



# Who can afford a home?

In this lesson students reinforce the concept of median and apply it and other pre-algebra skills to actual U.S. census data. Through these exercises students experience how applying mathematical concepts can help them make sense of real life data. They also gain an understanding of how much of a family's income is typically spent on housing.

## Objectives:

Students will:

- Identify the median in a data set.
- Calculate percentages using whole numbers.
- Utilize pre-algebra skills to make sense of real life data in their own communities.
- Convey mathematical information by creating visual graphs (pie graphs).
- Learn about the difficulty of finding affordable housing and discuss reasons why housing is unaffordable for many.

## Math content standards:

Algebra

- Use mathematical models to represent and understand quantitative relationships.

Data analysis

- Formulate questions that can be addressed with data, and collect, organize, and display relevant data to answer them.

Problem solving

- Build new mathematical knowledge through problem solving and solve problems that arise in mathematics and in other contexts.

## Materials:

- "Paying for a place to live"
- "Understanding median"
- "What does median household income mean?"
- "Can you afford the rent?"
- "What percent do we spend on housing?" (Extension Activity)
- "Housing in your community" (Extension Activity)

## Procedure:

### 1. Introduce the lesson.

Tell the class you will be looking at some typical costs that families incur every month. Ask the students to name items their family pays for each month.

Categories include:

- Food
- Clothing
- Housing (mortgage or rent, plus utilities)
- Transportation
- Health care
- Education
- Entertainment
- Travel

### 2. Distribute "Paying for a place to live" for students to read.

Discuss the terms "rent" and "mortgage."

### 3. Explain the term "median."

Distribute "Understanding median." Work with the students through the problems.

### 4. Calculate percent using whole numbers.

Distribute "Can You Afford the Rent?" Have students work through the problems individually. This worksheet asks students to determine whether households at four different levels of income can afford housing.

### 5. Create a live representation of the data.

After completing the worksheet, divide the class into five groups by counting off by fives. Assign each group to represent one of the five families from the worksheet. Have the families that cannot afford the average rent for a two-bedroom apartment stand on one side of the room. Have the others stand on the opposite side of the room. Tell the students that this is a rough representation of the percentage of families in the United States who are having troubles paying for a place to live. (Almost half of American families have difficulty paying for a place to live.)

**Optional Extension:****Create graphs to visually represent the data:**

- Use the worksheet “What percent do we spend on housing?” to have students draw a visual representation of the percent of income different families spend on housing.
- Have each student draw a pie graph for each of the families from the “Can You Afford the Rent?” worksheet. You may have the students use a computer program to practice technology skills. The pie graph should show what percentage of its income the family would have to spend on rent.

**Examine data for your county:**

- Students can look up housing data for every state and county in the United States at the National Low Income Housing Coalition’s Web site, <http://www.nlihc.org/oor/oor2008/?CFID=27816722&CFTOKEN=19793713>. Get the required data for your county and find out whether people who earn different levels of income in your county can afford to rent an apartment there. Have students use the included worksheet, “Housing in Your Community.”
- After completing the worksheet, discuss the problems that lower income families face in trying to pay for a place to live. What resources are there for families in your community who are having trouble paying rent? Research organizations in your local community that help families afford housing and investigate how they work.

A good starting place is to see if there is a local affiliate of Habitat for Humanity International in your area. To do this, go to [www.habitat.org/local](http://www.habitat.org/local) to enter

your zip code and find the Habitat affiliate that is closest to your community. From here you can click to open the affiliate’s Web site and see what ongoing work and events are going on in your community.

**Further Exploration:****Workforce and workforce housing: Who does median income represent?**

People who earn the median income in a community are usually the people who make a living by providing services to others who live in the local community. This includes people who make a living by working in jobs such as:

- Teachers
- Police
- Nurses
- Medical technicians
- Restaurant staff
- Store clerks

A term used to describe the group of people in these community service jobs is the community “**workforce**.” People in workforce jobs usually earn around 75 percent to 100 percent of median income in a community. From the lesson you can see that households that are in this income range are having trouble paying for housing in many parts of the United States.

The term “**workforce housing**” refers to housing that people in the community “workforce” can afford. If home prices increase far more than incomes do, people in community workforce jobs cannot afford to live in the community they are serving. You can see this phenomenon happen in many areas of the country where housing prices are high.

