

Name: _____

Date: _____



3.1 Navigation Project



Nautical charts have long been used by ship captains to navigate the oceans. As land has been increasingly developed and harbors built, more and more information is needed to safely navigate near shore. Additionally, offshore shallow banks, reefs, islands, seamounts, and other obstructions needed to be identified so that they don't hinder the passage of boats.

In this project, you and two other captains will navigate through the waters around Puerto Rico and some of the Virgin Islands using three real nautical maps. Your journey includes a stop at Isla de Vieques, which was a US Navy testing ground for bombs, missiles, and other weapons. It was vacated in May 2003 and now is used by locals and tourists. Bon Voyage.

Materials:

<ul style="list-style-type: none">• NOAA map #25640 (laminated)• NOAA map #25641 (laminated)• NOAA map #25647 (laminated)	<p>Note: Laminated maps are available from NOAA (www.noaa.gov) or boating/marine supply stores, as well as some Coast Guard Stations.</p>	<ul style="list-style-type: none">• Internet access• Erasable overhead projector marker
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Getting started:

1. Have all three maps accessible.
2. Before beginning your imaginary journey, spend some time studying the maps. Look at any legends (example: note on pipelines and cables), abbreviation lists, and Notes (such as Note E on map 25640). Look at the map scale. Note whether the soundings are in fathoms or feet.
3. Note that the maps are laminated, so you can use an erasable marker to outline your path.

Making predictions:

- a. What kind of ecosystem do you expect to find in these warm, sunlit waters?
- b. What does this mean about navigating this area?



It's time to go!

1. You and your two partners are tri-captains on a boat that is 12 feet deep. On board, you have a small row boat. Besides your clothes and toiletries for the trip, you will bring along wading boots, a solar still, a radio, your three maps, water, and food.
2. You will be traveling from the west coast of Puerto Rico, eventually ending your trip on the island of St. John. As captains, you will be making decisions about the course the boat will be taking based on directions given below. You will need to look out for (among other things) shallow water, pipelines, and other obstructions. Listen to what the map is telling you.
3. Let's start with map 25640. What is the scale of this map?
4. What does that mean?
5. How many feet are there in a fathom? Hint: The answer is outside the border of the map.
6. Find Punta Higuero on the west coast of Puerto Rico. What is located here? Use your abbreviations. You will probably have to look it up.
7. You will now be moving south along the west coast and then the south coast of Puerto Rico. Notice the light blue area around the coast. At the seaward edge of this area is a line. Every few inches along this line, you will see a number 10. What this means is that anywhere along this line the depth of the water is 10 fathoms. Remember, your boat is 12 feet deep. How many fathoms is this?
8. So your boat is fine anywhere along the line. However, as you head toward the coast from this 10-fathom line, the depth decreases, but since the depth is not marked again, you do not know how quickly it decreases and thus can't take your boat any closer to the shore. Remember this as you travel. So start traveling south. What do you encounter near the Bahia de Mayaguez?
9. What does this mean?
10. Is the depth of the water still suitable for traveling?
11. Travel around the marine conservation district. Should anyone be fishing here?
12. Can you pass between Bajos Gallardo and the Marine Conservation District? If so, trace the path through and if not, find another way around towards the south shore.
13. Stay near to shore so you can have great views of the beautiful shallow blue waters. Find Punta Cayito and Punta Barrancas on the south shore. In the area offshore, there is a section between the 10 fathoms line and the next depth line of 100 fathoms where there are several abbreviated notations. Name three by noting the abbreviation and what it means.
14. Find the lighthouse near Cayos de Ratones. What type of lighthouse is it and why is that different than occulting?
15. 5M means that it can be seen for 5 nautical miles, which is 1.852 kilometers or 1.15 miles.
16. As you travel towards the southeastern coast of Puerto Rico, what area in a square dashed purple box do you see?
17. Do you think it would be a good or bad idea to drop anchor there?



18. Head to Isla de Vieques. There are supposed to be two beautiful bays that are filled with organisms that are bioluminescent. These one-celled organisms give off a blue-green glow when disturbed. You'll have to wait here until night-time in order to see this natural wonder. Can you take your ship right up to the shore? If not, what can you do to get there?
19. How many lighthouses are there on the Island?
20. Two lighthouses are flashing. One is occulting. What is the fourth, what does the symbol mean, and what two colors are associated with it?
21. How far out can you see the flashing and occulting lighthouse lights on the Island?
22. Your next stop is Savana Isle, a small island just west of St. Thomas. As you travel in that direction, what do you notice there are many of in the area of the Virgin Passage?
23. What does that mean you should NOT do in this area?
24. Can you bring your boat in directly to Savana Isle?
25. What does the (269) mean?
26. Now you are going to move to map 25641. The soundings are done in what units?
27. Orient yourselves for a minute. You are currently at Savana Isle. Find it on the map.
28. What is the scale on this map?
29. You can see that the scales on the maps are quite different. What do you notice when you look at the maps themselves. How are they different?
30. When you are sailing in this area, where do you call to report spills of oil and hazardous substances? There are two choices.
31. For weather information, to what station do you tune?
32. From Savana Isle, head toward Cricket Rock using Salt Cay or Dutchcap Passage. How many fathoms deep is the coastline?
33. Should you anchor and row in or go right up to the shore?
34. How much rock is covered and uncovered?
35. What are the local bottom characteristics?
36. By the way, what is a cay?



37. Now you will head to White Horseface Reef at Hans Lollik Isle. Watch your depths as you travel in that direction. What is submerged en route to the Isle?

38. Anchor where you can and spend some time snorkeling. Once you have completed your swim and returned to the ship, start heading through the Leeward Passage. Move to map 25647 at this point. In what units are the soundings measured?

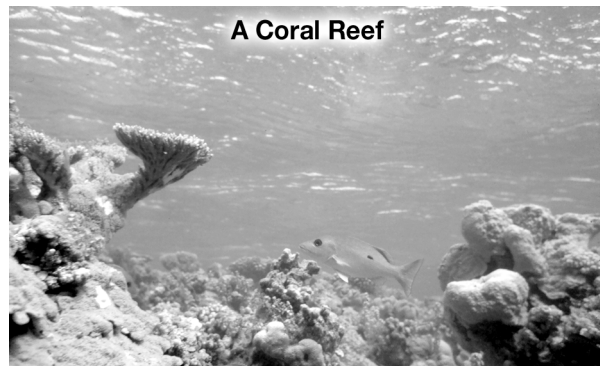


Photo by Dr. James P. McVey, NOAA.

39. What is the scale?

40. Once again, what do you notice about the scale and amount of detail in the map?

41. On this map, what do the green solid and dashed green lines represent?

42. How does that affect your boat?

43. Heading through Leeward Passage and south of Thatch Cay, there is a rectangular box with a blue tint in the waterway. It is there to let you know, as captains, that there is an obstruction, a fish haven, which is an artificial reef. These are usually made of rock, concrete, car bodies, and other debris. If you'll notice, inside the box, it states an authorized minimum depth of 60 feet. If you look at the depth of the water on the map around the box, the values are deeper than 60 feet. Because of the artificial reef, the map is telling you that you can be assured to not have any obstruction down to 60 feet, but it is hazardous after that depth. The minimum depth is checked by sweeping the area with a length of horizontal wire. If there is an obstruction, the wire would get snagged. Is your boat okay to travel through this area?

44. Continue to Cabrita Point and through to St. James Bay. You are headed towards Jersey Bay, but you are going to have to be very careful navigating the Jersey Bay area as you will then head into Banner Bay Channel. It is recommended by the map that you seek local knowledge about some broken piles (wooden columns driven into the harbor sand beds on which structures can be built in the water) which may be below the waterline and are not marked on the map. As you look at the channel, make note of the depth of the water. Will you be able to take your boat in or row in? How can you tell?

45. Bring your wading boots just in case you need them. The symbols that look like ties (colored in green and purple) will help you navigate your way. These are buoys. The first letter of each buoy is either an R for 'red' or G for 'green.' The rule of thumb is to keep red buoys to the right (starboard) when returning to a harbor and green buoys to the left (port). Using that rule, get yourself to the coast and have some lunch in town, especially after all that rowing.



A Mangrove Lagoon

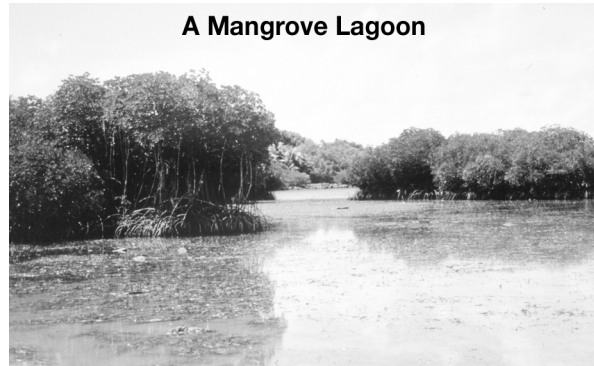


Photo by Ben Mieremet, NOAA.

46. Take a taxi ride west of the harbor to the mangrove lagoon. Can you wade in there with your boots?
47. Mangroves are trees and shrubs that grown in saline marine areas. The mangrove roots impede the water flow. Since the water is carrying sediment, the slowed water deposits the sediment over time and actually builds coastline. These are very special ecosystems.
48. Spend some time here, take the taxi back to the row boat, and get back to your ship.
49. Find a path to St. John and choose a landing site. Describe three more nautical notations that you encounter and how they influenced your route.
50. Congratulations! Your voyage has ended. Hope you learned how important map reading is for nautical navigation. Show your teacher your route.