Lesson Plan Title: **Using Logic to Learn Problem Solving**

Developed by: Heidi Sloan, 2018 Teacher on the Trail™

Discipline / Subject: Math, geography

Topic: Logic, problem solving

Grade Level: 3rd – high school

Resources / References / Materials Teacher Needs:
The Lion, the Witch, and the Wardrobe, quote by CS Lewis
https://www.exemplars.com/blog/education/mathematical-practice-and-problem-solving-preparing-your-teachers-for-common-core
Logic puzzles, copies for each student
This is a plan that will take more than one math period to complete.

Lesson Summary: Students learn step by step methods of creating logic puzzles, incorporating the geography and mushers of the Iditarod

Standards Addressed: (Local, State, or National)

Common Core – Mathematical Practices
1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

VA Standards Math 5.4**,** 4.4, 3.4, 3.6
The student will create and solve single-step and multistep practical problems involving addition, subtraction, multiplication, and division with and without remainders of whole numbers.

Online research
CCSS.ELA-LITERACY.W.6.7
Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.

Test Taking Skill: eliminate irrelevant choices

Learning objectives:	Assessment:
Learning objectives: 1. The student will create logic puzzles 2. Working backward to create logic puzzles will help the student learn how to logically solve them 3. Students will train their brains to think logically	**Assessment:** Student rubric – classmates test the logic puzzles created by other classmates Rubric for student made logic puzzles

Procedural Activities
1. Discuss logic – quote from CS Lewis, *Chronicles of Narnia, The Lion, the Witch, and the Wardrobe:*

"Logic!" said the Professor half to himself. "Why don't they teach logic at these schools? There are only three possibilities. Either your sister is telling lies, or she is mad, or she is telling the truth. You know she doesn't tell lies and it is obvious that she is not mad. For the moment then and unless any further evidence turns up, we must assume that she is telling the truth."
― **C.S. Lewis, The Lion, the Witch, and the Wardrobe**

2. What is logic? Compare to inferences in reading comprehension. Give example.
3. Work on practice Iditarod logic puzzle with partners. Afterwards, discuss. What procedure did you use?
4. Pass out Iditarod maps. Let students know they are going to read about at least five checkpoints on the Iditarod Trail. Give students website for Iditarod checkpoints. They should click on the map for each and zoom in via satellite view. Notes about the geography of the checkpoint can be made on their trail maps for future reference.
5. Go to Race Center on Iditarod.com, musher bios. Students choose four to use in their logic puzzles.
6. On a table template, mark which musher is going to be at which checkpoint. Emphasize that they are working backwards, so are beginning with the answers.
7. Work on clues. At least one should be easy so it is guessed on the first read. The others' answers can depend on the other clues.
8. Build clues so that at least two are not obvious until two other answers are known.
9. Students work at creating their puzzles with a partner. When finished, rewrite without the answers. Turn in so the teacher may print out a copy to be completed by another set of classmates. The partners complete a rubric for another pair's puzzle. If something is incorrect, the original creators can correct their work and resubmit.
10. Give students another pre-made logic puzzle to solve. Get their reactions.   "Was it easier since you have already built one?" Students answer on an exit ticket.

Materials Students Need:

Technological device

Iditarod trail maps

Two blank table templates for clues; one for working on, one to submit

Link progression: Iditarod.com, Race Center, Checkpoints or Musher Profiles

Rubric for assessing peer work

Technology Utilized to Enhance Learning:
- Iditarod.com
- Devices for Internet research
- Satellite maps of checkpoints

Other Information

For older students, the entire race route of checkpoints can be available for clues. The logic puzzle can also have more than four options.

For younger students, stick with a smaller section of the trail to create puzzle clues

Students can make logical inferences about the locations of the checkpoints based on geography seen like rivers as they click on the satellite map of each checkpoint.

Modifications for special learners/ Enrichment Opportunities:

For enrichment, students can create logic puzzle booklets to share with other classes.
For special learners, work with fewer clues per puzzle.

Create a Logic Puzzle   Creators: _____

Clues:

_____

_____

_____

_____

_____

Fill in mushers' names and the four checkpoints used in the clues.

Mushers ➜ Checkpoints ⬇				

Rubric for Logic Puzzle

Clues and logic	**3** The clues lead to a logical solution	**2** Two or three clues lead to a partial solution	**1** Not enough information in clues makes it confusing
Challenge	**3** Clues require thought and looking at maps of checkpoints.	**2** Clues do not require map study, but make you think.	**1** Clues are too obvious, making it too easy.
Correct grammar	**3** All clues have correct spelling, punctuation, and capitalization.	**2** 1 – 3 spelling, punctuation, or capitalization errors	**1** 4 + spelling, punctuation, or capitalization errors