

# Math TODAY™

## Teacher Edition

# USA TODAY

NO. 1 IN THE USA



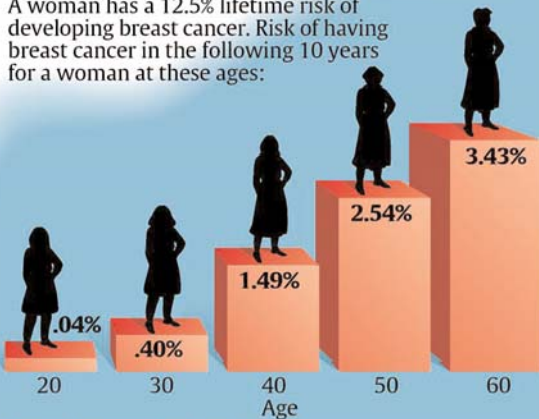
## Breast Cancer Risks

By: Bob Tower

### USA TODAY Snapshots

#### Breast cancer risks

A woman has a 12.5% lifetime risk of developing breast cancer. Risk of having breast cancer in the following 10 years for a woman at these ages:



Source: American Cancer Society

By Cindy Hall and Marcy E. Mullins, USA TODAY

### Activity Overview:

In this activity students will explore data that will be modeled by a logistic function. Students will have the opportunity to study real-life data and create a mathematical function to model the data. Students will use the mathematical model to make a prediction.

### Concepts:

- Identifying and interpreting non-linear data
- Reading and interpreting graphs
- Modeling data with a logistic function

### Objectives (using the TI-83 Plus or TI-83 Plus Silver Edition):

Students will:

- create a scatter plot from the data.
- explore logistic regression model from data.
- interpolate and extrapolate using a logistic model.

### Activity at a Glance:

- Grade level: 9-12
- Subject: Pre-Calculus
- Estimated time required: 10-30 minutes

### Materials:

- TI-83 Plus or TI-83 Plus Silver Edition
- Overhead view screen handheld for instruction/demonstration
- Student handout
- Transparency

### Prerequisites:

Students should:

- know how to enter data into lists.
- know how to use the regression capabilities of the handheld.
- know how to make a prediction from the model.
- be familiar with the characteristics of a logistic function.

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## Breast Cancer Risks

### Background:

As with many real-life problems this activity will show that few are linear. This activity will explore the logistic function and will demonstrate the need to understand how to read and interpret the graph. This activity will reinforce the concept that the rate of change can vary and is dependent on the data that the student is studying. A *risk factor* represents a chance of getting a disease but doesn't mean you will get the disease. There are different risk factors for different cancers. Visit [www.americancancer.com](http://www.americancancer.com) for more information about risk factors.

### Preparation:

- Provide one graphing handheld for each student.
- Each student should have a copy of the corresponding student activity sheet.

### Classroom Management Tips:

- Students will have a better understanding of how to read the graphic and retrieve data if you use the transparency for a class discussion before the students start working.
- Remind students to carefully read all parts of the graphic before they start collecting data.
- Students can work individually or in small groups on this activity.
- Students can work individually or in groups to assist each other as they learn the various features of the handheld.
- Technology appeals to almost all students. Encourage all students to handle and use the graphic handhelds. The TI graphing handhelds are designed to be durable for daily classroom use and backpack portability.
- If possible, use an overhead view screen graphic handheld for instruction. It will make it much easier for you to provide instructions and directions if the students can see the display on your graphing handheld.
- This would be an excellent time to discuss the differences between logistic and exponential functions. Include the concept of "carrying capacity" and "horizontal asymptote" for the logistic graph and what these mean.

### Data Source:

American Cancer Society

### National Council of Teachers of Mathematics (NCTM) Standards\*:

#### For Grades 9-12:

##### Algebra Standard

- Use mathematical models to represent and understand quantitative relationships.
- Analyze change in various contexts.

##### Problem Solving Standard

- Solve problems that arise in mathematics and in other contexts.
- Apply and adapt a variety of appropriate strategies to solve problems.

##### Representation Standard

- Create and use representations to organize, record, and communicate mathematical ideas.
- Use representations to model and interpret physical, social, and mathematical.

\*Standards are listed with the permission of the National Council of Teachers of Mathematics (NCTM), [www.nctm.org](http://www.nctm.org). NCTM does not endorse the content or validity of these alignments.

### Additional Resources:

#### Student Handout

#### Transparency

**TI Technology Guide**, for information on the following:

- TI-73 Explorer
- TI-83 Plus
- List Editor

## Breast Cancer Risks

### Activity Extensions:

- Have students read the Life section of USA TODAY to find health-related articles and bring an article to class.
- Encourage students to visit the Web site for the American Cancer Society, [www.americancancer.com](http://www.americancancer.com), and find two articles about breast cancer.
- Call the local American Cancer Society and invite someone to speak to the class.
- Have students look through USA TODAY's coverage of health, science and behavior in today's Life section. Before choosing an article, ask them to divide a sheet of paper into four columns labeled: "What I know (about this topic);" "What I want to know;" "What I learned;" "Why this information is important to me."

Have them choose an article, and read only the headline and subheading. Then, have them fill in five facts that they know about the subject, and list five new bits of information they would like to learn. As they read the article, have them fill in at least five new pieces of knowledge they learn. Next to each, ask them to jot down why each fact is important. Finally, have them assess how many of their "What I want to know" statements were answered by the article. Encourage them to research the answers to those they still want to know more about.

### Curriculum Connections:

#### CROSS-CURRICULAR

- Health and Physical Education
- Biology

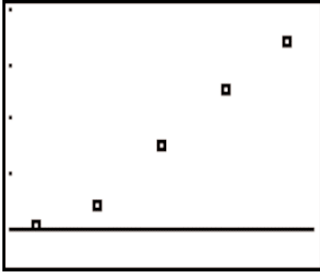
### Teacher Notes:

## Breast Cancer Risks

### Assessment and Evaluation:

**Q.** Create a scatter plot from the USA TODAY Snapshot data. Enter the data in two lists, L1 and L2.

**A.** Screen capture of the scatter plot of the data from the USA TODAY Snapshot.



**Q.** What mathematical function will be used to model the scatter plot?

**A.** Logistic function

**Q.** Use the regression capabilities of the handheld to determine the mathematical model for the data. Record your model below:

**A.** Screen capture of the logistic model from the handheld.

```

Logistic
y=c/(1+ae^(-bx))
a=479.1665443
b=.1408166298
c=.0373854289
    
```

**Q.** Use the model you found above to answer: For a women, what is the risk at age 70 of having breast cancer in the next ten years?

**A.** 3.65

**Q.** At 45?

**A.** 2.02

**Q.** What is the age of a woman who has a risk factor of 1.75%?

**A.** 43

**Q.** According to the mathematical model during what 5-year period does the risk of breast cancer seem to be increasing fastest?

**A.** An acceptable answer is between 40 and 45.