## Paying for a place to live

A home is one of the most expensive things people pay for each month. In the United States almost all families pay for housing in some form every month.

- **How much can a family afford to spend on housing?**

Wealthy people can certainly spend a lot on housing.

In general, however, economists consider housing to be affordable if a family spends no more than 30 percent of its income on housing. For example, if a family earns \$2,100 per month, it should spend no more than \$630 per month on rent. This leaves enough money to cover the other monthly costs in a household budget.

- **What do housing costs consist of?**

1. **Rent or mortgage:**

Most families pay either rent or mortgage for their homes, but not both.

- **Rent:** Rent is money you pay to a landlord each month to live in an apartment or house that is owned by the landlord.
- **Mortgage:** When you are ready to buy a house or a condominium, you can either pay the full price right away or get a loan from a bank to buy it. This loan is called a mortgage. Most people in the United States get a mortgage loan from a bank to buy a home. You must pay back a small part of the mortgage loan each month to the bank.

2. **Utilities:**

Utilities are services and things you use as part of living in your home. They include things like electricity, water, phone service, and trash pick-up. You pay for utilities whether you own or rent a home.

3. **Other fees:**

Other things you need to pay for include keeping the home in a good living condition. This means costs like repairing things that break, keeping any landscaping clean, and keeping the outside of the building weatherproof. A household may pay these costs when they occur, or pay a monthly fee to a homeowners association to take care of these items.

### When Housing Becomes Unaffordable

In the past few decades it has become harder and harder for middle and lower class families to pay for a place to live. Why has housing become so hard for people to afford?

#### Rising home prices:

If a town or city grows quickly, there are a large number of people looking for a place to live and not enough homes for sale or apartments for rent. When this happens, the prices of homes rise.

For example, in Seattle the growth of the Microsoft Corporation attracted many new businesses and people to the area. Because there were many more people looking for places to live and not enough houses, condominiums, or apartments, the price to buy or rent a home went up.

When home prices go up, people who earn high salaries will still be able to buy a home or find a place to rent. But people who have middle-paying jobs (including community serving jobs such as teachers, nurses, police officers, etc.) or lower paying jobs will have more difficulty finding a place they can afford to live.

#### Few simple low-priced homes:

In the past decades, companies that build housing have focused on building more extravagant, expensive homes rather than less expensive homes. Also, many landlords have converted simple apartments into fancier, more expensive apartments. As a result, there is not a large supply of inexpensive housing. At the same time, the number of lower income families has increased.

The number of low-cost places to live has not kept up with the number of lower income families. When the cost of renting or buying a home increases, middle to lower income families suffer. They will have trouble finding a place where they can afford to live. If they have to spend more than 30 percent of their income on housing costs, the families end up spending less on other necessary items like food and clothing.

## Understanding median

### What does “median” mean?

If you have a group of numbers and you put them in order from smallest to largest, the number in the middle is the median of that group of numbers.

in order from smallest to largest, the one that is in the very middle of the group is the median household income. Half of the households earn more than the MHI, and half of the households earn less. MHI is one way to show what a typical American household earns in a year.

### What does “median household income” (MHI) mean?

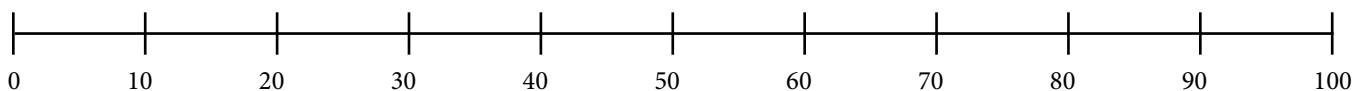
The U.S. government gathers information on how much money households in the United States earn each year (“household income”). If you put all the household incomes

### Directions:

For each of the problems below, circle the median number and plot the numbers on the line graph. When you plot the line graph, plot the median number in red so it is easy to identify.

1.

Data Points	2	3	46	47	49
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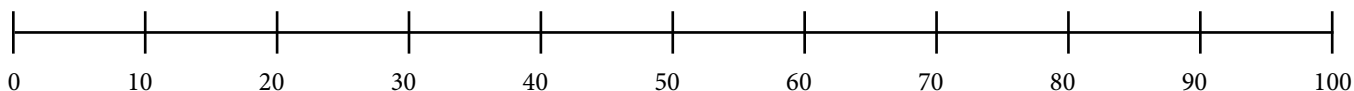
2.

