Dear Engineering Team,

My name is Emerson. I am a middle school student from Fort Lauderdale, FL. Yesterday, I saw a turtle on the bank of the New River. The New River is a large river that runs near my home and is part of the intracoastal waterway. I looked at the turtle and noticed a shiny rainbow in the water—oil! I was worried about the turtle swimming in oily water and decided to take it home with me. Right now, I have the turtle in a fish bowl.

But I have a problem. I know that the water in the fish bowl will not stay clean for long. I cannot change the water in the fish bowl, because the New River water is dirty. I need to clean the water with a filter. I have built several water filters. I do not know how to rank the filters. I would like your engineering team to look at test results from my filter designs. The chart below describes the color of the filtered water. It also describes the particles that remain in the filtered water. I included how much each filter cost to build and how long the filter took to clean the cup of dirty water. Please use this data to help me develop a procedure to rank the filters so it does not take too long to clean dirty water. Finally, your team must decide how clean the water must be for my turtle to be safe.

Here is a list of the materials that I used to create my filters:

- Screen
- Gravel
- Sand
- Sponges
- Coffee Filter Paper
- Cotton Balls

Here are the results of the filter tests that I have done so far.

	1 (Emerson)	**2 (Emerson)**	**3 (Emerson)**	**4 (Emerson)**	**5 (Emerson)**
Water Color	light	clear	light green	light	green/brown

	green/green			brown/green	
Particles present	few small particles	particle free	few small particles	many small particles	small particles present
Cost	$5.50	$13.00	$6.75	$9.50	$6.75
Time to filter 1 bowl of water (minutes)	8	30	15	25	5

Please write a letter to me telling me how to rank all of my filter designs. In your letter, send in the work which shows me how your team ranked the filter designs. Don't forget to tell me why you think your way of ranking water filter designs will help me pick the best design.

Several of my friends have created filters for me. They promised to keep making new filters. Your procedure will help me compare all the filters.

Thank you for your help! If my turtle could talk, she would thank you too!

Emerson

1. You have been asked to solve a problem.

a. What do you need to create to solve the problem?

_____

_____

_____

b. Who will use your solution?

_____

_____

_____

2. What things need to be included in your solution?

_____

_____

_____

_____

3. What might be difficult about solving this problem for the user?

_____

_____

_____

_____

Dear Emerson,

Our team, _____, has examined the data from your water filters. We believe that filter _____ is the best.

Our procedure puts the filters in the following order _____, _____, _____, _____, _____ from best to worst.

We used the following procedure to order the filters from best to worst:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Dear Engineering Team,

You must have worked very hard! I received your letter telling me how to rank my filter designs to clean the water in my turtle's bowl. Your procedure was very helpful. That is good, because I need more help from your team!

My friends came up with two more filter designs to help me clean the dirty water in the bowl. I have included my filter design results in the data table with the new results. The new results are under the numbers '(Friend) 6' and '(Friend) 7' in the table.

	1 (Emerson)	**2 (Emerson)**	**3 (Emerson)**	**4 (Emerson)**	**5 (Emerson)**	**6 (Friend)**	**7 (Friend)**
Water Color	light green/green	clear	light green	light brown/green	green/brown	light green	green
Particles present	few small particles	particle free	few small particles	many small particles	small particles present	particle free	small particles
Cost	$5.50	$13.00	$6.75	$9.50	$6.75	$9.50	$5.00
Time to filter 1 bowl of water (minutes)	8	30	15	25	5	10	10

Write another letter to me explaining how to rank all of the filters. In your letter, send me the work that shows how your team chose to rank them. Your team might need to change the old procedure if it does not work for filter designs '(Friend) 6' or '(Friend) 7.' My friends are still making more filters. I will use your team's procedure to help me compare all of the filters, both old and new.

Thank you for all your help.

Emerson

	3 points	2 points	0–1 point
Discussion	Actively participates with classmates	Listens, but does not offer suggestions	Not focused on task at hand and/ or disruptive
Design, Build, Test	Actively participates with classmates	Watches, but does not make suggestions	Not focused on task at hand and/or disruptive
Written Work	Completes written work independently or with classmates	Written work incomplete and lacking detail	Written work more than 50% incomplete
Self Reflection: My work today was: (Remember to explain your assessment)	GREAT!	OK	Needs to be better