**Arctic Mystery Facilitator Guide**

Welcome! You are about to embark on an exciting adventure that will genuinely excite youth. To prepare yourself to serve as a facilitator, we recommend you work to solve the mystery yourself. This is the best way to understand what youth will undertake. In fact, share the fun by inviting your whole family to solve it with you as part of game nights.

There are a few goals for this Arctic Mystery:

* Excite youth about the Arctic and being a scientist.
* Bring youth with different talents together to solve a challenge.
* Engage youth investigating various sources of data - include photographs, maps, graphs, tables, maps, and text.
* Build capacity for youth to make claims based on observed evidence and well-accepted rules/reasons.
* Allow youth to learn about polar science by exploring topics of interest to them.

You will notice that getting the “right answer” is not on the list. As the facilitator, the most important role you place is providing a safe, welcoming environment for all youth to share information, discuss their ideas, and work toward formulating their responses to the week’s challenge. You are a facilitator rather than an instructor. Never fear, at the conclusion of each week the kit includes a debrief with a summary of where the investigation stands with the “answers” and explanation as we all know how much youth what to know where they stand.

**Six Session Format (with Option for Two Additional Sessions)**

The Arctic Mystery is a six-session program, with each session lasting between 1 and 1.5 hours. The first session focuses on team building, youth getting to know one another, and you getting to know youth. In this first week, youth are detectives in training working to solve a theft. Their only pieces of evidence are contained in two photographs.

For the next five sessions, youth have graduated to detectives and are working to solve the mystery of a scientist, Perm A Frost, who disappeared in Alaska. During each session, youth are presented with a cover letter from the FBI that lists the evidence included in their kit and the key challenges to be accomplished that week.

Each week, youth receive a kit of materials in the mail. While they are not obliged to work on the kit independently, most will. During the Zoom call, youth are working in small teams to draft a “report” that answers the key challenges using evidence, rules/reasons, and claims. A few days later, youth will receive a digital update from the team informing them what evidence was useful and telling them which claims were correct. A diagram of the six weeks is shown below.

There is an option for two additional sessions, for a total of eight. These two sessions add a discussion with a polar researcher, a creative activity called a Data Jam, and a prelude activity that prepares youth for the data jam.

Update posted

Update posted

Open Session 1 Kit

Week 2

Open Session 0 Kit

Recruit & Register

Zoom session

Week 1

Zoom session

Open Session 3 Kit

Update posted

Zoom session

Zoom session

Update posted

Open Session 2 Kit

Week 3

Week 4

Update posted

Open Session 5 Kit

Update posted

Open Session 4 Kit

Zoom session

Week 6

Zoom session

Week 5

Mail Certificates

Week 6

Session 7 (optional)

Data Jam

Session 6 (optional)

Meet a Researcher

& Data Jam Prelude

Week 6

**Zoom Session Schedule (Sessions 0 to 5)**

A schedule for each of the Zoom sessions is provided below and will remain consistent week to week. There is a large group opening, mid-point check in, and closing. Between these large group segments, youth will spend most of their time with a small team that will also remain consistent week to week. Because of attrition and periodic absences, small groups will have 8 to 10 youths.

**Estimated time of approximately 75 minutes**

5 minutes Welcome and music

5 minutes Pre-session survey (depending on the week) and recap of the previous week

25 minutes Small team breakout rooms 1

5 minutes Midpoint check in as large group and share out

20 minutes Small team breakout rooms 2

10 minutes Regroup as large group, share out, discussion, and Q&A

5 minutes Post-session survey (depending on the week) and preparation for the next week

Roles are assigned to youth each week on a rotating basis to share critical responsibilities, such as leader, timekeeper, scribe, reporter, and encourager.

* **Leader:** Sets a schedule for the team and guides conversation along while following the schedule. Helps the group reach consensus and refine questions. *Official lifeline questions must be asked by the leader.*
* **Time Keeper:** Allots time on the schedule so that all tasks can be completed. Updates the group on time available, especially as it is running out.
* **Scribe:** Writes down important notes, claims, and evidence that the group discusses. Even if not everyone initially agrees, notes can be adjusted later to reflect new thinking. *Official reports come from the scribe.*
* **Reporter:** Shares team information during large group debriefs. *The reporter may use the scribes writing.*
* **Encourager:** Encourages everyone to add ideas and makes sure that different ideas are explored. Helps the group avoid groupthink and drawing conclusions too quickly.

