A Tacoma Nature Center Field Investigation for Grades 3-6
Aligned for Common Core for Grade 5

The Tacoma Nature Center at Snake Lake
An Educational Facility of Metro Parks Tacoma
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Thank you for scheduling a guided Titlow Beach tour with the Tacoma Nature Center. Our tour will take place at the Titlow Beach marine preserve at the end of 6th Avenue in Tacoma. Education staff and volunteers are eager to provide your children with a positive experience. Together we will learn about marine life and adaptations through beach exploration walks, an interactive program and sharing, and self-guided discovery.

The $6.00 per child fee includes 1.5 hours of activities led by staff and/or volunteers. Our tours will go rain or shine, so please advise your group to dress for the weather. In case of inclement weather, there is a designated area inside a local building to eat lunch. Otherwise, there are many picnic tables to enjoy an outdoor lunch. Restroom facilities are available inside.

We accept checks, cash or credit cards as well as purchase orders. If possible, please provide a single form of payment for the entire group. We require payment at the time of the program. Groups that arrive more than twenty minutes late cannot be guaranteed a program. If the program is cancelled due to tardiness, you may still be charged for your program.

We hope you enjoy your upcoming field trip with the Tacoma Nature Center. Please remember:

- Common Core aligned pre-visit vocabulary words and activities and post-visit activities are included in this packet in order to prepare your students for the field trip, and to continue the application of field trip discovery.
- Have at least one chaperone per every 7 children. Our field trips work best when chaperones are prepared to participate in activities and be in charge of necessary discipline.
- Be prepared to divide your class into small groups. Each small group of no more than 15 will be led by a staff and/or volunteer in order to provide the best experience for the students. **Check the confirmation form to see how many groups we will need to have you divide into.**
- Dress for the weather; we will go outside even if it rains. Please wear closed-toed shoes on the beach as the rocks are sharp and easy to trip over.
- Bring special medications/allergy treatments your child may need.

Your input is important. Please complete the enclosed evaluation after the field trip and help us improve. A student evaluation is also included at the end of this packet.

If you have any questions, please feel free to call the Tacoma Nature Center at (253) 591 – 6439.
From Northbound or Southbound I-5, take the Gig Harbor/Bremerton exit-Highway 16 West.

Exit Highway 16 West at Exit 4 for Jackson Ave towards University Pl.

Turn left on N. Jackson Ave.

Turn right onto 6th Ave.

Titlow Park will be at the end of 6th Ave.
Background Information on Titlow Beach and Park

As Tacoma’s only beach park on the west side, one with a rich cultural and environmental history, Titlow Park serves a broad public and as such, is designated one of the City’s five Signature Parks. The park is popular for bird watchers, walkers, picnickers and scuba divers, but also includes several other recreational amenities including courts, playgrounds, Titlow Lodge and currently, a 50m swimming pool.

The story of Titlow Park begins in 1903 when local attorney Aaron R Titlow purchased 30 acres of land on Tacoma’s west side. Ultimately he owned over 80 acres on which he developed a waterfront resort. Built in 1911, the central feature of the resort was the 3 1/2 story Swiss-chalet style Hotel Hesperides designed by prominent Tacoma architect Frederick Heath. Initially very successful, the construction of a Northern Pacific Railroad rail line between the hotel and the Puget Sound in 1913 negatively impacted business. In 1926, three years after Titlow’s death, the Metropolitan Park District of Tacoma purchased 53 acres of Titlow’s land. An additional 30 acres, including the Hotel Hesperides, was purchased in 1928. The Park Board changed the name of the hotel to the Titlow Beach Lodge.

Titlow Park contains two marine shorelines (Tacoma Narrows Central Waterway and Titlow Lagoon Wetland), 25 freshwater wetlands, and four streams (Crystal Springs, Titlow Park Gulch, Pedestrian Bridge Gulch and TOA Gulch). Of the 25 freshwater wetlands, 17 were classified into five separate wetland mosaic systems. A portion of the shoreline along Titlow Park is designated as a Marine Preserve Area. Cliff habitat, mature forest, snag habitat, pileated woodpecker habitat including a nest snag, a bald eagle nest, purple martin nest boxes, eel grass beds, fish forage habitat including documented surf smelt spawning areas and potential surf smelt/sand lance spawning areas are found within Titlow Park.

(Master Plan for Titlow Park 2010)

Titlow Park is open to the public year round, opening half an hour before sunrise and closing half an hour after sunset. Pets must be on a leash.
**Puget Sound**: An inlet of the Pacific Ocean in Northwest Washington.

**Adaptation**: A form or trait of an organism modified to fit a functional role in its life history.

**Isopod**: Any of numerous crustaceans characterized by a flattened body bearing 2 pairs of antennae, 5 pairs of branching appendages, and 7 pairs of legs.

**Microhabitat**: A very small, specialized habitat, such as a clump of grass or a space between rocks.

**Inlet**: A recess, such as a bay or cove, along a coast.

**Intertidal Zone**: Area above water at low tide and under water at high tide that contains high biodiversity of organisms.

**Chiton**: Any of various marine mollusks that live on rocks and have shells consisting of eight overlapping plates.

**Limpet**: Any of numerous marine gastropod mollusks, characteristically having a cone–shaped shell and adhering to rocks of tidal areas.

**Gunnel**: Eel-like fish found in shallow waters, usually under rocks in the intertidal zone.
To be sure your students get the most out of their visit to the Tacoma Nature Center, we suggest you prepare them with the lessons below. Each is designed to complement 5th grade Common Core Standards. 45-60 minutes (or more) each lesson.

### Science

<table>
<thead>
<tr>
<th>Learning Target</th>
<th>I can explain good science habits.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Next Generation Science Standards</td>
<td>Science Models, Laws, Mechanisms, and Theories; Explain Natural Phenomena Science explanations describe the mechanisms for natural events (5-LS2-1)</td>
</tr>
<tr>
<td>Do Now/Warm Up</td>
<td>Make a “wordle” for the word SCIENTIFIC. Use science-related words for each letter in the word. You can provide the example below to get students started thinking or have them work on their own. Provide a reasonable time frame for them to think of scientific words before having them share with their elbow partner. When each pair feels they have a good list, create a class list on the board or large paper. As you discuss each scientific word, emphasize any words or phrases that relate to the scientific method. You may want to circle them to discuss later. Example: Specimen Control group</td>
</tr>
<tr>
<td>Tools</td>
<td>11x17 paper for each team Markers, colored pencils or crayons</td>
</tr>
</tbody>
</table>
**Activities**

Students will discuss the traits of scientific inquiry and the scientific method. They will collaborate to show their understanding of good science habits on a poster to hang in the classroom prior to the field trip to the Tacoma Nature Center.

Write on the board or review the idea that science is about asking lots of questions. Discuss science habits of **observing, communicating, comparing, organizing and relating**. Observing means using all your senses to gather information. Communicating means sharing thinking with others and can be written, oral or other methods. Comparing means finding similarities and differences with what you discover and with what others discover. Organizing means showing data in a way that will be easy for others to understand. Relating means making sense of new information and using it to understand the world around you.

Have students work in pairs or threes. Assign each group one of the 5 science habits listed above so that groups nearby aren't next to a similar group. Assign each group to make a poster that explains the science habit in words and pictures and provides an example.

At the end of class student groups may share their poster with the class, or post them in class or the hallway as a reminder of the science habits they will need to use on the field trip.

**Assessment**

Summative: completed assignment
Formative: metacognitive exit task: Which science habit do you think will be the most difficult for you? Which will be the easiest for you? Why do you think so? Explain.

**Practice/Homework**

Differentiated-choose one of the following:

- Find an internet site about the scientific method. Print 1 page from the website and be prepared to share about it in class.
- What other subjects would the good science habits help with? Write a 5 sentence paragraph explaining your thinking.
- Use good science habits to discover something new in your neighborhood or playground. Write a paragraph explaining how you used the habits and how they helped you.
## Science/Language Arts

<table>
<thead>
<tr>
<th>Learning Target</th>
<th>I can explain the meaning of important ecology vocabulary.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Core Standards</td>
<td>5.RI.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.</td>
</tr>
<tr>
<td></td>
<td>5.RI.2 Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.</td>
</tr>
<tr>
<td>Do Now/Warm Up</td>
<td>Have students read the document (Handout Page 2-Appendix A). Tell them to circle any key words or words you don’t understand and underline the main ideas. Once students have finished, have them compare their circled words and main ideas with their elbow partner. Finally, compile a list of key words on the board or chart paper.</td>
</tr>
<tr>
<td>Tools</td>
<td>Copies of document for each student</td>
</tr>
<tr>
<td>Activities</td>
<td>Reading, Thinking Time, Turn and Talk, Whole Class Discussion, vocabulary pages in journal or handout</td>
</tr>
</tbody>
</table>

To prepare for the field trip, understanding some key vocabulary words will help all students get more out of the experience. From your class list, or the words provided, students will create a Personal Marine Dictionary of key terms. They may do this in their journals or on the handouts provided (Handout Pages 3-8-Appendix B). You may want to pair students as appropriate to work on their dictionary pages, and alter the number of words assigned as manageable for your students.

Suggested key words are:
- nature preserve
- habitat
- species
- crustacean
- isopod
- marine
- algae
- echinoderm
- mollusk

The following websites have great information about marine life that may help students make sense of the terms:
- [http://marinebio.org/oceans/creatures/](http://marinebio.org/oceans/creatures/)
- [http://ngkids.co.uk/did-you-know/Ocean-Facts](http://ngkids.co.uk/did-you-know/Ocean-Facts)
- [http://animals.howstuffworks.commarine-life](http://animals.howstuffworks.commarine-life)
| Assessment                                      | Summative: completed vocabulary pages  
Formative: metacognitive exit task: Rate yourself 1-5 on how well you think you understand the vocabulary words learned in class. Why do you think so? Explain. |
|-----------------------------------------------|------------------------------------------------------------------------------------|
| Practice/Homework                             | Differentiated-choose one of the following:  
- Find an article in print or online that is related to the article you read in class. Identify any words in common with the ones you learned in class.  
- Write an 8 line poem using the vocabulary words learned in class.  
- Explain the meaning of your vocabulary words to a parent or guardian at home. Have them send a note with their signature showing you understood the words. |
| Science/Math                                   | I can explain how I add and subtract with decimals.  
5.NBT.7 Add, subtract, multiply and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. |
| Learning Target                                | To check for understanding of decimal measurements and provide some background knowledge, explain the information below and allow several minutes for students to complete the task.  
One way scientists gather information about the health of an ecosystem is by measuring the growth of species living there. Scientists usually use metric measurements, and accuracy is very important. Often, measurements include decimals.  
Using a ruler, draw lines the following lengths:  
5.5 centimeters  
8.2 centimeters  
6.75 centimeters  
4.4 centimeters  
10.6 centimeters  
After students have had a chance to work independently, have them turn and talk with their elbow partner. Have them compare their lines and see if they match. They should discuss any differences and come to an agreement about the correct line.  
For a whole class discussion, have pairs share their lines on the document camera and come to agreement about how to find decimal measurements. |
**Tools**
- Copies of the handout for each student
- Rulers with centimeters

**Activities**
- Think Time, Turn and Talk, Partner Work, Whole Class Discussion
- Have students work on the handout individually or in pairs (Handout Page 9-Appendix C). Check for understanding of adding and subtracting with decimals.

**Assessment**
- Formative: class observation
- Summative: completed handout

**Practice/Homework**
- Differentiated-choose one of the following:
  - Measure 5 objects in your home in centimeters. Add the lengths.
  - Find an article online or in a magazine about scientists using math in their work.
Objectives
To understand the nature and challenges of a rocky beach habitat
To understand the concept of adaptations and recognize marine animal adaptations
To encourage scientific exploration and discovery
To provide a hands-on exploration experience

Schedule of Activities
1. Upon arrival, students gather on the large rocks. Children are encouraged to find a seat quickly and quietly so that we can begin. A Naturalist will then discuss the rocky beach habitat, adaptations and the activity for the group. Information will include:

   - Rules, etiquette and expected behavior
   - General outline of the day’s activities
   - An introduction to wetlands

We will spend approximately 15 minutes discussing the above. After this, we will split in to groups for one hour of beach exploration. Each chaperone will work with a “team” of students exploring a specific creature on the beach.

2. Once the students are divided in to groups, each group will have an animal to seek. The students are encouraged to answer the questions on the clipboard provided about their animal. This will guide them to think about the animal’s adaptations. Students should record what they discover about their animal on the clipboard. We also have Titlow Tidepool checklists of plants and animals available (Handout Pages 16-17 Appendix G).

3. After all the groups have answered the questions, we will reconvene on the rocks to discuss our findings. A naturalist will lead the group through a discussion of what was discovered. Each group will share what they learned with the rest of the class.
To be sure your students get the most out of their visit to the Tacoma Nature Center, we suggest you follow up your field trip experience with the lessons below. Each is designed to complement 5th grade Common Core Standards. 45-60 minutes (or more) each lesson.

Science

<table>
<thead>
<tr>
<th>Learning Target</th>
<th>I can explain how marine invertebrates are classified.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Next Generation Science Standards</td>
<td>Science Models, Laws, Mechanisms, and Theories; Explain Natural Phenomena Science explanations describe the mechanisms for natural events (5-LS2-1)</td>
</tr>
</tbody>
</table>

| Do Now/Warm Up | In journals or on a piece of paper, students are to write 3 things they learned on the field trip to the Tacoma Nature Center, 2 things they enjoyed about the field trip and 1 question they still have. Allow 5-10 minutes for students to think and write independently before asking for students to share. |

| Tools | Copies of picture cards for each team of 2-4 students Scissors Paper Colored pencils (optional) |

| Activities | Discussion, Collaboration, Inquiry |

Discuss the field trip and the diversity of life in the rocky beach habitat. Explain that scientists classify animals, or organize them in to groups, according to characteristics they have in common.

Many of the creatures on Titlow beach are marine invertebrates. This means that they are animals without a backbone. Within the invertebrate group there are many other groups too. Students will sort picture cards according to which group they think they belong to (Handout Pages 10-12 Appendix D).

Have students cut out their cards (or have them precut). Instruct the teams to sort their cards into groups with similar characteristics. They should also name each group an appropriate name. Allow time for teams to work together on this task.

Allow students to do a museum walk to observe each groups’ work. Some may find they have similar categories, some may be different. After everyone has had a chance to see each other’s grouping, agree as a class how to classify the organisms. You may want to include an “undecided” category for ones the class is not sure of yet. Keep a class set of cards displayed in the room. You may want to move cards around as you learn more about each organism.
### Activities

OPTIONAL- have students make a poster about one category of animals. It should include characteristics, examples, illustrations and color. Display in the room or in the school.

### Assessment

Summative: completed assignment
Formative: walk around and sorting. Ask probing questions as needed.

### Practice/Homework

Differentiated-choose one of the following:
- How can we keep our oceans clean for these creatures? Write a paragraph that will persuade someone to keep the ocean clean.
- Watch a documentary about one or more of the creatures we studied.
- Draw a food chain containing one or more of these marine invertebrates.

### Science/Language Arts

<table>
<thead>
<tr>
<th>Learning Target</th>
<th>I can explain an environmental issue in my city.</th>
</tr>
</thead>
</table>
| Common Core Standards | 5.RI.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.  
5.RI.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgably.  
5.W.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. |
| Do Now/Warm Up | Quick Write-write for two minutes about what you think may be an environmental issue in our city’s waterways. You may write complete sentences or a list but you must write for the entire time. |
| Tools | Student access to the internet and written resources  
Optional poster-making supplies |
| Activities | Writing, reading, inquiry, research  
Tacoma is a wonderful city, but even here there are environmental issues that impact us all. What are they? What can we do about them? That is what this research project is about.  
Students are to research an environmental issue in our city’s waterways. They can use the research template provided ("Troubled Waters") or another way of being sure they find all the information needed (Handout Page 13-Appendix E). Once they have researched their issue, they are to offer a possible solution or solutions. Their research, solution and call to action will be put together on a Call to Action Poster to be hung in the school hallways. |
| Assessment                  | Summative: completed research project  
                                    Formative: exit task- explain your research topic and why it is a problem for our city. |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Practice/Homework</td>
<td>Continue working on research project in order to finish by the required deadline.</td>
</tr>
</tbody>
</table>

**Science/ Math**

<table>
<thead>
<tr>
<th>Learning Target</th>
<th>I can explain how I make sense of my data using a line plot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Core Standards</td>
<td>5.MD.2 Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots.</td>
</tr>
</tbody>
</table>
| Do Now/Warm Up              | Hand out the tide table. Allow some time for students to be able to read and interpret the table by having them respond to the following prompts.  
                                    Whether or not students can visit Titlow Beach at any given time depends on the tide. Some times of the day and year, the tide is high and some times it is low. The tide table you have includes the times for high and low tide by date. Find the day we visited Titlow Beach on the tide table. Circle the height of the tide when we were there. Draw a box around the height the tide probably is right now. Why do you think some tide heights have a – (negative) sign in front of them? |
| Tools                      | Copies of handout for each student  
                                    Red and blue colored pencils  
| Activities                 | Inquiry, Whole Class Discussion, Think Time  
                                    Using the tide table, have students make graphs showing the changes in the height of the tide over time (Handout Pages 14-15 Appendix F). One graph will be high tide and one will be low tide. Have them mark and draw the line for AM in red and PM in blue colored pencil. This data provides an opportunity to introduce the idea of negative numbers, a topic of which some students may or may not be aware. For these purposes, they can think of zero as sea level and anything below it is below that imaginary line so it is marked with a “-” or less than sea level. What a great opportunity to introduce big math ideas!  
                                    Hold a class discussion about why the heights of the tides change over the month. Make a list of ideas. |
| Assessment                  | Summative: completed handout  
|                            | Formative: exit task - how could you use your graph to predict the height of the tide in a month? |
| Practice/Homework           | Find a line plot in the newspaper, a magazine or on the internet. Interpret what it means and write 2-3 sentences about it. Bring the line plot and your sentences to share with the class. |
Evaluation

School___________________________________________________
Grade level_______________________________________________
Date of visit ______________________________________________
How did you hear about us? _________________________________

Please rate the following by circling the appropriate number from 1 (lowest) to 5 (highest).

The packet contains clear and useful information. 1 2 3 4 5
The field trip met my expectations. 1 2 3 4 5
The Pre-Visit Lessons helped prepare students for program concepts. 1 2 3 4 5
The Post-Visit Lessons helped reinforce concepts students learned. 1 2 3 4 5
The Common Core aligned material met my curriculum goals. 1 2 3 4 5
My students were able to relate to and understand the Common Core aligned material. 1 2 3 4 5
My students had a learning experience. 1 2 3 4 5
My students had fun. 1 2 3 4 5
I am likely to recommend this program. 1 2 3 4 5
The presenter was knowledgeable and fun. 1 2 3 4 5
Presenter name ____________________________________________
Comments:
Student Evaluation

So, how was your day?

We want to know how you liked your field trip to Titlow Beach. Circle the symbol that best answers each question for you. Feel free to draw a picture too. Thanks!

😊 = Agree  😕 = Not Sure  ☹ = Disagree

Today I had fun.  😊  😕  ☹

Today I learned something new.  😊  😕  ☹

I understand what a tidal zone is.  😊  😕  ☹

I know why beach habitat is special.  😊  😕  ☹

I can tell others about some of the adaptations beach animals have for survival.  😊  😕  ☹

I know what I can do to help keep the beach and the animals that live there healthy.  😊  😕  ☹

My favorite discovery was:
Appendices
Read the passage below. Circle key words or any words you don’t know and underline the main idea.

Last week my aunt took me to visit a marine nature preserve. I couldn’t believe the biodiversity there! There were so many different species of marine plants and animals living in this habitat. First I saw several kinds of algae, and wondered what animals may be eating it. I also spotted the remains of some mollusks and wondered what animal may have eaten them. Under the rocks I spied isopods and crustaceans. Good thing I had my field guide so I could identify which kinds there were. I even saw a few kinds of echinoderms clinging to an old dock. I left the beach with questions swimming in my head. I can’t wait to go back!
Personal Marine Dictionary

Name: ___________________________
Date: ____________________________

<table>
<thead>
<tr>
<th>Definition in your own words</th>
<th>Facts / characteristics</th>
</tr>
</thead>
</table>

Word: nature preserve

Examples

Illustration

Non-examples

Word: habitat

Examples

Illustration

Non-examples
Appendix B

**Personal Marine Dictionary**

Name: ___________________________
Date: ____________________________

<table>
<thead>
<tr>
<th>Word</th>
<th>Definition in your own words</th>
<th>Facts / characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>species</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td></td>
<td>Non– examples</td>
</tr>
<tr>
<td>Illustration</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Word</th>
<th>Definition in your own words</th>
<th>Facts / characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>crustacean</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td></td>
<td>Non– examples</td>
</tr>
<tr>
<td>Illustration</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Personal Marine Dictionary

**Word**

<table>
<thead>
<tr>
<th>Definition in your own words</th>
<th>Facts / characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>algae</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Examples</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Illustration**

**Non-examples**

<table>
<thead>
<tr>
<th>Definition in your own words</th>
<th>Facts / characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>echinoderm</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Examples</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Illustration**

**Non-examples**
### Personal Marine Dictionary

<table>
<thead>
<tr>
<th>Definition in your own words</th>
<th>Facts / characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>mollusk</strong></td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td>Non– examples</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>biodiversity</strong></td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td>Non– examples</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Personal Marine Dictionary

Name: ___________________________
Date: __________________________

- Definition in your own words
- Facts / characteristics
- Examples
- Non-examples
- Illustration

Word

Definition in your own words
Facts / characteristics

Word

Examples
Non-examples
Illustration

Definition in your own words
Facts / characteristics

Word

Examples
Non-examples
Illustration
Dr. Gonzalez was studying the health of a section of ocean by measuring the size of the crabs that live there. She recorded her data in the table below.

<table>
<thead>
<tr>
<th>Crab number</th>
<th>Length in cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.22</td>
</tr>
<tr>
<td>2</td>
<td>4.3</td>
</tr>
<tr>
<td>3</td>
<td>4.7</td>
</tr>
<tr>
<td>4</td>
<td>5.11</td>
</tr>
<tr>
<td>5</td>
<td>5.5</td>
</tr>
<tr>
<td>6</td>
<td>5.9</td>
</tr>
<tr>
<td>7</td>
<td>6.0</td>
</tr>
<tr>
<td>8</td>
<td>6.65</td>
</tr>
<tr>
<td>9</td>
<td>7.9</td>
</tr>
<tr>
<td>10</td>
<td>8.75</td>
</tr>
</tbody>
</table>

What is the difference between the largest crab and the smallest crab?

___________________________________________________________________

Prove it.

What is the total length of all the crabs together?

___________________________________________________________________

Prove it.

Which is greater, the total length of the smallest 4 crabs or the largest 2 crabs?

___________________________________________________________________

How do you know?
Troubled Waters

Name: ___________________________

Tacoma is a great city, but there are still environmental issues that impact us all. Your job is to research one of these issues and help others learn more about it. The more people know, the more they can help with the solution!

Environmental issue I will research: ___________________________________________________________________________________
_________________________________________________________________________________________________________________________________

Where is it a problem? ___________________________________________________________________________________________________
_________________________________________________________________________________________________________________________________

Who does it impact? _____________________________________________________________________________________________________
_________________________________________________________________________________________________________________________________

How does it affect Tacoma? _____________________________________________________________________________________________
_________________________________________________________________________________________________________________________________

Why is it important? _____________________________________________________________________________________________________
_________________________________________________________________________________________________________________________________

Other interesting information about this issue: ______________________________________________________________________
_________________________________________________________________________________________________________________________________

Here are my ideas to solve this problem:

Sources

This is where I got my information: (list below)
Appendix F

Plotting the High Tide

Name: ___________________________
Date: ____________________________

Plot the height of high tide below. Draw the line for AM in red and the line for PM in blue.

Day of the month of ___________________

What was the height of the tide on the day of your field trip? How does it compare with today?

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________
Plotting the Low Tide

Name: ___________________________
Date: __________________________

Plot the height of low tide below. Draw the line for AM in red and the line for PM in blue.

Day of the month of ___________________

How does the high tide graph compare with the low tide graph? What patterns do you see?

____________________________________

____________________________________

____________________________________

____________________________________
Titlow Beach Tidepool Checklist

_Tiptoe through the Tidepools and help keep the beach a special place!_

* No collecting—leave all plant and animal life where you find it.
* If turning over rocks during your exploration, be sure to place the rock gently back where you found it to protect the animal life.

_Check in with a beach naturalist for more information about beach etiquette or the tidepool life._

Plants

**Red algae**
- [ ] Turkish towel (*pictured*)
- [ ] Rainbow

**Brown Algae**
- [ ] Bull kelp
- [ ] Sugar kelp
- [ ] Seersucker
- [ ] Rockweed

**Green Algae**
- [ ] Sea lettuce
- [ ] Sea confetti

**Vascular Plants**
- [ ] Eelgrass

**Tidepool Plant Tidbits**
- ‘Seaweed’ is a loose colloquial term for several groups of multi-cellular algae.
- Although classified as red, brown or green algae by it’s structure, these plants are many different colors. For example, Turkish towel can often appear more purple or black, than red.

Birds

_This is just a partial listing of some of the birds that might be observed at Titlow Beach_

- [ ] Glaucus-winged Gull
- [ ] Western Gull
- [ ] Common Crow
- [ ] Western Grebe
- [ ] Great Blue Heron
- [ ] Black Turnstone
- [ ] Dunlin
- [ ] Bufflehead
- [ ] Kingfisher
- [ ] Canada Goose
- [ ] Double-crested Cormorant
Titlow Tidepool Animals

**Anemones**
- Aggregate anemone
- Green anemone
- Sun anemone
- Sea pen

**Flatworms**
- Leaf worm

**Polychaetes**
- Calcareous tube worm
- Feather duster worm
- Lug worm
- Blood worm
- Paddle worm
- Spiral tube worm

**Chitons**
- Black chiton
- Gumboot chiton

**Limpets**
- Finger limpet
- Mask limpet
- Rough keyhole limpet

**Nudibranchs**
- Sea lemon
- Opalescent nudibranch
- Striped nudibranch

**Snails**
- Bittium
- Checkered periwinkle
- Sitka periwinkle
- Dog whelk
- Wrinkled snail
- Lacuna
- Leafy hornmouth
- Moon snail

**Clams**
- Bent nose
- Butter clam
- Little neck clam

**Oysters**
- Jingle shell

**Mussels**
- Blue mussel

**Octopus**
- Giant Pacific octopus
- Red octopus

**Amphipods**
- Beach hopper (Sand flea)

**Barnacles**
- Acorn barnacle
- Giant barnacle

**Crabs**
- Decorator crab
- Dungeness crab
- Graceful crab
- Green kelp crab
- Small kelp crab
- Hairy hermit crab
- Purple shore crab
- Yellow shore crab (Hairy crab)
- Red rock crab

**Isopods**
- Drab isopod
- Green isopod

**Shrimp**
- Broken back
- Coonstripe

**Sea Cucumbers**
- Burrowing cucumber
- Red cucumber
- Stichopus
- White cucumber

**Sea Stars**
- Blood star
- Leather star
- Mottled star
- Purple star (Orange star)
- Six rayed star
- Sunstar
- Sunflower

**Fish**
- Penpoint gunnel
- Tidepool gunnel
- Crested blenny
- Saddled blenny
- Starry flounder
- Shiner seaperch
- Northern clingfish

Tacoma Nature Center—Titlow