

Name: _____ Date: _____

Lab 4 – Cookie Mining

Purpose: Describe the methods of extraction of natural resources and their effect on the environment.

Overview:

The mining of our country's natural resources is not just a simple matter of finding the desired ore and digging it up. Important economic and environmental considerations are involved in any mining venture. These include property costs, mining equipment costs, operational costs, and land reclamation costs. Fines for violations of environmental regulations may also be incurred. If a mining corporation is to make a profit, the value of the recovered ore must be greater than the sum of all of its mining costs plus any environmental fines. In this lab you will create a mining corporation and attempt to run a cookie mining operation that is both profitable and environmentally sound.

1. First, you will create a corporation to run your cookie mining operation. You will decide the mining style of your corporation and use that information to select your cookie and the proper tools for the mining operation. All information regarding your mining venture will be recorded on your Cookie Mining Worksheet.
2. Next, you will purchase your cookie (mining property) and rent your mining tools. Each cookie contains minable ingredients (ore) such as chocolate chips and nuts. Mining tools include items such as toothpicks and paper clips.
3. Before the mining operation can begin, you will need to determine the original size and topography of your cookie using a sheet of graph paper.
4. You will then mine your cookie for its ore using only the rented tools. The mining operation will be timed in order to determine its cost. The value of the ore will be determined according to its listed world market price.
5. After removing the ore from your cookie, you will perform a reclamation operation on your cookie so that it matches its original size and topography as closely as possible. The reclamation operation will be timed in order to determine its cost. Upon completion, an "EPA inspector" will evaluate the reclamation and assess fines for any deviations from the cookie's original state.
6. Finally, you will use the information on your Cookie Mining Worksheet to determine the costs of your mining operation, the costs of any fines and the income you received for the ore. By combining these figures, you will determine whether or not your corporation made a profit or a loss.

Name: _____ Date: _____

LAB EQUIPMENT AND MATERIALS

A list of materials you will need to perform this lab is given below.

Equipment	Amount Needed
Stopwatch	1
Materials	Amount Needed
Assorted cookies (various chips)	1
Wood toothpick (flat)	1-2
Wood toothpick (round)	1-2
Paper clip (unfolded)	1-2
Graph paper (linear)	1 sheet

COOKIE MINING PRICE GUIDE:

- Chips Ahoy cookie \$5.00
- Chips Ahoy Deluxe cookie \$7.00
- Flat toothpick \$2.00 each
- Round toothpick \$5.00 each
- Paper clip \$7.00 each
- Mining cost \$1.00 per minute
- Sale of chocolate chip \$2.00 (broken chips can be combined to form one chip)
- Reclamation costs \$1.00 per square over the original count (any piece of cookie outside of original circle counts as reclamation)

LAB PROCEDURE

Hints for a successful lab:

1. Be sure to make accurate drawings of the original cookie. Trace the outline of the intact cookie on the graph paper and then eyeball the cookie from the side in order to draw the original topography. After mining is completed, the “EPA Inspector” will use both of these drawings in order to assess fines.
2. Choose the proper tools for your mining operation. You can choose any two tools out of a choice of three. Tools are rented, not purchased. Damaged or broken tools must be replaced at double the initial cost.
3. Make good decisions concerning the removal of ore from your cookie as this is your only source of income. You will sell the ore at a set world market price. Your teacher will supply a list of ores and their market prices.

Name: _____ Date: _____

Select cookie and tools

1. Determine which cookie you would like to mine (e.g. with chocolate chips, with colored chips, with peanut butter chips, with or without nuts, etc.). You can only purchase one cookie. To guide you in your decision, you can check a list of the ores that are currently in demand and their world market prices.
2. Record the type of cookie and its cost on the Cookie Mining Worksheet.
3. Determine which mining tools your corporation would like to use for the mining activity. You may only rent two of the three available tools: a flat toothpick, a round toothpick, or an unfolded paper clip. They have different rental prices: a flat toothpick = \$2.00, a round toothpick = \$5.00, and a paper clip = \$7.00. Broken tools are replaced at double the rental price.
4. Calculate and record the cost of the tools on the Cookie Mining Worksheet

Determine cookie size and topography

1. Trace an accurate outline of your cookie on a piece of graph paper. Determine the size (area) of the cookie by counting the graph paper squares within the outline.
2. Record the area of your cookie on the Cookie Mining Worksheet.
3. Look at the cookie from the side and carefully draw an accurate representation of its topography. Be sure to capture the natural peaks and valleys in the cookie.

