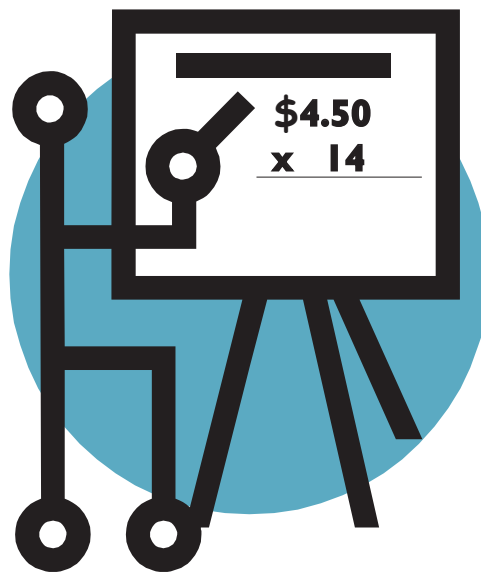


MATH LESSON

Calculating the Costs of Smoking



TOBACCO and LITERACY EDUCATION PROJECT

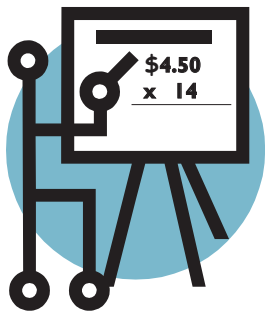


JSI Research & Training Institute, Inc.

New Hampshire Bureau of Adult Education, New Hampshire Department of Education

With funding from the American Legacy Foundation

2007



LESSON OVERVIEW

Introduction

In this lesson learners calculate the weekly, monthly, and annual costs of cigarettes, figure these costs as a percentage of income, and compare them to the costs of other items. The lesson also provides practice interpreting graphs using tobacco-related data. While furthering core math instruction goals of the adult education classroom, this lesson meets a key tobacco education need: showing learners the immediate effects of smoking in terms of monetary costs, which is often more relevant to young adults than more distant health effects.

Setting the Stage

Before beginning this lesson let students know that they will be learning about the dollar cost of smoking while practicing multiplication, calculating percentages, and interpreting graphs. Explain that the goal of the lesson is not to push anyone to quit smoking but to use real life cost examples to help them learn and practice important math skills.

Basic Skills Practice

- Practicing multiplication
- Calculating percentages
- Comparing quantities
- Interpreting graphs

Tobacco Education Objectives

After completing this lesson, students will be able to:

- Estimate the dollar amount spent on cigarettes weekly, monthly, and yearly by someone who smokes.
- Recognize that the cost of cigarettes can represent a significant percentage of a person's income.
- Understand that quitting smoking has immediate monetary benefits, and that the savings from quitting can be used to buy desired goods and services.

“Overall my students responded positively to this lesson. There was some good discussion about the cost of smoking and how much those costs add up.” (ABE/GED Instructor)



Materials

Student Materials: There is a student activity sheet for each of the three in-class activities included in this lesson: Calculating the Costs of Smoking, Comparing Costs, and Interpreting Graphs. Each activity sheet is designed to be copied as a one-page, two-sided handout. There is also a Take Home Activity sheet with similar problems to give students additional practice.

Teacher Materials: There are Teacher Notes pages for each of the three in-class activities and the Take Home Activity. Teacher Notes pages include an answer key along with tips for teaching from the instructors who pilot-tested these lessons. Reflections from students are also included on the Teacher Notes.

Background Materials: Visit these Web pages for more information on the monetary costs of smoking.

“This activity was great because it gave students the opportunity to do some self-exploration and inquiry practical to their lives, which I feel is the most useful information a student can obtain.” (Adult Diploma Instructor)



Federal Tobacco Taxes Factsheets

Web Page: www.tobaccofreekids.org/research/factsheets/index.php?CategoryID=11

Home Page: www.tobaccofreekids.org



State Tobacco Taxes Factsheets

Web Page: www.tobaccofreekids.org/research/factsheets/index.php?CategoryID=18

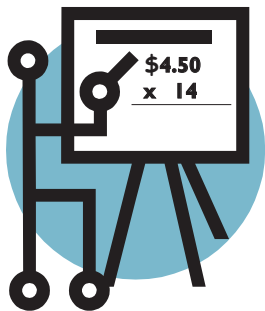
Home Page: www.tobaccofreekids.org



Tobacco Cost Calculator

Web Page: www.cancer.org/docroot/PED/ped_10_CigCostCalc.asp?sitearea=PED

Home Page: www.cancer.org



“Most students were engaged fully and found reading and solving the word problems to be a challenging and helpful skill.” (GED Instructor)

Math Activities

Activity 1: Calculating the Costs of Smoking

Learners practice multiplication by calculating the weekly, monthly, and annual cost of buying cigarettes. Learners then calculate the cost of cigarettes as a percent of income. Word problems get progressively more difficult. Some problems are multiple choice while others are open response. Students may begin solving the problems by hand and then use a calculator for the multi-step problems. For word problems there is space for students to show their work.