Data Points	4	7	46	78	82
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3.

Data Points	43	45	46	78	87
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4.

Data Points	4	8	12	46	47
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5.

Data Points	38	42	46	55	96
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**Questions:**

1. When the data points are spaced on a number line, is the median number always located at the midpoint between the smallest and largest data points?
2. Is the median number always in the middle of the data points?

## Understanding median

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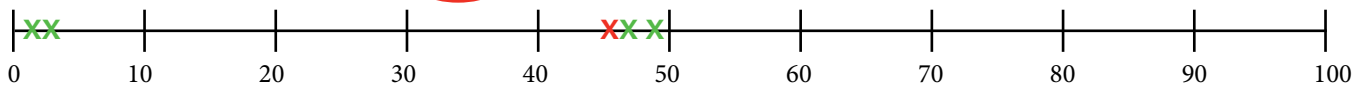
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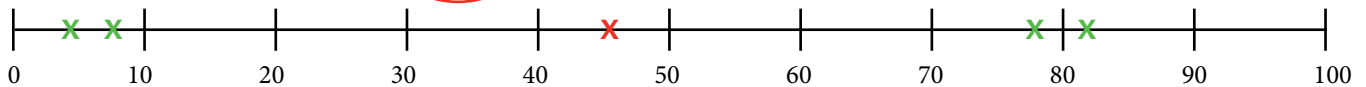
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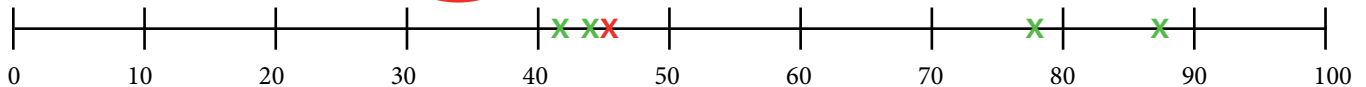
2.

Data Points	4	7	46	78	82
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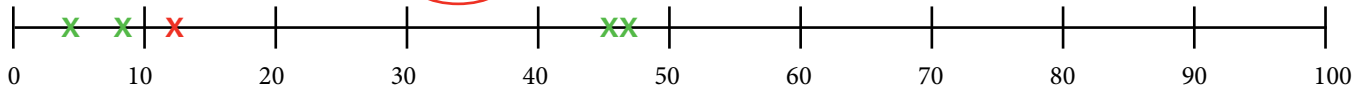
3.

Data Points	43	45	46	78	87
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4.

Data Points	4	8	12	46	47
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5.

Data Points	38	42	46	55	96
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**Questions:**

1. When the data points are spaced on a number line, is the median number always located at the midpoint between the smallest and largest data points?

No

2. Is the median number always in the middle of the data points?

Yes

## Can you afford the rent?

Mr. and Ms. Median live in the town of Housingland.

Their family income is \$46,000 per year. In terms of income, they are in the middle of all the families, or households, in Housingland. This means half of the households in their town earn less than they do, half of the households earn more.

Mr. and Ms. Median are good friends with two families that live nearby. These families have very different incomes.

- The Fiftypercent family earns half of what the Medians earn. This means they earn \$23,000 per year.
- The Hundredfiftypercent family earns 1.5 times what the Medians earn. They earn \$69,000 per year.

Some other families that live in the neighborhood include the Seventyfivepercent family and the Hundredtwentyfivepercent family.

### What is each family's montly income?

First determine how much money the different families earn.

### Problem 1:

#### Can Mr. and Ms. Median “afford” to pay the average rent for a two-bedroom apartment?

Remember, amount they can afford to spend on housing =  $30\% \times$  Monthly household income

Show your work here:

What can Mr. and Ms. Median afford to spend on housing each month? \_\_\_\_\_

Can Mr. and Ms. Median afford to pay the \$900 average rent?

YES or NO

Remember Mr. and Mrs. Median's income is in the middle of all household incomes in their town.

Family	Income per Year	Income per Month
Mr. and Ms. Median	\$46,000	\$3,833
Hundredfiftypercent Family		
Fiftypercent Family		

### Which of these families can “afford” to rent a two-bedroom apartment?

Use the following information in determining your answer<sup>1</sup>.

- The average rent for a two-bedroom apartment in the United States is \$900 per month.
- Housing is considered “affordable” if you spend 30 percent or less of your monthly income on housing costs.

<sup>1</sup> Based on 2005 figures from 2005 U.S. Census.

**Problem 2:**

**Can the Hundredfiftypercent family “afford” to pay the average rent for a two-bedroom apartment?**

Remember, amount they can afford to spend on housing =  $30\% \times$  Monthly household income

Show your work here:

What can the Hundredfiftypercent family afford to spend on housing each month? \_\_\_\_\_

Can the Hundredfiftypercent family afford to pay the \$900 average rent?

YES      or      NO

**Problem 3:**

**Can the Fiftypercent family “afford” to pay the average rent for a two-bedroom apartment?**

Remember, amount they can afford to spend on housing =  $30\% \times$  Monthly household income

Show your work here:

What can the Fiftypercent family afford to spend on housing each month? \_\_\_\_\_

Can the Fiftypercent family afford to pay the \$900 average rent?

YES      or      NO

**Problem 4:**

**The Seventyfivepercent family earns \$2,875 per month.**

What can this family afford to spend on housing each month?

Can the Seventyfivepercent family afford to pay the \$900 average rent?

YES      or      NO

**Problem 5:**

**The Hundredtwentyfivepercent family earns \$3,066 per month.**

What can this family afford to spend on housing each month?

Can the Hundredtwentyfivepercent family afford to pay the \$900 average rent?

YES      or      NO

Teacher's copy

## Can you afford the rent?

Mr. and Ms. Median live in the town of Housingland.

Their family income is \$46,000 per year. In terms of income, they are in the middle of all the families, or households, in Housingland. This means half of the households in their town earn less than they do, half of the households earn more.

Mr. and Ms. Median are good friends with two families that live nearby. These families have very different incomes.

- The Fiftypercent family earns half of what the Medians earn. This means they earn \$23,000 per year.
- The Hundredfiftypercent family earns 1.5 times what the Medians earn. They earn \$69,000 per year.

Some other families that live in the neighborhood include the Seventyfivepercent family and the Hundredtwentyfivepercent family.

### What is each family's monthly income?

First determine how much money the different families earn.

Remember Mr. and Mrs. Median's income is in the middle of all household incomes in their town.

Family	Income per Year	Income per Month
Mr. and Ms. Median	\$46,000	\$3,833
Hundredfiftypercent Family	\$69,000	\$5,750
Fiftypercent Family	\$23,000	\$1,917

### Which of these families can "afford" to rent a two-bedroom apartment?

Use the following information in determining your answer<sup>1</sup>.

- The average rent for a two-bedroom apartment in the United States is \$900 per month.
- Housing is considered "affordable" if you spend 30 percent or less of your monthly income on housing costs.

### Problem 1:

#### Can Mr. and Ms. Median "afford" to pay the average rent for a two-bedroom apartment?

Remember, amount they can afford to spend on housing = 30% x Monthly household income

Show your work here:

$$X = 30\% \times 3833$$

$$X = 0.3 \times 3833$$

$$X = 1149.9$$

$$\text{Round to } X = 1150$$

What can Mr. and Ms. Median afford to spend on housing each month? \$1,150 per month

Can Mr. and Ms. Median afford to pay the \$900 average rent?

YES or  NO

**Problem 2:**

Can the Hundredfiftypercent family “afford” to pay the average rent for a two-bedroom apartment?

Remember, amount they can afford to spend on housing = 30% x Monthly household income

Show your work here:

$$X = 30\% \times 5750$$

$$X = 0.3 \times 5750$$

$$X = 1725$$

What can the Hundredfiftypercent family afford to spend on housing each month? \$1,725 per month

Can the Hundredfiftypercent family afford to pay the \$900 average rent?

YES or  NO

**Problem 3:**

Can the Fiftypercent family “afford” to pay the average rent for a two-bedroom apartment?