Mine cookie

- ⇒ Start timing with the stopwatch as you begin to mine the desired ores from your cookie. The cost of mining operations is \$1.00/minute.
- ⇒ Excavate the ore using only the rented tools. You may not use your fingers! Be careful not to break or damage the tools.
- ⇒ Collect as much of the ore as you think is best. Whole chips are most desirable, but pieces of chips may be combined to form complete chips.

Reclaim mined cookie

1. Initiate reclamation of your cookie after mining is complete. The stopwatch should still be running. The cost of reclamation operations is \$1.00/minute.
2. Use only your mining tools to perform reclamation. You may not use your fingers! Try to reclaim your cookie so that it matches its original size and topography.

Name: _____ Date: _____

3. Stop timing when reclamation of your cookie is complete. Record the length of time the for mining and reclamation operations on the Cookie Mining Worksheet.
4. Calculate the operational (mining and reclamation) cost on the Cookie Mining Worksheet.
5. Ask the “EPA Inspector” to check your cookie reclamation. Your teacher or another student may act as the inspector. Ideally, the cookie should match its original space and topography. Fines are given for discrepancies from the original shape and topography. Fines can range from \$2.00 to \$10.00.
6. Record any fines on the Cookie Mining Worksheet.

Calculate profit or loss

1. Determine how many chips you removed. Small pieces of chips may be combined to form a complete chip.
2. Calculate and record the value of the ore collected using the listed world market prices.
3. Calculate a final profit or loss for your mining venture.

Cleanup lab

1. Place your cookie into the compost bin (or garbage container). Also, place used graph paper and broken tools into the trash.
2. Return reusable tools such as paper clips to your instructor.

Name: _____ Date: _____

LAB REPORT/ANALYSIS QUESTIONS

Answer the following questions in complete sentences after completing your calculations on the Cookie Mining Worksheet.

1. Were your ore materials evenly distributed throughout the cookie mine? Do you think this is a realistic simulation?
2. Were you able to restore the mined cookie to exactly its original size and topography?
3. Discuss the results of an actual mining reclamation operation. Be sure to consider the internal integrity of the land. How does a reclamation operation impact the plant populations, animal populations, water cycle and soil?
4. According to your Cookie Mining Worksheet, was the total value of your mining location positive or negative? What does this mean?
5. Is the additional expense of mine reclamation necessary? Why or why not?
6. Identify and describe a federal law that regulates mining.
7. Discuss some ways you can reduce your need for mined resources?
8. Write a summary and conclusion of your lab results.

END OF LAB

Name: _____ Date: _____

COOKIE MINING WORKSHEET

Name of Mining Corporation:	
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COOKIE INFORMATION

Type		Cost
		1.

MINING TOOLS

Type	Quantity	Unit Cost	Cost
Flat Toothpick		2.00	
Round Toothpick		5.00	
Paper Clip		7.00	
Tool Replacement Cost:			
Total Mining Tools Cost:			2.

MINING OPERATION

Mining /Reclamation Time	Unit Cost	Cost
	1.00/min	3.

TOTAL MINING COSTS (1+2+3): 4.

RECOVERED ORE

Type	Quantity	Unit Price	Value
Chocolate Chip		2.00/chip	
Total Value of Recovered Ore:			5.

TOTAL VALUE OF MINING LOCATION (5-4): 6.

RECLAMATION COSTS: 7.

CORPORATION PROFIT/LOSS (6-7): 8.