A mortgage is a loan:

- For buying a home, property, or real estate,
- For a "substantial" (large) dollar amount,
- To be paid back over a long period of time,
- Where the property itself is *security* for the loan.
- (also known as **deed of trust** or **security deed**)

- Term of the mortgage – the time until the final payoff of the loan.
- Down payment – portion of purchase price which the buyer pays up front.
- **Principal amount of the mortgage** (amount borrowed or amount financed) – subtract the down payment from the purchase price.

With a fixed-rate **mortgage**,

- the interest rate will remain constant throughout the term,
- initial principal balance, together with interest due on the loan, is repaid to the lender through regular (constant) periodic (we assume monthly) payments.
- This is called amortizing the loan.
- Here is a table used to help calculate the monthly payment on a fixed-rate mortgage:

**Monthly payments to repay Principal and Interest on a $1000 mortgage**

| Annual rate ($r$) | Term of Mortgage (Years) ($t$) | | | | | |
|---|---|---|---|---|---|---|
| | 5 | 10 | 15 | 20 | 25 | 30 |
| 4.0% | $18.41652 | $10.12451 | $7.39688 | $6.05980 | $5.27837 | $4.77415 |
| 4.5% | 18.64302 | 10.36384 | 7.64993 | 6.32649 | 5.55832 | 5.06685 |
| 5.0% | 18.87123 | 10.60655 | 7.90794 | 6.59956 | 5.84590 | 5.36822 |
| 5.5% | 19.10116 | 10.85263 | 8.17083 | 6.87887 | 6.14087 | 5.67789 |
| 6.0% | 19.33280 | 11.10205 | 8.43857 | 7.16431 | 6.44301 | 5.99551 |
| 6.5% | 19.56615 | 11.35480 | 8.71107 | 7.45573 | 6.75207 | 6.32068 |
| 7.0% | 19.80120 | 11.61085 | 8.98828 | 7.75299 | 7.06779 | 6.65302 |
| 7.5% | 20.03795 | 11.87018 | 9.27012 | 8.05593 | 7.38991 | 6.99215 |
| 8.0% | 20.27639 | 12.13276 | 9.55652 | 8.36440 | 7.71816 | 7.33765 |
| 8.5% | 20.51653 | 12.39857 | 9.84740 | 8.67823 | 8.05227 | 7.68913 |
| 9.0% | 20.75836 | 12.66758 | 10.14267 | 8.99726 | 8.39196 | 8.04623 |
| 9.5% | 21.00186 | 12.93976 | 10.44225 | 9.32131 | 8.73697 | 8.40854 |
| 10.0% | 21.24704 | 13.21507 | 10.74605 | 9.65022 | 9.08701 | 8.77572 |
| 10.5% | 21.49390 | 13.49350 | 11.05399 | 9.98380 | 9.44182 | 9.14739 |
| 11.0% | 21.74242 | 13.77500 | 11.36597 | 10.32188 | 9.80113 | 9.52323 |
| 11.5% | 21.99261 | 14.05954 | 11.68190 | 10.66430 | 10.16469 | 9.90291 |
| 12.0% | 22.24445 | 14.34709 | 12.00168 | 11.01086 | 10.53224 | 10.28613 |

**EXAMPLE:** Find the monthly payment necessary to amortize $80,000 at 6% for 25 years.

Monthly payments to repay Principal and Interest on a $1000 mortgage

| Annual rate (r) | Term of Mortgage (Years) (t) | | | | | |
|---|---|---|---|---|---|---|
| | 5 | 10 | 15 | 20 | 25 | 30 |
| 4.0% | $18.41652 | $10.12451 | $7.39688 | $6.05980 | $5.27837 | $4.77415 |
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| 7.5% | 20.03795 | 11.87018 | 9.27012 | 8.05593 | 7.38991 | 6.99215 |
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| 11.5% | 21.99261 | 14.05954 | 11.68190 | 10.66430 | 10.16469 | 9.90291 |
| 12.0% | 22.24445 | 14.34709 | 12.00168 | 11.01086 | 10.53224 | 10.28613 |

In the table above, read down to the row for 6.5% then read across to the column for 25 years.
What is that entry number? 6.44301

This number is the monthly payment amount needed to amortize a loan for $1000.
The money amount being amortized is based on increments of $1000.

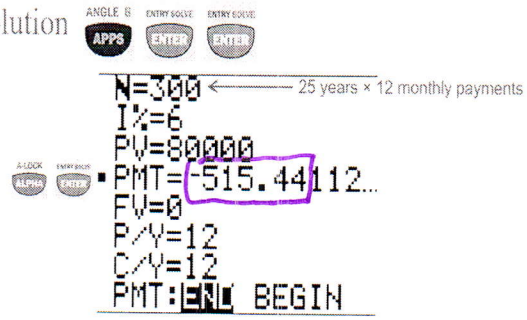
How many $1000's are we financing for? 80000 ÷ 1000 = 80

Multiply these two numbers together to find the monthly payment:

6.44301 (80) = 515.4408
= $515.44 rounded

Here's an ALTERNATE WAY to do this on your TI-83/84 calculator using **TVM Solver** app:

Solution




1. Press **APPS**, then **ENTER** (Finance), then **ENTER** (TVM Solver)
2. **N=** (number of months), type 12*number of years (calculator will do it for you)
3. **I%=** enter interest rate as given percent (no decimal)
4. **PV=** enter present value (amount of mortgage)
5. (skip **PMT=** for now)
6. **FV=** future value (enter 0)
7. **P/Y=** enter payments per year (use 12 for monthly)
8. **C/Y=** (this will switch to 12 once **P/Y** has 12)
9. **PMT:** keep **END** highlighted
10. Go back to **PMT=** now and press **ALPHA**, **ENTER** (this will "SOLVE" to find monthly payment based on all these conditions).

It's negative because it's paid out or "taken-away" from you!

NOTE: It's a good idea to know how to do BOTH ways (table and TVM Solver on calc), so you have one as a backup in case you run into problems or forget how to do one or the other.

**EXAMPLE:** Find the monthly payment needed to amortize the principal and interest for each fixed-rate mortgage using the chart (or TVM Solver on calc).

Monthly payments to repay Principal and Interest on a $1000 mortgage

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| 5.0% | 18.87123 | 10.60655 | 7.90794 | 6.59956 | 5.84590 | 5.36822 |
| 5.5% | 19.10116 | 10.85263 | 8.17083 | 6.87887 | 6.14087 | 5.67789 |
| 6.0% | 19.33280 | 11.10205 | 8.43857 | 7.16431 | 6.44301 | 5.99551 |
| 6.5% | 19.56615 | 11.35480 | 8.71107 | 7.45573 | 6.75207 | 6.32068 |
| 7.0% | 19.80120 | 11.61085 | 8.98828 | 7.75299 | 7.06779 | 6.65302 |
| 7.5% | 20.03795 | 11.87018 | 9.27012 | 8.05593 | 7.38991 | 6.99215 |
| 8.0% | 20.27639 | 12.13276 | 9.55652 | 8.36440 | 7.71816 | 7.33765 |
| 8.5% | 20.51653 | 12.39857 | 9.84740 | 8.67823 | 8.05227 | 7.68913 |
| 9.0% | 20.75836 | 12.66758 | 10.14267 | 8.99726 | 8.39196 | 8.04623 |
| 9.5% | 21.00186 | 12.93976 | 10.44225 | 9.32131 | 8.73697 | 8.40854 |
| 10.0% | 21.24704 | 13.21507 | 10.74605 | 9.65022 | 9.08701 | 8.77572 |
| 10.5% | 21.49390 | 13.49350 | 11.05399 | 9.98380 | 9.44182 | 9.14739 |
| 11.0% | 21.74242 | 13.77500 | 11.36597 | 10.32188 | 9.80113 | 9.52323 |
| 11.5% | 21.99261 | 14.05954 | 11.68190 | 10.66430 | 10.16469 | 9.90291 |
| 12.0% | 22.24445 | 14.34709 | 12.00168 | 11.01086 | 10.53224 | 10.28613 |

205000 → 5.5%

70000 → 10.0%

50,000 → 11.0%

| Loan Amount | Interest Rate | Term | Monthly Payment |
|---|---|---|---|
| ✓ $70,000 (70) | 10.0% | 20 years | 9.65022(70) = 675.5154 → $675.52 |
| ✓ $50,000 (50) | 11.0% | 15 years | 11.36597(50) = 568.2985 → $568.30 |
| ✓ $205,000 (205) | 5.5% | 10 years | 10.85263(205) = 2224.78915 → $2224.79 |

Property **taxes** are collected by your county or local government. Property taxes and mortgage interest are deductible on your income taxes.

