Name:_____ **Date:**_____

ADVENTURE ENGINEERING- "Lost in the Amazon"
LESSON 1: The Crash Scene

Activity 1: "Assess the Situation"

The pilot awakens to find you and your teammates gathered around him. He has a bandage on his head and tries to talk.

"There is a map… in the cockpit… the monitor… look at the monitor," the pilot manages to say before he faints. He is too weak to stay conscious very long but you go to the cockpit and find the map and the monitor which you can use to find your location.

You and your teammates look at the map. "Where are we? It all looks like forest to me," says someone.

Maria, who actually paid attention in geography class, speaks up. "Well, we can see our latitude and longitude on the monitor. It shows us exactly where we are by using the Global Positioning System satellites in the sky. Now we can figure out where we are on the map, where we want to go and how far away it is!" Everyone looks at the map hoping the nearest city isn't very far away.

Procedure:

On the next page is a map of the Amazon around the area that you have crashed. Notice the scale, the key, and the latitude and longitude markings on the map. Using the latitude and longitude values given in the box below, mark an **X** on the spot where you have crashed. (Hint: Trace along the latitude and longitude lines to help you find the exact crash location.)

Latitude: 2 ½° S
Longitude: 60° W

1. To be rescued, do you want to go to a (Hint: there could be more than one answer):
   City? _____ Village?_____ Airport?_____

2. Use the legend on the map to help you decide where you want to go and mark the spot on the map with an **O**.
   Record the name of where you want to go _____

3. Add the **X** and the **O** symbols to the legend. Then, use a ruler to draw a **dotted line** between the **X** and the **O** on your map.

4. Measure the length of the dotted line in inches and record it below.

_____

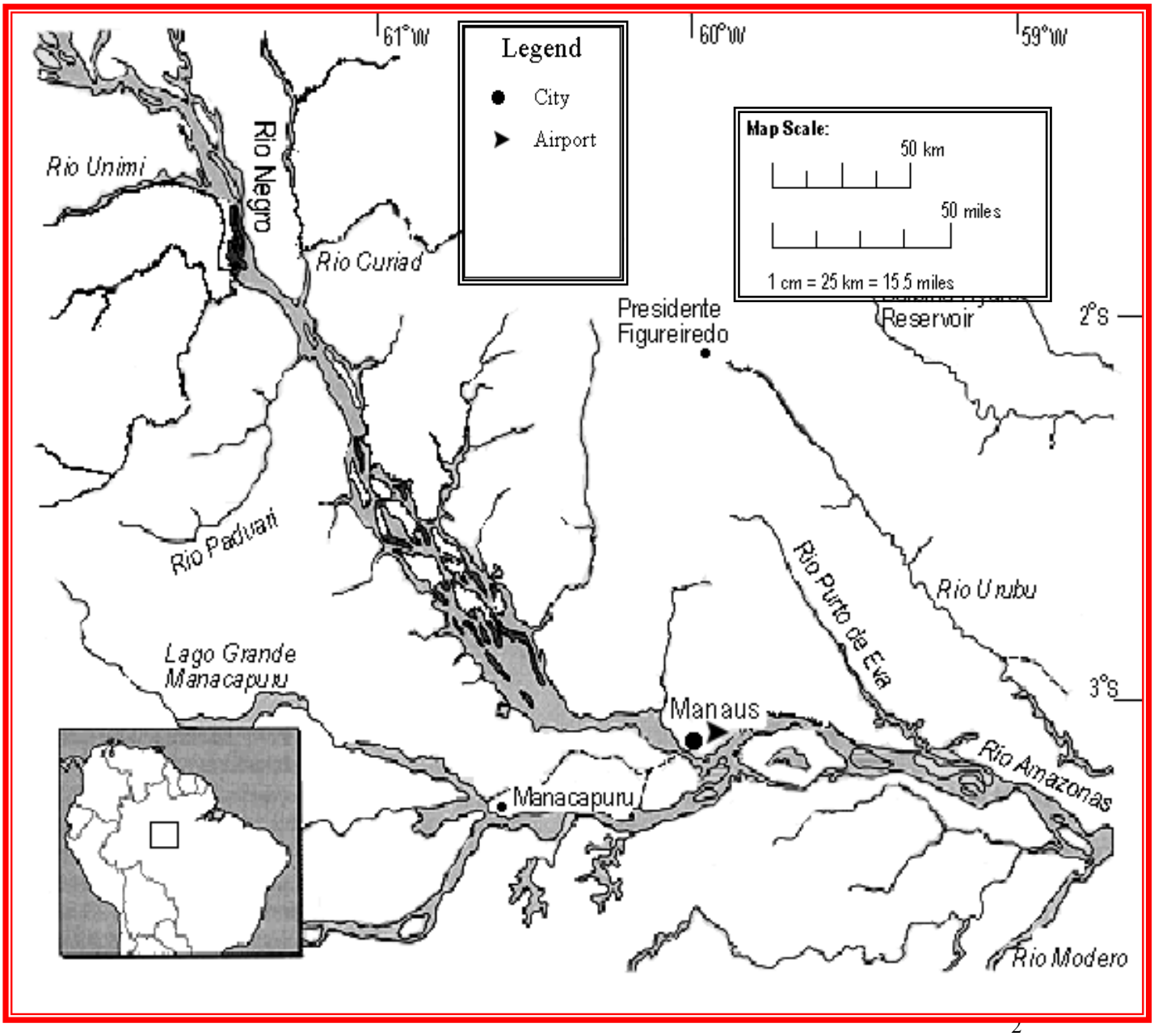
5. Convert the length from inches to miles (Hint: you'll want to use the conversion factor of 5280 ft/mile) and record your answer below.

_____

6. As a class, vote on a route that you all will follow. If the route chosen by the class is different than the one you chose earlier, draw the new route on your map in a **solid line**. Repeat steps #4 and #5 for the solid line and record your results below.

Length of solid line: _____

Distance in miles: _____



Estimating the Time of Travel:

Now that you know how far you will be traveling, you will need to estimate the time it will take to reach your destination. Use the tables below to help you plan for your journey.

Table 1: Walking Speeds

Weight carried	Walking Speed
0 – 23 lb.	3 mph
24 – 46 lb.	2 mph
47 – 70 lb.	1 1/2 mph

1. Use Table 1 to find your walking speed. Note that the speed you can travel depends on how much you are carrying. For now, assume you are carrying 45 lb.

   What is your walking speed? _____

Table 2: Speed and Distance

Speed	**3 mph**	**2 mph**	**1.5 mph**
Normal day's walk	24 miles	16 miles	12 miles

2. Use Table 2 to find out how many miles you can walk in an entire day. This chart assumes you will walk for about 8 hours. Match your walking speed from Question 1 to find your total miles per day

   How far can you normally walk in a day? _____

Table 3: Terrain Adjustments

Terrain Type	Speed modifier
Plains	Multiply miles walked by 1 (x 1)
Swamp	Divide miles walked by 2 (x 2)
Forest	Divide miles walked by 2 (÷ 2)
Mountains	Divide miles walked by 4 (÷ 4)
River	Multiply miles walked by 2 (x 2)

3. You can't walk as fast through the mountains as you can over a normal road. Use Table 3 on the previous page to find your speed modifier if you walk through the forest.

   What is your speed modifier? _____
   What if you walked through the swamp instead? Would your speed by faster, slower or the same than if you walked in the forest? Why? _____
   _____

4. Using the number of miles walked in a day (from Question 2), find the **distance** you can travel in a day by following the directions under "speed modifier".

   How far can you travel in the forest in a day? _____

   How far can you travel on the river in a day? _____

5. Using the Tables 1, 2, and 3, estimate how long it will take you to reach your destination. Calculate the speed and time for each part of the trip in the box provided below (i.e. for each type of terrain.) Show your work.

Type of Terrain	Speed	Time

Total Time: _____

Name:_____ **Date:**_____

ADVENTURE ENGINEERING- "Lost in the Amazon"
LESSON 2: Supplies

Activity Title: "What to Bring?"

Now that you've decided where you are going and figured out about how long it will take, you must decide what to take with you. You start to think about all that you will need. What will you take? Will you have everything you need to survive the trip to Manaus?