Activity 2: Comparing Costs

Learners compare the cost of cigarettes to the price of other items. They calculate the amount of money that could be saved by quitting smoking (thus no longer buying cigarettes) and then used to purchase desired goods and services. Students must locate the cost of items in a table and use both multiplication and division to answer the problems. Students then brainstorm a list of items they would like to buy, estimate their costs, and use that information to answer two more word problems. For more advanced students, there is a bonus question that asks students to write and solve their own word problem.

Activity 3: Interpreting Graphs

Learners use data presented in a pie chart on smoking-related diseases to answer fill-in-the-blank questions. They are also asked to describe in their own words what the chart shows. A second graph presents data on the cost of cigarettes over time. Students use the data to answer multiple choice questions including whether or not the increase in the cost of cigarettes is primarily due to the increase in taxes.



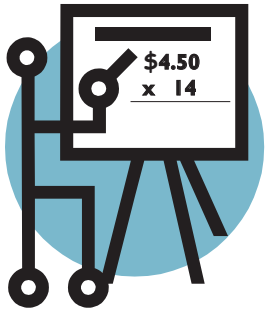
Take Home Activity

The Take Home Activity is designed to give students additional practice and contains problems similar to those done in class. It also provides a way for students to share with family and friends what they have learned about the costs of smoking.

Post-Lesson Assessment

Ask students to share – orally or in writing – what they learned about the cost of cigarettes. You might want to ask students who smoke what they might do with the money they could save by quitting. Or ask students who spend money on snacks or other nonessential items what they might do with the money if they were to save it rather than spend it.

*“One student, after completing the activity sheet, calculated her boyfriend’s weekly cigarette expense, and then prompted a classmate to figure out his 5-year costs. It came out to over \$10,000!”
(Adult Diploma Instructor)*



LESSON NOTES

Activity 1:

Calculating the Costs of Smoking



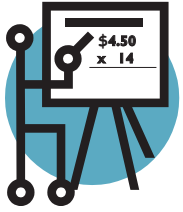
Complete the word problems below to see how much cigarettes cost over time. Practice multiplication by calculating the weekly, monthly, and annual cost of buying cigarettes. Practice using percents by calculating the cost of buying cigarettes as a percent of income.

1. Brenda buys 6 packs of cigarettes a week and each pack costs \$5.50. How much does Brenda spend on cigarettes each week?
 - a. \$5.56
 - b. \$11.50
 - c. \$33.00
 - d. \$25.00

2. Bob buys 3 packs of cigarettes a week and each pack costs \$5.00. How much does Bob spend on cigarettes each month (1 month = 4 weeks)?
 - a. \$15.00
 - b. \$60.00
 - c. \$75.00
 - d. \$120.00

3. Maria buys 8 packs of cigarettes a week and each pack costs \$4.50. How much does Maria spend on cigarettes each year (1 year = 52 weeks)?
 - a. \$36.00
 - b. \$144.00
 - c. \$856.00
 - d. \$1,872.00

4. Jim buys 1 carton of cigarettes a week for \$42.00 a carton (1 carton = 10 packs). How much would Jim spend on cigarettes if he smoked for 5 years (1 year = 52 weeks)?
 - a. \$42.00
 - b. \$1,820.00
 - c. \$10,920.00
 - d. \$2,184.00



5. Brenda works as an X-ray technician and her income is \$24,960 a year. Last year she spent 15% of her income on cigarettes. What was the total amount she spent on cigarettes last year?

6. Bill buys 12 packs of cigarettes a week and each pack costs \$6.00. He works 16 hours a week at a wage of \$15.00 per hour as an assistant coach at the high school. What percent of his weekly income does Bill spend on cigarettes?

7. Rita buys 5 cartons of cigarettes each month for \$40.00 a carton (1 carton = 10 packs). Last year she made an income of \$20,000 as a receptionist at a doctor's office. What percent of her income did she spend on cigarettes?

8. Sam buys 10 packs of cigarettes a week at a cost of \$3.50 a pack, and his wife Cindy buys 5 packs of cigarettes a week at a cost of \$5.00 a pack. What percent of their combined income of \$31,200 do they spend on cigarettes each year (1 year = 52 weeks)?

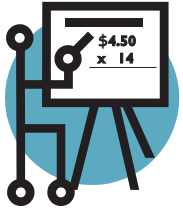
Activity 2: Comparing Costs



Find out what Mario, Rose, and Jake could buy if they quit smoking and no longer spent their money on cigarettes. Use the information in the table to answer the word problems below. For all problems, 1 month = 4 weeks.

Items to Buy	Cost
Two tickets to see a favorite band	\$84.00
Gas to fill the family car for two weeks	\$160.00
Tuition for one college-level course	\$550.00
A used car	\$1,600.00

- Mario buys 8 packs of cigarettes a week and each pack costs \$3.50. If he quit smoking and saved the money, **how long would it take him to save enough money to buy two tickets to see his favorite band?**
 - 1 week
 - 3 weeks
 - 1 month
 - 3 months
- Rose buys 5 packs of cigarettes a week and each pack costs \$5.50. If she quit smoking and saved the money in a jar, **how long would it take her to pay for tuition for one college-level course?**
 - 2 week
 - 12 weeks
 - 1 month
 - 5 months
- Last year Jake quit smoking. He used to buy 10 packs of cigarettes a week and each pack cost \$4.00. Jack saved the money he would have spent on cigarettes in a box. After saving for 10 months, **which item does Jake have exactly the right amount of money to buy?**
 - Two tickets to see his favorite band
 - Gas to fill his car for two weeks
 - Tuition for one college-level course
 - A used car



Create your own table. List four items you would like to buy. Estimate how much you think each item would cost and add this information to the table. Then use your table to answer the word problems below. For all problems, 1 month = 4 weeks.

Items to Buy	Cost

4. Mario buys 8 packs of cigarettes a week and each pack costs \$3.50. If he quit smoking and saved the money he would have spent on cigarettes, **about how many weeks would it take him to save enough money to buy** _____?

(Fill in the blank with an item from your table and then answer the question.)

5. Rita quit smoking six months ago. She used to buy 5 cartons of cigarettes each month for \$40.00 a carton (1 carton = 10 packs). After saving the money she used to spend on cigarettes for six months, **which item or combination of items in your table does Rita have enough money to buy? Does she have any money left over? If so, how much?**

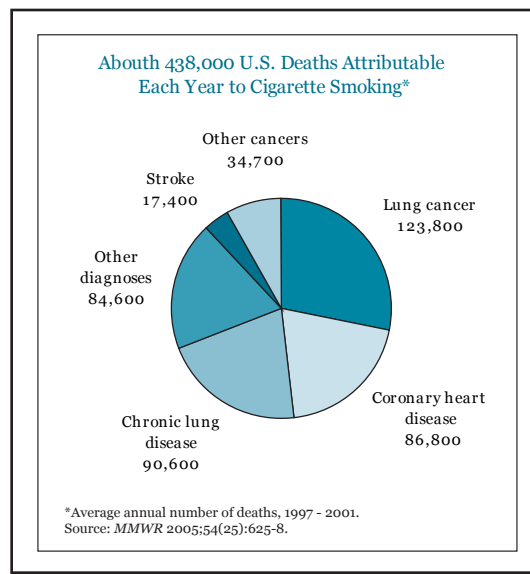
6. **EXTRA CREDIT:** Make up your own word problem. Model your word problem after one of the word problems above. Use information from your table, and be sure you know the answer to your word problem before you ask someone else to solve it.

Activity 3: Interpreting Graphs



Annual Deaths Due to Smoking Cigarettes United States 1997 – 2001

Data Source: CDC SAMMEC, MMWR, 2005; Vol. 54, No. 25:625-8
www.cdc.gov/tobacco/data_statistics/tables/health/attdths.htm

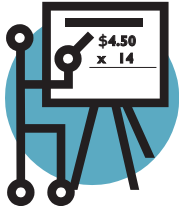


Smoking harms almost all the organs in the body, and is the leading preventable cause of death in the United States. Based on the data provided in the **pie chart**, answer the questions below.

1. About how many deaths each year are due to smoking-related diseases?

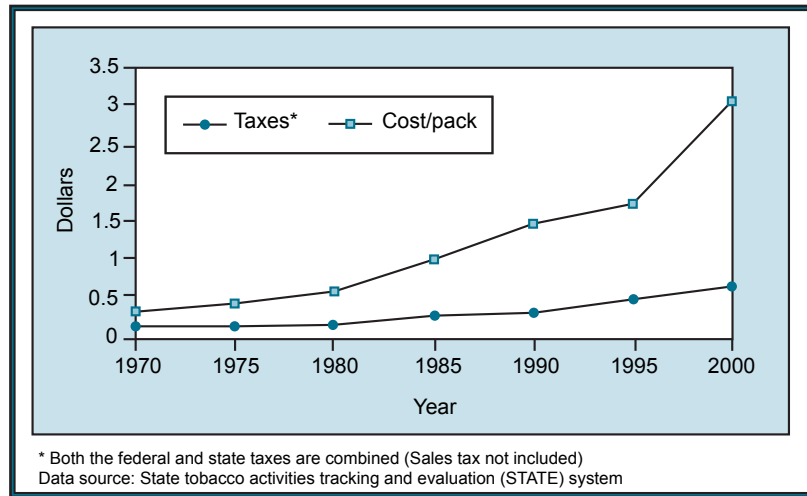
2. Which disease kills about 86,800 people who smoke each year?

3. About how many smoking-related deaths each year are due to cancer (lung and other cancers)? _____
4. About what percent of smoking-related deaths each year are due to lung cancer? _____
5. Write a sentence to describe what information this pie chart shows.



Cigarette Taxes and Cost Per Pack United States 1970 – 2000

Data Source: State tobacco activities tracking and evaluation (STATE) system
www.cdc.gov/tobacco/data_statistics/tables/economics/cigtax.htm



The cost of a pack of cigarettes has increased greatly over time. Based on the time series data provided in the **line graph**, answer the questions below.

- About how much did a pack of cigarettes cost in 1970?
 - \$2.00
 - More than \$2.50
 - \$1.50
 - Less than 50 cents
- About how much did a pack of cigarettes cost in 2000?
 - \$3.00
 - More than \$3.50
 - \$2.00
 - Less than \$1.50
- About how much did **taxes** on a pack of cigarettes increase between 1970 and 2000?
 - \$2.00 per pack
 - More than \$2.50 per pack
 - \$1.50 per pack
 - Less than 50 cents per pack
- Which of the following statements is **BEST** supported by the data presented?
 - Taxes on cigarettes have increased greatly over the past 30 years.
 - The increase in the cost of cigarettes over time is primarily due to an increase in taxes.
 - Taxes on cigarettes have increased only slightly compared to the overall cost of a pack of cigarettes.
 - The cost of a pack of cigarettes has decreased over time.

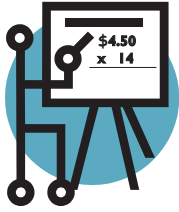
Take Home Activity:

Calculating the Costs of Smoking



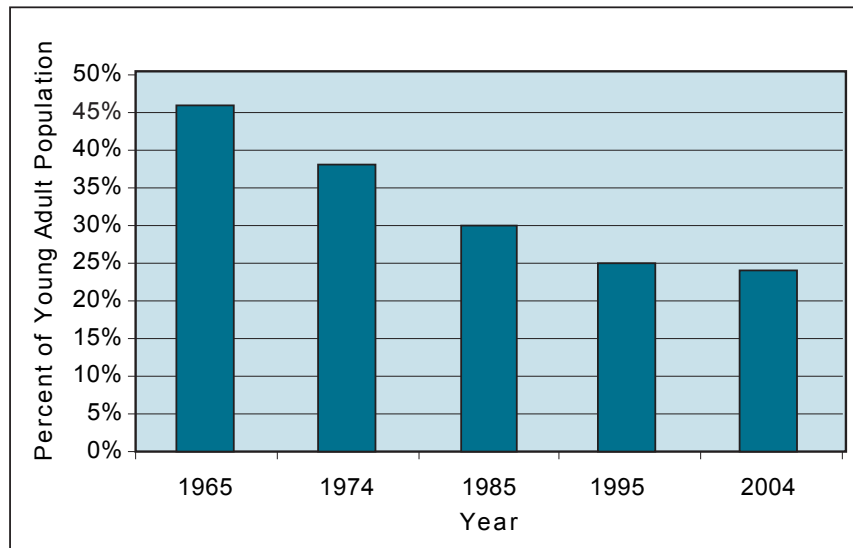
Practice using multiplication and percents to calculate the cost of buying cigarettes and compare that cost to the price of other items.

1. Sylvana buys 7 packs of cigarettes a week and each pack costs \$4.00. How much does Sylvana spend on cigarettes each month (1 month = 4 weeks)?
2. George works as an assistant teacher and his income is \$20,800 a year. Last year he spent 12% of his income on cigarettes. What was the total amount he spent on cigarettes last year?
3. Rose buys 6 packs of cigarettes a week and each pack costs \$5.50. If she quit smoking and saved the money in a jar, how long would it take her to save enough money to buy a new cell phone that costs \$231?
4. Mario buys 10 packs of cigarettes a week and each pack costs \$3.50. If he quit smoking and saved the money he would have spent on cigarettes, how long would it take him to save enough money to buy _____ that costs \$_____? *(Fill in the blanks with an item to buy and how much it costs. Then answer the question.)*



Percent of Young Adults (ages 18 – 24 years old) Who Were Current Smokers

Data Source: National Health Interview Surveys – United States 1965 – 2004
www.cdc.gov/tobacco/data_statistics/tables/adult/table_12.htm



Practice interpreting graphs. The percent of young adults who smoke has changed over time. Based on the data provided in the **bar graph**, answer the questions below.

1. This bar graph shows data for young adults of what ages? _____
2. In 1965 about what percent of young adults smoked cigarettes? _____
3. In 2004 about what percent of young adults smoked cigarettes? _____
4. Write one or two sentences to describe what this bar graph shows about the percent of young adults who smoked in 1965 compared to 2004.

To find a quit-smoking helpline in your state call 1-800-QUITNOW
(1-800-784-8669), or visit www.smokefree.gov

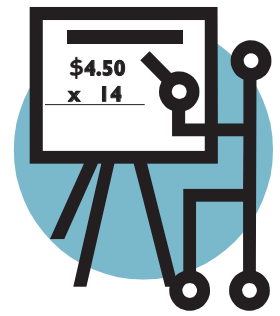
TEACHER NOTES

Activity 1: Calculating the Costs of Smoking

Answer Key

Complete the word problems below to see how much cigarettes cost over time. Practice multiplication by calculating the weekly, monthly and annual cost of buying cigarettes. Practice using percents by calculating the cost of buying cigarettes as a percent of income.

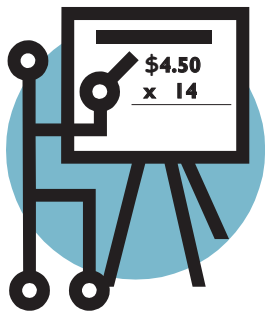
- Brenda buys 6 packs of cigarettes a week and each pack costs \$5.50. How much does Brenda spend on cigarettes each week?
 - \$5.56
 - \$11.50
 - \$33.00 (correct answer)**
 - \$25.00
- Bob buys 3 packs of cigarettes a week and each pack costs \$5.00. How much does Bob spend on cigarettes each month (1 month = 4 weeks)?
 - \$15.00
 - \$60.00 (correct answer)**
 - \$75.00
 - \$120.00
- Maria buys 8 packs of cigarettes a week and each pack costs \$4.50. How much does Maria spend on cigarettes each year (1 year = 52 weeks)?
 - \$36.00
 - \$144.00
 - \$856.00
 - \$1,872.00 (correct answer)**
- Jim buys 1 carton of cigarettes a week for \$42.00 a carton (1 carton = 10 packs). How much would Jim spend on cigarettes if he smoked for 5 years (1 year = 52 weeks)?
 - \$42.00
 - \$1,820.00
 - \$10,920.00 (correct answer)**
 - \$2,184.00



Tips from Teachers

“Working in small groups worked well. It led to discussion of different ways to solve problems. It kept the frustration down and promoted discussion.”
(ABE/GED Instructor)

“We read the first problem out loud and completed it as a whole class. Students began to move on to the next problem so I announced that they could work at on their own and ask for my assistance when needed.”
(Adult Diploma Instructor)



Tips from Teachers

"I began by reviewing the procedure for determining the correct mathematical operation to use for word problems." (GED Instructor)

"I outlined on the board how to do the percent problems and asked the students if they wanted to work individually or in pairs. They chose to work individually. We went over the answers together as a class." (GED Instructor)

5. Brenda works as an X-ray technician and her income is \$24,960 a year. Last year she spent 15% of her income on cigarettes. What was the total amount she spent on cigarettes last year?

Correct Answer: \$3,744

6. Bill buys 12 packs of cigarettes a week and each pack costs \$6.00. He works 16 hours a week at a wage of \$15.00 per hour as an assistant coach at the high school. What percent of his weekly income does Bill spend on cigarettes?

Correct Answer: 30%

7. Rita buys 5 cartons of cigarettes each month for \$40.00 a carton (1 carton = 10 packs). Last year she made an income of \$20,000 as a receptionist at a doctor's office. What percent of her income did she spend on cigarettes?

Correct Answer: 12%

8. Sam buys 10 packs of cigarettes a week at a cost of \$3.50 a pack, and his wife Cindy buys 5 packs of cigarettes a week at a cost of \$5.00 a pack. What percent of their combined income of \$31,200 do they spend on cigarettes each year (1 year = 52 weeks)?

Correct Answer: 10%

TEACHER NOTES

Activity 2: Comparing Costs

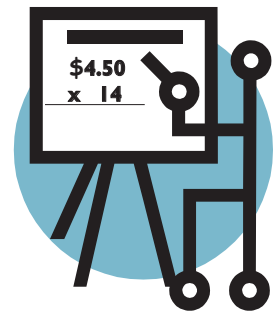
Answer Key

Find out what Mario, Rose, and Jake could buy if they quit smoking and no longer spent their money on cigarettes. Use the information in the table to answer the word problems below.

For all problems, 1 month = 4 weeks.

Items to Buy	Cost
Two tickets to see a favorite band	\$84.00
Gas to fill the family car for two weeks	\$160.00
Tuition for one college-level course	\$550.00
A used car	\$1,600.00

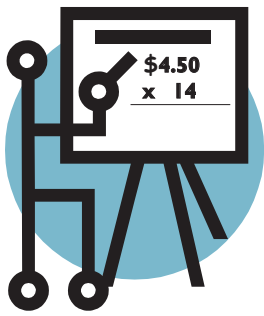
- Mario buys 8 packs of cigarettes a week and each pack costs \$3.50. If he quit smoking and saved the money, **how long would it take him to save enough money to buy two tickets to see his favorite band?**
 - 1 week
 - 3 weeks (correct answer)**
 - 1 month
 - 3 months
- Rose buys 5 packs of cigarettes a week and each pack costs \$5.50. If she quit smoking and saved the money in a jar, **how long would it take her to pay for tuition for one college-level course?**
 - 2 week
 - 12 weeks
 - 1 month
 - 5 months (correct answer)**
- Last year Jake quit smoking. He used to buy 10 packs of cigarettes a week and each pack cost \$4.00. Jack saved the money he would have spent on cigarettes in a box. After saving for 10 months, **which item does Jake have exactly the right amount of money to buy?**
 - Two tickets to see his favorite band
 - Gas to fill his car for two weeks
 - Tuition for one college-level course
 - A used car (correct answer)**



Tips from Teachers

“I read the title, directions and explained the chart. Students worked independently. Once all the students had finished, I had two students show their work on the board. I then reviewed each method verbally.”
(GED Instructor)

“Some students used calculators and others did not. We did the first problem together and talked about it before students moved onto doing the activity in pairs.” (ABE/GED Instructor)



Tips from Teachers

“First we brainstormed as a group items students would like to buy for under \$2,000. Then students worked in small groups to complete the table.” (ABE/GED Instructor)

“The students, I felt were prepared for this lesson by completing Activity 1: Calculating the Costs of Smoking.” (Adult Diploma Instructor)

Create your own table. List four items you would like to buy. Estimate how much you think each item would cost and add this information to the table. Then use your table to answer the word problems below. For all problems 1 month = 4 weeks.

Items to Buy	Cost

- Mario buys 8 packs of cigarettes a week and each pack costs \$3.50. If he quit smoking and saved the money he would have spent on cigarettes, **about how many weeks would it take him to save enough money to buy** _____?
(Fill in the blank with an item from your table and then answer the question.)
- Rita quit smoking six months ago. She used to buy 5 cartons of cigarettes each month for \$40.00 a carton (1 carton = 10 packs). After saving the money she used to spend on cigarettes for six months, **which item or combination of items in your table does Rita have enough money to buy? Does she have any money left over? If so, how much?**
- EXTRA CREDIT:** Make up your own word problem. Model your word problem after one of the word problems above. Use information from your table, and be sure you know the answer to your word problem before you ask someone else to solve it.

TEACHER NOTES

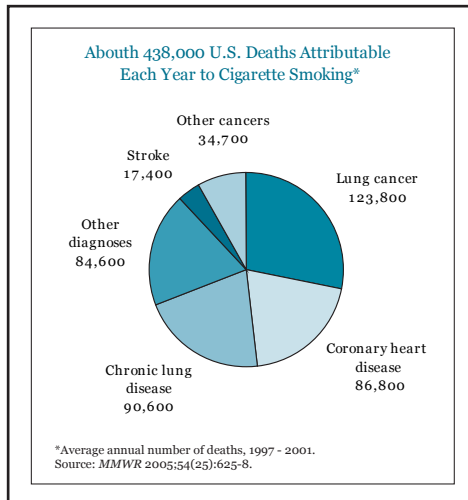
Activity 3: Interpreting Graphs

Answer Key

Annual Deaths Due to Smoking Cigarettes

United States 1997 – 2001

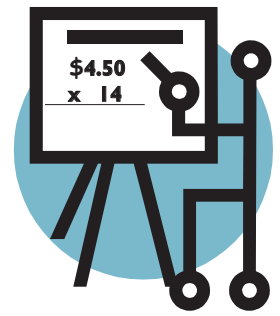
Data Source: CDC SAMMEC, MMWR, 2005; Vol. 54, No. 25:625-8
www.cdc.gov/tobacco/data_statistics/tables/health/attdrths.htm



Smoking harms almost all the organs in the body, and is the leading preventable cause of death in the United States. Based on the data provided in the **pie chart**, answer the questions below.

1. About how many deaths each year are due to smoking-related diseases? 438,000
2. Which disease kills about 86,800 people who smoke each year? Coronary heart disease
3. About how many smoking-related deaths each year are due to cancer (lung and other cancers)? 158,500
4. About what percent of smoking-related deaths each year are due to lung cancer? 28%
5. Write a sentence to describe what information this pie chart shows.

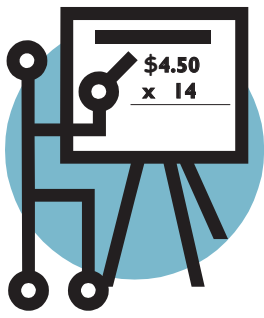
This pie chart shows the number of deaths each year in the United States due to the different diseases caused by smoking.



Tips from Teachers

“I defined pie graph and emphasized the correct way to read this graph. I focused on the title, labels and the source.” (GED Instructor)

“We discussed the meaning of the chart as a class. Students then began working on filling in the blanks individually. This naturally progressed into small groups discussing correct answers. I helped individuals who needed more assistance. Then we went over the answers orally.” (GED Instructor)



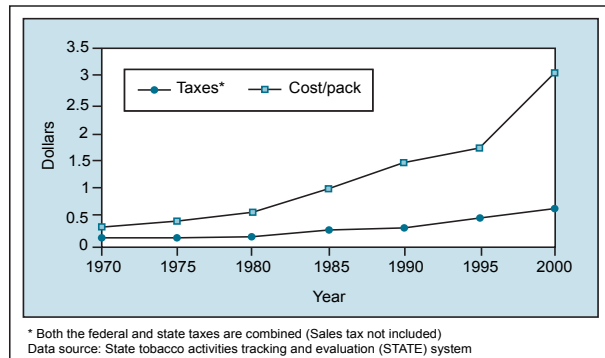
Tips from Teachers

“I defined time series data and explained how the graph shows data over time. I then focused on the title, axis labels, and the key.” (GED Instructor)

“Students were challenged by the graph, but interested. It led to some interesting discussion about the cost of cigarettes.” (ABE/GED Instructor)

Cigarette Taxes and Cost Per Pack United States 1970 – 2000

Data Source: State tobacco activities tracking and evaluation (STATE) system
www.cdc.gov/tobacco/data_statistics/tables/economics/cigtax.htm



The cost of a pack of cigarettes has increased greatly over time. Based on the time series data provided in the **line graph**, answer the questions below.

- About how much did a pack of cigarettes cost in 1970?
 - \$2.00
 - More than \$2.50
 - \$1.50
 - Less than 50 cents (correct answer)**
- About how much did a pack of cigarettes cost in 2000?
 - \$3.00 (correct answer)**
 - More than \$3.50
 - \$2.00
 - Less than \$1.50
- About how much did **taxes** on a pack of cigarettes increase between 1970 and 2000?
 - \$2.00 per pack
 - More than \$2.50 per pack
 - \$1.50 per pack
 - Less than 50 cents per pack (correct answer)**
- Which of the following statements is **BEST** supported by the data presented?
 - Taxes on cigarettes have increased greatly over the past 30 years.
 - The increase in the cost of a pack of cigarettes over time is primarily due to an increase in taxes.
 - Taxes on cigarettes have increased only slightly compared to the overall cost of a pack of cigarettes. (correct answer)**
 - The cost of cigarettes has decreased over time.

