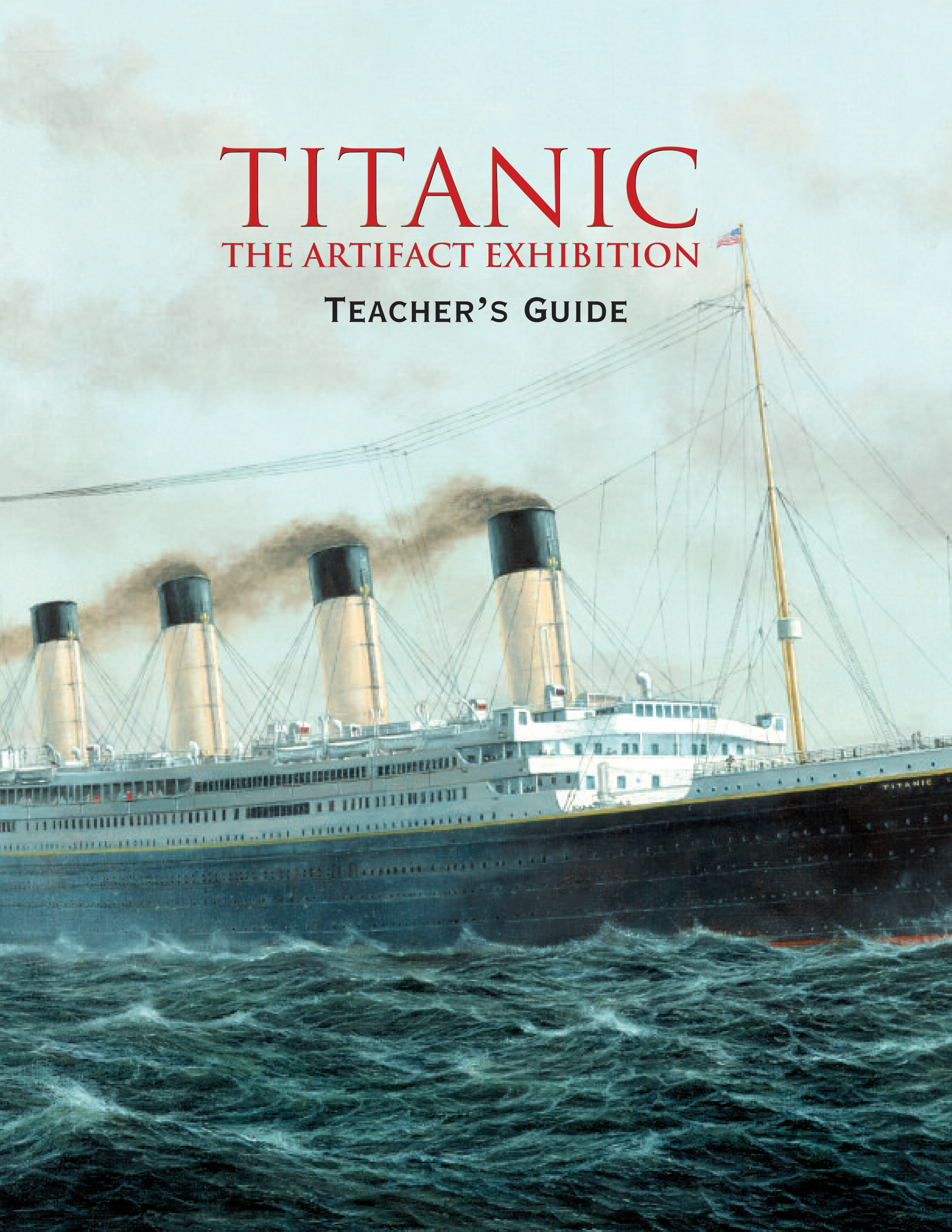
TITANIC
THE ARTIFACT EXHIBITION
Teacher's Guide



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TIMELINE

Please give students the following timeline to help with some of the questions.

Titanic's maiden voyage began in Southampton, England at noon on April 10, 1912. The Ship's destination was New York.

On April 10 at 6:30 p.m *Titanic* arrived at Cherbourg, France, where many of its wealthy and famous passengers boarded.

The Ship's last stop was in Queenstown, Ireland, on the afternoon of April 11. At this port, a large number of third class passengers emigrating to the United States boarded Titanic.

The ship struck an iceberg at about 11:40 p.m. on April 14. It sank during the early morning hours of April 15.

WRITE LETTERS FROM PASSENGERS

Have each student read his/her boarding pass. Ask them to do additional research to learn more about their passenger. Assign each student to write a letter from their passenger sent on April 14th, the day before the Ship sank.

Here are some questions students can consider as they are writing their letters:

1. Who would this passenger write a letter to? A friend back home? A parent, child or sibling? A boyfriend, girlfriend, wife or husband? Create a fictional name and address for the recipient of the letter. Also, show how this passenger feels about the person he or she is writing to.

2. When did this passenger board *Titanic*? Why is he or she going to the United States?

3. What does this passenger expect do or see once he or she reached the U.S.?

4. What is the passenger's impression of the Ship so far? Include some specific details about the size and the interior of *Titanic*.

5. How does this passenger feel about being on *Titanic*? Excited? Overwhelmed? Bored? Nervous?

6. Include one detail that gives a hint about the unforeseen disaster about to happen. For example, the passenger could describe a small iceberg he or she saw from the deck of the ship, or comment about the coldness of the water.

7. What does this passenger do during the day? Describe his or her cabin, the meals, recreational activities, etc.

8. Would this passenger meet any interesting people aboard *Titanic*? Describe some of the people this passenger might have encountered in the several days he or she has been aboard the ship, keeping in mind that 1st and 3rd class passengers were often segregated.

ASSESSMENT

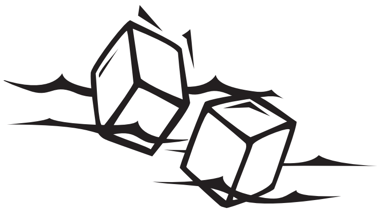
Have students read their letters aloud to classmates or pass around their letters for others to read. After collecting the written products, evaluate the students' letters based on how well the students answered some or all of the above questions. The letters should reflect the students' understanding of the experiences of the passengers on *Titanic*.

Letters may also be evaluated on the following writing criteria:

- student should create an interesting persona for their passenger
- student should create a consistent and engaging voice which communicates this persona to the reader
- letter should include foreshadowing of the *Titanic* disaster
- letter should be grammatically correct and appropriately paragraphed

WHAT MAKES THINGS FLOAT? UNDERSTANDING DENSITY

A SCIENCE AND MATH ACTIVITY FOR GRADES 6 – 8



OVERVIEW

Before it sank, the *Titanic* was an awesome sight. It was about 882 feet long (almost the length of three football fields!) and weighed 46,328 tons. But how could such an enormous craft stay afloat in the first place? This intriguing question will be answered in the following activity, which challenges students to explain two simple phenomena: why ships float on water, and why ice (and icebergs) float. Students will learn about the concepts of mass, volume and density, and apply these to several ordinary real-life situations.

DEFINITIONS

Mass=amount of material in an object that, when placed in a gravitational field, gives the object weight (For our purposes here, we will use the terms weight and mass interchangeably.)

Volume=the amount of space an object takes up

Density=mass divided by volume

CONCEPTS

Defining Density=mass/volume

Understanding why ice floats

Learning why ships float and sink

OBJECTIVES

Students will understand and apply the formula for calculating density.

Students will understand that objects which are less dense than water can float.

Students will observe how water expands when it freezes and understand why ice has a lower density than water.

Students will observe how air helps dense materials to float.

Students will define mass, volume and density

MATERIALS

- Two plastic soda bottles or milk jugs
- Small buckets of water (one for each group of students)

  Miscellaneous small objects-crayons, popsicle sticks, metal washers, etc. (optional)
- Empty tin cans (one for each group of students)
- Metal spoons (one for each group of students)
- Tape and Scale

PROCEDURE

This activity will take about two class periods.

1. Introduction: Students should learn the definitions of the words in the sidebar.

2. Why ice floats

a. Fill two milk jugs or plastic soda bottles about halfway with water, showing the students that both of the bottles have the same amount of water. Then have a student weigh the bottles; they should weigh the same. Therefore, both bottles have the same mass and the same volume. Mark the water level on each bottle.

b. Freeze one of the bottles. *(Note: To save time, freeze one of the bottles in advance and start the activity at step c.)*

c. The next day, show the students the frozen bottle and the bottle of water. The ice in the frozen bottle will have expanded past the water level mark. Ask students which has more volume: the water or the ice? Students should see that the frozen water has more volume because it takes up more space. Then the students should weigh the two bottles to demonstrate that both still have the same mass.

d. Finally, ask students to figure out which has a higher density. the water or the ice? Remind students that density is defined as mass divided by volume. When water freezes and expands, it has more volume than unfrozen water. But the bottle of water and the bottle of ice still have the same mass, so which has a lower density, water or ice? *The answer should be ice..*

e. To help students see the concept of density in a different way, pose this question: which weighs more, a pound of lead or a pound of feathers? *(The answer, of course, is that they both weigh the same because they both have the same mass.)* But which has a greater density? The lead, of course, because it takes up less space so its volume is lower.

f. Explain that anything with a density lower than water will float. That's why icebergs float, though they don't float very high in the water because they are only a little bit less dense than water. Have students drop a few ice cubes in water to demonstrate that ice floats, so it must be less dense than water. In pairs or groups, students can also experiment with dropping various solid objects, such as crayons, metal washers, popsicle sticks, scissors, etc. into water to see which ones are more or less dense than water.

3. **Why ships float, why ships sink**: Now it's time for students to find out why ships such as the *Titanic* float despite being made of materials like steel, which is much more dense than water. Students will be given an empty tin can and a metal spoon which both weigh about the same.

a. Have students weigh both objects. Point out to students that these two items have approximately the same mass.

b. Then the students will put both items into the buckets of water. The tin can will float, while the spoon will not. Ask students whether the spoon is more or less dense than water. *(The answer should be that the spoon must be more dense than water because it does not float)*

c. Leave both the spoon and the can in the water. Ask students to explain why the tin can floats, given that its mass is about the same as the mass of the spoon. Students should see that the tin can must have a lower density than the spoon. Ask students f if the volume of the can is less or more than the spoon. *The answer should be that the volume of the can is higher than the volume of the spoon because it takes up more space.* Finally, ask students to think about what the tin can has that the spoon does not have. *The answer should be that the tin can has air.* Ask students to predict whether air would be more or less dense than water. Of course, air is less dense than water because air doesn't sink in water!

d. Students will then look back at the tin can, which by now, has probably tipped over and started to fill with water. Students should fill the can entirely with water and watch it sink. Ask students to explain why the can no longer floats. *The answer is that the tin can no longer contain air, which is less dense than water. Instead, it contains metal, which is denser than water.* .

e. Finally, ask students to use this experiment to explain why the *Titanic* sank when its hull was breached and water began pouring into the ship. Students should understand that a ship floats because its total density-composed of the density of its materials, such as wood and steel, and the density of air-is less than the density of water. When the air on a ship is replaced with water, the density of the ship becomes greater than water.

ASSESSMENT

Students may report their results from steps 2f and 3 in a chart similar to the one below.

Item dropped in water	Mass of item	Will it float?	Did it float?	Is it more or less dense than water?

SAFETY REGULATIONS

A SOCIAL STUDIES ACTIVITY FOR GRADES 6 – 8

OVERVIEW

This lesson plan will ask students to think about how to develop effective safety regulations (such as requiring lifeboats on a ship) without creating unintended consequences such as in the case of the *S.S. Eastland* when additional lifeboats were added as a result of the *Titanic* tragedy.

CONCEPTS

Understanding the challenges of ensuring safety and preventing accidents

Preventing unintended consequences

OBJECTIVES

Students will design a safety device for a common classroom hazard.

Students will investigate other safety devices designed in response to disasters.

BACKGROUND INFORMATION

One effect of the *Titanic* disaster was the call for safety regulations to prevent such a tragedy from happening again. Shipping lanes were shifted further south, all ships with more than fifty passengers were obliged to have a twenty-four hour radio watch, and ships were required to hold lifeboat drills and to carry enough lifeboats to hold everyone on board. Furthermore, the International Ice Patrol was created in 1914 to sight and track thousands of icebergs ever since.

Of course, there can be unintended consequences of these regulations. In 1915, the *Eastland*, filled with employees on their way to a company picnic, rolled over on its side into the Chicago River with 2,500 people on board. Though the vessel was anchored only a few feet from shore, over 800 people died. There are several possible explanations for the disaster, but a major factor was the boat's top-heaviness, caused partly by the extra lifeboats added after the sinking of the *Titanic*. Because the lifeboats had been added to the *Eastland* without any engineering to compensate for the additional weight, these life-saving devices became lethal.

PROCEDURE

This activity will take one to two class periods (perhaps more if the research extension activities are used)

1. Introduce the activity by asking students how many of them have ever ridden a bicycle. (Most will probably raise their hands.) Then ask students to raise their hands if they have ever fallen off a bicycle. (Again, many of the students will probably raise their hands.) Finally ask the students to raise their hands if they wear a helmet when they ride their bikes. (Probably less than half will raise their hands.) Ask the students to explain how a helmet helps make riding a bicycle safer. Tell the students that their community is considering a law that would require all children under 18 to wear a helmet at all times when riding a bike. Ask students their opinions about such a law. (A list of "pro's" and "con's" could be written on the board during the discussion.)

2. Tell students that today, they will be designing their own safety devices to protect their classmates from hazards in the classroom. Ask students to brainstorm a list of accidents that could occur in their classroom. (Some ideas might include tipping over chairs or desks, falling asleep during class and hitting their heads on the desk, stabbing themselves or others with sharpened pencils, or stapling their fingers.)

3. In groups of 2 to 4, have students design a safety device to prevent one of the accidents listed in their brainstorming. If there is time and materials are available, students could actually create the device. Otherwise, the design can be done on paper.

4. Explain to the groups that they should consider the unexpected consequences of the safety device. For example, a bike helmet

can protect cyclists from head injuries, but it has to fit correctly or it might block a person's vision and cause an accident. Ask students to consider the possible unforeseen consequences of their safety devices and to make a plan to avoid such unintended hazards.

ASSESSMENT

Students' safety devices can be evaluated according to their originality and/or usefulness.

EXTENSION ACTIVITIES

1. Investigate other disasters which spurred new safety regulations, including the Triangle Shirtwaist Fire in New York City, the Great Chicago Fire, and the Beverly Hills Supper Club fire on May 28. 1977. Report findings to classmates and comment on possible unintended consequences of the responses to these tragedies.

2. Investigate other safety devices that have had unintended consequences, including automobile seat belts, air bags, and carbon monoxide detectors.

3. Interview parents or other adults about new safety regulations implemented in their neighborhood or community. Evaluate new safety laws to determine if they could have unintended consequences. Identify potential safety hazards in their own school, neighborhood. or community and propose safety regulations to address these hazards. Analyze the possible unintended consequences.

course students will say that it was smooth, white and flat.) Ask students how they could restore the object so that it would be close to its original condition: How could they get rid of the wrinkles in the paper? How could they get the paper to lay flat? After students have explored this problem for a little while, tell them they are ready to be museum scientists!

2. **Conservation and preservation experiment**

a. Students will work in groups of two or three. Each group will receive the following materials:

small piece of torn construction paper soaking in a jar or bowl filled with "ocean water," a.k.a cold salt water

paper towels to dry the construction paper once it is removed from the jar

sheet of plain white paper, randomly torn into 3-5 pieces

large paper clip, bent and twisted

pencil broken in half

tape, glue, stapler

b. Tell students that these are important artifacts found at the wreckage site of the *Titanic*. For each object, students will follow these steps:

1. Make a plan to conserve the object.
2. Decide what the object originally looked like.
3. Make a plan to restore the object.
4. Using tape, glue, staples or some other method, restore the object so that it looks as close to new as possible.

ASSESSMENT

Students could report their results in a chart similar to the one below. Groups could be evaluated on how well they conserved the objects and how closely their restored objects resemble the originals.

Description of object

What condition did you find the object in ?

What techniques did you use to conserve the object?

What techniques did you use to restore the object?

How successful were your conservation and restoration efforts?

FOllOW-UP QUESTION

How did your strategy change as you worked on conserving and restoring the objects?

Description of object	What condition did you find the object in?	What techniques did you use to conserve the object?	What techniques did you use to restore the object?	How successful were your conservation and restoration efforts?

PLOTTING A COURSE

A GEOGRAPHY ACTIVITY FOR GRADES 6 – 8

OVERVIEW

Why did it take more than 70 years (1912-1985) to find the wreckage of the *Titanic*? One look at a map reveals the obvious answer: the *Titanic* sank in a vast, empty area of the North Atlantic Ocean, hundreds of miles from land. The following lesson asks students to imagine themselves in this same part of the Atlantic, navigating their own imaginary ship through a maze of icebergs. Students will work cooperatively to plan their ship's route and to react to information about new "iceberg sightings."

CONCEPTS

Reading a map

Plotting points on a map

Making group decisions

OBJECTIVE

Students will mark specific locations on a map and plot a course to avoid obstacles.

MATERIALS

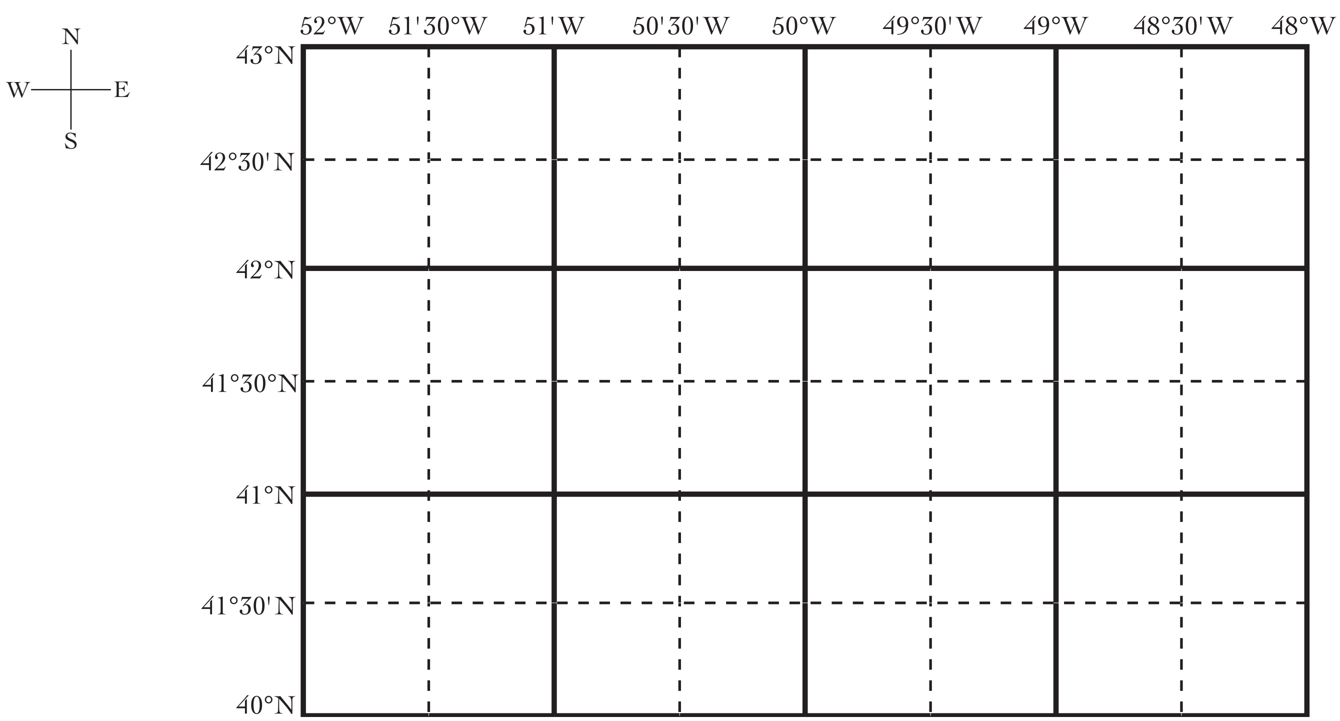
A basic map of the North Atlantic

BACKGROUND INFORMATION

If students need a review of map terms, the following information may be helpful.

On maps of the Earth, the globe is divided into meridians of longitude and parallels of latitude. The meridians of longitude measure the distance from the prime meridian, which is an imaginary line which goes through Greenwich, England and both the North and the South Poles. The parallels of latitude are all parallel to the equator. Latitude is measured north and south of the Equator, and longitude is measured east and west of the prime meridian.

Latitude and longitude are measured in degrees, minutes and seconds. Each degree indicates one parallel or meridian. For example, a location at *40°* N, *30°* W would be at the 40th parallel north of the Equator and at the 30th meridian west of the prime meridian. Minutes and seconds are smaller units within degrees. A minute is 1/60 of a degree, and a second is 1/60 of a minute. A location at *40°20'15* N is at 20 minutes, 15 seconds north of the 40th parallel. The following activity will include locations expressed in degrees and minutes, but not in seconds.



PROCEDURE

1. Distribute the map grid of a portion of the north Atlantic. If necessary, review geography terms contained in the background information above.

2. Divide students into pairs. Tell students that they are about to embark on an adventurous voyage from England to America through the North Atlantic Ocean. Ask students to appoint roles in their groups: one student will act as the captain and one student will act as radio officer receiving messages from other ships. You may want to encourage each pair of students to give their imaginary ship a name. You could also give the students a specific mission for their voyage: for example, their ship could be bringing immigrants to America, much as the *Titanic* did.

3. Give students the following information about their ship and the obstacles in their way:

a. Tell each pair of students that their ship is now at 49°W and 43°N. (Have students draw a small picture of a ship at their starting place.)

b. Tell them icebergs have already been reported in the following locations:

41°N, 49°30'W

41°31'N,50°W

42°N, 50°W

42°N, 51°W

40°30'N, 50°30'W

Have students mark each of these icebergs on their maps with a big "I."

c. The students will navigate their ship in a southwestern direction, toward America. Have each team begin to plot out their course on the map, using a ruler to draw lines between points. Students should plot their courses in pencil, since they may need to change their plans later. In order to keep the activity relatively simple, have students use straight lines between the major points on the map. For example, students could move from their original location, *43°N 49°W,* toward *42°N 49°W.*

d. A few minutes into the activity, each radio officer should receive the "Emergency Ice Report" as seen below. The students must then adjust their course to take into account this new information.

EMERGENCY ICE REPORT!

Red alert! Red alert! The radio room has just received the following reports of major icebergs spotted at the following locations. Please mark these icebergs on your maps and change your course to avoid the ice!

41°N, 50°W

40°30'N, 52°W

40°N, 50°W

43°N, 50°30'W

e. When students have successfully plotted a course to the far southwestern corner of the map, they will be on their way to America!

ASSESSMENT

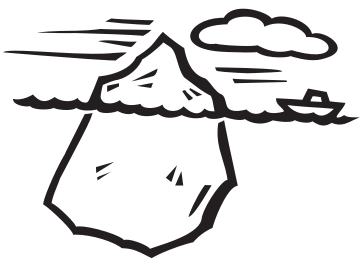
You may wish to collect students' maps to check the accuracy of their markings for iceberg locations and to evaluate the efficiency and logic of their courses. Students may also wish to compare their maps with other groups to see if their courses were different from their classmates'.

ICEBERGS

A MATH ACTIVITY FOR GRADES 5 -8

OVERVIEW

Perhaps one reason for the seemingly endless interest in the *Titanic* story is the image of a supposedly "unsinkable" ship colliding with a monstrous iceberg. These mysterious floating hunks of ice. some as big as a city, exert a strong pull on the imagination. In this activity, students will explore actual data on icebergs compiled by the International Ice Patrol. They will learn about the sizes and frequency of icebergs and use data to perform simple calculations and to create graphs.



CONCEPTS

Understanding multiplication, division and fractions

Reading charts and graphs

Calculating averages

OBJECTIVES

Students will perform a simple calculation using fractions.

Students will read and interpret data on a chart and a bar graph.

Students will create a line graph.

MATERIALS

Access to the Internet is required because this activity is based on information found in the U.S. Coast Guard's International Ice Patrol web site. The web address is www.uscg.mil/lantarea/iip/home.html

For the following activities, the relevant information from the web site may be printed out in advance and distributed to the students.

Graph paper

PROCEDURE

This activity will take one to two class periods.

1. Using fractions: According to the U.S. Coast Guard International Ice Patrol's web site, the iceberg that hit the *Titanic* was approximately 50 to 100 feet high and 200 to 400 feet long. Tell students that 7/8 of the typical iceberg is underwater. Then ask students to do a simple math activity calculating how much of the height of the iceberg was visible above water. Students may want to see a photograph of the iceberg which may have hit the *Titanic*. This photograph is available at the Coast Guard web site (www.uscg.mil/lantarea/iip/home.html) under the Frequently Asked Questions (F AQ) section. Once you get to the FAQs page, scroll down to the section entitled "RMS Titanic Information" and click on question #1, "How large was the iceberg that sank the *Titanic*?" You will find the photograph on this page.

2. Reading a chart: Next, have students look at the Coast Guard site's chart which lists the different iceberg size classifications. This chart is also found on the FAQs page. Scroll down to the "Icebergs" section and click on question #4, "What are the shapes and sizes of icebergs?" Ask students to determine the classification of the iceberg that sank the *Titanic*.

3. Interpreting and manipulating data: On the FAQs page, in the "Icebergs" section, click on question #3, "How many icebergs last long enough to reach the Atlantic shipping lanes?"Locate the chart and the bar graph.

a. Have students examine the chart with the number of icebergs passing through the Atlantic Ocean shipping lanes south of 48°N in the years between 1985-1996. Ask students to use this chart to create a line graph with the years from 1985-1996 on one axis and the number of icebergs in each year on the other axis.

b. On this same page, below the chart, there is a bar graph which gives approximate numbers for icebergs in the years

1900-1998. Once students have studied the graph. ask them to do the following:

- Use the data on the bar graph to calculate the average number of icebergs in each of the decades between 1900 and 1989. (Numbers will be approximate because the numbers of icebergs are expressed in intervals of 500.)
- Rank the decades (1900s through 1980s) from 1 (the decade with the most icebergs) to 9 (the decade with the fewest icebergs).
- Determine whether the decade in which the Titanic sank (the 1910s) was an average, above-average or below-average decade in terms of numbers of icebergs recorded. Do the same for the year 1912.

ASSESSMENT

Students' performance on this task will be measured by the accuracy of their calculations and their graphs.

EXTENSION ACTIVITIES

1. If there are enough computers for each student (or pairs of students) to have individual connections to the Internet, students can explore the Coast Guard International Ice Patrol site on their own. Have students list of 5 or 10 facts they learned about icebergs from the site.

2. Have older students research scientists' theories on why there have been several spikes in the number of icebergs in the past 25 years. (One explanation is global warming.)

INTERNET SCAVENGER HUNT

A RESEARCH ACTIVITY FOR GRADES 4 - 8

OVERVIEW

Even though the *Titanic* sank almost 90 years ago and the wreckage was discovered back in 1985, interest in Titanic seems to grow every year. Nowhere is this phenomenon more evident than on the Internet, where thousands of sites cater to Titanic enthusiasts. The following activity will allow students to explore these useful sites and expand their knowledge of the Titanic disaster.

CONCEPTS

Solving problems

Using research strategies

OBJECTIVE

Students will explore various web sites for specific information about the *Titanic*.

MATERIALS

Students must have access to the Internet.

PROCEDURE

This activity will take one or more class periods.

Students may work individually or in pairs. Most of the questions can be answered using several different web sites, so occasionally the answers will vary. This activity can be shortened or lengthened according to the age of the students and the availability of class time.

After each question, the answer is indicated in italics.

THE TITANIC WEB SCAVENGER HUNT

A. Who's Who of Titanic History

1. The president of the White Star Line was on *Titanic*'s first and only voyage. What was his name, and what happened to him when the ship sank? *Answer: J. Bruce Ismay escaped by lifeboat*

2. What was the name of the company that built Titanic? *Answer: Harland & Wolff*

3. Who was the captain of the ship? What happened to him when the ship sank? *Answer: Edward J. Smith went down with the Ship*

4. Who was Margaret Brown, also known as "the unsinkable Molly Brown," and why did she become famous? *Answer: She was a first-class passenger who helped load people into lifeboats during the sinking of the Titanic. After she boarded a lifeboat, she helped keep her fellow passengers calm and upbeat. Later she established a fund to aid impoverished survivors. She was the subject of a the play and film, "The Unsinkable Molly Brown".*

5. Who discovered the wreck site and when? *Answerr: Dr. Robert Ballard, with the Woods Hole Oceanography Institute in Massachusetts, led a team that discovered the Titanic wreckage on Sept. 1, 1985. Jean-Louis Michel of France was also a part of the discovery effort.*

B. Facts about *Titanic*

1. How much did it cost to build Titanic? How much would it cost now? (Hint: try the web site "The Life and Death of the RMS Titanic" for this question.) *Answer: $7.5 million; now it would cost about $400 million*

2. Why did the ship hit the iceberg sideways instead of head-on? *Answer: when the lookout officers saw the iceberg straight ahead, they ordered the officers on the bridge to steer the ship out of the way. However, the ship was too close to the iceberg, which scraped the hull allowing water into the ship's lower decks.*

3. Why didn't the lookout officers see the iceberg until it was very close to the ship? *Answer: there was no moon that night, also there were no binoculars in the crow's nest where the lookout crew kept watch. The binoculars were aboard the ship on its first leg – Belfast to Southhampton – but were never seen after that. No one knows what happened to them.*

4. How long did it take Titanic to sink between the time it hit the iceberg and the time it disappeared from view?
Answer: about 2 *hours*

5. What was the name of the ship that picked up survivors in the lifeboats? *Answer: the Carpathia*

6. How deep is the ocean at the site of *Titanic*'s wreckage? *Answerr: 12,460 feet or 2.5 miles deep*

EXTENSION ACTIVITY

Research any passengers or crew from your local city or state. Suggested sites include www.encyclopedia-titanica.org and www.titanicinquiry.org

Have a team or group of students create their own scavenger hunt, with a key for the correct answers. (It would be helpful if students also listed the web site where they found the answer to each question.) Then students can complete each other's scavenger hunts.

ASSESSMENT

Students' scavenger hunt sheets can be collected and checked for accuracy.

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