

LESSON 10:

MINING FOR CHIPS

Students will better understand how gold is formed and where it is found; they will also use Math skills to complete an activity that simulates what California Gold Miners experienced.



HOOK

🕒 1-2 min

Have you ever heard of the football team the San Francisco 49ers? Did you know that that name has something to do with gold?

DISCUSSION

🕒 5-6 min

What is gold? What things can be made of gold?

Gold was formed billions of years ago and lies deep in the core, or the middle, of Earth. Over millions of years, volcanoes, erosion, and earthquakes brought gold closer to Earth's surface. A lot of times gold can be found in rock that also has copper and lead.

Earlier this year we learned about physical weathering.

- Q: What are some ways that physical weathering can occur?
 - A: Moving water can smooth, change, break, or weather rocks.

Often, small pieces of gold break off from larger sources and are washed through rivers and streams. That is precisely how gold was discovered in California in 1848. A man named James Marshall found gold in a creek in California. This was the first report of gold and news spread very fast. Back then, the United States had no law that people could not go and dig or mine wherever they wanted to in that area - so everyone came to look for gold! This is where the name "49ers" came from - most of the gold miners showed up in California in 1849. It was called the great Gold Rush. Gold miners came from all over the WORLD!



DISCUSSION

The Gold Rush led to many violent disagreements among people in the area. Some people wanted to mine the land and strike it rich, other, like settlers and Native Americans, wanted to keep the natural resources and land protected and healthy.

- Q: Mining can cause a lot of damage to the environment. Why do you think this is?
 - A: Mining requires digging into the land. This can not only damage the landscape, but release a lot of debris and chemicals into the surrounding land, air, and waterways.

Mining for gold was hard work – and it was also hard to afford the tools needed to look for it. Little towns were created around places people were finding gold

These little towns made money by selling mining tools. These tools were expensive. Miners looking in the water needed pans to pan gold, miners looking in the rock and ground needed pickaxes, drills, and shovels. Food and other supplies were also very expensive in the small mining towns.

HYPOTHESIS

🕒 1-2 min

If you were a miner, how would you prioritize buying land and tools? How would you distribute your time between extracting the gold and limiting pollution?

EXPERIMENTATION

Step One

🕒 2-3 min

Have the kids help you pass out supplies to every student in class.

- Paper Plate
- Pencil
- Chocolate chip grid print out
- \$25 in fake money

Step Two

🕒 3-5 min

Explain the activity to the class.

Today you are going to be a California Gold Rush miner! You are leaving your home in Oregon to try and strike it rich.

Instead of mining for gold in a mountain, we will be mining for chocolate chips inside of cookies! Here's the hard part– after setting the cookie(s) down on your plate, you can't touch them with your hands! You can only use the tools that you buy to get the chocolate chips out of the cookies.


EXPERIMENTATION

It's important we don't eat the cookies we are using for the activity– they're yucky after being touched by so many hands and tools!

At the end of the activity, you will sell the chocolate chips to your teacher, and you can use the money you earned to buy fresh, clean cookies to eat.

You will also need to keep your land clean, otherwise prospectors in the neighboring towns will get angry! All of your crumbs need to stay on your paper plate. Students who have crumbs on their desk or floor at the end of the activity will be fined.

Step Three

 5-10 min

Have students write \$25 for "starting money" on their worksheet. Explain the cost of supplies.

Have the students come to your seat one at a time to purchase supplies. Have them write down how much money they spent for "supplies cost" on their worksheet.

If the students have money leftover, give them change and tell them they can use that leftover money to purchase cookies at the end of class.

Supplies Costs



Cookies (Land) – \$8 each



Toothpicks – \$3 each



Paperclips – \$2 each



Spoons – \$4 each



Paintbrushes – \$4 each

Worksheet

Clean Chocolate Chips	
1	18
2	17
3	16
4	15
5	14
6	13
7	12
8	11
9	10
10	9
11	8
12	7
13	6
14	5
15	4
16	3
17	2
18	1
19	0
20	0
21	0
22	0
23	0
24	0
25	0
26	0
27	0
28	0
29	0
30	0
Total x \$3=	
+	
Dirty Chocolate Chips	
1	16
2	15
3	14
4	13
5	12
6	11
7	10
8	9
9	8
10	7
11	6
12	5
13	4
14	3
15	2
16	1
17	0
18	0
19	0
20	0
21	0
22	0
23	0
24	0
25	0
26	0
27	0
28	0
29	0
30	0
Total x \$2=	
+	
Partial Chocolate Chips	
1	18
2	17
3	16
4	15
5	14
6	13
7	12
8	11
9	10
10	9
11	8
12	7
13	6
14	5
15	4
16	3
17	2
18	1
19	0
20	0
21	0
22	0
23	0
24	0
25	0
26	0
27	0
28	0
29	0
30	0
Total x \$1=	
Money earned:	
Starting Money	–
Supplies Cost	=
Money Earned	+
Spending Money	=