**Homeowner's** insurance usually covers losses due to fire, storm damages, and other casualties. Homes also require **maintenance**, but these costs can vary greatly.

Payments of property taxes and homeowner's insurance are commonly made from a **reserve account** (also called an escrow or an **impound account**) maintained by the mortgage lender. The borrower must pay enough each month, along with amortization costs, so that the reserve account will be sufficient to make payments when they come due.

**EXAMPLE:** A couple has a 25-year, $175,000 fixed-rate loan at 7%. In addition, they owe $2800 in annual taxes and $750 annually for homeowner's insurance. What is their net average monthly expenditure? (Find the total monthly payment, including taxes and insurance.)

**Monthly payments to repay Principal and Interest on a $1000 mortgage**

| Annual rate (r) | Term of Mortgage (Years) (t) | | | | | |
|---|---|---|---|---|---|---|
| | 5 | 10 | 15 | 20 | 25 | 30 |
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| 6.0% | 19.33280 | 11.10205 | 8.43857 | 7.16431 | 6.44301 | 5.99551 |
| 6.5% | 19.56615 | 11.35480 | 8.71107 | 7.45573 | 6.75207 | 6.32068 |
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| 7.5% | 20.03795 | 11.87018 | 9.27012 | 8.05593 | 7.38991 | 6.99215 |
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| 9.5% | 21.00186 | 12.93976 | 10.44225 | 9.32131 | 8.73697 | 8.40854 |
| 10.0% | 21.24704 | 13.21507 | 10.74605 | 9.65022 | 9.08701 | 8.77572 |
| 10.5% | 21.49390 | 13.49350 | 11.05399 | 9.98380 | 9.44182 | 9.14739 |
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| 12.0% | 22.24445 | 14.34709 | 12.00168 | 11.01086 | 10.53224 | 10.28613 |

Property taxes and homeowner's insurance can vary from year to year, so these are NOT included with the mortgage payment...they are added on after the mortgage payment!!

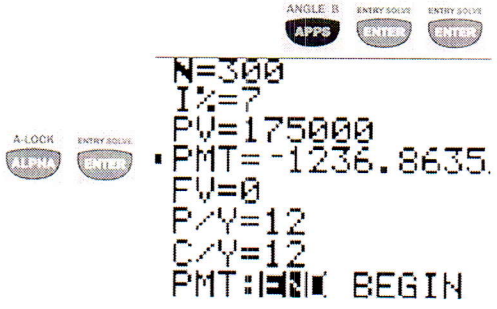
In the table above, read down to the row for 7% then read across to the column for 25 years. What is that entry number? 7.06779

This number is the monthly payment amount needed to amortize a loan for $1000.
The money amount being amortized is based on increments of $1000.

How many $1000's are we financing for? 175000 ÷ 1000 = 175

Multiply these two numbers together to find the monthly payment:

7.06779 (175) = 1236.86325
= $1236.86 rounded




If you use the **TVM Solver** app on the calculator:

(continued on next page...)

Here is the original problem, for reference:

**EXAMPLE:** A couple has a 25-year, $175,000 fixed-rate loan at 7%. In addition, they owe $2800 in annual taxes and $750 annually for homeowner's insurance. What is their net average monthly expenditure? (Find the total monthly payment, including taxes and insurance.)

(... carried over from the previous page...)

So, the monthly payment (not including taxes and insurance yet) is: $\$1236.86$

Taxes and insurance together total how much per year? $2800 + 750 = \$3550$

So, taxes and insurance together would be how much per ***month***? $\$295.83$ rounded

Add the ***monthly*** taxes and insurance onto the monthly mortgage payment:

$\$1236.86 + \$295.83 = \boxed{\$1532.69}$ = average net monthly expenditure

(total monthly payment, including taxes and insurance)