2,074.65, it takes less than 90 months to pay off this loan.

PV

Or the PV (Present Value) function. If we make monthly payments of $1,074.65 on a 20-year loan, with an annual interest rate of 6%, how much can we borrow? You already know the answer.

D2 =PV(B2,C2,A2,E2)

	A	B	C	D	E	F
1	Pmt	Rate	Nper	PV	Fv	
2	($1,074.65)	0.50%	240	$150,000	0	
3						

FV

And we finish this chapter with the FV (Future Value) function. If we make monthly payments of $1,074.65 on a 20-year loan, with an annual interest rate of 6%, do we pay off this loan? Yes.

E2 =FV(B2,C2,A2,D2)

	A	B	C	D	E	F
1	Pmt	Rate	Nper	Pv	FV	
2	($1,074.65)	0.50%	240	$150,000	0	
3						

But, if we make monthly payments of only $1,000.00, we still have debt after 20 years.

E2 =FV(B2,C2,A2,D2)

	A	B	C	D	E	F
1	Pmt	Rate	Nper	Pv	FV	
2	($1,000.00)	0.50%	240	$150,000	($34,489.78)	
3						

The PMT function in Excel calculates the payment for a loan based on constant payments and a constant interest rate. This page contains many easy to follow PMT examples.

PMT examples

Consider a loan with an annual interest rate of 6%, a 20-year duration, a present value of $150,000 (amount borrowed) and a future value of 0 (that's what you hope to achieve when you pay off a loan).

1. The PMT function below calculates the annual payment.

A2 =PMT(B2,C2,D2,E2)

	A	B	C	D	E	F
1	PMT	Rate	Nper	Pv	Fv	
2	($13,077.68)	6.00%	20	$150,000	0	
3						

Note: if the fifth argument is omitted, it is assumed that payments are due at the end of the period. We pay off a loan of $150,000 (positive, we received that amount) and we make annual payments of $13,077.68 (negative, we pay).

2. The PMT function below calculates the quarterly payment.

A2 =PMT(B2,C2,D2,E2)

	A	B	C	D	E	F
1	PMT	Rate	Nper	Pv	Fv	
2	($3,232.25)	1.50%	80	$150,000	0	
3						

Note: we make quarterly payments, so we use 6%/4 = 1.5% for Rate and 20*4 = 80 for Nper (total number of periods).

3. The PMT function below calculates the monthly payment.

A2 =PMT(B2,C2,D2,E2)

	A	B	C	D	E	F
1	PMT	Rate	Nper	Pv	Fv	
2	($1,074.65)	0.50%	240	$150,000	0	
3						

Note: we make monthly payments, so we use 6%/12 = 0.5% for Rate and 20*12 = 240 for Nper (total number of periods).

Consider an investment with an annual interest rate of 8% and a present value of 0. How much money should you deposit at the end of each year to have $1,448.66 in the account in 10 years?
4. The PMT function below calculates the annual deposit.

A2 =PMT(B2,C2,D2,E2)

	A	B	C	D	E	F
1	PMT	Rate	Nper	Pv	Fv	
2	($100.00)	8.00%	10	0	$1,448.66	
3						

Explanation: in 10 years time, you pay 10 * $100 (negative) = $1000, and you'll receive $1,448.66 (positive) after 10 years. The higher the interest, the faster your money grows.

Consider an annuity with an annual interest rate of 6% and a present value of $83,748.46 (purchase value). How much money can you withdraw at the end of each month for the next 20 years?
5. The PMT function below calculates the monthly withdrawal.

A2 =PMT(B2,C2,D2,E2)

	A	B	C	D	E	F
1	PMT	Rate	Nper	Pv	Fv	
2	$600.00	0.50%	240	($83,748.46)	0	
3						

Explanation: you need a one-time payment of $83,748.46 (negative) to pay this annuity. You'll receive 240 * $600 (positive) = $144,000 in the future. This is another example that money grows over time.

PPMT and IPMT

Consider a loan with an annual interest rate of 5%, a 2-year duration and a present value (amount borrowed) of $20,000.

1. The PMT function below calculates the monthly payment.

A2 =PMT(B2,C2,D2,E2)

	A	B	C	D	E	F
1	**Payment**	**Rate**	**Nper**	**Pv**	**Fv**	
2	($877.43)	0.42%	24	$20,000	0	
3						

Note: we make monthly payments, so we use 5%/12 for Rate and 2*12 for Nper (total number of periods).

2. The PPMT function in Excel calculates the principal part of the payment. The second argument specifies the payment number.

A2 =PPMT(B2,5,C2,D2,E2)

	A	B	C	D	E	F
1	**Principal**	**Rate**	**Nper**	**Pv**	**Fv**	
2	($807.41)	0.42%	24	$20,000	0	
3						

Explanation: the PPMT function above calculates the principal part of the 5th payment.

3. The IPMT function in Excel calculates the interest part of the payment. The second argument specifies the payment number.

A2 =IPMT(B2,5,C2,D2,E2)

	A	B	C	D	E	F
1	**Interest**	**Rate**	**Nper**	**Pv**	**Fv**	
2	($70.02)	0.42%	24	$20,000	0	
3						

Explanation: the IPMT function above calculates the interest part of the 5th payment.

4. It takes 24 months to pay off this loan. Create a loan amortization schedule (see picture below) to clearly see how the principal part increases and the interest part decreases with each payment.

2

	A	B	C	D	E	F
1	Annual Interest Rate	5.00%				
2	Years	2				
3	Payments Per Year	12				
4	Amount	$20,000				
5						
6	**Payment Number**	**Payment**	**Principal**	**Interest**	**Balance**	
7	1	($877.43)	($794.09)	($83.33)	$19,205.91	
8	2	($877.43)	($797.40)	($80.02)	$18,408.50	
9	3	($877.43)	($800.73)	($76.70)	$17,607.78	
10	4	($877.43)	($804.06)	($73.37)	$16,803.71	
11	5	($877.43)	($807.41)	($70.02)	$15,996.30	
12	6	($877.43)	($810.78)	($66.65)	$15,185.53	
13	7	($877.43)	($814.15)	($63.27)	$14,371.37	
14	8	($877.43)	($817.55)	($59.88)	$13,553.82	
15	9	($877.43)	($820.95)	($56.47)	$12,732.87	
16	10	($877.43)	($824.37)	($53.05)	$11,908.50	
17	11	($877.43)	($827.81)	($49.62)	$11,080.69	
18	12	($877.43)	($831.26)	($46.17)	$10,249.43	
19	13	($877.43)	($834.72)	($42.71)	$9,414.71	
20	14	($877.43)	($838.20)	($39.23)	$8,576.51	
21	15	($877.43)	($841.69)	($35.74)	$7,734.81	
22	16	($877.43)	($845.20)	($32.23)	$6,889.62	
23	17	($877.43)	($848.72)	($28.71)	$6,040.89	
24	18	($877.43)	($852.26)	($25.17)	$5,188.64	
25	19	($877.43)	($855.81)	($21.62)	$4,332.83	
26	20	($877.43)	($859.37)	($18.05)	$3,473.45	
27	21	($877.43)	($862.96)	($14.47)	$2,610.50	
28	22	($877.43)	($866.55)	($10.88)	$1,743.95	
29	23	($877.43)	($870.16)	($7.27)	$873.79	
30	24	($877.43)	($873.79)	($3.64)	($0.00)	
31						
32						

Note: the principal part and the interest part always add up to the payment amount.