TEACHER NOTES

Take Home Activity: Calculating the Costs of Smoking

Answer Key

Practice using multiplication and percents to calculate the cost of buying cigarettes and compare that cost to the price of other items.

1. Sylvana buys 7 packs of cigarettes a week and each pack costs \$4.00. How much does Sylvana spend on cigarettes each month (1 month = 4 weeks)?

Correct Answer: \$112

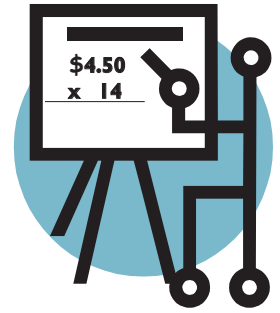
2. George works as an assistant teacher and his income is \$20,800 a year. Last year he spent 12% of his income on cigarettes. What was the total amount he spent on cigarettes last year?

Correct Answer: \$2,496

3. Rose buys 6 packs of cigarettes a week and each pack costs \$5.50. If she quit smoking and saved the money in a jar, how long would it take her to save enough money to buy a new cell phone that costs \$231?

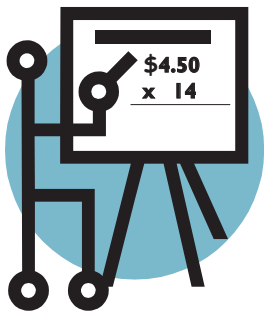
Correct Answer: 7 weeks

4. Mario buys 10 packs of cigarettes a week and each pack costs \$3.50. If he quit smoking and saved the money he would have spent on cigarettes, how long would it take him to save enough money to buy _____ that costs \$_____?
(Fill in the blanks with an item to buy and how much it costs. Then answer the question.)



Student Reflection

“Nonsmokers need this information so they can help inform smokers.” (GED Student)

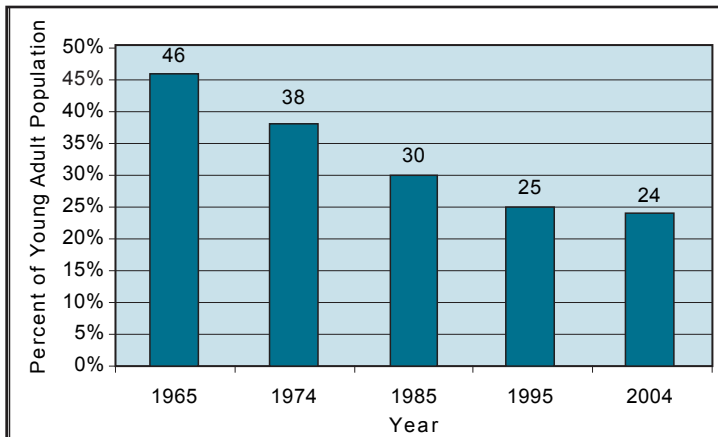


Student Reflection

“Because of this program I am going to try to quit smoking. I am also going to help my family quit.” (GED Student)

Percent of Young Adults (ages 18 – 24 years old) Who Were Current Smokers

Data Source: National Health Interview Surveys – United States 1965 – 2004
www.cdc.gov/tobacco/data_statistics/tables/adult/table_12.htm



Practice interpreting graphs. The percent of young adults who smoke has changed over time. Based on the data provided in the **bar graph**, answer the questions below.

1. This bar graph shows data for young adults of what ages?
18 – 24 years old
2. In 1965 about what percent of young adults smoked cigarettes? 46%
3. In 2004 about what percent of young adults smoked cigarettes? 24%
4. Write one or two sentences to describe what this bar graph shows about the percent of young adults who smoked in 1965 compared to 2004.

The percent of young adults who smoke has decreased steadily over time. Fewer young adults smoked in 2004 compared to 1965.

To find a quit-smoking helpline in your state call 1-800-QUITNOW

(1-800-784-8669), or visit www.smokefree.gov

LESSON NOTES





TOBACCO and LITERACY EDUCATION PROJECT



2007

This lesson was developed with financial support from the American Legacy Foundation. Its contents are solely the responsibility of the authors and do not necessarily represent the views of the Foundation, its staff or its Board of Directors.