Procedure:

Look at the list below to see what supplies survived the plane crash. In your group, mark all the items in the list below that you think are important for survival in the Amazon Rainforest.

matches (0.1 lb, 0.045 kg)
chlorinated tablets (0.1 lb, 0.045 kg)
plastic utensils (0.1 lb, 0.045 kg)
scotch tape (0.1 lb, 0.045 kg)
coffee filters (0.1 lb, 0.045 kg)
plastic cups (0.1 lb, 0.045 kg)
decks of cards (0.1 lb, 0.045 kg)
gum (0.1 lb, 0.045 kg)
pillows (0.25 lb, 0.11 kg)
compass (0.25 lb, 0.11 kg)
magazines (0.25 lb, 0.11 kg)
oxygen supplies (0.25 lb, 0.11 kg)
mirror (Small) (0.25 lb, 0.11 kg)
duct tape (0.4 lb, 0.18 kg)
flash light (1/2 lb, 0.227 kg)
binoculars (1 lb, 0.454 kg)
airline blankets (1 lb, 0.454 kg)
kitchen pots (1 lb, 0.454 kg)
maps (1 lb, 0.454 kg)
bottles of water (1 lb, 0.454 kg)
first aid kit (2 lb, 0.908 kg)
suitcases (2 lb, 0.908 kg)
seat floatation pads (2 lb, 0.91 kg)
books about the Amazon (2 lb each, 0.91 kg)
medium sized water bottles (2 lb, 0.91 kg)
backpacks (2 lb, 0.91 kg)
scrap metal (2 to 10 lb, 0.91 to 5.54 kg)
2-liter plastic bottle w/ water (2.5 lb, 1.13 kg)
tools (5 lb, 2.27 kg)
rope (5 lb per 10 ft., 2.27 kg)
food (5 to 10 lb, 2.27 to 5.54 kg)
wheels (100 lb, 45.4 kg)
emergency escape slide (100 lb, 45.4 kg)

- Using the list of items that survived the plane crash, organize your supplies into categories. In your group, decide what categories to make (such as most important, most useful, or least necessary) and write the names of the categories in the blanks at the top of the chart.

- Next, write down the items in the categories your group decided on and include the weight of each item next to it in parenthesis. Example: first aid kit (2 lb.). You don't have to use all the columns!

Category 1:	**Category 2:**	**Category 3:**	**Category 4:**

- As a class, you will decide the maximum weight each person can carry. Think about how weight will effect how fast you can walk to Manaus. Which items are most important?

1. How much weight can each person carry? _____

- In your groups, decide which items you want to take. Figure out who will carry what item so that no one is carrying more than the maximum amount of weight your class decided on.

- Write the items only you will carry in one of the following charts. (Include the weight of each item.) Add up your total to make sure you aren't carrying too much!! Write the same information for each of the members in your group.

Member 1: _____

Item	Weight of Item
Total Weight: _____	

Member 2: _____

Item	Weight of Item
Total Weight: _____	

Member 3: _____

Item	Weight of Item
Total Weight: _____	

Member 4: _____

Item	Weight of Item
Total Weight: _____	

Name:_____ **Date:**_____

ADVENTURE ENGINEERING – "Lost in the Amazon"
LESSON 3: The Need for Shelter

ACTIVITY 1: Home Sweet Home!

As you begin your journey into the exciting and mysterious Amazon Rainforest, you hear chattering monkeys in the distance. You walk along for about ten minutes and you notice it is very warm and humid even though there is plenty of shade. The pack you are carrying is starting to get a little bit heavier and you wish you were back in the hotel swimming pool. Then, out of nowhere you hear a high-pitched scream coming from behind you. At first you think it is a wild monkey or bird but then you realize that it is only your friend Jennie, an Environmental Engineer.

"Eeeeek, who's wasting water!?" She yells as you notice everyone looking confused. But before anyone has time to answer, a warm rain begins to pour furiously from the sunny sky.

"It's raining, and our supplies are starting to get wet!" Robert, a Civil Engineer, cries out from the back of the group. You quickly realize you need a shelter that is easy to build and can be taken with you. What can you use? How will you build it? There are no umbrellas here!

Procedures:

1. Get into groups and discuss a few ideas of some possible designs for a shelter. What features do you want your shelter to have? (Protection from rain? Wind? Will it have windows? Should it be portable?) Sketch your ideas in the box below.

2. Place the “Amazon Plant Leaves” handout under the wax paper so that you can see the outlines through the paper.

3. Decide which kind of leaves and how many of each you will need to build the shelter you planned. Trace the leaves you wish to use onto the wax paper. Keep in mind that there is only 1 sheet of wax paper so try to fit the leaves on the sheet carefully.

