

Modeling Exploration Geology: Finding the Next Diamond Deposit

Your long lost uncle passed away leaving you the leases for his mining company, J.K. Industries. Your uncle seemed intrigued by this prospect and thought it might yield diamonds. You could sell your leases and walk away with \$10,000. However, being brave you decide to scrape up \$2,500 and possibly strike it rich! You hire a whip-smart geologist to assist you. She devises a crash course in diamond prospecting. After your training, she informs you that it will cost \$500 for her expertise and assistance at **each** sample location.

Part 1: Where should we look for diamonds?

Use the maps provided to answer the following questions: Are diamond deposits evenly distributed around the world? What countries are major producers? Compare the map of diamond deposits to a map of plate tectonic boundaries. Do diamond deposits appear to be associated with convergent or divergent plate boundaries? Compare the map of diamond deposits to a map of geologic provinces. Select three different diamond deposits on three different continents; what is the age of the rocks that host each deposit? Write a general statement about the distribution of diamond deposits. Infer what the distribution suggests about where the conditions are ideal for diamond formation.

Part 2: Your Geologic Sample Training.

Because diamonds occur in parts per billion in their host rock, geologists hunt for the minerals that commonly form along with the diamonds (called indicator minerals – shown in bold in the table below). You need to learn some mineral and rock basics before you can go exploring. Your hired geologist has provided sand-sized samples of **eight** different minerals and **two** common

rocks. Some minerals are commonly associated with kimberlite, the volcanic rock that hosts diamonds, and may indicate if the diamond source is nearby. Some minerals and rock fragments are from rocks in the surrounding area. With the **Mineral and Rock Identification Chart** in hand, examine each sample. Be sure you are familiar with each material **before** beginning your exploration. Failure to properly identify materials may result in time lost for retraining and financial loss.

When you think you know your minerals and rocks ask your local geologist (teacher) for a quiz.

Get a ✓ for each mineral and rock correctly identified.

Diamond	Diopside	Garnet	Ilmenite	K- feldspar	Olivine	Phlogopite	Quartz	Basalt	Limestone

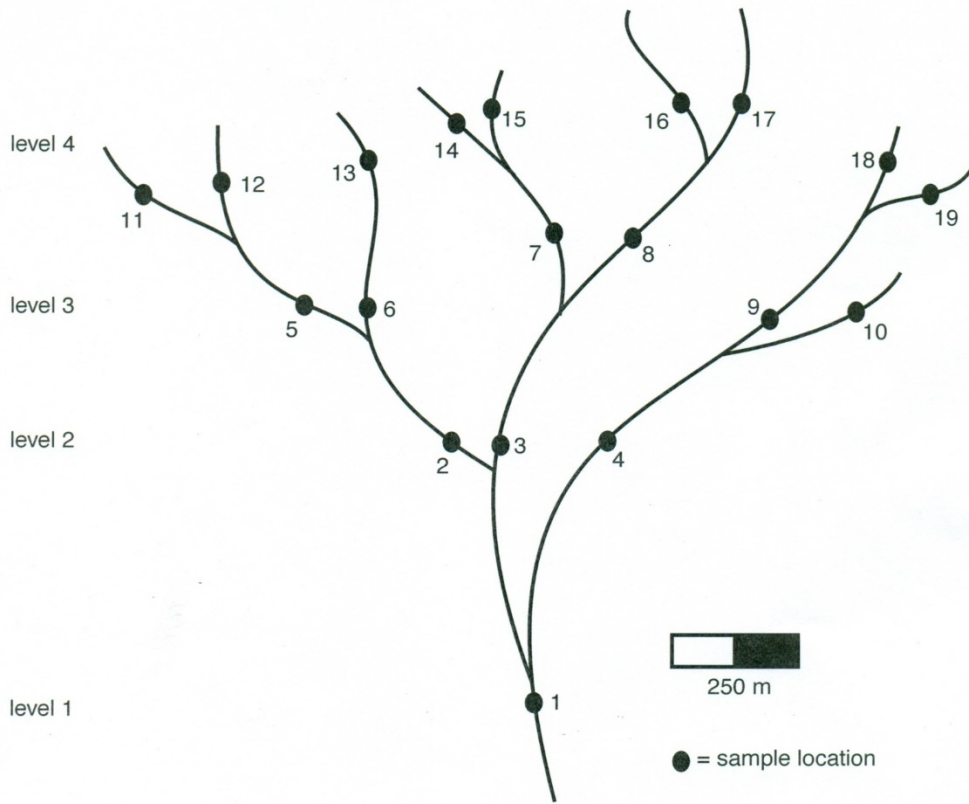
Part 3: Mapping Your Exploration

The map of your field area shows potential sample locations (such as • 1). As you study the grains from each location record your data in the table provided below. Continue upstream until you find a sample with a higher percent of indicator minerals or a diamond (or run out of money.) All teams start at location 1. Note: In reality a geologist would collect 45-100 pounds (millions of grains) at each location to find one (1) indicator mineral – we’ll settle for modeling their method.

Rules

1. Your group can only have one sample at a time. For each sample you must identify the materials, record your data in the table, and check your answers with the local geologist (your lab teacher). You can only proceed if all materials are counted and identified correctly.
2. Before you can receive your next sample you must write a justification for selecting the next location and balance your exploration budget.
3. Continue upstream towards the diamond source, unless your data suggest you should move to another stream.
4. Tip: Companies hold their search successes and failures in secrecy. They do not want to give other companies any advantage (or impact their stock price). You should model this behavior. You need to quietly convey your data, in writing or speaking quietly.

Map of Exploration Area



Student Data

Sample/Loc	Diamond	Diopside	Garnet	Ilmenite	K-feldspar	Olivine	Phlogopite	Quartz	Basalt	Limestone
1										

Results at Location 1 and Justification for sample Location Expenditures: \$ 500, amount remaining: \$ 2000. Justification:

Results at Location and Justification for sample Location Expenditures: \$, amount remaining: \$. Justification:

Results at Location and Justification for sample Location Expenditures: \$, amount remaining: \$. Justification:

Results at Location and Justification for sample Location Expenditures: \$, amount remaining: \$. Justification:

Results at Location ___ and Justification for sample Location ___ Expenditures: \$ _____,
amount remaining: \$ _____. Justification:

Results at Location ___ and Justification for sample Location ___ Expenditures: \$ _____,
amount remaining: \$ _____. Justification: