Introduction to the Game & Assessment

Today we will be playing a game called the “Algorithm Relay Race”. We will be playing the first 2 levels of this game today. Before we begin the game today, we need to have you complete the pre-game assessment. Think of it as a “mini-game,” like what you might do in a computer game to test your skills before you start the regular game.

Please read the questions carefully, and answer as well as you can. If you really do not know, then just choose “I do not know” as your answer. Pass out assessment and pencils. When everyone is done, move on to the next step.

Before we begin the game, does anyone know what an algorithm is?

After participants share their thoughts, show the definition on the screen:

• An algorithm is a series of very clear and precise directions for how to complete a task or solve a problem step by step.

In computer science, algorithms are used to tell computers what to do. Since computers do exactly what you tell them, algorithms have to be very detailed and not leave out any important steps. In this game, you’ll be writing algorithms for other people to follow, and it also will be important that you are as clear and specific as possible so that the person completing the task does it correctly.

Let’s see if we can write an algorithm about how to make a peanut butter and jelly sandwich:

(Get students to volunteer simple steps. Deliberately be not real specific. The following is the desired initial algorithm. Write the suggestions from the students as similarly to the following as possible.)

1) Take out 2 slices of bread
2) Put Peanut butter on one slice
3) Put Jelly on the other slice
4) Put them together and eat

Now let’s see if we can make the sandwich using the algorithm. (using 2 jars, and bread)

Do not open the jars, and do not include the knife yet. The result should be funny.

How can this be improved? (ask students to offer corrections on board)

1) Open the bread, and take out 2 slices of bread, and separate them.
2) Open the Peanut butter
3) Use a butter knife to spread some peanut butter on one slice of bread
4) Open the Jelly
5) Use a butter knife to spread some jelly on the other slice of bread
6) Put the two slices of bread together with the jelly facing the peanut butter.
7) Pick up the sandwich and Eat

So, do you see how this algorithm is much clearer and precise than what we had before? When you are writing your algorithms in the game, be sure to write them clearly, and with enough detail to be accurately followed, just as we did this one.

**Story Context Introduction: Crazy Cat Relay Race**

*Personalized Introduction* This game is called Crazy Cat Relay Race. has a very interesting story. Have any of you ever had a pet cat? *I do – I actually have nine!* So I like cats a lot. Aren’t they great pets? It’s easy to get very attached to them.

This game is about finding a pet cat that has escaped and is on the loose! You’ll be playing in teams that are trying to be the first to find the cat. You will be getting clues related to tracking down the cat so you can bring it home. The clues will be algorithms that your team will write and follow step-by-step.

**Note to Facilitator: Contents of Clue Bags**
- Clue Bag #1: Dish, toys, picture of how to arrange, instruction card, pencil, blank file card
- Clue Bag #2: One unmarked grid map, one marked grid map, pencil, instruction card, blank file card

**READ THESE INSTRUCTIONS:**

**Ok, now let’s start playing the game!**

You will be split into teams with four members, and each team will have two pairs working together on two different parts of the mission to find the missing cat. One pair from each team will get Clue
Bag #1, and the other pair from each group will get Clue Bag #2. Each bag contains directions telling you what to do.

**Now here are some general instructions:**

- All pairs will be writing algorithms at the same time using the enclosed instructions and a picture. You will have 10 minutes to write your algorithms. At the end of the 10 minutes, give the pictures to me. Put your algorithm and other materials back into the clue bag.
- After the 10 minutes are up, the pairs that wrote the algorithm for Clue Bag #1 will give the bag to the other pair from their team. Remember when you write your algorithm, that the other pair in your team will not be able to see the picture when they try to follow the steps of your algorithm. Be sure to read the instructions in the bag about what you are supposed to write about.
- The second pair of each team must perform a task using the algorithms written by the first pair. Both teams want the same result, to find the cat! The first pair cannot give them any help, but they should watch carefully so they can correct any part of the algorithm that might be unclear.
- If there are any issues or confusion with the algorithm, the pair that wrote it must fix it before continuing, so take your pencils with you.
- **Depending on the results of Clue Bag #1**, your team will then move on to the next bag.

**Ready? Begin!**

The teams will have 10 minutes to follow the instructions and write their algorithms. If some pairs finish early, tell them to practice following their own algorithm.

When both pairs in a team are finished, collect their pictures. The pair with Clue Bag #1 gives their bag to the second pair. The facilitator should tell the second pair:

**This cat is picky, and likes her meal setting laid out just the right way. If you put these things out for her, maybe she’ll come for it. Follow the directions carefully!**

A facilitator should watch to make sure there is no “cheating” and to judge the accuracy of the final placement. Teams that finish early can watch the other teams.

**NEXT READ THESE INSTRUCTIONS:**

The cat lures from Clue Bag #1 were set out very well, but they did not attract the missing cat. Since the cat has not been found yet, we need to continue looking for her. We think she might be hiding in
a neighbor’s house! To get to the house, you will need to follow the directions your team-mates have written.

Here is what you will do next:

• The pairs that wrote the algorithm for Clue Bag #2 will give the bag to the other pair from their team.

• The first pair will complete the task using the algorithm that was written by the second pair, and is now in the bag. The first pair cannot give them any help, but they should watch carefully so they can correct any part of the algorithm that might be unclear.

• If there are any issues with the algorithm, the pair that wrote it must fix it, before continuing.

• Let one of the facilitators know when you are done!

The pair with Clue Bag #2 gives their bag to the second pair. A facilitator should watch to make sure there is no “cheating” and to judge the accuracy of the final placement. Teams that finish early can watch the other teams.

When all teams are done, move on to the concluding discussion and wrap up.

Winners: The team to complete both Clue bag 1 and Clue bag 2 first wins this level of the game!

Stay tuned – Next week we will continue the search for the missing cat! Your team will have another chance to compete and win. You will be writing more algorithms, so let’s talk about what you learned today about how to write accurate algorithms.

Possible Discussion Questions:

1. What did you think about first when you began to write your algorithms? 
   (possible points to address: breaking down the task into different steps; what the other person should do first, second, etc.; how the different parts or places on the map were related to each other; all are related to sequence/steps)

2. What (features of the task) made it easier to write the algorithm? (using directions like east/west or north/south; the grid; using a clock as a reference point, etc.)
3. What (features of the task) made it harder to write the algorithm? (*not having a grid for the cat dish, having different alternatives – for example, the ship could travel different ways on the map*)

4. Did any of your algorithms need to be revised? Tell us what your original steps were and what changes you made to make them better. What did you leave out the first time and why?

5. We often follow algorithms when we do things in daily life, like making a peanut butter and jelly sandwich. Can you think of other algorithms you use for tasks, say like washing dishes or making your bed? What would you need to be sure to tell someone else if you were writing out the steps for these tasks?

**DETAILED RULES FOR REFERENCE**

Players all start in the center of the room.

The facilitator gives Clue Bags #1 to Pair A from team 1 and Pair A from team 2 (etc. for team 3 and team 4). Inside these bags are four objects and a picture that shows how and where to position the objects on the floor. The Pair A duos simultaneously write precise directions for displaying the objects: their relative position to each other, distances apart, and each object’s pose or orientation, and place where the objects were photographed. Mention to them that their Pair B teammates won’t be able to see the picture, so the directions need to be clear and complete.

Meanwhile, at the same time, the facilitator takes the Pair Bs to a place in another room, or outside, gives Clue Bags #2 to Pair B from team 1 and Pair B from team 2 (etc for team 3 & 4). Inside these bags are two maps. Pair B must write directions to where the bag is now located. Inside the bag is a routeless grid with obstacles, and the other map has a marked route to a ship that the Pair B players must carefully describe, as the second half of the algorithm. Mention to them that their Pair A counterparts won’t be able to see the real route or the location of the ship; again, their directions should be clear and complete about how to locate the ship on the map. The blank grid stays in the bag.

When everyone is finished writing, (approx. 20 min) Pair A duos give the picture to the facilitator and their written algorithm to their Pair B teammates. Pair B duos give the real map with the route and their written algorithms, to the facilitator.

First, with Pair A looking on, Pair B duos follow the written algorithm of their Pair A teammates to display the objects in Clue Bag 1 precisely. If they succeed on the first try, that team is ready to continue
to the map algorithm. If the pair B is confused, then pair A writers have to redo their instructions to make them clearer, and the facilitator makes sure the algorithm is improved.

Next, with Pair B looking on, Pair A duos are given the algorithm to find the bag with the map. Pair A follow the written algorithm of their Pair B teammates to find the Bag with the map, and then to follow the map, by marking the blank map with the correct route to the ship. If the pair A is confused, then pair B writers have to redo their instructions to make them clearer, and the facilitator makes sure the algorithm is improved.

WINNERs: The first team whose players are done with both Clue Bag 1 and Clue Bag 2 win this level of the game!

**Potential extra task for a third pair.**
If there is a pair without the rest of the team of 4, then put that pair with another team of four and they will do this extra task. Picture needs a pink collar. And the cat needs some black fur on its back

**Directions to the student pair:**
Describe the following poster, including how to draw the cat.
You can not just repeat the poster’s words exactly.

**LOST CAT!**

Meow
She is black and white with big eyes.
She has a pink collar with her name Collin.
She was last seen on Farley at the docs.
If you find her, please call 908-737-1234
Introduction

Hello everyone, welcome back! Does anyone remember what we did last week?

Be sure to discuss how to write a good algorithm: an algorithm is a series of very clear and precise directions telling us how to complete a task step by step.

Review: When you wrote an algorithm, or directions for placing objects, what was important?
   Use a reference point, like a clock
   Use the perspective of the person and directions like left and right

When you wrote an algorithm, or directions for following a map, what was important?
   use map directions like east, west, north, south
   write how many steps (“units”) you need to go in each direction

Now, let’s get back to our game!

the two pairs on each team switch partners to ensure that no partnership has an advantage.

Story Context Part 2

Last week, we tried to lure the missing cat home with her toys and food, but without success. Then we learned that she might be hiding in a neighbor’s house, and used maps to locate the house. But we still did not find her.

Today we will be playing the third and fourth levels of this game, and writing more algorithms. These algorithms will be different from last week, but it will still be important to be as clear and specific as possible. Remember, your team needs to completing the task correctly and accurately, just like last week.

Now we have new information about our missing cat!

TEXT MESSAGE – CAT LOCATED!

We have another lead on the location of the missing cat. But we know that the cat is very clever, and if we do find her, she will need to be safely contained until we get her home. She is going to need a crate to travel in safely, and we will need to make the crate look appealing to her. Some of your team members will also need to check that the cat really is there, and help the rest of the team get to the cat once the crate is ready.

Ok, now let’s get started playing the game! (Give the crate to the pair that wrote the map algorithm last week. Give the bag to the pair that wrote the cat toys & food bag last week.)
Let’s PLAY!

You will be playing in teams of four students, and each team will have two pairs playing together on two different parts of the game. One pair from each team will get Clue Crate #3, and the other pair from each group will get Clue Bag #4. Each bag contains directions telling you what to do. (If there is an odd number, ask if there is one volunteer person who would write an algorithm by themselves. They will still be in a team, but it will be only 3 persons, or 5 persons if 1 extra. As an alternative, the extra person can join a pair.)

All pairs will write their algorithm at the same time. You will have 15 minutes to write your algorithms. After the 15 minutes are up, the pairs that wrote the algorithm for Clue Crate #3 will give the crate to the other pair from their team. Remember when you write your algorithm, that the other pair in your team will not be able to see the picture, when they try to do the steps of your algorithm.

Be sure to read the instructions in the bag about what you are supposed to write about. Clue Bag #4 will go outside this room, so your facilitator will have to take you out, and the other pair will write in this room.

When the algorithm time is up, the second pair of each team must follow and perform the algorithms written by the first pair, with things that are in the crate.

If there are any issues or confusion with the algorithm, the pair that wrote it must fix it before continuing, so take your pencils with you. Once Clue Crate #3 is performed and finished, your team will now move on to the next bag. Now, the pairs that wrote the algorithm for Clue Bag #4 will give the bag to the other pair from their team.

Then, the first pair must follow and perform the algorithm that was written by the second pair, that is now in the bag. If there are any issues with the algorithm, the pair that wrote it must fix it, before continuing. Once Clue Bag #4 is performed and finished, you have to put the item found from bag #4 into the crate from algorithm #3, and come back to your table.

**Winners:** The team to complete both Crate 3 and Clue bag 4 first wins this half of the game!

Clue Crate #3: Items to decorate the crate, a photo of the decorated crate, pencil, two file cards, instruction card

Clue Bag #4: A card indicating that they should ask to see a photo of the cat’s location, pencil, two file cards, instruction card INCLUDING THE DIRECTIONS TO RETURN TO THEIR TABLE AFTER FINDING THE CAT

**Wrap-Up**

**Possible Discussion Questions:** (same as for week #1)

1. What did you think about first when you began to write your algorithms?
(possible points to address: breaking down the task into different steps; what the other person should do first, second, etc.; how the different parts or places on the map were related to each other; all are related to sequence/steps)

2. What (features of the task) made it easier to write the algorithm? (using directions like east/west or north/south; the grid; using a clock as a reference point, etc.)

3. What (features of the task) made it harder to write the algorithm? (not having a grid for the cat dish, having different alternatives – for example, the ship could travel different ways on the map)

4. Did any of your algorithms need to be revised? Tell us what your original steps were and what changes you made to make them better. What did you leave out the first time and why?

5. We often follow algorithms when we do things in daily life, like making a peanut butter and jelly sandwich. Can you think of other algorithms you use for tasks, say like washing dishes or making your bed? What would you need to be sure to tell someone else if you were writing out the steps for these tasks?

For Data Collection:

1. Distribute & complete the engagement survey
2. Distribute & complete the algorithm post-assessment
3. Discuss: What did you like about these games? Did you learn something and if so, what? What suggestions do you have to improve the games? To make them more appealing for girls like you?

Stay tuned – Next week we will introduce a new game, the “Hidden Image” game, that will ask you to use computational thinking to save refugees of war.
Players all start in the center of the room. The facilitator gives Clue Crate #3 to Pair A from team 1 and Pair A from team 2 (etc for team 3 and team 4). Inside these crates are a picture that shows how to decorate the crate. The Pair A duos simultaneously write precise directions for decorating the objects: their relative position to each other, distances, each object’s pose or orientation. Mention to them that their Pair B teammates won’t be able to see the picture, so the directions need to be clear and complete.

Meanwhile, at the same time, the facilitator takes the Pair B to a place in another room, or outside, gives Clue Bags #4 to Pair B from team 1 and Pair B from team 2 (etc for team 3 & 4). Pair B must place the clue and identify the cat’s location. Then they should write directions to where the clue and the cat are located. Mention to them that their Pair A counterparts won’t be able to see the location of the cat; again, their directions should be clear and complete to find the clue and the cat.

When everyone is finished writing, (approx. 10 min) Pair A duos give the picture to the facilitator and their written algorithm to their Pair B teammates. Pair B duos give their written algorithms to the facilitator.

First, with Pair A looking on, Pair B duos follow the written algorithm of their Pair A teammates to decorate the objects in Clue Crate 3 precisely. If they succeed on the first try, that team is ready to continue to find the cat algorithm. If the pair B is confused, then pair A writers have to redo their instructions to make them clearer, and the facilitator makes sure the algorithm is improved.

Next, with Pair B looking on, Pair A duos are given the algorithm to find the clues and cat.

Pair A follow the written algorithm of their Pair B teammates to find the clue and cat. If the pair A is confused, then pair B writers have to redo their instructions to make them clearer, and the facilitator makes sure the algorithm is improved.

**WINNER:** The first team whose players are done with both Clue Bag 3 and Clue Bag 4, and gets back to their table first, wins this level of the game!
Potential extra task for a third pair.

If there is a pair without the rest of the team of 4, then put that pair with another team of four and they will do this extra task. Picture needs a pink collar. And the cat needs some black fur on its back.

Directions to the student pair: Describe the following poster, including how to draw the cat.

You cannot just repeat the poster’s words exactly.

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She has a pink collar with her name Collin.

She was last seen on Farley at the docs.

If you find her, please call 908-737-1234