4. Cut out all the leaves traced on the wax paper.

5. Throw away any left over wax paper.

6. In your team of engineers, decide which design you will use to construct your shelter using only the materials that you have been provided.

7. Using the leaves, kite string, reinforcers and Popsicle sticks create a shelter big enough to hold the cup inside. Use the stickers or tape to connect the string to the leaves. Keep in mind that these shelters will need to be mobile. Make sure that you can fold them up in order to carry them with you on your journey.

Name:_____ **Date:**_____

ADVENTURE ENGINEERING – "Lost in the Amazon"
LESSON 3: The Need for Shelter

ACTIVITY 2: Built to Last?

1. As a class, design an experiment that will test the model shelters. This experiment should test the ability of the shelter to keep out water and the durability of its structure after being carried through the rainforest. Write your ideas below.

2. Test the shelters using the experiment you designed.

Questions:

3. How did each step in the test help us check our shelter?

4. List any problems you saw in the experiment:

5. Compare your model shelter to other groups. How would you improve your model if you built it again?

Name:_____ **Date:**_____

ADVENTURE ENGINEERING – "Lost in the Amazon"
LESSON 4: The Growling Stomach

ACTIVITY 1: Finding Food in the Amazon

After you break down the night's camp you decide to walk around and see how your fellow engineers are doing. Everyone is packing away their supplies and getting ready for another adventurous day in the Amazon. You notice that the pilot is lying under a big leaf fast asleep. He is still very weak but is starting to eat more.

"Grrrrr." You hear a low roar coming from your stomach and you realize that it is time for breakfast. You walk over to where a group of Mechanical Engineers- Ken, Daniel, and Cari, are preparing today's breakfast.

"How is the food looking?" you ask.

"I think we will only have enough food left for one more day!" Cari responds looking troubled.

"I guess we will have to find some of food," Ken adds as he hands you a buttered roll and a can of apple juice.

In order to find food, you know that you will have to find plants or animals that are safe to eat, but how will you find them? What kind of plants or animals can you eat in the Amazon?

Procedures:

Now that you know there is a need to find food, you realize you need to find out what is safe to eat. You'll need to research various plants and animals found in the Amazon Rainforest and determine what you can use as food. Using books or other possible resources from the library or in your classroom, you are to classify the plants and/or animals your group has researched. Then your group will create a poster of one or two plants and/or animals that you've researched for presentation to the class. Remember that you must be careful of the dangers of the Amazon Rainforest! Not all plants and animals found the Amazon Rainforest can be eaten; many are poisonous or inedible.

Choose two organisms, either plants and/or animals, that you want to research in detail. Use the following graphic organizer as a guide for some ideas and questions you may want to include on your poster presentation.

	Organism #1	Organism #2
Name		
In which layer of the rainforest does it live? (Canopy, rainforest floor, etc.)		
Is it plentiful? Can it be easily found or caught?		
Is it safe to eat?		
Is it poisonous?		
What does it use for energy or food?		
Do other organisms rely on it for energy or food? If so, what organisms?		
Anything else special about it?		

Now that you've researched your organisms, create a poster and present your group's findings to the class. Be creative!!

Name:_____ **Date:**_____

ADVENTURE ENGINEERING – "Lost in the Amazon"
LESSON 5 – Where's the Water?

ACTIVITY 1: Is it Safe to Drink?

Even though hunting has been slow, you have been able to survive the pangs of hunger during your adventure in the Amazon Rainforest on the few plants and insects you and your colleagues have found. But time is an important factor since the pilot needs medical help that can only be found in a large city. You continue on your quest to finding Manaus with the hope that each day will bring you a little closer.

"Hey guys we are almost out of water," you hear Julie say, "and there are several pools of water nearby according to the map. Maybe some of the water is good enough to drink." You realize that testing the water will be hard with the tools you have, but you also worry about how to filter the water in case it isn't safe to drink. Or perhaps Julie, a Chemical Engineer, can come up with an idea for a filter design. What will you use? Will it work?

