Finding the Monthly Mortgage Payment

The **amortization** of a loan is when the repayment of a loan in equal installments, are applied to principal and interest over a specified period of time. It is customary to use various methods to calculate the **monthly mortgage payment**, such as, tables, formulas, a financial calculator that has the formula programmed into the calculator, or computer software. The monthly payment table gives the factor that is multiplied by the dollar amount of the loan in thousands to give the total monthly payment, including principal and interest. A portion of a monthly payment table is shown in Table 8-1.

Interest rates for first mortgages are relatively low and have fluctuated between 5% and 9%, for the past few years however, second mortgage rates are generally higher.

Table 8-1. Annual Interest Rate

Years financed	**5.00 %**	5.25 %	**5.50 %**	5.75 %	**6.00 %**	**6.25 %**	**6.50 %**	**6.75 %**	**7.00 %**	**7.25 %**	**7.50 %**	**7.75 %**	**8.00 %**	**8.25 %**	**8.50 %**	**8.75 %**
10	10.61	10.73	10.85	10.98	11.1	11.23	11.35	11.48	11.61	11.74	11.87	12	12.13	12.27	12.4	12.53
12	9.25	9.37	9.5	9.63	9.76	9.89	10.02	10.15	10.28	10.42	10.55	10.69	10.82	10.96	11.1	11.24
15	7.91	8.04	8.17	8.3	8.44	8.57	8.71	8.85	8.99	9.13	9.27	9.41	9.56	9.7	9.85	9.99
17	7.29	7.42	7.56	7.69	7.83	7.97	8.11	8.25	8.4	8.54	8.69	8.83	8.98	9.13	9.28	9.43
20	6.6	6.74	6.88	7.02	7.16	7.31	7.46	7.6	7.75	7.9	8.06	8.21	8.36	8.52	8.68	8.84
22	6.25	6.39	6.54	6.68	6.83	6.98	7.13	7.28	7.43	7.59	7.75	7.9	8.06	8.22	8.38	8.55
25	5.85	5.99	6.14	6.29	6.44	6.6	6.75	6.91	7.07	7.23	7.39	7.55	7.72	7.88	8.05	8.22
30	5.37	5.52	5.68	5.84	6	6.16	6.32	6.49	6.65	6.82	6.99	7.16	7.34	7.51	7.69	7.87
35	5.05	5.21	5.37	5.54	5.7	5.87	6.04	6.21	6.39	6.56	6.74	6.92	7.1	7.28	7.47	7.65

Table values show the monthly payment of a S1.000 mortgage for the given number of years at the given annual interest rate if the interest is compounded monthly. Table values can be generated by using the formula: $M = (51.000R)/(1 - (I + R)A (-N))$, where $\boldsymbol{M}$ = Monthly payment, $\boldsymbol{R}$ = the monthly interest rate, and $\boldsymbol{N}$ = total number of payments of the loan.

<u>Using a per-$1,000 table to find the monthly mortgage payment of principal and interest</u>

1. Amount financed: the difference between the down payment and the purchase price.
2. $1,000 units of amount financed: divide the amount financed (step 1) by $1,000.
3. Find on the table, the number of years financed and the annual interest rate.
4. Multiply the value found in step 3 by the $1,000 units found in step 2.

*Amount financed / $1,000 x table value = monthly mortgage payment

Example 1

Ms. Miller is purchasing a home for $100,000. Her loan application has been approved for a 30-year fixed-rate loan at 8% annual interest. Ms. Miller pays 20% of the purchase price as a down payment, calculate the monthly payment.

$100,000(0.20)	= **$20,000**	Down payment
$100,000 - $20,000	= **$80,000**	Amount financed
$80,000/ $1,000	= **80**	$1,000 units

Using the table to find the factor for financing a loan for 30 years with a 8% annual interest rate, the factor is 7.34.

Multiply the number of units by the factor

80(7.34) = $587.20

The monthly payment of $587.20 includes both, principal and interest.

Using a formula to find the monthly mortgage payment of principal and interest

1. Identify the variables: (R) - monthly rate as a decimal equivalent, (N) - number of months, (P) - loan principal
2. Substitute the values found into the formula. **$M = P[R / (1 -(1 + R)^{-N})]$**
3. Evaluate the formula.

Example 2 Using the monthly payment of principle and interest formula, calculate the monthly payment for Ms Miller's loan from Example 1.

