Activity 12:

Home sales records

by: Bob Tower

Home sales records

Home sales and prices reached new levels in June. Existing home sales, seasonally adjusted at an annual rate. (in millions):

6.95

5.92

6

5

J J A S O N D J F M A M J
└─ 2003 ─┘ └─ 2004 ─┘

Source: National Association of Realtors
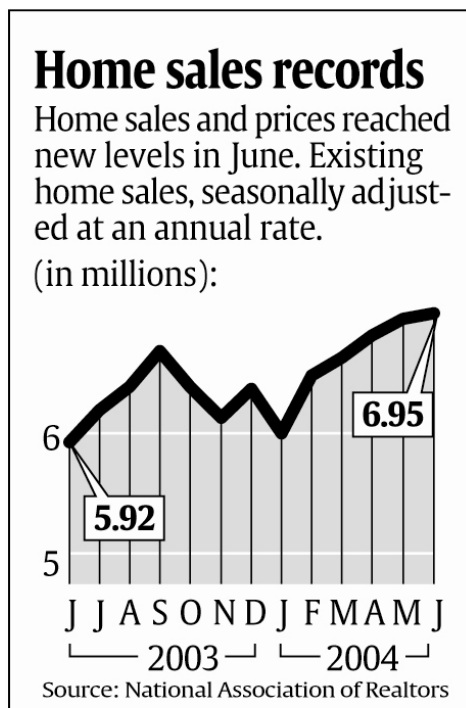
By Karl Gelles, USA TODAY

Activity Overview:

Many young people choose to buy their own homes, rather than rent them. Most will have to take out a home mortgage in order to fulfill this dream. If they plan to buy a home in the future, they will need to think about: How much does it cost per month to pay back a home loan? How do the period of time for the loan and the rate of interest affect the payments? How much does one actually pay for the house over the period of time for the loan?

Concepts:

- Using ratios
- Understanding interest rates, loan amounts, total amount of a loan
- Using a spreadsheet
- Using percents and decimals

Activity at a Glance:

- Grade level: 9-12
- Subject: Algebra
- Estimated time: 50 minutes

Materials:

- TI-Navigator™ system
- TI-83 Plus family or TI-84 Plus family of graphing calculators
- CellSheet™ App

Recommended:

- USA TODAY newspapers
- Multimedia Projector
- TI Keyboards
- Microsoft® Excel

Prerequisites:

Students should know how to:

- use the CellSheet Application
- enter a formula in a spreadsheet
- convert a percent to a decimal
- apply the concept of ratio

TI | navigator.

For use with the TI-Navigator™
Classroom Learning System

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Student Objectives:

- Use USA TODAY to find interest rates for 30-year and 15-year loans
- Express percentages in decimal notation
- Use a spreadsheet to compute the monthly payment, total amount paid, and ratio of total amount paid to loan amount for a home mortgage

Background:

Many students will need to make a decision about taking out a loan for large purchases during their lifetime. This activity will give them a start in making knowledgeable decisions about these types of purchases. Students will use a formula to calculate the monthly payment on a home mortgage. Then, they will compare different periods of time and interest rates for the national median price of a home. This activity will give students experience with determining monthly payments and total amount paid over the term of a loan.

Preparation:

- Download the activity files to your computer: Teacher Edition, Student Edition, Transparency, Activity Center Settings, Cellsheet files, and LearningCheck™ Assessment. (See Appendix B for a list of the files.)
- Make copies of the Student Edition for your class. Students can refer to the Student Edition during the activity and use it to record their work.
- Set up your TI-Navigator system and make sure you are familiar with the following functions: Send to Class, Collect from Class, Screen Capture, Quick Poll, Activity Center, LearningCheck Assessment, and Class Analysis.
- Students will need a TI-83 Plus or TI-84 Plus graphing calculator, either working in pairs or individually.
- Recommendations:
  - ○ Multimedia Projector for sharing the Activity Center, Quick Polls, and Screen Captures with your students
  - ○ TI Keyboards to easily answer LearningCheck assessment questions

Data Source:

National Association of Realtors

Activity Extensions:

- Encourage students to contact local financial institutions and real estate agents about the local interest rates, price of homes, and mortgages.
- Have students research the starting salary for a job that students would like to pursue after high school, technical school, or college. Some lenders say that you can spend about 25% of your gross income on a house payment. Have them estimate the amount of money they would be able to pay per month for a house payment.
- Have students use the formula for determining the monthly payment that they used in the spreadsheet to find how much money they can borrow at the current 15-year and 30-year rates.
- Have students discuss the pros and cons of owning a home.

Curriculum Connections:

- Business
- Finance
- Economics
- Agriculture Science
- Family and Consumer Science

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Teacher: **Students:**

Classroom Management Tips:

- You may use the transparency for a class discussion before the students start working. This will give the students a better understanding of how to read the graphic and retrieve data.

- Take time at the beginning of the class period to talk to the class about how they should choose the eight additional loan amounts used in the CellSheet App.

- You can have the students work together on the material they need from USA TODAY. This is a good way to introduce the students to the different sections of USA TODAY.

- The interest rates used to determine the answers below were taken from the September 2, 2004 edition of USA TODAY's Money Section. The answers may vary when using a different edition of USA TODAY.

Activity Step-by-Step:

The following steps represent a suggested TI-Navigator classroom procedure to answer the focus questions.

1. Calculator – create a spreadsheet titled Payment using the CellSheet App and use the given formula to determine the payment per month for a loan
2. Screen Capture – check student understanding
3. USA TODAY – read the article and find the national median price of a house in June and May 2004. In the Money section, find the table titled "Consumer rates" and look for the section titled "Mortgage rates." Find interest rates for 30-year fixed and 15-year fixed for the previous day, 6 months ago, and a year ago.
4. Calculator – enter the two rates, 30-year and 15-year, for the previous day in the appropriate columns in the spreadsheet; calculate the remaining columns for the median priced houses found in Step 4 by completing the spreadsheet
5. Screen Capture – check student understanding
6. Quick Poll – Open Response, how much does it cost per month to pay back a 30-year home mortgage for the median priced home in May and June 2004?
7. Quick Poll – Open Response, if your pay rate is $15 per hour and you work eight hours a day, how many days would you have to work to make your monthly mortgage payment on a 30-year loan for the median priced home in May and June 2004?

Focus Questions:

- How much does it cost per month to pay back a 15-year home mortgage for the median priced home?

- If your pay rate is $15 per hour and you work eight hours a day, how many days would you have to work to make your monthly mortgage payment on a 15-year loan?

- How much do you actually pay for a house when you take out a 15-year loan?

- What is the ratio of a 15-year total amount paid to the loan amount?

- Suppose the monthly payments for a 30-year and a 15-year loan are determined using the same interest rate and loan amount. How will the monthly payments for the 30-year loan compare to the 15-year loan? How will the total amount paid for a 30-year loan compare to the total amount paid for the 15-year loan?

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Teacher: **Students:**

8. Quick Poll – Open Response, how much would you actually pay for a house when you take out a 30-year loan in May and June 2004?
9. Quick Poll – Open Response, what is the ratio of a 30-year total amount paid to the loan amount?
10. LearningCheck Assessment – answer the focus questions and discuss the results with your class to check for understanding
11. LearningCheck Reading Comprehension – answer the reading comprehension questions and discuss the results with your class to check for understanding

See below for details on each of these steps.

STEP 1 – CALCULATOR

1. Instruct your students to create a spreadsheet titled Payment using the CellSheet App and use the given formula to determine the payment per month for a loan.
2. The following are suggested column headings:

    LA – loan amount

    30IR – 30 year interest rate

    30MP – 30 year monthly payment

    30TAP – 30 year total amount paid

    15IR – 15 year interest rate

    15MP –15 year monthly payment

    15TAP – 15 year total amount paid

    R30L – ratio of a 30-year total amount paid to the loan amount

    R15L – ratio of a 15-year total amount paid to the loan amount

3. Instruct your students to login to the TI-Navigator system when ready to go to the next step.

    Note: *If you would like the students to start with the headings and formulas download the Cellsheet AppVars named PAYMENT.8xv. If you are going to use PAYMENT.8xv instruct students to go to STEP 4 and follow the directions.*

1. Press `APPS` and select `Celsheet`.
2. Press `MENU` (`GRAPH`) `File…` and `New…`
3. Enter `PAYMENT` for the name.
4. Use the functionality of the CellSheet App to write formulas to format the columns.
5. Press `2nd` `"` to start each of the column headings then enter your text.
6. Press `APPS` and select `NavNet`, login using your username and password.

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Teacher: Students:

STEP 2 – SCREEN CAPTURE

1. Use **Screen Capture** to check student understanding.

   The spreadsheet, PAYMENT, should look like the image on the right. If not, this is an opportunity to discuss how to create a spreadsheet using the CellSheet App.

2. Instruct students to exit the TI-Navigator.

PAYM	A	B	C
1	LA	30IR	30MP
2			
3			
4			
5			
6			
C2:			Menu

1. Press 4 to EXIT APP to return to the home screen of the calculator.

MATH TODAY™ Student Edition STEP 3 – USA TODAY

1. Instruct your students to read the article in the Activity 12 Student Edition and find the national median price of a house in June and May 2004.

2. In the Money section of USA TODAY, find the table titled "Consumer rates" and look for the section titled "Mortgage rates."

3. Find interest rates for 30-year fixed and 15-year fixed for the previous day, 6 months ago, and a year ago.

1. Read page 2 of the Activity 12 Student Edition.

2. Research the USA TODAY Money section for the current 30-year and 15-year fixed interest rates.

STEP 4 – CALCULATOR

1. Instruct your students to enter the two rates, 30-year and 15-year, for the previous day in the appropriate columns in the spreadsheet. Enter the median price of a house in June and May 2004 in the appropriate columns.

   The interest rates you and your students use may be different from those shown in the screenshot.

PAYM	A	B	C
1	LA	30IR	30MP
2	191800	.0582	
3	182400	.0582	
4			
5			
6			
A4:			Menu

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Teacher:

2. Instruct your students to calculate the remaining columns for the median priced houses found in Step 3 by completing the spreadsheet.
3. Instruct students to use the formula below to calculate the values in column C.

$$P = \frac{Ar}{1 - (1 + r)^{-t}}$$

Your values in the spreadsheet may be different from those shown in the screenshot.

4. Instruct students to use the copy/paste features of the CellSheet App to complete the spreadsheet for all loan amounts.

Students:

PAYM	A	B	C
1	LA	30IR	30MP
2	191800	.0582	1127.8
3	182400	.0582	
4			
5			
6			
C2: =(A2*(B2/12)),→ Menu

1. Press STO► to start a formula with an =.
2. Use the arrow keys to highlight C2 (contains the formula).
3. Press ZOOM for Copy, Range (Y=) and use the arrow keys to highlight the cells where you would like to paste the formula.
4. Press Paste (TRACE).

STEP 5 – SCREEN CAPTURE

1. Use **Screen Capture** to check student understanding.

    The spreadsheet, PAYMENT, should look like the image on the right. If not, this is an opportunity to discuss how to create a spreadsheet using the CellSheet App. Instruct students to enter eight additional loan amounts of their choice in column A so that they can look for trends in the data. The image on the right shows some suggested amounts.

2. Instruct your students to return to TI-Navigator when you are ready to go to the next step.

PAYM	A	B	C
1	LA	30IR	30MP
2	191800	.0582	1127.8
3	182400	.0582	1072.6
4	225000	.0582	1323.1
5	500000	.0582	2940.1
6	125000	.0582	735.03
C2: =(A2*(B2/12)),→ Menu

1. Press PRGM, select GONAVNET and press ENTER.

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Teacher: **Students:**

STEP 6 – QUICK POLL

1. From the pull-down menu select **Open Response** and check **Resubmit** so that students may change their answers.
2. Press ▶ **Start Poll** when you are ready to start.
3. Instruct the class to answer this question:

    Q. How much does it cost per month to pay back a 30-year home mortgage for the median priced home in May and June 2004?

    A. $1,073 for May median priced home
    $1,128 for June median priced home

4. Discuss with your class to check for understanding.

    NOTE: Select ‖ **Pause Poll** to have a class discussion. Select ‖ **Resume Poll** to continue.

5. Press ■ **Stop Poll** when you are ready to go to the next step.

1. Input answer and press SEND (Y=).
2. Resubmit answer as needed during the class discussion.

STEP 7 – QUICK POLL

1. From the pull-down menu select **Open Response** and check **Resubmit** so that students may change their answers.
2. Press ▶ **Start Poll** when you are ready to start.
3. Instruct the class to answer this question:

    Q. If your pay rate is $15 per hour and you work eight hours a day, how many days would you have to work to make your monthly mortgage payment on a 30-year loan for the median priced home in May and June 2004? Round your answers to the nearest half-day.

    A. About 9 days for May median priced home
    About 9 ½ days for June median priced home

4. Discuss with your class to check for understanding.

    NOTE: Select ‖ **Pause Poll** to have a class discussion. Select ‖ **Resume Poll** to continue.

5. Press ■ **Stop Poll** when you are ready to go to the next step.

1. Input answer and press SEND (Y=).
2. Resubmit answer as needed during the class discussion.

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Teacher: **Students:**

STEP 8 – QUICK POLL

1. From the pull-down menu select **Open Response** and check **Resubmit** so that students may change their answers.
2. Press ▶ **Start Poll** when you are ready to start.
3. Instruct the class to answer this question:

   Q. How much would you actually pay for a house when you take out a 30-year loan in May 2004 and June 2004?

   A. $387,122 for May
      $406,021 for June

4. Discuss with your class to check for understanding.

   NOTE: Select ❚❚ **Pause Poll** to have a class discussion. Select ❚❚ **Resume Poll** to continue.

5. Press ■ **Stop Poll** when you are ready to go to the next step.

1. Input answer and press SEND ([Y=]).
2. Resubmit answer as needed during the class discussion.

STEP 9 – QUICK POLL

1. From the pull-down menu select **Open Response** and check **Resubmit** so that students may change their answers.
2. Press ▶ **Start Poll** when you are ready to start.
3. Instruct the class to answer this question:

   Q. What is the ratio of a 30-year total amount paid to the loan amount?

   A. 2.12

4. Discuss with your class to check for understanding.

   NOTE: Select ❚❚ **Pause Poll** to have a class discussion. Select ❚❚ **Resume Poll** to continue.

5. Press ■ **Stop Poll** when you are ready to go to the next step.

1. Input answer and press SEND ([Y=]).
2. Resubmit answer as needed during the class discussion.

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Teacher: **Students:**

STEP 10 –
LEARNINGCHECK ASSESSMENT

1. Using 🔅**Send to Class**, distribute the LearningCheck assessment file Home1.edc to your students using **Force send to students now**.

2. Prompt them to open the ☑️LearningCheck assignment and answer the following questions:

   Q. How much does it cost per month to pay back a 15-year home mortgage for the median priced home? (Round your answers to the nearest dollar.)

   A. The monthly payment for the May 2004 median priced home of $182,400 is $1,462 for 15 years. The monthly payment for the June 2004 median priced home of $191,800 is $1,538 for 15 years.

   Q. If your pay rate is $15 per hour and you work eight hours a day, how many days would you have to work to make your monthly mortgage payment on a 15-year loan? Round your answer to the nearest half-day.

   A. About 12 days for May median priced home. About 13 days for June median priced home.

   Q. How much do you actually pay for a house when you take out a 15-year loan?

   A. The home owner would pay a total of $276,805 for a loan amount of $191,800 over 15 years. The home owner would pay a total of $263,239 for a loan of $182,400 over 15 years.

   Q. What is the ratio of a 15-year total amount paid to the loan amount?

   A. The ratio of the 15-year total amount paid to the loan amount is 1.44 for every case and this means that you are paying 1.44 times the original loan.

1. Press `BACK` (`ZOOM`) to go to the TI-Navigator home screen.

2. From the TI-Navigator home screen press ② `Network Apps`.

3. Select `LearnChk`.

4. Select the `HOME1` assignment and follow the prompts to answer the questions.

NOTE: TI Keyboards may be used.

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Teacher: **Students:**

Q. **Suppose the monthly payments for a 30-year and a 15-year loan are determined using the same interest rate and loan amount. How will the monthly payments for the 30-year loan compare to the 15-year loan? How will the total amount paid for a 30-year loan compare to the total amount paid for the 15-year loan?**

A. The monthly payment for the 15-year loan is higher than the 30-year loan. The total amount paid for the 30-year loan is higher than the total amount paid for the 15-year loan. As an example, a $225,000 loan amount at an interest rate of 5.82% would require a monthly payment for the 15-year loan that is $554 (rounded to the nearest dollar) greater than the 30-year loan. This same loan and interest rate would generate a total amount paid over the 30 years that would be $138,466 (rounded to the nearest dollar) more than the total amount paid for the 15-year loan.

3. Select **Class Analysis** and make sure all of the students have completed the assignment.

4. Select **Collect From Class**.
   NOTE: Before collecting the answers, we recommend that you check these options:
   - **Delete Answer File from Device after Collect**
   - **Delete Assignment File from Device after Collect**

5. Using **Class Results Slide Show**, discuss the results with your class to check for understanding.

STEP 12 – LEARNINGCHECK
READING COMPREHENSION

1. Using **Send to Class**, distribute the LearningCheck assessment file Home2.edc to your students using **Force send to students now**.

2. Prompt them to open the **LearningCheck** assignment and answer the following questions regarding the USA TODAY articles.

   Q. **According to the article the sales of existing homes rose at a seasonally adjusted rate of _____in June 2004.**

   A. 2.1%

1. Press BACK (ZOOM) to go to the TI-Navigator home screen.

2. From the TI-Navigator home screen press ② Network Apps.

3. Select LearnChk.

4. Select the Home2 assignment and follow the prompts to answer the questions.

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Teacher:

Students:

Q. The national median price of a home rose to $191,800 in June 2004, which is _____% above the same month a year before.

A. 9.6%

Q. What is the expectation for U.S. mortgage interest rates for the next year? What are the reasons given in the article for the expected change in the mortgage rates?

A. Rates are expected to increase in the next year. Stronger economy and more jobs.

Q. Why would a region's house prices stay flat or decline?

A. Regions with weak job markets have stayed flat or experienced declines.

Q. Federal Reserve officials raised interest rates at the end of June 2004. How are interest rates expected to change after the August 2004 meeting, and throughout 2004 and into 2005?

A. The rates are expected to increase by another quarter percent after the meeting and will continue rising throughout 2004 and 2005.

3. Select 📊 **Class Analysis** and make sure all of the students have completed the assignment.

4. Select 👥 **Collect Files Class**.

   NOTE: Before collecting the answers, we recommend that you check these options:

   - **Delete Answer File from Device after Collect**
   - **Delete Assignment File from Device after Collect**

5. Using 📊 **Class Results Slide Show**, discuss the results with your class to check for understanding.