**Your Role as a Facilitator**

Your most important role each week as a facilitator is providing a safe, welcoming environment for all youth to share information, discuss their ideas, and work toward formulating their responses to the week’s challenge. This involves disappearing into the background when small team discussions are going well, helping advance the conversation when discussion is stuck (there are weekly Discussion Tips to help you), and elicit contributions and nurture team dynamics (in addition to the Team Roles there are a list of example questions below to help engage all youth and showcase healthy group dialogue).

Finally, Zoom sessions present their own challenges as youth work to overcome internet delays/bandwidth issues, negotiate social interactions, and figure out how to visually share content (holding an item up to the camera, screensharing, creating a shared GoogleDoc, etc.). We do not require students to share their video and they are allowed to mute their audio as they see fit. We have successfully used Zoom chat-bombs to gather responses and feedback from the group when conversation lulls or you want individual responses to be distinct from the group dialogue. In many sessions, the facilitator has elected to be the scribe, writing exactly what the youth request in the report format and either sharing their screen or providing a regular summary of what they have written. Under the circumstance, we have taken an approach of attempt whatever maintains good conversation and healthy group dynamics.

Open-ended questions and invitations to participate are most helpful.

1. I heard Sue mention that she thinks the broken glass is important evidence. What else is did the team observe?
2. Jason, why do you think that map is important to figuring out the location? Is there anything else?
3. So, we have had a suggestion to eliminate the musk ox, Arctic fox, and the polar bear, what is the evidence and reasoning for eliminating each of them?
4. Karina, can you repeat that comment so I make sure that I understood it?
5. Justin, you appear to be onto something here. Can you walk me through the details?
6. Emily, what are your thoughts on that?
7. Has the group reached agreement? If so, what are we going with for our claim, and if not, what are the options we have?
8. How much time is left? Do we want to stay on this question or move on to the next?

Wait time is also critical. In most settings, youth are only given 2 to 3 seconds to reply when they need to be given 10 or more seconds. It takes times time to formulate a response and rapid fire questions overwhelm youth. We recommend facilitators count to 10 to 15 slowly in their heads before asking a second question.

*Note: Additional question ideas are available from the Teacher Talk Moves page at* [*http://teach.conceptuamath.com/talk-moves*](http://teach.conceptuamath.com/talk-moves)*. A laminated sheet could be created for facilitators to use during implementation.*

**Video Support**

A series of short videos have been created to help facilitators implement this program virtually or in person. The QR codes/weblinks below will take you to each of the videos. The QR codes/weblinks for these videos can be found throughout this booklet with the instructions for each session.

**Preparing or Ordering Materials**

All the print materials for sessions are available for download using the QR codes/weblinks below. In addition to the materials themselves, there is a page of instructions that provides advice on how to print, assemble, and arrange the materials to make them look more authentic. Instructors should be prepared to devote sufficient time to print and assemble materials.

Materials may also be ordered from The Ohio State University Byrd Center for a small fee. The materials will arrive assembled. Instructors just need to sort the materials into folders for each of the individuals or small groups. The fee pays for the printing of materials and shipment within the U.S.

**Zoom Session Schedule (Sessions 6 to 7)**

Youth and facilitators alike have requested time to interact with a polar researcher, to ask questions about the region, learn more about living and working in the Arctic and Antarctic, and see them as human beings. This opportunity is provided in Session 6. Likewise, youth have often elected to explore different topics during the first six sessions on their own and bring their individual talents to solving the mystery. Session 7 allows youth to deploy their talents creatively to display some of the information that they have explored during the program.

**Session 6 (approximately 90 minutes)**

5 minutes Welcome and music

5 minutes Pre-session survey (depending on the week) and recap of the previous week

30 minutes Introduction and Q&A with the polar researcher

5 minutes Introduction of Data Jam Prelude

25 minutes Small team breakout

10 minutes Regroup as large group, share out, discussion, and Q&A

5 minutes Introduction of Data Jam

5 minutes Post-session survey (depending on the week) and preparation for the next week

**Session 7 (approximately 85 minutes)**

5 minutes Welcome and music

5 minutes Pre-session survey (depending on the week) and recap of the previous week

10 minutes Discussion of things that were unrealistic about the mystery based on conversation with polar researcher

35 minutes Data Jam presentations in large group or small team breakout rooms depending on group size

10 minutes Regroup as large group, share out, discussion, and Q&A

15 minutes Post-session survey (depending on the week) and popcorn-style share out of the experience in 3 words

5 minutes Conclusion

**Session 0 Format and Introduction**

The purpose of Module 0 is to establish small working groups, allow youth to introduce themselves, set group norms, and hone skills needed to complete the remainder of the kit. The materials in this paxket include: a green letter and images and notes from a crime scene. All materials should be stacked with the green page on top, then stuffed into a large envelope. All of the materials should be packaged into one large envelope labeled “Module 0 - Open Immediately”.

In this module, youth will be asked to use visual and context clues to recreate a timeline of events at the accident scene. To facilitate this module, allow the youth to discuss the materials amongst themselves and solve the mystery as a group.

**Session 0 Hints**

**New Challenge**

**Scenario:** Alice, Beatrice, and Claire had arranged to meet at a cabin in the Brooks Range of Alaska that Beatrice owned.

This group of friends had a long history. Claire was the barista at the local coffee shop. She saw both Alice and Beatrice daily were the only ones in the group known to cross-country ski. Alice and Beatrice originally met when learning to drive snow machines, striking up a conversation about both liking waffles and being left-handed. Following a long texting chain, they settled on a weekend in early spring. A snowstorm hit, delaying some of the group from arriving.

When you are called in to investigate, you check out the scene outside the cabin as you approach and open the door to cabin to examine the inside. Who was able to enjoy their weekend at the cabin?

**Hints:** Use the hints below to help solve the challenge.

**First Hint**

How many people visited the cabin over the last day?

How did everyone arrive at the cabin? Did they come from the same location?

Have the people in the cabin been able to get warm and fed?

**Second Hint**

Why was the window broken?

Did the bear break the window? Did one of the people break the window?

Was the window broken from the outside or inside?

Did anyone injure themselves? If so, how do you think this happened?

**Third Hint**

Who arrived at the cabin first?

How many are still in the cabin or in the vicinity?

Would you leave your coat, hat, and boots in the cabin if you were going outside or leaving the vicinity?

Where specifically are we likely to find the people still present?

**Fourth Hint**

Who do you think arrived at the cabin first? Is that person still in the cabin?

Did all three people dine together? Were they left-handed or right-handed?

Who ate the meal and at which chair were they sitting?

**Session 0 FBI Report**

**Comprehensive FBI Report: For Immediate Release**

**There are multiple sets of prints and paths that lead to and from the cabin.***As a rule, the direction and the number of prints could tell us who came and who left.* The snowmobile and snowshoes each walk one direction – towards the cabin. There are two ski paths; this suggests that someone used skis to visit the cabin and left again.

**Claire is the only person who knows how to cross country ski.***As a rule, we can assume that nobody else has learned to ski before this incident.* Because the skis lead both to and from the cabin, we theorize that Claire is not at the cabin, and we should be looking for her in the woods.

**In the cabin, there are two wet coats hanging on the wall and one pair of boots.***As a rule, we know that nobody will be traveling in this weather without a coat.* We believe that there are two people still in the area.

**There are boot footprints that lead to the outhouse, but not back.***As a rule, we can use the shape and direction of the footprints to determine what the person was wearing and where they might be.* One pair of boots is missing from the cabin, but not the coat. We believe that there is one person in the outhouse, wearing boots but not a coat.

**One set of boot prints and snowshoes lead into the cabin, but not out*.*** *As a rule, we can use the method of transportation to determine who walked when and where.* The person/people who arrived by snowmobile and snowshoes did not leave by that transportation. There is also one coat, pair of boots, and hat still hanging in the cabin. We believe that there is at least one person still inside of the cabin.

**In the cabin, there is a table set for two.** *As a rule, the placement of the silverware can reveal a person’s handedness.* The forks and knives are both placed on the left side of the plates. This suggests that the two people in the cabin are left-handed and may be Alice and Beatrice.

**The window on the front door is broken.** *As a rule, the direction of the glass could tell us where the breakage occurred.* There are glass shards inside of the cabin only. This suggests that the window was broken from the outside. Beatrice owns the cabin and would not need to break the window to open the cabin door. Therefore, either Alice or Claire broke the cabin window.

**There is blood on the crime scene.** *As a rule, a trail of blood could show where someone went and recreate the scene.* The blood first appears on the door where the window is broken. It also appears next to the first aid kit, and again along one the most recent ski trail. It appears that someone cut their hand while breaking the window, applied first aid, and left on skis**.**

**Session 1 Format and Introduction**

Session 1 introduces the overarching mystery of Perm A. Frost. Youths will receive an envelope containing the session’s materials, including a map of Alaska, Alaska airports, Alaska ecoregions, a plant field guide, Instagram posts, and a letter from the FBI. This session sets the scene, describing how a scientist in the field went missing, and how family and friends aren’t sure about her whereabouts. Using Perm’s Instagram and plant field guide, students should be able to uncover which ecoregion and county Perm is conducting research in. The goal of this session is to become familiarized with the geography and ecology in Alaska.

**Session 1 Hints**

**First Hint**

1. Based on the Instagram posts, are all the plants in the field guide? Yes or No
2. Using the plant descriptions, what plants are Perm describing?
3. What ecoregion are the plants in?

**Second Hint**

1. Which counties are in more than one ecoregion?
2. Which counties are in only one ecoregion?
3. Which county has the plants from the guide?

**Third Hint**

1. How far did Perm fly?
2. Does Perm mention the direction they flew?
3. What airports are within range of Fairbanks?
4. What airports are in the ecoregion?
5. How many airports \*could\* have Perm flown to?

**Session 1 FBI Report**

**Comprehensive FBI Report:**For Immediate Release

**Key: Bold is evidence**; *italic is reason/rule;*claims are underlined.

**Perm wrote that she traveled ~500 miles.** *As a rule, all airports on the perimeter are possible destinations for Perm.*Based on this information alone, we have several airports that Perm could have traveled to, including many airports along the Gulf of Alaska. Perm could have traveled to Eagle Airport, Boundary Airport, Kaktovik Airport, Deadhorse Airport, Nuiqsut Airport, Umiat Airport, Hughes Airport, Ruby Airport, Nikolai Airport, McGrath Airport, Seldovia Airport, or Port Graham Airport.

**Perm described plants she saw during a hike.** *As a rule, certain plants can appear in several ecoregions, while others may only appear in one.* Using the “Plants of Alaska” Field Guide, detectives determined that Perm was describing Cotton Grass, Jacob’s Ladder, and Arctic Poppy. These plants appear in the “Arctic” chapter of the field guide.These clues indicate that Perm is in the Arctic ecoregion.

**The county map shows which counties are in the Arctic ecoregion.** *As a rule, there is only one county that is completely inside the Arctic ecoregion – North Slope.* Other counties, such as Northwest Arctic or Yukon-Koyuku Census Area have some parts in the Arctic ecoregion, but neither are mostly in the Arctic ecoregion. This supports Perm traveled to North Slope, Alaska.

Overall, evidence supports that Perm traveled to North Slope, but there is not enough evidence to tell us *which airport* Perm traveled to. North Slope County officials were contacted to help us pinpoint her exact location.

**In the meantime, do not discard the evidence you have received so far – we may need it again later.**

**Session 2 Format and Introduction**

Session 2 follows a similar format to Session 1; however, this session introduces the “suspects” who may be responsible for Perm’s disappearance. During their group meetings, youths will have to determine which airport Perm flew into, and which animal is **not** a suspect responsible for Perm’s disappearance. The goal of this session is to become familiarized with Alaska weather, climate, and wildlife. In this session, youths are also asked to “eliminate a suspect,” which means crossing off an animal who may be responsible for Perm’s disappearance. In order to eliminate a suspect during this session, youths will have to pay attention to key details and understand the geographic location difference between the Arctic and Antarctic. IMPORTANT: It is important to note that Perm was not necessarily abducted. Some youths may assume this is a kidnapping, but that would not fit the context of this mystery; some of the suspects are too small so there must be another reason for her absence.

**Session 2 Hints**

**First Hint**

1. What information might we have about Perm’s location?
2. Which information might be useful? Which information are we unsure about?

**Second Hint**

1. Do we know anything about the weather where Perm traveled? Yes or No
2. What was the weather on the first day of Perm’s trip? What about the second day? And the third day?
3. Do any of the airports record the same trends? Yes or No
4. Does this information match the plane ticket? Why or why not?

**Third Hint**

1. What animals are in the Polar Animal Guide?
2. What do we know about each animal?
3. Which animals live in the Arctic?
4. Which animals do not live in the Arctic?
5. Do we have enough information to eliminate a suspect?

**Fourth Hint**

1. Which airport did Perm fly to?
2. Which suspect is not responsible for Perm’s disappearance?

**Session 2 FBI Report**

**Comprehensive FBI Report:**For Immediate Release

**Key: Bold is evidence**; *italic is reason/rule;*claims are underlined.

**Perm described the weather during her first three days in Alaska.** *As a rule, weather can be unique to a place or region.*Based on the description in her Instagram, we have determined that the weather was 42 degrees and wet the first day, lower 40s and dry the second day, and 50 degrees and dry the third day. The location that Perm traveled should reflect the weather patterns she described.

**Perm left behind an airline ticket on her desk at Ohio State University.** *As a rule, airline purchases can be final and are expensive to change.* However, attached to the ticket was a note which told us that the booking was incorrect, and it did not say which part of the ticket was incorrect.As a result, we cannot confidently use the ticket as evidence, because we do not know which part of the ticket (location or dates) is wrong.

**Airport weather was sent to us from NOAA.** *As a rule, airports keep detailed records of weather data for air traffic management.* Multiple airports included temperature maximums and minimums, as well as precipitation. Airports included those within and outside of North Slope County. When cross-referenced with Perm’s Instagram, we found that Nuiqsut airport matches Perm’s weather descriptions from June 13 to June 15.

**A handy guide for wildlife, *Polar Animals for Dummies*, was provided.** *As a rule, polar animals live in both the Arctic and the Antarctic, although rarely is one animal found in both regions.* According to the note from the FBI, two animals - the Beluga Whale and the Muskox - were already eliminated from the list as suspects. All remaining animals, except for the Adelie Penguin, live in the Arctic and are possible suspects for Perm’s disappearance. As a result, the Adelie Penguin is the first suspect eliminated, because it does not live in the Arctic.

Overall, evidence supports that Perm traveled to Nuiqsut, Alaska and the Adelie Penguin is **not** responsible for her disappearance. Nuiqsut offers were dispatched to the area to find Perm’s research station.

**In the meantime, do not discard the evidence you have received so far – we may need it again later.**

**Session 3 Format and Introduction**

Session 3 takes a deeper dive into the data that Perm collects and studies. The session materials include a map of Nuiqsut, instructions for using a pH meter, a framed data set, animal tracking coordinates, and a letter from the FBI. During their breakout sessions, small groups should focus on the actual location of Perm’s campsite and eliminate a suspect before moving on to river erosion data. The goal of this session is to grapple with legitimate data, become familiar with maps, and exercise basic mask skills to uncover a password. Eliminating a suspect involves recognizing Perm’s location in proximity to the coastline.

**Session 3 Hints**

**First Hint**

1. Where can we find information about where Perm traveled after arriving in Nuiqsut?
2. What features can we see on the topographic map? Is there an airport? What about a marsh? What about a perennial stream? Can we see the hills?
3. Which direction did Perm travel?
4. What number box is Perm’s camp located in?

**Second Hint**

1. What do we know about each animal in the Polar Guide?
2. Which animals live on land?
3. Which animals can travel long distances?
4. Which animals cannot live on land?

**Third Hint**

1. What do we need to find the password to Perm’s password?
2. What information do we know about Perm’s research?
3. How do we calculate the sum of numbers?
4. How do we calculate the average numbers?
5. When we write out the gray boxes in order, does it make a word?

**Answer to Laptop Password**

1. **Site \_\_\_\_** *(3)*
2. \_\_\_\_   \_\_\_\_  \_\_\_\_   \_\_\_\_   **\_\_\_\_**   \_\_\_\_ *(meters)*
3. \_\_\_\_    \_\_\_\_ **\_\_\_\_ Meters**  *(330)*
4. \_\_\_\_  **.**   \_\_\_\_   \_\_\_\_    **\_\_\_\_**   **m/year** *(1.375)*
5. **\_\_\_\_**   \_\_\_\_   \_\_\_\_ *(180)*
6. \_\_\_\_   **\_\_\_\_**   \_\_\_\_   \_\_\_\_   \_\_\_\_   \_\_\_\_   \_\_\_\_   \_\_\_\_   *(Colville)*
7. \_\_\_   \_\_\_   \_\_\_   \_\_\_   \_\_\_   \_\_\_   \_\_\_   \_\_\_   **\_\_\_**   \_\_\_   *(increasing)*
8. **Site \_\_\_\_**   *(4)*

What is the computer passcode?

\_\_\_  \_\_\_  \_\_\_  \_\_\_  \_\_\_  \_\_\_  \_\_\_  \_\_\_  *3R051ON4*

**Session 3 FBI Report**

**Comprehensive FBI Report:**For Immediate Release

**Key: Bold is evidence**; *italic is reason/rule;*claims are underlined.

**Perm provided details about her journey to the campsite when she arrived at Nuiqsut.** *As a rule, these details should match up with a topographic map.*Based on the description in her Instagram post from the first day of her travels, Perm traveled northeast off the runway and crossed a perennial stream. She then drove along the outskirts of a marsh and stopped at the top of a small hill, overlooking a few small lakes and ponds. Using the topographic map and Perm’s description, we find that Perm set up her campsite in grid number 17.

**Perm left behind a sheet with questions about research that might help us uncover her laptop password.** *As a rule, the laptop password can be any combination of numbers and letters.* Using the framed data table and some clever math, each question on the sheet was answered, and each gray box was carried down to spell out the password.  The password is “3R051ON4”.

**Animal tracking coordinates and information about a pH meter were present.** *As a rule, these documents may provide some context for Perm’s research and the whereabouts of potential suspects.* Without a map to plot the coordinates and without further information about Perm’s research, we are unable to use these documents. Therefore, we found that neither the coordinates nor the pH meter info were useful at this time.

**A handy guide for wildlife, *Polar Animals for Dummies*, was provided earlier.** *As a rule, animal habitat varies based on food source, animal behavior, and ability for animal to travel.* According to findings about Perm’s location, Perm is located near the coast but not directly on the coast. Although she is located along a river, the one animal that will *not* be able to travel to Perm’s location is the seal. As a result, the Ringed Seal is the second suspect eliminated, because it cannot travel inland from the coast.

Overall, evidence supports that Perm is camping northwest of Nuiqsut in topographic map Grid 17 and the Ringed Seal is **not** responsible for her disappearance. Nuiqsut officers were dispatched to Perm’s research station to gather evidence.

**In the meantime, do not discard the evidence you have received so far – we may need it again later.**

**Session 4 Format and Introduction**

Session 4 is where youth become acquainted with camping in the Arctic. During this session, youths will look at the ‘crime scene’ where Perm went missing and a few pieces of evidence on the scene, including food eaten, footprints, a fallen weather station, and trace evidence of wildlife, such as fur and scat. During this session, youths are asked to identify which evidence should be sent to a forensic lab for further analysis, as well as determine the time and date Perm went missing, and which two suspects are not responsible for her disappearance. To eliminate a suspect during this session, youths should pay attention to the diets of each suspect and recognize that the lack of any trace evidence of a suspect is compelling enough to eliminate it.

**Session 4 Hints**

**Hint 1**

1. What evidence do we have that might tell us *what time* Perm went missing?
2. Why is this evidence helpful?
3. What do we know about the weather station?
4. What time did the weather station fall over? How do you know?

**Hint 2**

1. What data do we have to help us learn more about the animals?
2. What information is habitat range, and what information is most recent location?
3. Which animals have been at Perm’s campsite?
4. Which two suspects are *not* responsible for Perm’s disappearance? How do we know?
5. What is the white stuff at the campsite?

**Hint 3**

1. What evidence in the photos might help us learn more about Perm’s disappearance?
2. Which evidence might not help us?
3. Which items could be sent to a laboratory and analyzed further?
4. What analysis should the laboratory do?
5. Write specific instructions.

**Session 4 FBI Report**

**Comprehensive FBI Report:**For Immediate Release

**Key: Bold is evidence**; *italic is reason/rule;* claims are underlined.

**Perm provided details about her daily routine on her Instagram.** *As a rule, these details should provide insight into when she goes missing.* On the 5th day, Perm mentions her routine, including what she eats, when she works at her research site, and what time she returns to her camp for dinner. On the 7th day, Perm noted that she had just returned from filling her water bottle before posting on Instagram. Because this happens in the evening, we have reason to believe that Perm goes missing in the evening, after she returns from her research site with water.

**Perm has a weather station which records the temperature, precipitation, and wind speed and direction, and had fallen over before Perm went missing.** *As a rule, we can use the weather data to figure out when the station fell and when Perm went missing.* If we compare the data table to the airport data, which did not change when Perm went missing, we see that the weather station data roughly aligns with the airport data (temperature highs and lows) until June 19, when the data looks completely wrong.  This supports that Perm went missing on June 19.

**Camera pictures taken of the site included white fur.** *As a rule, there are several animals who have white fur, and some that do not.* According to the Polar Animals for Dummies guide, the polar bear, arctic fox, and arctic hare all have white fur. The snowy owl has white feathers; however, no feathers are on the scene. The caribou has brown fur. The white fur could belong to the polar bear, arctic fox, or the arctic hare.

**The fur will be taken to the lab to be tested.**

**Camera pictures taken of the site included footprints.** *As a rule, each animal has its own footprint.* According to the Polar Animals for Dummies guide, footprints for Perm, the arctic fox, and arctic hare, and at least one of the two bears appear in the mud. Caribou footprints and snowy owl footprints are absent. The snowy owl can fly, so it is possible that it left no footprints. Based on the footprints, we can assume that the caribou is not responsible for Perm’s disappearance.

**Camera pictures taken of the site included food from the picnic basket.** *As a rule, we may learn more about our suspect based on the foot eaten.* According to the image, the watermelon, caribou, eggs, and berries were all bitten into. According to the Polar Animals for Dummies guide, the polar bear and snowy owl eat fish, the brown bear eats caribou, the arctic fox eats eggs, and the arctic hare eats berries. The caribou’s diet does not match the items in the photo. The food could have been eaten by the arctic hare, arctic fox, or brown bear.    
 **A map of North Slope County, Alaska was provided.** *As a rule, data on animal whereabouts can be plotted on the map to see if they overlap with Perm's campsite location (the starred location).* Using the animal tracker coordinates from the previous week, we plotted the collar data as individual points (each ping = 1 location), and the satellite data as a polygon (connect each coordinate point to outline a habitat range). Using this information, we discover that the polar bear and owl coordinates do not overlap with the campsite. This suggests that only the caribou, arctic fox, arctic hare, or brown bear could be at the campsite.

**The food will be sent to the lab for a saliva test.**

Overall, evidence supports that Perm went missing on June 19 around 6:00 and the caribou is **not** responsible for her disappearance. Lack of evidence and tracking data suggests that the snowy owl is also **not** responsible for her disappearance. The food was sent to the FBI lab to be tested for DNA, the scat was sent to another lab to determine who made it, and the fur sample was sent to another lab to figure out who shed it. Camera photos were taken for development.

**In the meantime, do not discard the evidence you have received so far – we may need it again later.**

 \***NOTE:** At this point, some youth may determine that the polar bear is not responsible for Perm’s disappearance. Evidence supports that the polar bear may not be a suspect due to the lack of tracking data and lack of polar bear-friendly food at the scene. Evidence may support the polar bear’s presence due to the footprints and fur left behind at the scene.

Some youth may determine that the brown bear is not responsible for Perm’s disappearance. Evidence supports that the brown bear may not be a suspect due to the color of the fur left behind at the scene. Evidence may support the brown bear’s presence due to the food and footprints left behind at the scene.

**Lab analyses may prove useful in narrowing down the suspect.**

**Session 5 Format and Information**

Session 5 is the finale of the mystery. During this finale, youths will be asked to identify the final suspect and determine where Perm is located. In order to identify the suspect, youths will be asked to evaluate the results from the forensic lab (DNA data, hair sample analysis, scat sample analysis) and peruse the field notebook that Perm used during her research. At the end of the finale, each team should have completed the tasks and found Perm. **To conclude this event, play the recorded video of Perm as she thanks the detectives for their hard work and describes the situation when she went missing.** A summative FBI report is also provided.

If there is time at the end of this session, now is a great moment to reflect on the case and how it came about. Discuss with the group: What mistakes did Perm make before she went missing? What are some things Perm could have done to reduce her chances of going missing? How can we practice being safe when spending time in the wilderness? How do we reduce our encounters with dangerous wildlife? In a real-world situation, scientists do not go missing like this; all field researchers have communications equipment and both their colleagues, and the local community are always aware of their whereabouts.

**Session 5 Hints**

**Hint 1**

1. What evidence do we have that might who is responsible for Perm disappearing?
2. How do we match scat to an animal?
3. What information do we have about the scat that can point us to a suspect?
4. Are all of the samples from an animal?

**Hint 2**

1. What kind of fur was analyzed?
2. Was the fur from the scat sample analyzed?
3. Does it tell us anything more about the scat samples?
4. Could one of the samples possibly be Perm’s hair by accident?

**Hint 3**

1. Was human DNA found in all samples?
2. Could the non-human DNA samples come from an animal?
3. Do all animals eat the same foods? Do some animals have more limited diets than others?
4. Could there be two different animals who have eaten the food?

**Hint 4**

1. What information do we have that might help us figure out which research site we should go to?
2. Does Perm mention seeing any animals? Does Perm mention seeing different sized animals?
3. What site are we certain Perm didn’t go to?
4. Do we have a description of the site?
5. Which grid is the site in?

**Session 5 FBI Report**

**Comprehensive FBI Report:**For Immediate Release

**Key: Bold is evidence**; *italic is reason/rule;* claims are underlined.

**The laboratory analyzed the saliva samples and reported on presence of human DNA.** *As a rule, this information can be used to determine which food was eaten by Perm and not something else.* The results indicate that saliva was found on the meat, watermelon, eggs, and berries. Evidence suggests that Perm’s saliva was found on the watermelon and berries. The saliva found on the DNA was not human. Therefore, we can assume that one or more animals ate the caribou meat and the eggs.

**The laboratory analyzed the scat and reported on their findings.** *As a rule, the scat can be used to determine which suspects were present at the scene.* One sample of scat appears to be dirt because it has a lot of clay and no E.Coli, which is a common bacteria found in dung. Two other scat samples reveal an animal that eats eggs and an animal that eats smaller animals. When comparing the samples to the Polar Animals for Dummies guidebook, the characteristics of one sample scat most closely match the brown bear and the arctic fox, and the second sample matches the scat of the arctic fox.

**The laboratory analyzed the fur and described the quality of the samples.** *As a rule, the results can be used to determine which animal left behind the fur at the scene.* One hair sample appears to belong to a human because it shows evidence of hair dye, such as ammonia and peroxide. One sample appears to belong to a lemming – a small rodent found in the Arctic. The third sample reveals fine, high-quality fur. The results of the lab tests reveals that the fur left behind at the scene belongs to the arctic fox.

Arctic foxes are known to eat old meat, eggs, and lemmings. They also have light-colored fur of high quality. Using the laboratory data and information from previous evidence, the FBI has identified the suspect responsible for Perm’s disappearance – **the arctic fox.**

**In her laboratory notebook, Perm kept a record of some of the sights she saw while collecting lab samples**. *As a rule, this information can be used to determine where Perm might be found.* Perm notices several animals with white fur at her sampling sites, including an arctic fox at Site C. Therefore, we can assume that Perm can be found at Site C, near the arctic fox’s primary whereabouts.

**Perm kept detailed laboratory notes that describes the equipment she used at each site and the water conditions from her sampling.** *As a rule, this information can be used to determine where Perm might be found.* Perm’s water samples at Site C describe high concentrations of iron. Perm labeled Site C to be 2000 feet north and 5000 feet west of her campsite, which is located at the number 17 on the map. Using a ruler and the map of Nuiqsut from Session 3, we know we can find Perm on the other side of the river, in Grid 12.

Overall, evidence supports that the arctic fox is the suspect responsible for Perm’s disappearance, and both Perm and the arctic fox can be found at Site C, in Grid 12.