R = 8% / 12 = 0.08/ 12 = 0.00666	Monthly interest rate
N = 30(12) = 360	Total number of payments
P = $80,000	**Amount financed**

M = P(R / 1 - (1 + R)-n Substitute known values

$M = 80{,}000(0.00666 / 1 - (1 + 0.00666)^{-360})$

$M = 80{,}000(0.00666 / 1 - (1.00666)^{-360})$

M = 80,000(0.00666 / 1 -0.09166)
M = 80,000 (0.00666 / 0.90834)
M = 80,000 (0.00733)
M = $586.4

The monthly payment of $586.4 includes both, the principal and interest.

Note that using the table values while using the formula in steps will vary slightly compared to using the formula in a calculator sequence because of rounding.

Finding the total interest on a mortgage and the PITI

Often, a buyer will want to know the total amount of interest that will be paid during the ENTIRE loan.

Finding the interest on the entire loan

1. Total payments: multiply the principal and interest by the number of payments.
2. Subtract the financed amount from the total of the payments.

Number of payments x amount of payment - amount financed= total interest

Example 1. Calculate the total interest paid on the fixed-rate loan of $80,000 for 30 years at 8% interest loan.

Total interest= number of payments x amount of payment – amount financed

= 30(12)($586.4) - $80,000 = $211,104 - $80,000 = $131,104

The total interest paid is $131,104

Finding the PITI (Principal, Interest, Taxes, and Insurance) payment

The two examples above show how to calculate both the monthly payment and the total interest for a mortgage loan, but there are also other costs associated with buying a home. Lending companies may require **points** to be paid at the time the loan is made or closed. The payment of points is a one–time payment of a percentage of that loan in addition to the mortgage. One point =1%, two points= 2%, and so on.

Mortgage closing costs are process and loan closing charges that must be performed before purchasing a home. Examples of these charges include fees for credit reports, surveys, inspections, appraisals, legal, title insurance, and taxes. Lending companies are required by law to disclose to the buyer in writing the estimated mortgage closing costs prior to the closing date. This is known as the **good faith estimate**. Average closing costs are about 6% of the loan amount and the fees are paid by the buyer as well as by the seller.

Since the lending agency must be assured that the property taxes and insurance are paid on the home, the annual costs of these items may be prorated each year and added to the monthly payment for that year. The lending agency will hold on to these funds in **escrow** until the taxes or insurance payment is due and then makes the payment for the buyer. The monthly mortgage payments are more than just the principal and interest payment we found in the preceding examples and are the adjusted monthly payments that includes the principal, interest, taxes and insurance or PITI.

To find the PITI (Principal, Interest, Taxes, and Insurance) payment

1. Find the principal and interest portion of the monthly payment
2. Divide the annual taxes by 12 for the monthly tax amount
3. Divide the annual insurance by 12 for the monthly insurance amount
4. Find the sum of the monthly principal, interest, taxes and insurance.

Example 2. Ms Miller's annual taxes are $3,600 and her annual insurance is $600, find her total PITI payment. As we found above, her monthly payment of principal and interest is $586.4.

$586.4	Monthly principal and interest found in Example 1
$3600 / 12 = $300	Monthly taxes
$600 / 12 = $50	Monthly insurance

PITI = $586.4+ $300 + $50 = $936.40

The total PITI payment is $936.40.

Example 3 Trying to determine whether to accept a 25-year 6% mortgage or a 20-year 5% mortgage, Nina needs to finance $200,000 and has budgeted $1,350 monthly for his payment of principal and interest. Which mortgage should Qua choose?

Given information:

Amount financed: $200,000
Annual interest rate: 6% and 5%
Monthly budgeted payment: $1,000

Solution:

Total cost = monthly payment x 12 x number of years
$1,000 units financed = amount financed / $1,000
Monthly payment = number of $1,000 units financed x table value
Number of $1,000 units financed = $200,000 / $1,000 = 200

With the 25-year mortgage , from Table 8-1: Value for 25 years and 6% is $6.44. Monthly payment = number of $1,000 units financed x table value = 200($6.44) = $1,288 Total cost = monthly payment x 12 x years financed = $1,288(12)(25) = $386,400 The monthly payment for the 25-year mortgage is $1,288for a total cost of $386,400	With the 20-year mortgage, from Table 8-1: Value for 20 years and 5% is $6.6. Monthly payment = number of $1,000 units financed x table value = 200($6.6) = $1,320 Total cost = monthly payment x 12 x years financed = $1,320(12)(20) = $316,800 The monthly payment for the 20-year mortgage is $1,320for a total cost of $316,800.