Remember, amount they can afford to spend on housing = 30% x Monthly household income

Show your work here:

$$X = 30\% \times 1917$$

$$X = 0.3 \times 1917$$

$$X = 575.1$$

$$\text{Round to } X = 575$$

What can the Fiftypercent family afford to spend on housing each month? \$575 per month

Can the Fiftypercent family afford to pay the \$900 average rent?

YES or  NO

**Problem 4:**

The Seventyfivepercent family earns \$2,875 per month.

What can this family afford to spend on housing each month?

$$X = 30\% \times 2875$$

$$X = 0.3 \times 2875$$

$$X = 862.5$$

$$\text{Round to } X = 863$$

Can the Seventyfivepercent family afford to pay the \$900 average rent?

YES or  NO

**Problem 5:**

The Hundredtwentyfivepercent family earns \$3,066 per month.

What can this family afford to spend on housing each month?

$$X = 30\% \times 4791$$

$$X = 0.3 \times 4791$$

$$X = 1437.3$$

$$\text{Round to } X = 143$$

Can the Hundredtwentyfivepercent family afford to pay the \$900 average rent?

YES or  NO







Teacher's copy

# What percent do we spend on housing?

Assume each of the families below pay \$900 per month to rent a place a live.

What percent of their income does each of the following families spend on housing?

Family	Monthly Income	Percent Spent on Rent
Mr. & Ms. Median	\$3,833	23%
Hundredfiftypercent Family	\$5,750	16%
Fiftypercent Family	\$1,917	47%
Hundredtwentyfivepercent Family	\$4,791	19%
Seventyfivepercent Family	\$2,875	31%

**Problem 1:**

**Mr. and Ms. Median**

Rent = Percent x Monthly Income

900 = Rent x Monthly Income

$900 = Y \times 3,833$

$900 / 3,833 = Y$

$0.23 = Y$

$Y = 23\%$

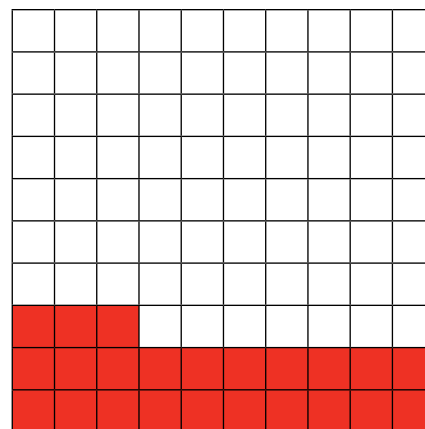
What percent of their income do Mr. and Ms. Median need to use to pay \$900 per month rent?

23%

Is this "affordable" (less than 30 percent of their income)?

YES or NO

Color in the number of boxes that equal the percent of their income the Medians need to spend on \$900 rent each month.



**Problem 2:**

**Hundredfiftypercent Family**

Rent = Percent x Monthly Income

900 = Rent x Monthly Income

$$900 = Y \times 5,750$$

$$900/5,750 = Y$$

$$0.156 = Y = 0.16$$

$$Y = 16\%$$

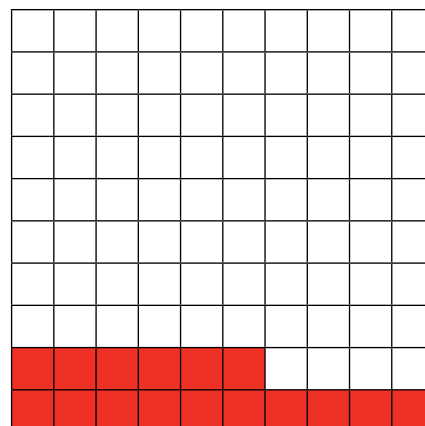
What percent of their income does the Hundredfiftypercent family need to use to pay \$900 per month rent?

16%

Is this “affordable” (less than 30 percent of their income)?

YES or NO

Color in the number of boxes that equal the percent of their income that this family needs to spend on \$900 rent each month.



