Math 105 Section 003
Buying a House Worksheet
Solutions

1. If a family's annual income is $\$60,000$, what do the first two affordability guidelines tell them regarding the purchase price and monthly payments for a potential home purchase?

   Solution. The first affordability guideline tells us that they should not buy a house that is more than three times their annual income. So the most they should spend on the house is $\$180,000$. Moreover, their monthly house payments should not exceed 25% of their monthly income. Their monthly income is \$5000, so their monthly house payment should not be more than \$1250.

2. If a couple has a combined monthly income of $\$2,500$, what do affordability guidelines tell them regarding purchase price and monthly housing expenses?

   Solution. The couple's annual income is $\$30,000$, so they should not buy a house that is more than $\$90,000$. Their monthly housing expenses should not exceed 25% of $\$2,500$, or \$625.

3. The Marrs family is going to borrow $\$95,000$ for a new house. If there is a 2.25 points loan origination fee and 0.75 points for a discount charge, what are their costs for these two items?

   Solution. The fees are

   $$\begin{aligned} \text{Origination Fee:} \quad \$95,000(0.025) = \quad & \$2137.50 \\ \text{Discount Fee:} \quad \$95,000(0.0075) = \quad & \$712.50 \end{aligned}$$

4. There is a \$1.5 point loan origination fee and no discount charge on a $\$115,000$ loan. What is the fee for this loan?

   Solution. The fee for this loan is

   $$\$115,000(0.015) = \$1725.$$

5. Jim has saved money to buy a home and has $\$19,000$ for a down payment. The realtor says that he should expect a 20% down payment. What is the maximum price he will be able to afford based upon the down payment?

   Solution. Since the down payment should be $(0.2)(\text{House price}) = \$19,000$, with

   $$\text{House price} = \frac{\$19,000}{0.2} = \$95,000.$$

6. Jim has saved money to buy a home and has $\$19,000$ for a down payment. The realtor says that there is a special loan for first-time buyers, and he would only need a 5% down payment. What is the maximum price he will be able to afford based upon the down payment?

   Solution. Since the down payment is $(0.05)(\text{House price}) = \$19,000$, with

   $$\text{House price} = \frac{\$19,000}{0.05} = \$380,000.$$

7. A family decides to buy a home at an agreed upon price of $\$135,000$. They will make a down payment of 20% and finance the rest at 6% for 30 years. The origination fee is 3 points and the discount charge is 1.25 points. How much money is needed at closing, and what is the mortgage payment?

   Solution. Since the closing costs are made up of the down payment and the loan fees, we have

   $$\begin{aligned} \text{Down payment:} \quad \$135,000(0.2) = \quad & \$27,000 \\ \text{Loan:} \quad \$135,000 - \$27,000 = \quad & \$108,000 \\ \text{Origination Fee:} \quad \$108,000(0.03) = \quad & \$3240 \\ \text{Discount Fee:} \quad \$108,000(0.015) = \quad & \$1350 \\ \text{Closing costs:} \quad \$27,000 + \$3240 + \$1350 = \quad & \$31,590 \end{aligned}$$

Since the loan amount is being financed at 6% APR for 30 years, we can use the installment loan formula to find what the monthly mortgage payments should be:

$$\$108,000 = F\left[\frac{1-\left(\frac{1}{1+0.005}\right)^{360}}{0.005}\right], \text{ so } F = \$647.51.$$

8. If one has calculated the mortgage payment to be \$859, what are the total monthly house expenses if the annual property tax is \$2,200 and the annual homeowner's insurance is \$450?

   Solution. The monthly property taxes are \$2200/12 = \$183.33 and the monthly insurance is \$450/12 = \$37.50. So the total monthly house payment is

   $$\$859 + \$37.50 + \$183.33 = \$1079.83.$$

9. House Price = \$140,000
   Mortgage interest rate = 9%
   Term = 30 years
   Property Taxes = 2.5% of the House Price (usually assessed value but we will use the house price)
   Homeowner's insurance = \$650 a year
   Calculate the total monthly house payment. Assume a standard 20% down payment.

   Solution. The monthly house payment is made up of the mortgage payment, the monthly insurance payment, and the monthly property taxes. The insurance payment is \$650/12 = \$54.17. The taxes are \$140,000(0.025)/12 = \$291.67. The loan amount is \$140,000 − \$140,000(0.2) = \$112,000. So the mortgage payments are

   $$\$112,000 = F\left[\frac{1-\left(\frac{1}{1+0.0075}\right)^{360}}{0.0075}\right], \text{ so } F = \$901.18.$$

   So the monthly house payments are

   $$\$54.17 + \$291.67 + \$901.18 = \$1247.02.$$

10. House price \$200,000
    Mortgage interest rate = 8%
    Term = 20 years
    Property taxes = 2.5% of House Price
    Homeowner's insurance = \$480
    Origination fee = 1.25-points
    Discount charge = 1-point
    Other closing costs = \$1,800

    (a) Calculate the total amount needed at closing. Assume a standard down payment.

    Solution. The closing costs are the down payment, the origination and discount fees, and any other closing costs.

Down payment:	\$200,000(0.2) =	\$40,000
Loan:	\$200,000 − \$40,000 =	\$160,000
Origination Fee:	\$160,000(0.0125) =	\$2000
Discount Fee:	\$160,000(0.01) =	\$1600
Total closing costs:	\$40,000 + \$2000 + \$1600 + \$1800 =	\$45,400.

(b) Calculate the monthly mortgage.

Solution. Using the installment loan formula:

$$\$160,000 = F\left[\frac{1-\left(\frac{1}{1.006667}\right)}{0.006667}\right], \text{ so } F = \$1338.34.$$

(c) Calculate the sum of all the mortgage payments. Calculate the total price of this house paid to the bank. (All the mortgage payments plus money needed at closing.)

Solution. There are 240 payments of \$1338.34, so the total amount paid over 20 years is $240(1338.34) = \$321,201.60$. If we add this to the money needed at closing from part (a), we get

$$\text{Total price of the house} = \$321,201.60 + \$45,400 = \$366,601.06.$$

(d) Calculate the monthly house payment.

Solution. The monthly house payment is the mortgage plus the monthly property taxes plus the monthly homeowner's insurace. The monthly property taxes are $\$200,000(0.025)/12 = \$416.67$. The monthly homeowner's insurance is $\$480/12 = \$40$. So,

$$\text{monthly house payment } = \$416.67 + \$40 + \$1338.34 = \$1795.01.$$

(e) What must be the minimum annual income required? (Must calculate for both guidelines.)

Solution. Guideline 1 tells us that the house price should not be more than 3 times the annual salary. So the annual salary has to be at least $\$200,000/3 = \$66,666.67$. However, guideline 2 tells us that the total monthly house payment should not be more than 25% of the monthly income. So we have

$$\text{monthly income } = \frac{\$1795.01}{0.25} = \$7180.04.$$

So the annual income should be $\$7180.04(12) = \$86,160.48$. So the minimum annual income is the larger value, so it should be at least $\$86,160.48$.