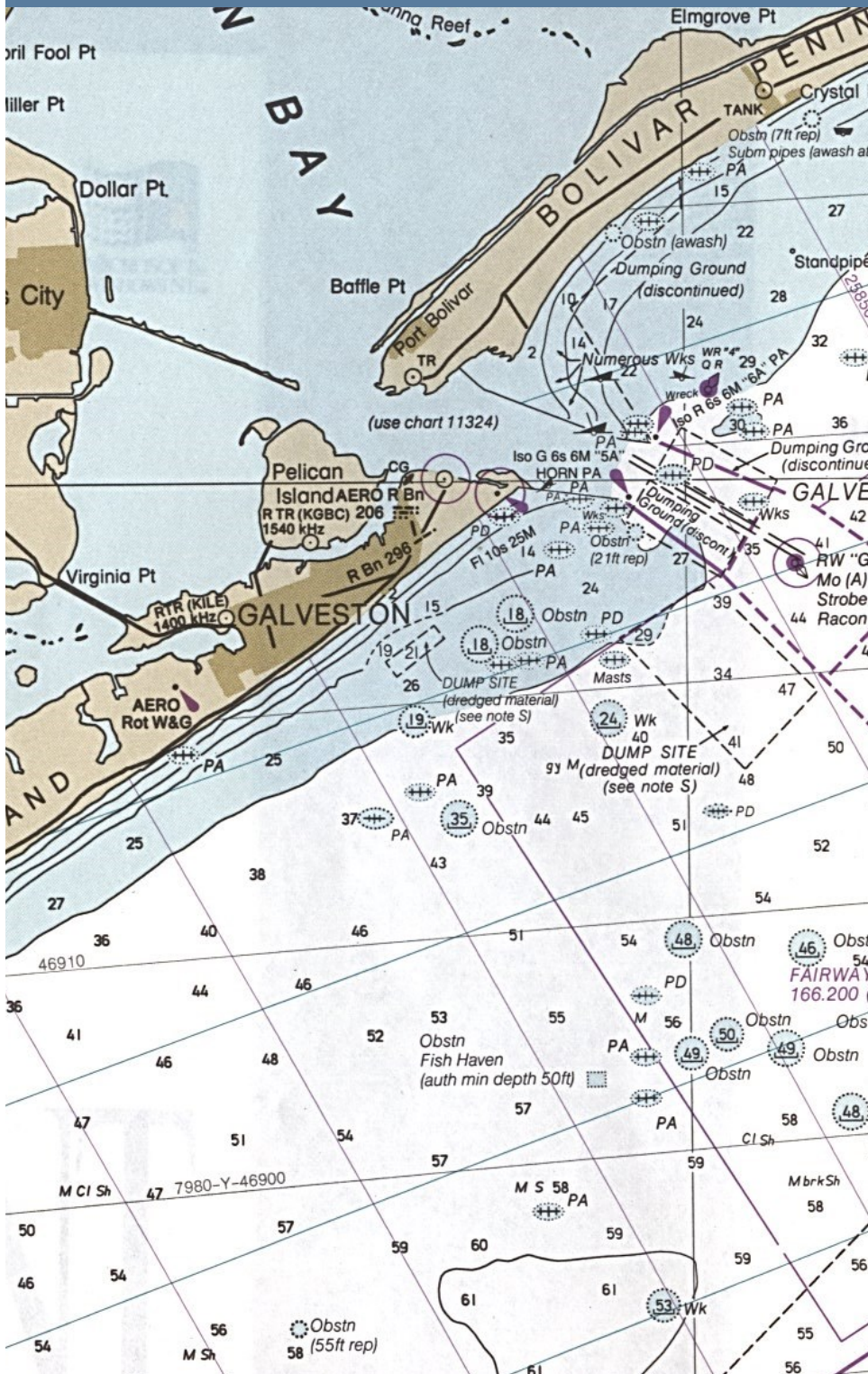


Math at Sea Education Packet

GALVESTON
HISTORICAL
FOUNDATION



www.galvestonhistory.org

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Introduction

Dear Educator,

Thank you for your interest in the Texas Seaport Museum's *Math at Sea* program. This program provides students with the opportunity to experience history and mathematics through hands on learning. This Educator's Packet has been developed to enhance your class visit to the Texas Seaport Museum.

The information and lessons in this packet should help you correlate your classroom lessons with your field trip to the Texas Seaport Museum.

The Texas Seaport Museum's Education Department recommends looking over the *FAQ packet* and using the *Pre-Visit* lesson plans before your field trip to the Texas Seaport Museum. The *Post-Visit* lesson plans will help reinforce concepts learned during our program.

This *Education Packet* reflects Galveston Historical Foundation's mission to broaden public awareness of maritime preservation and the seafaring legacy of Texas and the Gulf Coast.

We look forward to your visit!

Sincerely,

Education Staff

Texas Seaport Museum



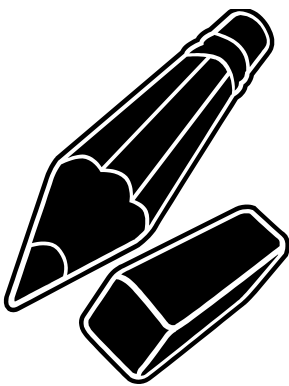
Using this Packet

Use the following icons to help guide you through the *Education Packet*.



Teacher Preparation

Use these pages to prepare your lessons and plan the field trip



Student Preparation

These sheets should be copied and distributed to students



Pre-Visit Lesson Plans

Listed below are lesson plans for you to use before your program at the Texas Seaport Museum. All activities meet Texas Essential Knowledge and Skills curriculum standards.

Activity 1: Local tidal report

Objective: After completing this worksheet, students will be able to:

- Communicate importance of local tides on navigation.
- Use a graphic organizer to express ideas, gather information, generate options, and predict outcomes.
- Apply critical thinking skills to organize, sequence, and categorize information acquired from a variety of valid sources

Answer key:

Allow students to make reasonable predictions basis on their analysis of NOAA data.

<https://www.youtube.com/watch?v=pwChk4S99i4>

Activity 2: Build an Anemometer

Objective: After completing this worksheet, students will be able to:

- Communicate the importance of wind direction in relation to navigation.
- Describe wind speed and its effect on the ocean and boats.
- Define wind scientifically using speed and direction.

Materials:

Pencil with new eraser, paper Dixie cups (5each), 2 plastic drinking straws (non-bending), masking tape, straight pin (for sewing), black marker, electric fan and hole punch.

Answer key:

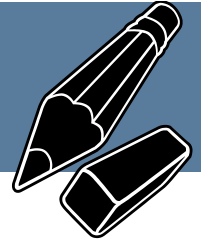
Allow students to take measurements using the scales and charts provided.

<https://www.youtube.com/watch?v=50e9PDjETnQ>

<https://www.youtube.com/watch?v=uBqohRu2RRk>

Name:

Date:



Activity #1: Local Tidal Report

Using the information below, create a line graph that shows the tide data for Pier 21 in Galveston. Use intervals of 6 hours, height in feet, and date. Then, as a group, discuss the role of tides to the local ecosystem as well as its importance to ship navigation. What could prevent a ship from leaving harbor? Are the tides the same everywhere in the world? What determines the tides?

Date	Day	Time	Pred	High/Low
2017/08/01	Tue	03:26 AM	1.18	H
2017/08/01	Tue	08:34 AM	1.08	L
2017/08/01	Tue	10:57 AM	1.11	H
2017/08/01	Tue	07:27 PM	-0.05	L
2017/08/02	Wed	04:10 AM	1.27	H
2017/08/02	Wed	08:03 PM	-0.12	L
2017/08/03	Thu	04:39 AM	1.32	H
2017/08/03	Thu	08:37 PM	-0.17	L
2017/08/04	Fri	05:03 AM	1.34	H
2017/08/04	Fri	09:09 PM	-0.19	L
2017/08/05	Sat	05:26 AM	1.35	H
2017/08/05	Sat	10:36 AM	1.19	L
2017/08/05	Sat	01:27 PM	1.23	H
2017/08/05	Sat	09:42 PM	-0.20	L

Name:

Date:



Activity #2: Build an anemometer

1. Take one dixie cup and punch 4 hole in the sides at right angles to each other.
2. Mark another cup with a black permanent marker; this will be the marker when counting spins (evolutions per minute).
3. Arrange 4 paper dixie cups and two drinking straws to form a cross through the holes in the first cup.
4. Tape the straws to the top of the dixie cups. The open end of all the cups should face the same direction. Let the students test the cups at different angles if time permits.
5. Cut a hole in the bottom of the first cup and push a pencil through, eraser up.
6. Push a straight pin through the center of the straws into an eraser on the end of a pencil to provide an axel.

This device is called an anemometer. It is used to measure wind speed. The more spins/minute, the greater the wind velocity (speed). Place the instrument in front of an electric fan on low speed and count the revolutions or how many times the black cup goes by the start mark. 10 revolutions per minute is approximately 1 mile per hour. Test your anemometer.

Trial #	Number of spins per minute
1	
2	
3	
4	

Name:














Date:



Next, take your anemometer outside and take reading of the wind speed at different times of the day. Discuss the Beaufort scale of wind and add that to your chart.

Time	Number of spins per minute	Beaufort Scale

Beaufort Scale

Beaufort number	Wind Speed (mph)	Seaman's term		Effects on Land
0	Under 1	Calm		Calm; smoke rises vertically.
1	1-3	Light Air		Smoke drift indicates wind direction; vanes do not move.
2	4-7	Light Breeze		Wind felt on face; leaves rustle; vanes begin to move.
3	8-12	Gentle Breeze		Leaves, small twigs in constant motion; light flags extended.
4	13-18	Moderate Breeze		Dust, leaves and loose paper raised up; small branches move.
5	19-24	Fresh Breeze		Small trees begin to sway.
6	25-31	Strong Breeze		Large branches of trees in motion; whistling heard in wires.
7	32-38	Moderate Gale		Whole trees in motion; resistance felt in walking against the wind.
8	39-46	Fresh Gale		Twigs and small branches broken off trees.
9	47-54	Strong Gale		Slight structural damage occurs; slate blown from roofs.
10	55-63	Whole Gale		Seldom experienced on land; trees broken; structural damage occurs.
11	64-72	Storm		Very rarely experienced on land; usually with widespread damage.
12	73 or higher	Hurricane Force		Violence and destruction.

Vocabulary

Bow- The front part of the ship

Stern- The after end of the ship

Port- The left side of the ship when facing forward

Starboard- The right side of the ship when facing forward

Hull- The main body of the ship

Navigation- The activity of finding out one's position and following a route

Traverse Board- A wooden board used to keep track of speed and direction

Chip Log- Navigation tool used by sailors to determine the speed of the ship

Dead Reckoning- Processes of calculating a position based on speed and distance traveled

Nautical Mile- A unit of measurement for distance at sea (approx. 6,076 feet)

Knot- A unit of measurement for speed at sea

Chronometer- An instrument to measure accurate time at sea in spite of the motion, humidity and temperature of the ocean.

Sextant- An instrument for measuring angular distances between objects at sea

Chart- map of the surrounding ocean and inland waterways

Cardinal directions- The 4 main directions on a compass (North, South, East and West)

Compass- An instrument that uses magnets to determine magnetic north and other Bearings

True North- North according to the Earth's axis, not magnetic pole

Magnetic North- North according to the Earth's magnetic pole, not axis.

GPS- Global Positioning System that uses satellites to determine one's exact location despite weather conditions



Post-Visit Lesson Plans

Post -Visit Activity : Ship's Navigational Logbook

Objective: After completing this worksheet, students will be able to:

- Record data with real time applications.
- Predict event outcomes based on data retrieved.
- Apply critical thinking skills to organize, sequence, and categorize information acquired from a variety of valid sources.

Answer key:

Allow students to record real time data and summarize their findings.

DURING Your Program:

Using the chart below, keep an accurate log of the data required during your voyage on SEAGULL II. Designate one student to keep time and prompt his fellow shipmates to log their data. Data can be collected using the onboard compass, as well as asking the boat captain for speed and wind reading from our modern equipment.

AFTER Your Program:

Drawing on the recorded responding and manipulated variables, summarize the voyage in terms of likelihood of reaching a destination. What factors could make the voyage longer/shorter? What environmental changes could effect the trip?

