

Crewmates and Classmates



Program Guidebook

“What I hear I forget, what I see I remember, what I experience I understand!”

Dear Teachers:

Coast Guard Headquarters is pleased to offer Crewmates & Classmates program and guidebook. In it, educators and students will find practical maritime-related activities for elementary and middle school students. Originally conceived and produced for use by cutters working with elementary teachers, we are now offering it for use by all Coast Guard units, especially those with Partnership in Education (PIE) programs, service-wide. We appreciate and acknowledge the generosity of author Patricia Turner Custard, who wrote the guidebook ten years ago and recently updated it for our use.

For nearly twenty years, Coast Guard members have supported students and teachers through the PIE program. Established in 1991, under authority of The National and Community Service Act of 1990, PIE promotes excellence in education, creates opportunities which enhance students' academic abilities through efforts supporting local schools, exposes students to Coast Guard missions and increases potential for recruiting a diverse workforce.

This guidebook offers hands-on activities that incorporate information about Coast Guard into suggested classroom science, math, reading, writing and history instruction. Under the age-old rubric that students forget what they hear, remember what they see, and learn what they experience, The Crewmates & Classmates program brings the classroom to life. Its activities are designed to explore Coast Guard and its exciting maritime mission as a means to introducing subjects, augmenting and enhancing classroom instruction, and stimulating comprehension, and retention. We encourage all schools to implement this unique program, irrespective of PIE participation. Through it, educators will help their students experience adventures sure to last a lifetime.

To learn more about PIE in a given locality, contact the nearest Coast Guard unit or cutter. For more information, you may also contact Coast Guard's national PIE program manager at 202-372-4519. Be sure to schedule Coast Guard into class field trips, and invite them to offer classroom visits about their mission. I know you and your students will enjoy all of the exciting, new experiences the Crewmates & Classmates program brings!

Sincerely,

Terri A. Dickerson
Director
Office of Civil Rights

Program History

The *Adopt a Ship/Adopt a Class* (now *Crewmates & Classmates*) Program was developed in 1998 to bring together the resources of the Columbia River Maritime Museum and the U.S. Coast Guard to provide a real world learning experience for elementary school children. Located in Astoria, Oregon the Columbia River Maritime Museum has the unique situation of having two 210-foot Coast Guard cutters, STEADFAST and ALERT, stationed literally right outside the Museum's front door and a buoy tender just a mile down the road.

The cutters adopted local 4th or 5th grade classes to become honorary crewmembers for the school year. Teachers were given a guidebook of activities to help them incorporate this experience into their lesson plans. During the year, crewmembers made visits to their class and invited the students onboard the cutters for tours and activities. A surrogate classmate, in the form of a small stuffed bear wearing a Coast Guard uniform – named CG Bear – accompanied the cutters on their voyages. CG Bear also maintained a web-site which posted messages while he was at sea and answered the students' questions about all things maritime. The students visited the museum and had access to the materials developed by the Education Department.

From its inception, the program proved to be a success. In the past ten years, the *Adopt a Ship/Adopt a Class* program has had over 1,000 student participants. The program was honored with the Award of Merit from the Association of State and Local History and a Public Service Commendation from the U.S. Coast Guard.

This guidebook is a reworking of the original guidebook to allow it to be used by teachers and U.S. Coast Guard cutters, units and commands nationwide. You are encouraged to modify the guidebook to best fit your needs and objectives. Although originally used in 4th and 5th grade classes, the program has been successfully adapted by individual teachers for use through the middle school grades.

Getting Started

Whether you are a crewmember on a cutter or stationed at a Coast Guard unit, this guidebook will allow you to bring an exciting, new program to schools in your area.

Here's what you will need to do to get started:

1. Purchase a CG bear and name the bear (or allow students to choose a name).
2. After meeting with the school principal and talking with the teachers you ask to participate in this program, introduce CG Bear and the Crewmates & Classmates program to participating classes. Give each teacher a Crewmates & Classmates program guidebook.
3. Explain that CG Bear will get underway with the cutter or travel around the unit and provide regular updates via email to keep the class informed about a day in the life of a CG crewmember.
4. Assign a member to provide updates to the class (es) via email. Include information/activities that are consistent with the unit or cutter's mission and the classroom curriculum.
5. Write in first person for CG Bear (Ex. "Today I flew on a HH-65 Dolphin helicopter. The helicopter has this name because its nose looks like a dolphin's nose. I met new crew members who told me about their jobs on cutters and at other CG units.")
6. Visit the class (es) at least four times during the school year.
7. Invite your adopted class (es) to visit your cutter or unit and be the crew for the day.
8. Finally, Crewmates & Classmates is a flexible program that can be easily adapted to meet the needs of elementary and middle school students in your community.
9. Make the program your own!

Crewmates & Classmates Program

Program Purpose: To use the resources of U.S. Coast Guard cutters/units as learning laboratories to supplement and enrich classroom education.

Program Overview: USCG cutters or non-cutter units will adopt and be adopted by local fourth, fifth or middle school grade class(es). Through site visits to the cutter/unit/facility, crew visits to the classroom, "at sea," "on duty," "on travel" updates, and a curriculum guide, the students will sharpen their math, science, social studies and critical thinking skills. Using the cutter or unit as a real world learning lab, students will learn the history and missions of the U.S. Coast Guard, simple navigation skills, how weather and climate effect maritime travel, life at sea, geography, duty stations, and the importance of working as a crew. Students will also participate in a community service project that reflects the missions of USCG.