Conclusion: Qua would save $69,600 over the 20-year period if he chooses the 20-year plan. That is the plan he should choose, since his budget of $1,350 monthly can cover either option.

Amortization Schedules and Qualifying Ratios

Preparing a partial amortization schedule of a mortgage

An amortization schedule is given to homeowners to show the amount of principal and interest for each payment of the loan. Extra amounts paid with the monthly payment are credited against the principal, allowing for the mortgage to be paid sooner.

To prepare an amortization schedule

1. First month:
   - (a.) Find the interest portion of the first monthly payment (principal and interest ONLY) = Original principal x monthly interest rate
   - (b.) Find the principal portion of the monthly payment = monthly payment – interest portion of the first monthly payment
   - (c.) Find the first end-of-month principal = original principal – principal portion of the first monthly payment

2. For each remaining month in turn: find the interest portion, principal portion, and end-of-month principal:
   - (a.) Find the interest portion of the monthly payment = previous end-of-month principal x monthly interest rate
   - (b.) Find the principal portion of the monthly payment = monthly payment – interest portion of the monthly payment
   - (c.) Find the end-of-month principal = previous end-of-month principal – principal portion of the monthly payment

Example 1 Ms. Miller's mortgage of $80,000 at 8% annual interest for 30 years gives her a monthly payment of interest and principal of $586.4. With this information, complete the first two rows of the amortization schedule.

First month

Original principal x monthly rate = Interest portion of monthly payment

= $80,000(0.08 / 12) = 533.33   Note: 8% = 0.08

Monthly payment (without insurance and taxes) – interest portion of monthly payment = Principal portion of monthly payment

= $586.4 - $533.33 = $53.07

Previous end-of-month principal – principal portion of monthly payment = End-of-month principal

= $80,000 - $53.07= $79,946.93

Second Month

Interest portion of monthly payment = $79,946.93 (0.08 / 12) = $532.97

End-of-month principal = $79,946.93- $532.97 = $79,413.96

The first two rows of an amortization schedule for this loan are shown below.

Portion of payment applied to:

Month	**Monthly Payment**	**Interest (previous end of month principal x Monthly Rate)**	**Principal (monthly payment interest portion)**	**End of month principal (previous end of month principal portion)**
1	$586.40	533.33	$53.07	$79,946.93
2	$586.40	$532.97	$53.43	$79,413.96

To generate an amortization schedule that shows the interest and principal breakdown for each payment of the loan, software programs, such as Excel are normally used.

Calculating qualifying ratios

Lending institutions examine first, your credit report and then mortgage ratios to determine loan applicants' capacity to repay a loan. By dividing the amount mortgaged by the appraisal value of the property, **the loan-to-value ratio (LTV)** is found. If this ratio, when expressed as a percent, is more than 80%, the borrower may be required to purchase private mortgage insurance (PMI). By dividing the monthly housing expenses (PITI) by your gross monthly income, the **housing ratio** or **front-end ratio** is found. In most cases the housing ratio should not exceed 28%.

By dividing your fixed monthly expenses by your gross monthly income, **the debt-to-income ratio (DTI)** or **back-end ratio** is found. The debt-to-income ratio should be no more than 36%. Fixed monthly expenses are monthly housing expenses (PITI plus any other expenses directly associated with home ownership), monthly installment loan payments, monthly revolving credit line payments, alimony and child support, and other fixed monthly expenses. Income from employment, including overtime and commissions, self-employment income, alimony, child support, Social Security, retirement or VA benefits, interest and dividend income, income from trusts, partnerships and so on are all considered monthly income.

<u>To find the qualifying ratio for a mortgage</u>

1. Decide which formula to use to find the desired qualifying ratio

   Amount mortgaged / appraised value of property = Loan-to-value ratio

   Total mortgage payment (PITI) / gross monthly income = Housing ratio

   Total fixed monthly expenses / gross monthly income = Debt-to-income ratio

2. Evaluate the formula

Example A buyer will purchase a home that was appraised at \$300,000, for \$240,000 and makes a down payment of \$80,000. Find the loan-to-value ratio.

Amount mortgaged = \$240,000 - \$80,000 = \$160,000
Appraised value = \$300,000

Amount mortgaged / Appraised value of property = Loan-to-value ratio
Substitute values in the formula

Loan-to-value ratio

Loan-to-value ratio = \$160,000 / \$300,000

= 0.5333 or 53.33%

The loan-to-value ratio is 53.33%.