**Problem 3:**

**Fiftypercent Family**

Rent = Percent x Monthly Income

900 = Rent x Monthly Income

$$900 = Y \times 1,917$$

$$900/1,917 = Y$$

$$0.469 = Y = 0.47$$

$$Y = 47\%$$

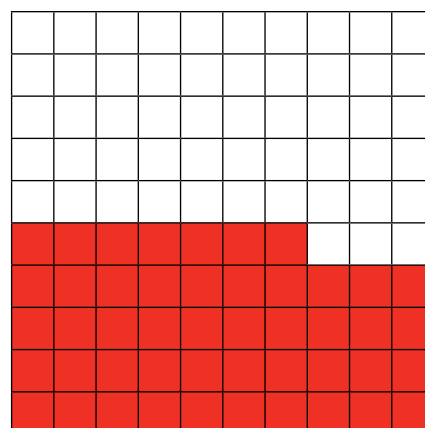
What percent of their income does the Fiftypercent family need to use to pay \$900 per month rent?

47%

Is this “affordable” (less than 30 percent of their income)?

YES or NO

Color in the number of boxes that equal the percent of their income that this family needs to spend on \$900 rent each month.



**Problem 4:**

**Hundredtwentyfivepercent Family**

Rent = Percent x Monthly Income

900 = Rent x Monthly Income

$$900 = Y \times 4,791$$

$$900/4,791 = Y$$

$$0.187 = Y = 0.19$$

$$Y = 19\%$$

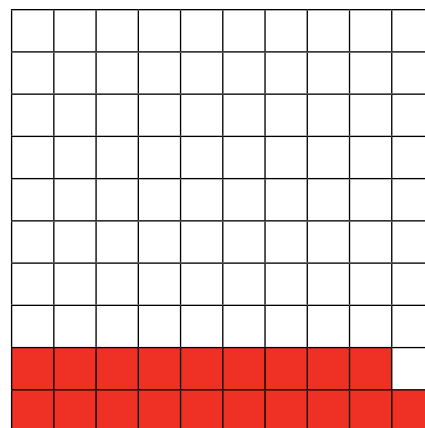
What percent of their income does the Hundredtwentyfivepercent family need to use to pay \$900 per month rent?

19%

Is this “affordable” (less than 30 percent of their income)?

YES or NO

Color in the number of boxes that equal the percent of their income that this family needs to spend on \$900 rent each month.



**Problem 5:**

**Seventyfivepercent Family**

Rent = Percent x Monthly Income

900 = Rent x Monthly Income

$$900 = Y \times 2,875$$

$$900/2,875 = Y$$

$$0.313 = Y = 0.31$$

$$Y = 31\%$$

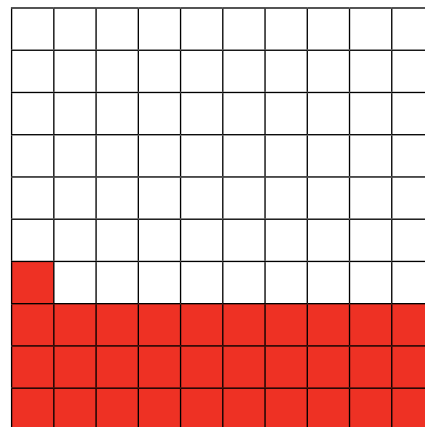
What percent of their income does the Seventyfivepercent family need to use to pay \$900 per month rent?

31%

Is this “affordable” (less than 30 percent of their income)?

YES or NO

Color in the number of boxes that equal the percent of their income that this family needs to spend on \$900 rent each month.



## Housing in your community

Look up housing data for your state and county by going to the National Low Income Housing Coalition report entitled “Out of Reach.” Go to [www.nlihc.org](http://www.nlihc.org) or try <http://www.nlihc.org/oor/oor2008/?CFID=27816722&CFTOKEN=19793713>.

**Get the following data:**

Fair Market Rent for a two-bedroom apartment in your county: \_\_\_\_\_  
(Fair Market Rent is a term in real estate that indicates the amount of money that a given property would command if it were open for leasing at the moment.)

Area Median Income for your county: \_\_\_\_\_

Remember, housing is considered “affordable” for a family **if the family spends 30 percent or less of its income on housing costs each month.**

**1. Can a family that earns Median Household Income (MHI) in your county afford to rent an apartment there?**

Show your work below:

**2. Can a family that earns 50 percent of MHI in your county afford to rent an apartment in your county?**

Show your work below:

**3. Can a family that earns 75 percent of MHI in your county afford to rent an apartment in your county?**

Show your work below: