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Buying a House

This worksheet will cover many of the basic workings of obtaining a home mortgage.

Affordability Guidelines

Owning a home requires a large amount of money. Since most people do not have enough money to purchase a home outright, they must borrow the money. We have covered the topic of loans, but with real estate there are more aspects to consider before securing the loan. This section will focus on the main mathematical issues that affect the ordinary person. When you actually purchase a home, one trusts that you will have professionals help sort out the legal details.

Traditionally, a few general guidelines have been used to estimate how much a buyer could afford to spend on a house. Here are three of the most common ones.

1. The home you purchase should not cost more than three times your annual family income (gross), assuming a standard down payment of 20%.
2. You should limit your monthly housing expenses, including mortgage payment, property taxes, homeowner's insurance and association fees (if applicable) to no more than 25% of your monthly gross income.
3. You must have enough cash on hand for the standard down payment (20% of the house price), and all closing costs. If your planned house purchase fits under these guidelines, then you can almost surely afford it. Your loan application would then be approved.

The person or persons seeking a loan or homeowner with a loan is the **borrower**. A **financial institution** is the money lender, which can be a bank, a credit union, or some other lending institution. Many times the decision to buy a house comes down to whether or not a financial institution will approve the loan application. Sometimes a financial institution will take into account other debt you have already incurred. For example, having a car payment or credit card balances may affect your ability to buy a house. Some financial institutions will allow up to 38% of the borrower's monthly income to go for the house payment, if the borrower does not have any major outstanding debt. This is not recommended, especially with a long term debt like a mortgage, since a person may not be able to make the same level of payments over a long period of time.

Example 1: If your annual family income is \$45,000, what do the first two traditional affordability guidelines tell you regarding a purchase price and monthly expenses for your potential home?

Solution:

Guideline 1: The house you consider should not cost more than three times your annual income.

$$3 \times 45,000 = 135,000.$$

The maximum price of the house is \$135,000.

Guideline 2: The monthly expenses for the house payment which includes the mortgage payment, property taxes, and homeowner's insurance should not exceed 25% of the monthly gross income.

$$\frac{45,000(0.25)}{12} = 937.5.$$

The maximum monthly house expenses are \$937.50.

Example 2: Suppose George and Betty both have jobs and will purchase the house using both their salaries. George's monthly gross is \$3,083 while Betty's is \$4,000. Find the maximum house price and monthly expenses using the affordability guidelines.

Solution:

Total family monthly income: $\$3,083 + \$4,000 = \$7,083$

Total family annual income: $12 \times \$7,083 = \$84,996$

Guideline 1: House price no more than 3 times annual family income: $3 \times \$84,996 = \$254,988$.

Guideline 2: Monthly house expenses are no more than 25% of monthly family income: $0.25 \times \$7,083 = \$1,770.75$.

Example 3: Sally is interested in a house with the monthly house expenses of \$989. What is the least amount of money Sally can make per year in order for the loan to be approved using the Affordability Guideline 2?

Solution:

Guideline 2: Monthly house expenses are less than or equal to 25% of monthly income (in other words, monthly income must be more than 4 times the monthly house expenses).

$4 \times 989 = \$3,956$ at least this income per month.

$\$3,956 \times 12 = \$47,472$, at least this income per year. Note that from Guideline 1, we can see that the house price must be no more than 3 times the annual income. So, if annual income was \$47,472 then the house could cost no more than \$142,416.

The Mortgage

A **mortgage** is a loan that is guaranteed by the real estate. If the borrower fails to make the payments, the lender can take control of the property. Technically only certain loans secured by real estate are called mortgages, but we use the term in the sense of everyday conversation rather than its full legal meaning.

There are many types of mortgages available. Before 1970s, there was not much diversity of mortgages since there was financial stability. In the 1970s and 1980s, there was high inflation and high interest rates, so financial institutions introduced new types of mortgages to attract borrowers.

The two main categories of mortgages are fixed rate mortgages and adjustable rate mortgages. For a **fixed rate mortgage**, the interest rate is the same for the entire time of the loan. For an **adjustable rate mortgage** (ARM), the interest rate can change from year to year. These changes are made without refinancing. An ARM of 5/1 would mean an adjustable rate mortgage where the interest rate stays fixed for the first 5 years and then the interest rate can change every year after that. The actual interest rate is usually a specified amount higher than some particular financial index (for example, the interest rate paid by Treasury bonds); often there is a limit (called a cap) on how much the interest rate is allowed to rise in a single year.

One question is “Do I want a fixed rate mortgage or an adjustable rate mortgage?” Unfortunately, the answer depends on what is going to happen to interest rates in the future and your own future plans. For example, if you knew that interest rates were going to go down significantly over the life of your mortgage, then you would want to have an adjustable rate mortgage so that the interest rate you pay would go down also. On the other hand, if you knew that interest rates were going to go up over the life of your mortgage, then you would want a fixed rate mortgage to lock in the initial lower interest rate. Unfortunately, this is basically impossible to know. It also depends on how long you plan to live in the house you are buying. If you are planning to live in the house for a few years (less than 5) it might be wise to take the adjustable rate mortgage.

The second major distinction among mortgages is the term of the mortgage. Usually one chooses a 15, 20 or 30 year loan. In today’s market, some financial institutions are offering 25 and 40 year mortgages. There is a higher lender’s risk with long-term loans so these usually carry a higher interest rate.

Another variable in choosing a mortgage loan is commonly referred to as points. One point is one percent of the amount of the loan. These charges are paid by the borrower before receiving the actual loan, usually at the time of actually purchasing the house.

The points are generated by two conditions:

1. A loan origination fee for making the loan at all. This is what a financial institution charges for giving you a loan. This is in addition to any closing costs (to be discussed later).
2. A discount charge for offering a lower interest rate. The interest rate is 5.25% with no discount charge. The financial institution might offer a 4.95% interest rate with a 1.25 point discount charge. Most people can’t decide if they should or should not take the discount charge. They know that with the lower interest rate, the monthly payments will be lower and the amount of total interest one pays on the loan will be less. The dilemma is, is it worth it? One would need to calculate the difference in

the total interest paid for the two loans and compare this difference to how much one is paying for the discount charge.

These fees are associated with the interest rate of that particular finance institution. Each financial institution has their points and the points change for different interest rates. See chart below. Similar tables are published weekly in most major newspapers.

Interest Rates and Morgages Schemes

Bank	Terms	Rate	Fee + Discount Charge	APR	Comments
American Bank	15	6.625%	1.75 points	6.94%	
	30	7.125%	1.75 points	7.32%	
Broward Co. Bank	15	6.375%	1.775 points	6.706%	Adjustable rate
	30	6.875%	1.925 points	7.097%	
	30 ARM(3/1)	5.75%	2.1 points		
First Interstate	15	6.5%	1.75 points	6.865%	
	30	7.0%	1.75 points	7.23%	
First Security Bank	15	6.625%	1.25 points	6.94%	
	30	7.0%	1.25 points	7.23%	
Liberty Federal Bank	15	6.3%	1 point and 2.5 points	6.485%	This Bank shows the points For Origination/Discount fees
	15	6.625%	2 points and 0.5 points	6.83%	
	30	6.875%	2 points and 0 points	7.096%	

In addition to these charges from financial institutions, there are other **closing costs**. Before the house is actually sold there are inspections and paperwork that is done on behalf of the buyer. The financial institution pays for them during this process of closing the house. At the time the house is sold the buyer pays for all of these charges. A few finance companies have a fixed closing cost while others pass on all these extra charges to the buyer. Sometimes the closing costs are negotiated between the seller and the buyer. The time when the house keys are passed to the buyer is called the time of closing. The total cash at closing is the down payment, origination fee, discount fee, and all the additional closing costs.

Example 4: If you are going to borrow \$75,000 for a home and there is a one point loan origination fee and 1.25 points for a discount charge, what will be your added costs?

Solution:

Each point is one percent of the loan.

Origination fee: $0.01 \times 75,000 = \$750$ Discount charge: $0.0125 \times 75,000 = \$937.50$ Total charges are \$1,687.50.

Once the interest rate and terms are agreed upon, one can calculate the monthly mortgage payment. The monthly house payment includes the following:

- the monthly mortgage payment,
- the monthly property taxes
- and monthly homeowner's insurance.

Most people call this the mortgage since this is paid to the financial institution, but actually it is only the loan portion which is the mortgage. So we will call the actual payment to the bank the **monthly house payment**. The financial institution collects all three of these expenses in the monthly payment. The **mortgage** is the amount one pays each month for the loan; this is the financial institution's money. The financial institution, in order to protect the property and their investment, makes sure the property tax and homeowner's insurance is paid. They estimate the cost of the property tax and insurance and divide by twelve. These **monthly charges** are then added to the monthly mortgage payment. The homeowner is paying the property tax and homeowner's insurance but the financial institution makes the payment to the insurance company and the government on behalf of the homeowner. The additional amount of money paid each month is placed into an escrow account. When these annual or semi-annual charges are due, the finance institution takes the money out of escrow and pays the bills for the borrower.

Example 5: John's monthly mortgage payment is \$1,254.34. If the annual property tax is \$3,267, and the annual homeowner's insurance cost is \$550, what is the monthly house payment rounded to the nearest

penny?

Solution:

Monthly mortgage: \$1,254.34

Monthly property taxes: $\$3267/12 = \272.25

Monthly homeowner's insurance: $\$550/12 = \45.83

Monthly house payment: \$1,572.42

Additional note about the escrow account: every month \$272.25 and \$45.83 are placed into an escrow account, and from that account the financial institution pays those bills when they become due.

You should note that every year, property taxes and insurance charges change. So your house payment will change annually even with a fixed mortgage. The finance company recalculates the house payment every year based on the bills the previous year. They are constantly making sure there is enough in the escrow account to cover the property tax and insurance.

Down Payment

A standard **down payment** on a house is 20% of the total value of the house. The loan amount is the difference between the house price and the down payment.

$$\text{Down Payment} = 0.20(\text{House price})$$

This means that the loan is usually 80% of the house price.

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Example 6: If you have \$22,000 for a down payment, what is the highest priced home you can afford if a 20% down payment is required?

Solution:

Down payment = $0.20 \times$ price of the house, so the maximum house price is \$110,000.

Example 7: Karen is buying a house for \$98,000. How much is her down payment, assuming a standard down payment? How much is her loan?

Solution:

Down payment: $\$98,000(.20) = \$19,600$

Loan: $\$98,000 - \$19,600 = \$78,400$

A lender prefers a large percentage down payment (20%) as a protection against the borrower defaulting on the loan, or something physically happening to the property. If a borrower has an invested amount in the house, the borrower might not easily walk away from the house. If a borrower defaults on the loan (not making payments), the lender will take control of the property. The lender can sell the property for the amount left on the loan. This would entice a new buyer since it is at most 80% of the actual selling price. This is how the lender uses the down payment to lessen the risk of lending the money. If a smaller down payment is made, one must expect to pay in some way for the lender's increased risk. The interest rate maybe higher, or one might be required to purchase Private Mortgage Insurance – which has a price in points – to insure the lender against a default on the loan. An FHA (Federal Housing Administration) Loan is offered to qualified borrowers which not only insures the lender against default but also requires a lower down payment. Down payments lower than 20% are becoming more common, particularly in programs aiming to first-time buyers and government service employees (teachers, police officers, firefighters, etc.). Returning to example 7, if the \$22,000 is used to make a 5% down payment, then the value of the property could be as high as

$$\frac{\$22,000}{0.05} = \$440,000.$$

Note that if you bought the \$440,000 house with 5%, or \$22,000 down, that would mean a loan of \$418,000. Even with a low interest rate of 5%, the interest alone the first month is \$2090!

Example 8: The Bates family purchases a home for \$135,000. They pay a 20% down payment and all closing costs. If the balance is financed at 6% for 30 years, what will their monthly mortgage payment be?

Solution:

Down payment: $0.2(135,000) = \$27,000$

Loan: $\$135,000 - \$27,000 = \$108,000$ amount needed to be financed

(Using the amortization formula) Monthly payments on the loan: \$647.51

Example 9: Sally is buying a house for \$180,000. She will be paying the standard down payment along with all closing costs. She has found a bank that has a 30-year term with an interest rate of 5.5%. This rate has an origination fee of 2 points and a discount charge of half a point. Along with these charges the bank estimates other closing costs to be about \$1,100. How much is Sally financing, and what is her monthly mortgage payment? How much will be needed at the time of closing? **Solution:**

Down payment: $0.20(\$180,000) = \$36,000$

Loan: $\$180,000 - \$36,000 = \$144,000$

She will finance \$144,000 at 5.5% for 30 years.

The cash needed at closing:

Down payment: \$36,000 Origination fee: $\$144,000(0.02) = \$2,880$, (2 points)

Discount fee: $144,000(0.005) = \$720$ (0.5 points)

Other closing costs: \$1,100

Total cash at closing \$40,700

Example 10: Suppose you have saved \$15,000 toward a down payment and closing costs on a home, and your total household income is \$35,000 per year. What is the most you could afford to pay for a home? Assume that (1) your homeowner's insurance cost will be 0.25% of the value of the home, (2) your property taxes will be 2% annually, (3) your closing costs will be about \$2,000 and (4) you can obtain a fixed rate mortgage for 30 years at 8% interest.

Solution:

First calculate the maximum loan you can afford. In addition to the down payment, a limiting factor to the amount of the loan you can obtain is the monthly payment you can afford to make. Your monthly obligations include your mortgage payment, monthly homeowner's insurance and monthly property tax.

Guideline 1: House price is no more than 3 times your annual salary

$$3(\$35,000) = \$105,000$$

Guideline 2: Monthly house payment no more than 25% of monthly gross income.

$$0.25 \cdot \frac{\$25,000}{12} = \$729.17.$$

Guideline 3: Enough money saved for money needed at closing: \$15,000 saved but \$2,000 for closing costs leaves \$13,000 for a down payment. A house price of \$105,000 requires a down payment of $105,000(0.2) = \$21,000$. \$105,000 with a down payment of \$13,000 is about 12.4%. One would need to purchase mortgage insurance to cover the difference. With a savings of \$13,000, the max house price $\$13,000/0.2 = \$65,000$.

	The \$105,000 house	The \$65,000 house
Cost of house	\$105,000	\$65,000
Down payment	\$13,000	\$13,000
Amount to finance	\$92,000	\$52,000
Monthly payment	\$675	\$381.56
Cost of insurance	$\frac{\$105,000(0.0025)}{12} = \21.88	$\frac{\$65,000(0.0025)}{12} = \13.54
Property taxes	$\frac{\$105,000(0.02)}{12} = \175.00	$\frac{\$65,000(0.02)}{12} = \108.33
Total monthly payment	\$871.88	\$503.43

With the guidelines one would be approved for the loan with a house price of \$65,000. It would meet all 3 guidelines.

For the house price of \$105,000, one would not be approved according to the second guideline. With a \$13,000 down payment, the house payment is greater than the maximum allowed, which is \$729. This is one reason you should not try to find a house worth 3 times your annual salary. Even with a proper down payment (20% of the price of the house), the monthly payments might still be too high. What are some things you can do to afford the more expensive house?

Example 11: A house price is \$150,000. The bank has a term of 20 years and an interest rate of 5%. The bank has an origination fee of 1.5 points, along with additional closing costs of \$1,500. The homeowner's insurance is \$650 per year. The property tax is 2.5% of the price of the house. Calculate the down payment, the loan, the money needed at closing, the monthly mortgage payment, and the monthly house payment.

Solution:

Down payment: $\$150,000(.20) = \$30,000$

Loan: $\$150,000 - \$30,000 = \$120,000$

Money needed at closing: Down payment + origination fee + discount charge + other closing costs

Origination fee: $\$120,000(0.015) = \1800

Discount charge: \$0

Other closing costs: \$1,500

Down payment: \$30,000

Total money needed at closing: \$33,300

Mortgage:

$$\text{Monthly mortgage payments} = \frac{120,000(q-1)}{q(q^{240}-1)} = \$791.95, \text{ where } q = \frac{1}{1 + \frac{0.05}{12}}.$$

House payment = mortgage + monthly homeowner's insurance + monthly property tax

Monthly homeowner's insurance: $\frac{\$650}{12} = \54.17

Monthly Property tax: $\frac{\$150,000(0.025)}{12} = \312.50

Mortgage payment = \$791.95

House payment = \$1,158.62

How much would the family need to save each month for the previous 5 years to come up with the cash at closing if the savings interest rate is 3%?

$$p = \frac{0.02}{12} = 0.0025,$$

so

$$P = \$33,300 \left[\frac{0.0025}{(1.0025)^{60} - 1} \right] = \$515.11.$$

So the monthly savings should be \$515.11.

The last page has a sample of the different closing costs for a \$200,000 house. This shows some of the other fees that are added to the cash needed at closing. This is taken from Bank of America's mortgage website. For your project, you will get this information from the bank in a loan interest rate from. You are required to calculate the down payment, origination fee, discount fee, loan, monthly mortgage and monthly house payment, as well as find other closing costs. Even if the bank or realtor gives you all this information, you are to do the calculations and verify the values (show your work!).