

STEM Experiment: Mine-a-Pie

Names _____

Synopsis

In this experiment, you and your team, will carefully "mine" a pie for valuable "minerals." You have a budget of \$1000 and you must decide how to use your money to receive the highest possible profit. Since the mining season is limited by the weather, you will have a finite amount of time to mine (ten minutes). Your profit is based on how many valuable minerals you can extract from the mine before the time expires. You will receive substantial monetary penalties (\$200 per incident) if you damage the environment (e.g. get frosting or crumbs anywhere). You may not touch anything except the tools that you purchase. You will complete the Profit Analysis Sheet to determine your overall success.

EXPENSE CHART

You begin the mining season with a \$1000 budget to purchase various mining resources. Complete the following Expense Chart BEFORE you begin mining. The funds that you don't spend are considered profit. You may not make additional purchases after you begin mining.

Resource	Description	Cost	Purchases
Land Lease	Pie	\$300	\$300
Insurance	Only pay \$100 per incident (1/2 normal)	\$250	
Excavator	Fork	\$150	
Loader	Spoon	\$100	
Scraper	Knife	\$50	
Crane	Toothpick	\$50	
Drill	Straw (cost per drilling)	\$50	
		TOTAL EXPENSES	

PROFIT ANALYSIS SHEET

Carefully identify and count the minerals that you extracted.

Resource	Description	Value	Amount Mined	Income
Gold	Corn	\$100		
Coal	Black Beans	\$10		
Jade	Peas	\$50		
Oil	Chocolate Syrup	\$150 per time "oil" was found with a "drill" (straw)		
Precious Stones (rubies & diamonds)	Red or White Hard candy	\$200		
			TOTAL INCOME	

How many times did your team have a "spill" (frosting or crumbs)?

Penalties	Expense	Incidents	Fines
Environment incidents	Pay \$200 per incident, or \$100, if you bought insurance		

Total Income _____

Fines _____

Total Expenses _____

Net Profit

REFLECTION

What did your team learn about mining?

What would you do differently if you had a second opportunity to mine?

Mining Background

Mining has played a major role in Alaska since the first days of the Klondike Gold Rush in the late 1800's. Before the advancement of large scrapers and bulldozers, mining was mainly done on a small scale using pans, sluice boxes, or small dredges along river beds. With the advent of track bulldozers in the late 1920's to the big bulldozers and drag lines of the 1950's, Alaska's large mineral deposits have become increasingly economical to mine.

There are many mineral commodities mined today in the state, including: copper, gold, jade, lead, platinum, sand and gravel, silver, tin, zinc, coal, oil and natural gas. There are different types of mining techniques used in Alaska including placer, strip or open pit, and underground mining. Generally, Alaska zinc and coal are mined above ground. Alaska silver and gold is mined underground, as seen in Southeast, or in placer mines as seen in the Interior.

Before a company decides to open a mine, the area must be tested and explored to predict if the mine will yield a profit. If the geologic testing proves favorable, the company will decide to go ahead and begin the permitting process through the local, state, and federal government. During this permitting process the company must pay to have an environmental impact statement (EIS) conducted on the proposed area. An EIS is a study which determines the potential hazards to safety, wildlife, habitats, and air/water quality, to name a few, from which the company, public, and agencies can respond on the various development reviews. From this information the permits may or may not be awarded.

After a company purchases or leases a piece of land, they must determine if the area is worthwhile to mine and receive permission to do so from local, state, and federal government agencies. The company will then make the investment to build roads, housing, milling facilities, and prepare the area to mine. This requires an enormous amount of planning and design, and could cost the company hundreds of millions of dollars. Even after all of the studies and exploration, the mining company always takes an economic risk. All of their studies are only educated guesses about the mineral amount and quality and the future economic conditions.

The mined material is called ore; it is the rock which contains the valuable mineral. Sometimes the mineral is found as a vein or chunk. Sometimes it is intermixed with the rock. You could think of an ore like a cookie with big chocolate chips and tiny bits of finely crushed nuts. Both the large chunks of chocolate and the tiny bits of nut would be the mineral and the whole cookie (flour, sugar, eggs. . .) the ore.

After the ore is extracted from the ground, it is taken to the mill. This facility is usually located near the mine. During the milling process, the mineral is extracted from the ore by crushing it with large steel balls or rods, and separated using large magnets, gravity, or chemicals. The wastes, called tailings, are the left over rock from this extraction process. The milled mineral, called concentrate, is then sent on to a smelter or a refinery to be made into its purest form. Some mining companies mill, smelt, refine, and mine. Others only mine and mill, selling their concentrate to someone else who will process it and sell it to the manufacturer.

In Alaska, as in other states, the state and federal government tax mining companies. This money is used to help run state and federal government. A mine in Alaska may be in operation anywhere from 5-50+ years depending on the mineral they are mining, the location, the mining technology being used, the amount of mineral to be extracted, and the market value of the product.

Mining is not a delicate procedure. It involves moving a lot of the Earth's crust to extract the minerals we use in our everyday lives. The Surface Mining Control and Reclamation Act of 1977 and the state reclamation laws address some of the environmental concerns of mining. These laws require a mined area be returned to a natural, safe state and without harm to other resources. This means contours and vegetation are returned to the area to stabilize erosion and provide suitable habitat. Surface and ground-water is protected from contamination, and the area is made safe and usable. The permitting process of mining requires that the company wishing to mine an area state, in explicit detail, their plans to reclaim a mine. They must also indicate how they will pay for this reclamation. The cost for reclamation is included in the cost of mining.