Starting Money (\$25)

Supplies Cost

Leftover Money

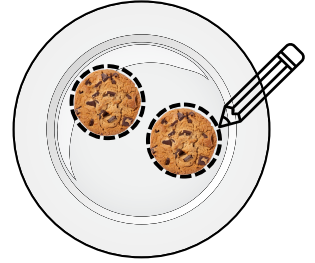
EXPERIMENTATION

Step Four


 1-2 min

Have the students set their cookies on their paper plates and trace a line around them with their pencil. Explain that this is the plot of land that they bought.

By the end of the activity, all of the crumbs from mining should be swept into the circle. Students who succeed will receive a bonus of \$5. Students who get crumbs on their table will be fined \$10 at the end of the activity, and students who get crumbs on the floor will be fined \$15 for polluting the environment.

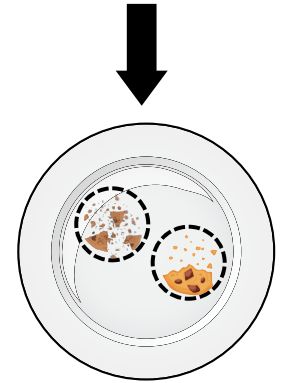


Step Five

 15-20 min

Students will now have 15 minutes to extract as many chocolate chips as they can from their cookies. They can only use their tools– they cannot use their fingers to remove the chocolate chips.

Have students look at their worksheets. Explain to them that there are 3 categories of chocolate chips you (the teacher) will be buying at the end of the activity. Each kind is worth a different amount.



All crumbs should be inside the traced circles by the end of the activity.

	Description	Worth
Clean Chips	Chips with no (or very few) crumbs attached	\$3
Dirty Chips	Chips with some crumbs attached	\$2
Partial Chips	Chips that have been broken or damaged	\$1

Tell the students that the only time they can touch the chocolate chips with their fingers is to move them to the worksheet.

As they uncover chocolate chips, they should line them up on the grid in their worksheet. They should sort them into "clean," "dirty," and "partial." This will make counting easier later.

The teacher can decide what counts as "clean"



Partial Chip

\$1



Dirty Chip

\$2



(Mostly) Clean Chip


\$3



Clean Chip

EXPERIMENT

Step Six

 10-15 min

Once the 5 minutes is up (make sure to give them 10, 5, and 1 minute warnings), tell the students you are going to walk around and give the students the money they earned one by one.

While you are doing this, tell them to think about the following discussion questions. You can go over the answers at the end of the activity.

- Q: Why do you think the tools were so expensive?
 - A: Locals knew that everyone coming to the area would want to buy these supplies, so they could charge a lot of money for them. Older students can talk about the concepts of supply/demand.
- Q: Why do you think gold is so valuable?
 - A: Gold is very rare, and it can be used to make jewelry, electronics, and even medical/dental equipment! It is hard to extract, and it takes a lot of time to mine (as you saw in the activity!), so the cost it very high.
- Q: If you could do they activity again, what would you do differently? Would you buy more tools of fewer tools? Would you spend more time on extracting, cleaning, or collecting crumbs? Would you have bought more cookies or fewer cookies? Why?

As they walk around, the teacher can decide if any of their chips need to move to a different category (i.e. from "clean" to "dirty").

Remember to give the students \$5 bonus if all of their crumbs are inside the circle on their plate. If they got any crumbs on the table, fine them \$10. If they got any crumbs on the floor, fine them \$15.






Once a student has earned their money, have them carefully walk to the trash can to throw away their chocolate chips and crumbs. Tell the students to hang onto their money so that they can use it to buy cookies at the end of class.

Once you are done handing out money and cleaning up, go over the discussion questions.

If there's time, the students can fill out the remainder of their worksheets and do the math on how much money they've earned.

SAMPLE WORKSHEET







Clean Chocolate Chips

	16	31	46	61
	17	32	47	62
	18	33	48	63
	19	34	49	64
	20	35	50	65
	21	36	51	66
7	22	37	52	67
8	23	38	53	68
9	24	39	54	69
10	25	40	55	70
11	26	41	56	71
12	27	42	57	72
13	28	43	58	73
14	29	44	59	74
15	30	45	60	75

Total x \$3=

\$18

Dirty Chocolate Chips

	1	31	46	61
	1	32	47	62
	1	33	48	63
	1	34	49	64
	2	35	50	65
	2	36	51	66
22	37	52	67	
23	38	53	68	
24	39	54	69	
25	40	55	70	
26	41	56	71	
27	42	57	72	
28	43	58	73	
29	44	59	74	
30	45	60	75	

Total x \$2=

\$42

Partial Chocolate Chips

	16	31	46	61
	17	32	47	62
	18	33	48	63
	19	34	49	64
	20	35	50	65
6	21	36	51	66
7	22	37	52	67
8	23	38	53	68
9	24	39	54	69
10	25	40	55	70
11	26	41	56	71
12	27	42	57	72
13	28	43	58	73
14	29	44	59	74
15	30	45	60	75

Total x \$1=

\$5

<u>\$25</u>	Starting Money	=	
<u>\$24</u>	Supplies Cost	-	
<u>\$1</u>	Money Earned	+	
<u>\$10</u>	Pollution Fee	-	
<u>\$56</u>	Spending Money	=	

Money Earned:

\$65

Clean Chocolate Chips

1	16	31	46	61
2	17	32	47	62
3	18	33	48	63
4	19	34	49	64
5	20	35	50	65
6	21	36	51	66
7	22	37	52	67
8	23	38	53	68
9	24	39	54	69
10	25	40	55	70
11	26	41	56	71
12	27	42	57	72
13	28	43	58	73
14	29	44	59	74
15	30	45	60	75

Total x \$3=

Dirty Chocolate Chips

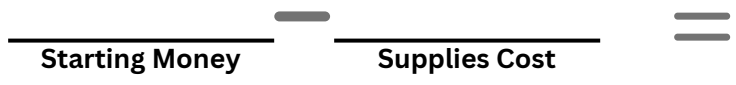
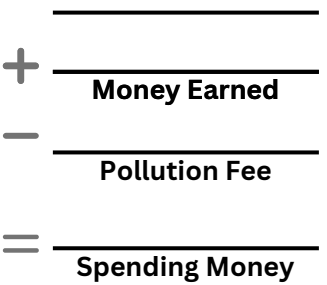
1	16	31	46	61
2	17	32	47	62
3	18	33	48	63
4	19	34	49	64
5	20	35	50	65
6	21	36	51	66
7	22	37	52	67
8	23	38	53	68
9	24	39	54	69
10	25	40	55	70
11	26	41	56	71
12	27	42	57	72
13	28	43	58	73
14	29	44	59	74
15	30	45	60	75

Total x \$2=

Partial Chocolate Chips


1	16	31	46	61
2	17	32	47	62
3	18	33	48	63
4	19	34	49	64
5	20	35	50	65
6	21	36	51	66
7	22	37	52	67
8	23	38	53	68
9	24	39	54	69
10	25	40	55	70
11	26	41	56	71
12	27	42	57	72
13	28	43	58	73
14	29	44	59	74
15	30	45	60	75

Total x \$1=



Money Earned:

OBSERVATION & EXPLANATION

 2-7 min

Remember the discussion questions we thought about earlier in the activity, and use them to expand on the following ideas.

How is mining for chocolate chips similar or different to mining for gold?

What do you think has changed since the time of the gold rush? Why can't people mine wherever they want?


If there hadn't been a fee for getting crumbs on your table or floor, do you think you would have been as careful about not polluting the environment?

SCIENTIST'S WORKSHEET

Tip: Can draw or write the following down on whiteboard!

Hypothesis	Observation	Conclusion
<p>If you were a miner, how would you prioritize buying land and tools?</p> <p>How would you distribute your time between extracting the gold and limiting pollution?</p>	<p>What did you think of this experiment? What were the challenges? What made you frustrated?</p> <p>If you could start over, would you have spent your money differently or used your tools differently?</p>	<p>How is mining for chocolate chips similar or different to mining for gold?</p> <p>What do you think has changed since the time of the gold rush? Why can't people mine wherever they want?</p> <p>Did charging a fee for pollution make you less likely to pollute?</p>

CONCLUSION

 1-5 min

If you have time, fill out Hypothesis/Observation/Conclusion charts on the white board together as a group. If you are short on time, just discussing these questions is okay. Instruct students to clean their stations. Make sure to leave the classroom the way you found it.

As students leave the classroom, they can exchange their money for clean cookies. to eat. We recommend charging \$10 per cookie, but you can adjust that price depending on how many cookies you have left and how much money the average student has earned.