USCG Responsibilities

The cutter or non-cutter unit will:

Host a start of program tour of vessel or facility

Provide "at sea" "at work," "on duty," "on travel," updates via emails

Make 2-4 classroom visits

Host an end of program day on the vessel/at your unit where students will serve as crew

Teacher/School Responsibilities

The teacher will:

Integrate program into lesson plans

Provide transportation for cutter/unit visits

Develop with students a community service project that reflects USCG missions and/or learnings from program

Resources provided to the teacher include:

1. Visits from cutter/unit crew to classroom where crew will discuss:
 - a. life on a ship/at the unit
 - b. navigation
 - c. law enforcement/fisheries
2. At-sea, on duty updates from cutter or unit
3. Guidebook with suggested activities and handouts
4. Classroom mascot (CG Bear) that will accompany cutter or unit crew members on voyages or around the unit

Resources suggested teacher obtain:

1. World or Western Hemisphere map to chart cutter voyages
2. Coast Guard DVD - The History Channel has several DVDs on the topic of the Coast Guard including *Coast Guard History* and *The Great Ships series – Coast Guard Ships*. Check your local library to inquire about obtaining these DVDs.

It is also recommended that the teacher contact the Education Department at their nearest maritime, science or history museum/center to see what resources they have available on the subject of maritime science or history.

Crewmates & Classmates Program Sequence

You are encouraged to use the *Crewmates & Classmates Program* materials and resources in the way that best suits your lesson plans and class needs. Below is one possible outline for the program. The cutter's schedule and your class needs will determine how you design your program outline.

Suggested Program Sequence – Items listed in bold indicate guidebook resources

Maritime Vocabulary

About Your Cutter or Ashore Facility

Ship or Unit History

Coast Guard History and Timeline Activity

Tour cutter or facility

About Time

Watches and Bells

Meet the Crew

Daily Routine

Crew visits class to talk about life on a ship/at a unit

Classroom Log

Grog-Tub, Scuttlebutt and Harness Casks

Make a Compass

Imaginary Lines

Crew visits class to talk about navigation/duties at a unit

Signal Flags

Maritime Weather

Tides and Currents

Crew visits class to talk about missions

Class develops community service project

All day visit to cutter/unit

Maritime Vocabulary

Increase your VOCABULARY by learning the meaning of the following words used in the maritime world.

BOW = The front section of a ship or boat.

CABIN = A space for the crew to live in on a ship.

DECK = The floor of a ship.

GALLEY = The ship's kitchen.

MARITIME = Of the sea or the seacoast.

MAST = A tall pole that rises up from the deck of a sailing ship to support the sails and rigging.

MESS = The area on the ship where the sailors eat.

NAUTICAL = About sailors, ships, or navigation.

NAVIGATE = To travel from one point to another over water in a boat or ship.

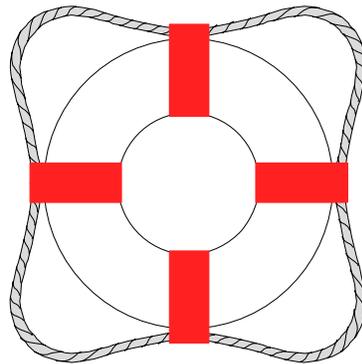
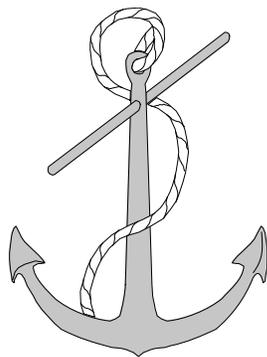
PORT = The left-hand side of the ship looking forward.

RIGGING = The system of lines that works the sails.

STARBOARD = The right-hand side of a ship looking forward.

STERN = The rear of the vessel.

WATCH = The periods of duty the day is divided into onboard ship.



About Your Cutter or Unit

Have your adopted cutter or unit provide you with the information needed to fill in the blanks below.

Name:

Location:

Mission:

Length of Patrols:

OR

Length of Duty:

Crew:

Ship Characteristics:

OR

Unit Characteristics:

Length:

Departments:

Beam:

Duties:

Displacement:

Length of work day:

Propulsion:

Full Speed:

Standard Speed:

Range at Standard Speed:

Fuel Capacity:

Water Capacity:

Armament:

CUTTER or Unit History

Ask your adopted cutter or unit to supply you with a history and a photo of the vessel, station, or facility.

History of the United States Coast Guard

The Coast Guard has a long and colorful history and is one of the oldest of the armed services. Your first mission as a new member of the cutter's crew is to research and make a timeline of U.S. Coast Guard facts, people, and history.

To do your research:

1. To begin, read the activity sheets on **CUTTER History** and **Famous Coasties**. This will give you clues for doing your research.
2. Look in your library under U.S. Coast Guard, United States Lighthouse Service, U.S. Life-Saving Service, and the U.S. Revenue Service.
3. On the Internet visit the Coast Guard site at www.uscg.mil Pay particular attention to the Historian's page www.uscg.mil/history

To look for as you research:

1. Dates of important events in Coast Guard history, such as when the Coast Guard was established.
2. Famous firsts – first lighthouse, first cutter, first exploration, etc.
3. Important people in the Coast Guard.

Making your timeline:

Using all the information you collected in your research, as a class, make a timeline to hang in your classroom. Work as a crew to decide what information to include in the timeline.

Decorate the timeline with your own artwork.

Make another timeline – you can use the same information from your classroom timeline – to present to your cutter or unit.



Famous "Coasties"

Joshua James

Joshua James was the greatest lifesaver in Coast Guard history. He was in charge of a lifesaving station near Boston for many years. James rescued hundreds of people during his long career. He died at age 75 while working at his station.

Ida Lewis

Ida Lewis was the keeper of the Lime Rock Lighthouse in Newport, Rhode Island for 39 years. From 1872-1911 she rescued 20 people with the lighthouse rowboat. She was celebrated as a heroine by the entire nation.

Michael Healey

Michael Healey was a Revenue Cutter captain and the first African American to command a ship belonging to the United States government. He sailed along the coast of Alaska and the Arctic. Healey saved lives, enforced laws, and protected the environment. He also helped the Native Alaskans by bringing reindeer from Russia to Alaska. The reindeer were used for food, clothing and transportation.

Hopley Yeaton

Hopley Yeaton was the first captain of a Revenue Cutter. Yeaton was appointed by President George Washington in 1790. Yeaton's main job was stopping smugglers. The Revenue Cutter Service was one of the early branches of the Coast Guard.

Sinbad

Sinbad was the Coast Guard's most famous mascot. The canine Coastie lived on the cutter CAMPBELL during World War II. He had adventures all over the world. Sinbad was so popular, a book was written about him.



Sinbad with his crew aboard CAMPBELL

About Time

Onboard your adopted cutter you will see many examples of how life on a ship is different from life on land. One difference that you may not realize is how time is measured at sea.

On land we measure time in two 12 hours periods which together equal one 24 hour day. We break the day into a.m. and p.m. – anytime between midnight and noon is considered a.m. and from noon to midnight is in the p.m.

On Navy and Coast Guard ships, time is measured in terms of one 24 hour period. Four numbers are used to indicate the time. The first two numbers represent the hour and the last two are the minutes. The day begins at 0001 or what we on land would call 12:01 a.m. – one minute after midnight. 0200 is 2:00 a.m., 0600 is 6:00 a.m., 12:00 is noon, 1500 is 3:00 p.m., and so on all the way until 2400, midnight.

Test your skill measuring sea time by doing the following exercises:

- How would you write 9:30 a.m. in ship's time?

11:45 a.m.? 3:00 p.m.? 8:10 p.m.? 12:20 a.m.?

HINT: For any hour after 12:00 noon, add 12 to the hour number to get ship's time.

- What would 0025 be on land?

0830? 1140? 1300? 1850?

HINT: For any ship's time 1300 and greater, subtract 12 from the hour number to get land time.

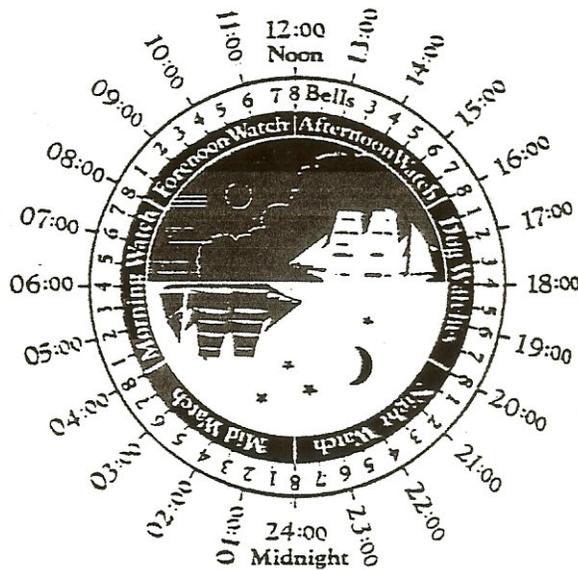
- In ship's time, when does your school day begin and end?



Watches and Bells

Days on ships are divided into four-hour shifts, or watches. When the cutter is at sea, most of the crew stands watches either on the bridge or in engineering. While not on watch crewmembers participate in law enforcement boardings, training, or have free time.

Look at the clock diagram. If training begins at the start of the forenoon watch, what time would this be? During what watch do you start your school day? Have lunch? End your school day?



The ship's bell is used to announce the time every half-hour during a watch, with one additional bell struck each time. The watch changes at eight bells, then one bell is struck after the first half-hour, then two bells at the hour, three at the hour-and-a-half, and so on until the watch changes again at eight bells.

Words to Know:

Boarding = To go onto a vessel. The Coast Guard boards other vessels at sea to make sure that they are not carrying any illegal substance such as drugs, are using legal fishing practices, or are equipped with all the necessary safety equipment.

Bridge = The location from which the vessel is steered and its speed controlled.

Meet the Crew

A U.S. Coast Guard cutter has officers and crew stationed on board – in other words, the cutter is where they work. A chain of command is followed starting at the top with the Captain and ending with the Seamen. The Captain is the master of the vessel and has authority over the ship and its crew. The Executive Officer serves as the Captain's second in command and makes sure that the Captain's orders are carried out by the crew. He is aided in his duties by three Department Heads: the Operations Officer, Engineering Officer, and First Lieutenant. Other positions on the cutter include:

Quartermaster = Plots the ship's course.

Communications Specialist = Receives and sends messages for the ship.

Corpsman = Takes care of the crew's medical needs.

Cook = Plans and prepares meals.

Machinist = In charge of all the ship's machinery such as the engines.

Damage Control = Makes sure the ship remains watertight.

Boatswain Mate = Oversees Seamen, all small boats, anchoring, towing, and lifesaving gear.

Electronics Technician = Maintains and repairs all radios and radar.

Electricians = Maintains ship's generator and electrical power systems.

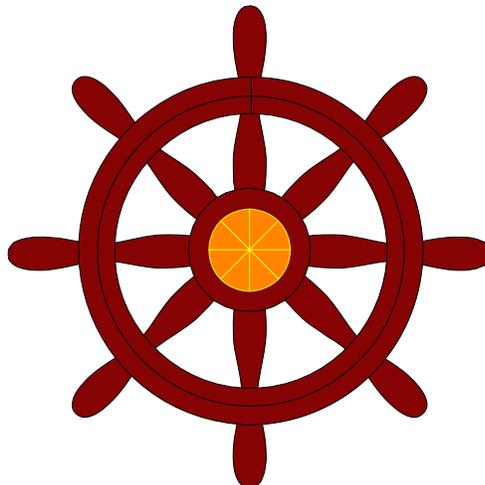
Seamen = General duties and repairs, a deckhand, helmsman, lookout, and boat crew member.

To Do:

Make a crew list for your class or school. Who is in command? What other jobs are there in the class/school? What other examples of the chain of command do you see in your community?

To Think About:

The USS CONSTITUTION, one of the first ships in the Navy, was 204 feet long and had over 400 men serving aboard. What is the length of your adopted cutter? How many officers and crew are stationed aboard? Why would the CONSTITUTION have needed more crew than a modern cutter?



Daily Routines

Onboard ship a daily routine is followed. This general schedule of events remains the same from day to day. Changes to the routine are announced in the "Plan of the Day."

Below are two examples of the daily routine; one for when the ship is at sea and one for when the ship is inport.

Daily Routine at Sea – Monday through Saturday

Sunrise	Secure Navigation Lights
0600	Call Duty Cooks and Mess Cooks
0630	Reveille
0645	Breakfast
0730	EOW Check Small Boats and Report Condition to OOD
0745	Secure from Breakfast
0800	Return to Ship's Work
0830	Secure Messdeck for Cleanups
1000	Reveille for the Midwatch, Coffee Break for the Crew
1015	Secure Coffee Break, Return to Ship's Work
1100	Inspection of Food Handlers and Galley, Check Chronometer
1115	Noon Meal for Watch Reliefs and 1 st Class Petty Officers
1130	Strike Eight Bells, Test of Ship's Whistle and Alarm System
1255	Officer's Call
1300	Quarters
1315	Monday through Friday – Drills and Training Saturday – Commence Holiday Routine
1545	Sweepers
1600	Secure Ship's Work
1700	Evening Meal for Watch Reliefs and 1 st Class Petty Officers
1715	Evening Meal for the Crew
Sunset	Energize Navigation Lights
1800	1 st Movie
1945	Evening Reports
2000	2 nd Movie
2200	Taps

Daily Routine Inport – Monday Through Friday

Sunrise	Secure Deck, Anchor, and Aircraft Warning Lights
0545	Liberty Expires for Duty Cooks and Mess Cooks
0600	Reveille
0615	Breakfast

0645	Liberty Expires
0655	First Call to Morning Muster
0700	Morning Muster, Turn to Ship's Work
0755	First Call to Morning Colors
0800	Morning Colors
1000	Reveille for the Midwatch
1100	Check Chronometer
1200	Strike Eight Bells
	Test of Ship's Whistle and Alarm System, Monday
1245	Sweepers
1255	Officer's Call
1300	Quarters
	Liberty, Noon Meal for the Crew
1730	Evening Meal for the Crew
Sunset	Energize Deck, Anchor and Aircraft Warning Lights
1945	Evening Reports
2200	Taps

Questions????

Reading the routines may have caused you to come up with many questions. What are sweepers? Why do they check the chronometer? What is a chronometer? What does it mean to energize the deck?

Write down all the questions that you have. Someone from your adopted cutter or unit will be coming to your class to talk to you about life onboard a Coast Guard cutter and will answer all your questions.

To Think About:

Compare the at sea and inport routines. How are they different? How are they the same?

Why is it important to follow a routine on a ship?

What other examples of routines can you think of?

Do you follow a daily routine? Does it change from day to day or on the weekend?



The Classroom Log

A log is the daily record of a ship's voyage. The ship's position, distance traveled, the weather and any unusual occurrences, such as the sighting of land or another ship, are reported in the log. The log serves as the official and accurate record of the voyage.

The following is a portion of a fictional cutter's log:

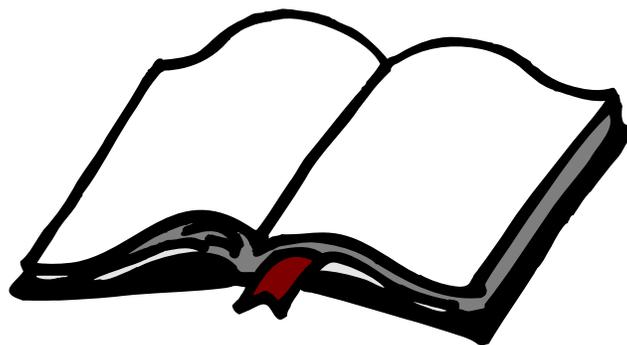
0800-1200

Underway as before. 0845 received distress call on Channel 16 VHF-FM from fishing vessel Dolphin taking on water, position 46N 125W, with three people onboard. 0846 diverted to assist. 0950 on scene. 0955 launched STEAD 1 BM2 Smith coxswain with two other crew. 1000 STEAD 1 alongside F/V Dolphin. 1010 Evacuated three people from F/V Dolphin, Mr. Black, Mr. White and Ms Green. 1020 STEAD1 alongside and all people safely aboard. 1025 STEAD 1 cradled and secure for sea. 1110 F/V Dolphin sinks in position 46N 125-01W. 1120 enroute to homeport to disembark crew of Dolphin. 1145 ENS Jones assumed the duties of the Officer of the Deck.

What information is included in the log? What does it tell you about this part of the ship's voyage? How could logs be used to learn about history?

To Do: Keep a Classroom Log

At the end of each class day, have a student write an entry in the official class log detailing the events of the day. Select a different student each day to write the entry. Be sure to include the time of day (in sea time) the entry is written, the weather, and the student's location in each entry. At the end of the grading period or school year have a "log reading party" where students read from the log of their accomplishments.



Grog-Tub, Scuttlebutt, and Harness Casks

Before the days of refrigeration, food carried aboard ships was either salted or dried to keep it from spoiling. Sailors nicknamed the barrels of salted meat “harness casks” because they thought the meat was so tough it was like eating a horse harness. Fresh water was carried in a large barrel called the “scuttlebutt” and the “grog-tub” contained the ship’s supply of spirits – rum.

A large sailing ship like the USS CONSTITUTION, one of the first ships in the U.S. Navy, would have a crew of over 400 men. The CONSTITUTION would carry 48,600 gallons of fresh water and 4,500 gallons of spirits when she sailed. Below is the typical daily ration for each man onboard the USS CONSTITUTION in the early 1800s:

Sunday: 1 ¼ lbs. beef, 14 oz. bread, ½ lb. flour, ¼ lb. suet (beef fat), ½ pint spirits

Monday: 1 lb. pork, 14 oz. bread, ½ pt. peas, ½ pt. spirits

Tuesday: 1 lb. beef, 14 oz. bread, 2 oz. cheese, ½ pt. spirits

Wednesday: 1 lb. pork, 14 oz. bread, ½ pt. rice, ½ pt. spirits

Thursday: 1 ¼ lb. beef, 14 oz. bread, ½ lb. flour, ¼ lb. suet, ½ pt. spirits

Friday: 14 oz. bread, ½ pt. rice, 4 oz. cheese, 2 oz. butter, ½ pt. molasses, ½ pt. spirits

Saturday: 1 lb. pork, 14 oz. bread, ½ pt. peas, ½ pt. vinegar, ½ pt. spirits

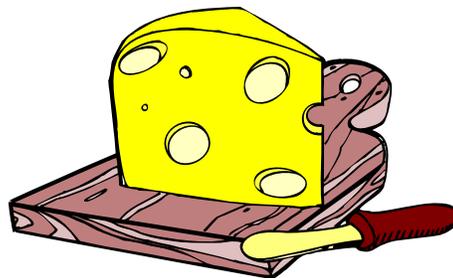
Compare the sailor’s diet with your school’s menu for the week. How does this diet compare to yours? What types of foods are missing in the sailor’s daily ration? Imagine you are going on a sailing trip for a week. What foods would you take with you? What would be your menu for each day?

To Find Out: Ask your Unit or Cutter. (If yours is a non-cutter unit, ask someone to discuss from past experience on a cutter):

How is food stored on your adopted cutter?

How much food do they take with them out to sea?

What is the typical daily menu for the crew on your cutter?



Make a Compass

A compass can tell you which direction you are going. This is known as your heading. A compass can also tell you the direction an object is from you. Those directions are known as bearings. Once bearings of objects are known, you can use a map or chart to find out where you are. You can then figure out the direction you want to go and use the compass to make sure that you follow that heading.

A compass works by using a magnetized needle that lines up with the earth's natural magnetic field to point in the direction of North. The bearing or heading is then read from numbers on the compass to indicate directions such as north, south, east, or west. Compasses have been used by mariners since the 1300s.

Try your hand at making a compass:

You will need a pin or needle, candle wax, magnet, and a glass bowl with water. Rub the needle in one direction along the magnet. After the needle has been rubbed along the magnet, rub it gently along the candle wax so that it is covered with wax. Now gently place the needle in the bowl of water. The needle will point north.

Draw a map of your classroom or school using the compass to determine directions.



Imaginary Lines

Look on a globe. To make locating places easier, imaginary lines called latitude and longitude have been drawn. Latitude measures distance north or south of the Equator. Longitude measures distance east or west of the Prime Meridian, which runs through Greenwich, England. Find the Equator and the Prime Meridian on the globe. Find the North and South Poles.

Latitude is measured in degrees North or South of the Equator. Longitude is measured in degrees East or West of the Prime Meridian. What is the latitude of the Equator, North Pole and South Pole? What is the longitude of the Prime Meridian? Degrees are further divided into minutes and seconds. 60 seconds equal a minute and 60 minutes equal a degree.

When given together, latitude and longitude pinpoint a location on the earth's surface. Mariners use instruments to measure latitude and longitude to find their location at sea. Before the time of satellites and global positioning systems, sextants were used to find the relationship of a vessel to celestial bodies – the sun, stars, moon and planets. From this a navigator could determine latitude. Today, global positioning systems (GPS), instruments that fit in the palm of your hand, use information from satellites to find latitude and longitude. Your family may own a car that includes a GPS device. GPS can locate the position of an object within inches!

Using a map or globe determine the latitude and longitude for the following:

Your hometown

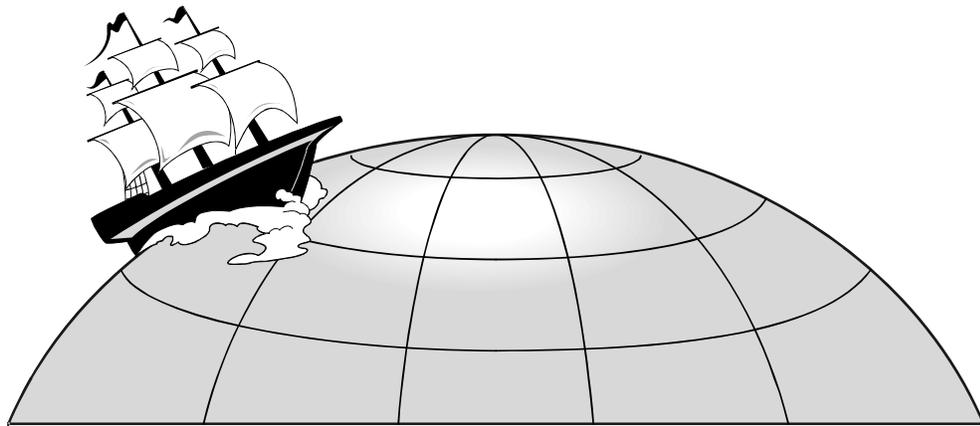
Orlando, Florida

Buenos Aires, Argentina

Moscow, Russia

Find the location given the following latitude and longitude:

38 degrees 54' N 77 degrees 2' W



Signal Flags

The International Code of Signals is used by ships as a means of communication with each other or with shore. It was first established in 1855 and has been revised three times. Each signal flag represents a letter, number or special meaning.

To Think About:

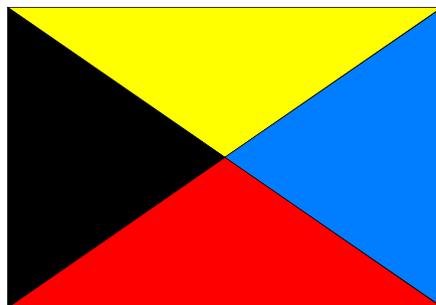
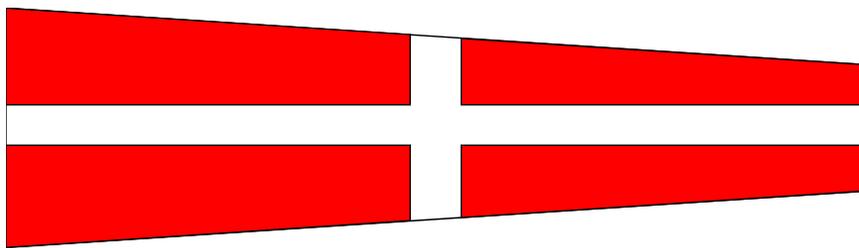
Since ships now have radios and other equipment used for communication why would they still use signal flags?

To Do:

The following website has a signal flag chart that you may find helpful:

<http://www.marine waypoints.com/learn/flags/flags.shtml>

Using the signal flag chart, crayons or colored markers, and paper spell out your school's name or your name in signal flags.



Maritime Weather

We live at the bottom of an ocean of air called the earth's atmosphere. Weather is the swirling movement of the atmosphere's lowest layer called the troposphere. The troposphere is 5 miles deep over the poles and 11 miles deep over the Equator. The heat from the sun warms the earth unevenly, mountains get in the way of wind, and the earth is spinning. This means that the troposphere is in constant motion.

Air masses measuring thousands of miles across are warmed up or cooled down by the land and sea below them. A cold front is the leading edge of a cold air mass moving into the territory of a warm air mass. A warm front is the leading edge of a warm air mass moving into the territory of a cold air mass. What happens when two fronts collide? This is when you "see" the weather. Clouds form and the wind may become stronger. Rain, snow, hail or sleet may occur.

In 1805, Britain's Sir Francis Beaufort created a scale to estimate wind speeds and their effects on ships. The Beaufort Scale is still used today to measure wind strengths at sea. Why is knowing the weather forecast important to a mariner?

The Beaufort Wind Scale

No.	MPH	Description	Visual Clue (land/water)
0	0-1	Calm	Smoke rises vertically/sea flat
1	1-3	Light Air	Smoke drifts/sea ripples
2	4-7	Slight Breeze	Leaves rustle/small wavelets
3	8-12	Gentle Breeze	Twigs move/whitecaps begin
4	13-18	Moderate Breeze	Branches move/many whitecaps
5	19-24	Fresh Breeze	Small trees sway/8' whitecaps
6	25-31	Strong Breeze	Large branches sway/13' whitecaps
7	32-38	Moderate Gale	Whole trees move/18' caps
8	39-46	Fresh Gale	Twigs break/30' caps
9	47-54	Strong Gale	Branches break/large rolling waves
10	55-63	Whole Gale	Trees break/35'+ seas
11	64-72	Storm	Widespread damage/huge waves
12	73-83	Hurricane	Extreme damage/46'+ seas white with foam

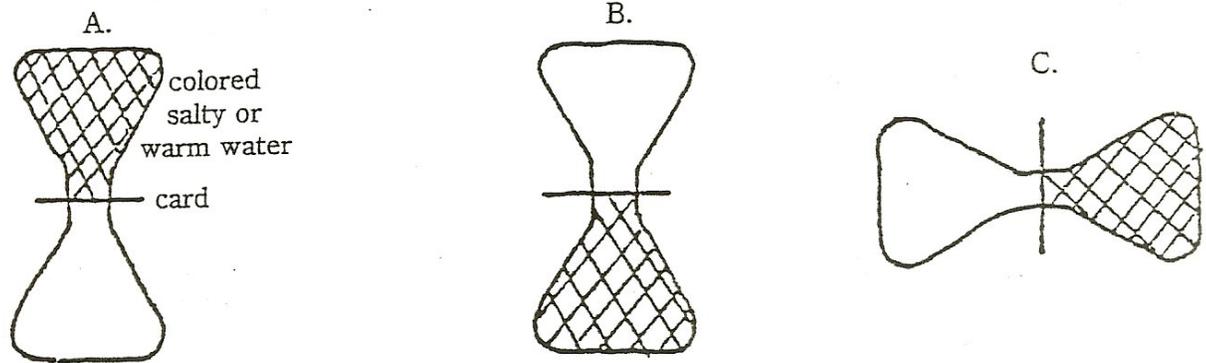
Currents, Tides and Waves

The following six activities are courtesy of the Marine Science Center, Poulsbo, Washington.

Experiment 1: Salinity Currents

Method

1. Fill both bottles with water. Dissolve $\frac{1}{2}$ teaspoon of salt in one bottle and add a drop of food coloring. Place a 3 x 5 card on top of the salt water bottle and carefully invert it; the upward pressure of air will hold the card in place (most of the time).
 - a. Place the salt water bottle on top of the fresh water container and have someone remove the card. (Now is the time for the dish pan!) Observe results.
 - b. Repeat No. 1—place fresh water jar on top of salt water jar, remove card and observe.
 - c. Repeat No. 1—place both jars horizontally, remove card and observe.



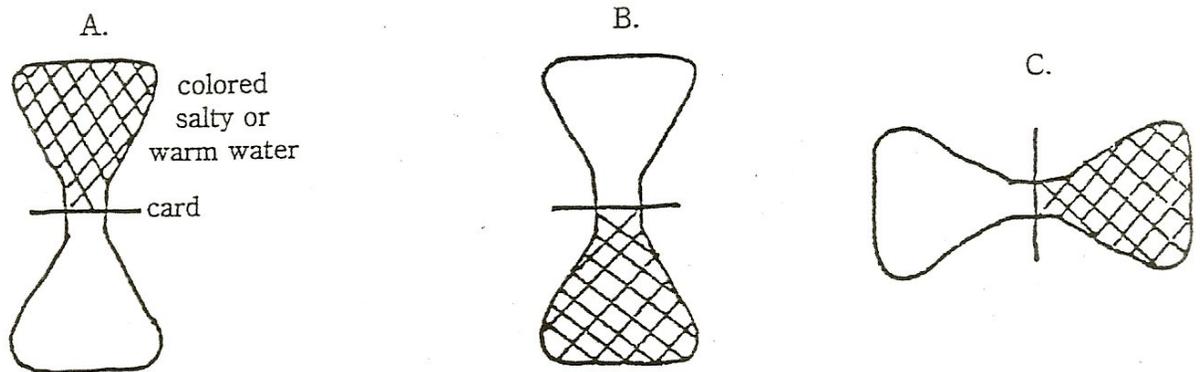
Interpretation

1. Is salt water heavier or lighter (higher or lower density) than fresh water? Explain your answer in terms of the results you obtained from the experiment.
2. What happens to river water when it flows into the ocean?
3. Freddy Fisherman was fishing at a spot near the *mouth* of a river. Five feet down he caught a fresh water perch. His luck was so good he let out more line. At thirty feet he caught a salt water cod. Freddy is so excited about this strange occurrence he is going to call the Sports Editor of the Post-Intelligencer. What would you tell Freddy to save him from embarrassment?

Experiment 2: Temperature Currents

Method

2. Fill one bottle with warm water and the other with cool water. Add a drop of food coloring to the warm water. Do the three variations listed in Experiment No. 1. (see diagram below).



Interpretation

1. Is warm water heavier or lighter (higher or lower density) than cool water? Explain your answer in terms of the results you obtained on the above experiment.
2. Where does most heating of ocean water take place?
3. Where does most dilution of sea water occur?
4. Is it easier for a human to swim in salty or in fresh water? Explain.
5. Is it easier for a human to swim in cool water or warm water? Explain.

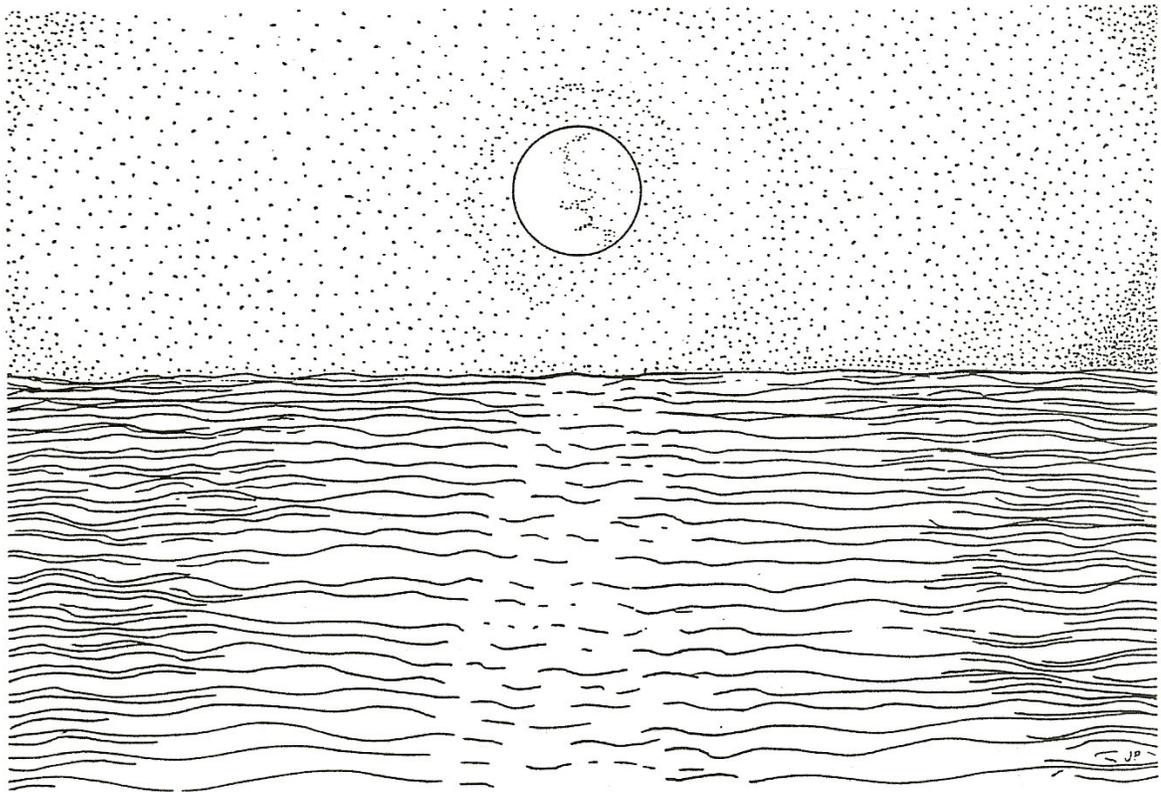
Tides

Tides move the entire ocean. If you have ever been to a beach, you have seen the water come high up on the shore and at other times the water has been much lower. You may have heard people say that the tide is coming in, (high tide) or that it is going out (low tide). This alternate rise and fall of the ocean is called the tide, but what causes the tide?

Tides are caused by the gravitational pull between the Earth, Sun and the Moon. As the Moon rotates around the Earth the water follows it and forms the daily tides. The Sun's effect on the tides is about half that of the Moon's because the Sun is so far from the Earth.

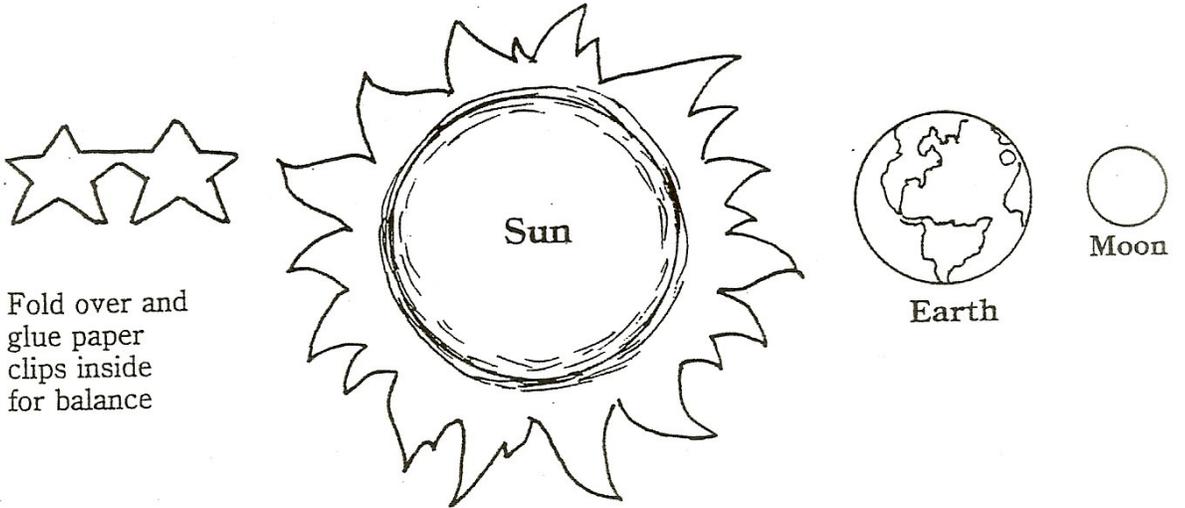
Spring tides are caused when the full Moon (and again with the new Moon) lines up in a straight path with the Sun and the Earth. When the Moon and Sun are in-line with the Earth they work together as a tidal team. Spring tides, which occur twice a month all year, rise higher and fall lower than normal.

Neap tides are caused when the Sun, the Earth and the Moon, in the first and third quarters, are at right angles to each other. These tides are unusually low because the pull of the Moon and the pull of the Sun somewhat cancel each other out. The Moon and the Sun engage in a tidal tug of war. Neap tides have the smallest difference between the water levels at high tide and low tide.



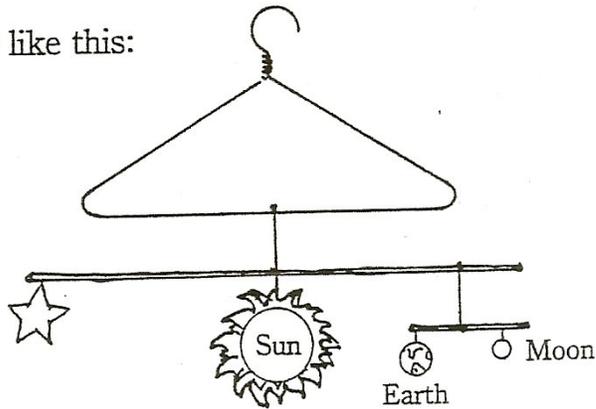
Tide Mobile

Materials: one hanger, two sticks, string, magic markers or paint, glue, paper clips.



On a piece of construction paper draw your own stars, Sun, Earth and Moon. Color or paint the Sun yellow, the Moon purple, Earth blue and green, and the star white.

Construct the mobile like this:



1. What is the position of the Earth, Moon and Sun during Spring Tides?
2. What is the position of the Earth, Moon and Sun during Neap Tides?

Making Waves

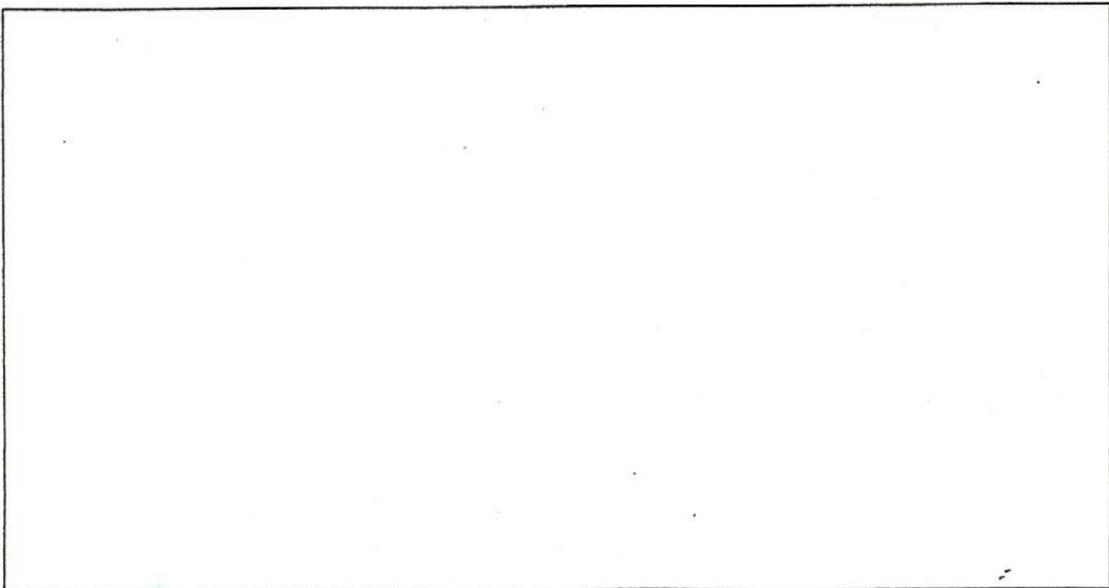
All waves have several features in common. They have height, which is the distance from the trough to the crest, they have length, the distance from crest to crest, and all waves move. What creates a wave? The Wind.

In the space below draw your own wave with two crests like this: 

1. Label the two highest parts of the wave the "CREST."
2. Label the lowest part of the wave the "TROUGH."
3. Figure out the height of your wave (distance from trough to crest) if one inch equals ten feet. _____
4. What is the length of your wave (distance from crest to crest) if one inch equals eight feet? _____
5. Draw an arrow to show which way the wind is blowing your wave.

The highest wave ever recorded was 112 feet by U.S.S. Rampo, on February 7, 1933.

What other kinds of waves have you heard about but can not see? _____



Tides and Currents Follow-Up

Obtain a current tide book – your telephone book may include one or many marine and fishing supply stores have copies. Begin to list the phase of the tide in your daily classroom log entry.