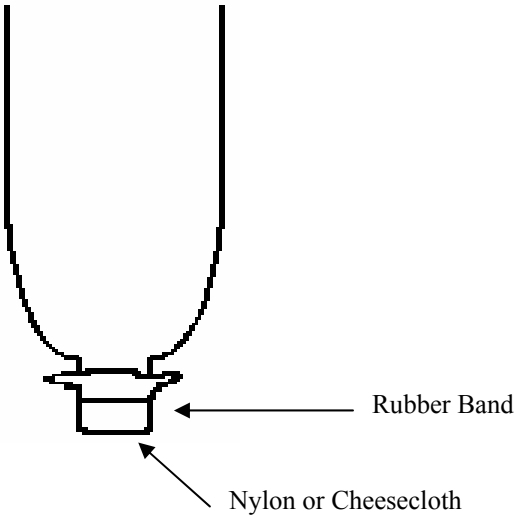
Procedures:

You must use your engineering knowledge to find a way to filter the dirty water that you've been given. Build and test a water filter of your design using the 2-liter plastic bottle along with the layering supplies given to you. Below are some procedures to help you. Remember that you will want your filter to work correctly and fast!

<u>Prepare your bottle prior to adding the layering materials</u>

1. Place the piece of nylon stocking or cheesecloth on the mouth of the bottle (the smaller hole).
2. Use the rubber band to secure it to the mouth of the bottle.
3. See picture on the right.

Picture of bottle after steps 1 and 2.



<u>Design your layering system</u>

4. Here is a list of items from the plane and the Amazon:
   - Sand
   - Gravel
   - Paper Towels
   - Coffee Filters
5. Discuss among your group different ways of layering the materials to make a filter.

Name:_____ **Date:**_____

6. Choose the method you think will filter the best. Fill in the correct area below with the items your team chose to use and draw a picture of your filter design.

Write down the materials used.

_____

_____

_____

_____

_____

Draw a picture of **your** filter idea:

Draw a picture of your **team's final** filter. Label the parts.

7. Carefully place the items in the upside down 2-liter bottle in the order your group agreed upon.
8. Hold the mouth of the bottle over the bowl.
9. Have another student in your group keep track of the time.
10. When the timekeeper says **start,** pour the cup of dirty water into the bottom of the filter you designed.
11. **Stop** the time when the water has gone completely through the filter.
12. Use the line below to record the time your filter took.

Record the time for water to go through filter:

_____ *Min* _____ *Seconds*

Name:_____ **Date:**_____

13. Rate how clean your filtered water is using a scale of 1 to 5, with 1 meaning the water came out clear and 5 meaning that the water remained dirty.

Questions:

1. Describe the water before you filtered it.

2. Describe how the water changed after you filtered it.

3. Describe what you saw as the water went through filter.

4. After discusssing all the filters as a class, record which filter worked best and why.

.

5. Are there other ways to purify the water besides filtering?

6. Do you think there is a limit to the number of times you could use your filter. Why or why not?

Name:_____ **Date:**_____

ADVENTURE ENGINEERING- "Lost in the Amazon"
LESSON 6: Attack of the Raging River

Activity 1: Anchors Away

You are almost to your destination; your body is feeling more and more tired and you don't know if you can walk another step.

Suddenly, you hear Beth, a Marine Engineer, yell from the front, "Guys we have a problem! I think we have strayed slightly from the original route. The GPS unit says our location is 3°S and 60.2°W. It looks like we are going to have to cross a river in order to get to Manaus."

You look at the map and realize Beth is right. How will you cross the river? Will the supplies you have be enough to get everyone across safely?

Procedures:
Before designing a vessel to cross the water safely, you'll first want to better understand how to make something float.

1. Fill the bowl with water approximately ¾ of the way full and mark this level on the cup.
2. Roll the clay into a ball shape in your hand.
3. Using a pan balance measure the mass of the ball in grams and record on the table below under Trial #1.
4. Carefully drop the ball into the water.
5. Record your observations of the clay ball. _____
6. Mark the new level of the water on the cup. Did the water level change, and if so, how?

   _____
7. Take the ball out of the water and use a paper towel to dry it off.
8. Now, try to change the shape of the clay so that it will float on the water.
9. After you get the clay to float, measure the clay's mass and record it under Trial #2.

Trial #1 Mass Before Change (in grams)	**Trial #2** Mass After Change (in grams)

Name:_____ **Date:**_____

Questions: Answer the following in complete sentences.

1. Did the clay float after you changed its shape? Why?

---

2. Compare the mass of the clay in Trial #1 and Trial #2. Was the mass of the clay similar or different?

---

3. How did the clay change between Trial #1 and Trial #2?

---

4. What shape did you change the clay to?

---

5. Do you think your clay creation could hold some paperclips inside and still float?

---

6. How many paperclips do you think it could hold?

Procedures (cont'd):

10. Write the name of the three materials you were given by your teacher in the data table on the following page.

11. Estimate how many items of each material your clay boat can hold all at once:

---

12. Slowly and carefully fill the boat with the materials until it fills with water and sinks. (The items should be placed in one at a time.)

13. Record the number of each item that your clay boat held.

14. Take the boat with the items out of the water and dry them off (be very careful not to deform the boat!).

15. Using the weighing balance measure in grams the weight of the total number of items your clay boat held. Set aside the items, as they will be used again.

Name:_____ **Date:**_____

DATA TABLE:

Material	Mass of Each Item (in grams)	Number of Items Held	Total Mass of Items (in grams)
1.			
2.			.
3.			

Total Mass that Boat Held: _____

Answer the following questions using complete sentences:

1. How much mass (in grams) did it take to sink your boat? (Use the largest value found)

_____

2. What is the ratio of the amount of mass your boat held vs. the mass of the boat itself? (Hint: Divide the total mass that the boat held by the mass of the boat itself.) Show your work.

_____

_____

3. What, if anything, can you do to improve the amount of mass your boat will hold?

_____

_____

_____

Name:_____ **Date:**_____

ADVENTURE ENGINEERING- "Lost in the Amazon"
LESSON 6: Attack of the Raging River

Activity 2: Taking a Boat to Manaus

Given your need to cross the river to reach Manus, you realize that the fastest way to continue on to Manaus is to use the river's current to float your way there. While building a boat may not be easy, you are tired of walking after so many days and the idea of floating down the river instead of continuing to hike appeals to everyone. Can you successfully design a boat to cross the river and float with the current downstream to Manuas?

Procedures:

Using your engineering knowledge gained during the previous activity and the materials given to you by your teacher, construct a boat in your group that will hold the amount of mass needed. Your teacher will tell you how many items you will have to hold. Write the type of materials you will use and how many items of each material you must carry in the table below.

Below are some suggestions to help you in your construction.

1. Recall the first activity with the clay and what was important to making the clay float.
2. Have different members of the group try different ideas and test to see which one is the best.
3. Remember, you don't have to use all of the materials given to you to construct a boat.

DATA TABLE:

Material	Minimum Number of Items to Be Carried
1.	
2.	
3.	

Name:_____ **Date:**_____

Congratulations! You sucessfully made it to Manaus! You're at the airport, soon to board a plane that will take you and your team mates home. You're really looking forward to seeing your family and friends, and enjoying all the creature comforts that you've been missing while surviving your crash and adventure in the Amazon Rainforest. Just as you're boarding the plane, the pilot arrives to thank you and your team for saving his life. He wishes you a safe trip home and good luck with your future endeavors. He is much stronger and recovering quickly after getting the medical help he needed in Manaus.

As you settle into your seat, you reflect on your recent adventure through the Amazon Rainforest and how much you've learned and accomplished in the last two weeks. Soon after take-off, the stewardess informs you and your team mates that word of your grand adventure has already spread back home. You're a local celebrity! There will be news reporters waiting at the airport to interview you and your teammates when you arrive. You are excited about being in the evening news program, but also a little nervous – you've never been on T.V. before! What will they ask? How will you respond?

Procedure:
To help you prepare for your interview on the T.V. evening news, below are a series of questions the interviewer may ask you. Your interview will last for only three minutes, so you need to be well prepared with your answers. Use your time wisely and be sure to write in complete sentences!

1. What did you enjoy most about your adventure in the Amazon?

_____

_____

_____

_____

_____

2. What did you find to be the most challenging?

_____

Name:_____ **Date:**_____

3. What skill(s) did you learn that will be helpful in the future?

4. What was the most memorable part of your adventure?

Here are two blank question and answer sections for your group to fill out. Think about what else you would want to share about your adventure in the Amazon rainforest. Be creative and write down two additional questions that the interviewer may ask you, and supply the appropriate answers.

5. Question:

Answer:

Name:_____ **Date:**_____

6. Question:

Answer: