ALL ABOARD!

Teacher's guide for the exhibition

cycles 2 and 3 elementary school

PORT MONTRĒAL

GRAND QUAY
PORT OF MONTREAL

The Port of Montreal's Grand Quay
200, rue de la Commune Ouest
Montréal

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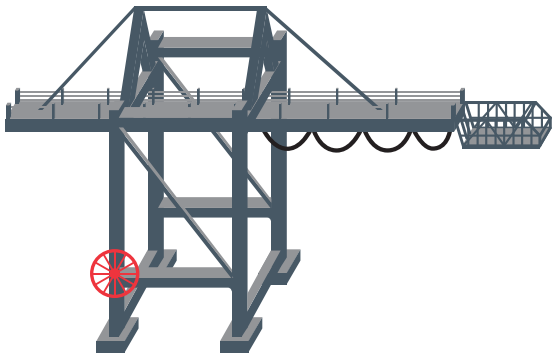


ALL ABOARD!

Located at the Port of Montreal's Grand Quay in the Old Port, the new Port Centre is home to the exhibition All Aboard!

This **free interactive** exhibition takes visitors on a physical and digital adventure to learn about the cargo shipping cycle, from its starting point to its final destination. Your mission, should you choose to accept it, is to **import** or **export** goods and make sure they get delivered on time. This involves planning the route, sailing the ocean and the St. Lawrence, loading and unloading the goods, arranging ground transportation, and protecting the environment, among other things!

This guide is for teachers of cycles 2 and 3 elementary school classes and is designed to complement a tour of the exhibition. It will help students build and reinforce knowledge related to the subjects of science, and technology.

USER'S GUIDE

The guide provides an **overview** of the exhibition's topics and zones so you can prepare for your visit.

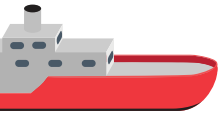
To better align the exhibition content (subject areas of science and technology) with in-class teaching, use the **progression of learning chart**.

The exhibition and the teacher's guide also cover other areas of learning and teaching approaches. For instance, learning the vocabulary used in the shipping and port industries engages the English language arts, while a guidance-oriented approach to learning about careers takes the form of associative games and short videos to explain certain jobs in the shipping and port industries.

Lastly, we provide fun activities to do **before, during, and after the tour** as enrichment. Each activity is geared toward a specific grade level and targeted learning.

PLANNING YOUR VISIT

Complement your tour of All Aboard! at the Port Centre with: **THE PORT OF MONTREAL OVER TIME!**



An exhibition in the corridor of Terminal 1 and a timeline on the *Promenade d'Iberville* green roof.

The Port of Montreal invites you to sail into its history. Once upon a time, there was one cargo ship and a couple of tugs. That turned into a thousand merchant ships and cruise liners; grain, silos, containers, cranes, and longshore workers; travel and travellers–and it's still all that today!

The exhibition features scale models of the types of ships that have called into the port in the past and the present.

There is also a large mural illustrating the fascinating history of cargo transport, arranged by theme:

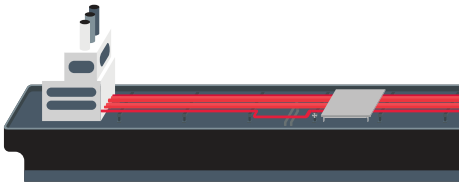
- An overview of the port then and now, focusing on 1900 to the present.
- The overall development of the Port in terms of moving goods and its infrastructure, presented thematically: the shoreline, the dock, the pier, and the current port.
- The modern era: Alexandra Pier, the hangars, land routes, silos and grain elevators.
- Cargo diversity and the heyday of wheat.
- Modern facilities of the 21st century.
- Port careers along the water.

Also featured is a second mural on passenger transportation, which covers:

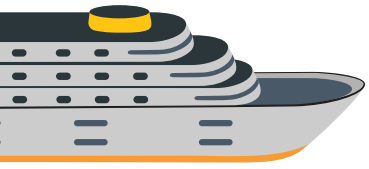
- Arrival and departure areas over time.
- Passenger terminals for Expo 67.
- The new cruise ship terminal: explanation and illustration of the plans to revitalize the site.

The timeline on the *Promenade d'Iberville* green roof illustrates the Port of Montreal's rich history and its close connection to that of Montréal itself. Explore the important stages in its development, and learn about key figures and innovations over time.

OVERVIEW OF THE EXHIBITION ALL ABOARD!



Eight fun and informative stations about port activities await you. Your mission: transport merchandise to its destination as quickly as possible. To do so, you'll face challenges along the way. Warning! Mistakes will result in costly delays.



Station 1 – Your mission

At the first station, you select a mission: arrange the import or export of merchandise and transport them to their destination. You can choose between three main types of cargo: **containers**, **dry bulk**, or **liquid bulk**.

Between the first station and the last – **Merchandise** – you do not have to visit the exhibition in any particular order.

Station 2 – Logistics

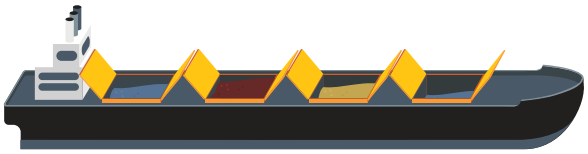
What are the port's day-to-day activities? Here, you will discover the wide range of ships that dock at the port and how the Port of Montreal stacks up against others around the world. Plan your route and watch the results of your simulation on the big screen. You're on your way!

Station 3 – Navigation

Navigating the St. Lawrence is a unique and challenging experience. Avoid the river's obstacles and dangers by experimenting with our navigation simulator.

Station 4 – Longshoring

New technology has led to many changes in longshoring work. Longshore workers now use various types of equipment to transship cargo, equipment you will learn about by playing a matching game.



Station 5 – Port installations

It's fascinating to see how the Port of Montreal has expanded. Here, an augmented reality installation shows visitors how this expansion has impacted the port's infrastructure.

Station 6 – Environment

What steps do Port of Montreal employees take to protect the environment? Go through an "environmental container" to learn about accident prevention measures and procedures such as supplying electricity to docked ships.

Station 7 – Land transportation

Did you know that cargo also moves by truck and train at the port? Learn how the careful coordination of various modes of transport is a challenging but vital part of making sure that goods get delivered efficiently.

Station 8 – Merchandise

Your journey ends with the delivery of the merchandise. Do you realize just how important shipping and port activities are to your everyday life?

Pay attention: At various points in this exiting quest, short videos inform you about key shipping and port occupations. Meet some of the port's hardworking people as they share their passion for their jobs.

Excerpts from the progression of learning chart
for exhibition content

SUBJECT AREAS OF SCIENCE AND TECHNOLOGY

MATERIAL WORLD

	Grade 3	Grade 4	Grade 5	Grade 6
A. MATTER				
1. PROPERTIES AND CHARACTERISTICS OF MATTER				
h. Associates the buoyancy of a volume of liquid in an identical volume of a different liquid with the densities of these liquids (relative density)	✔	✔		
i. Explains the buoyancy of a substance in another substance, using their respective densities (relative density)			✔	✔
j. Describes various other physical properties of an object, a substance or a material (e.g., elasticity, hardness, solubility)			✔	✔
k. Recognizes the materials of which an object is made			✔	✔
B. ENERGY				
3. TRANSFORMATION OF ENERGY				
a. Describes situations in which human beings consume energy (e.g., heating, transportation, food consumption, recreation)	✔	✔	✔	✔
b. Names means used by human beings to limit their energy consumption (e.g., fluorescent light bulbs, timers) and to conserve energy (e.g., insulation)	✔	✔		
C. FORCES AND MOTION				
5. CHARACTERISTICS OF MOTION				
a. Describes the characteristics of motion (e.g., direction, speed)	✔	✔		
7. COMBINED EFFECTS OF SEVERAL FORCES ON AN OBJECT				
a. Predicts the combined effect of several forces on an object at rest or an object moving in a straight line (e.g., reinforcement, opposition)			✔	✔
D. SYSTEMS AND INTERACTION				
1. EVERYDAY TECHNICAL OBJECTS				
a. Describes the parts and mechanisms that make up an object	✔	✔		
b. Identifies the needs that an object was originally designed to meet	✔	✔		
2. SIMPLE MACHINES				
a. Recognizes simple machines (lever, inclined plane, screw, pulley, winch, wheel) used in an object (e.g., lever in seesaw, inclined plane for an access ramp)	✔	✔		
b. Describes the uses of certain simple machines (to adjust the force required)	✔	✔		
3. OTHER MACHINES				
a. Identifies the main function of some complex machines (e.g., cart, waterwheel, wind turbine)			✔	✔

	Grade 3	Grade 4	Grade 5	Grade 6
6. TRANSPORTATION TECHNOLOGY (E.G., CAR, AIRPLANE, BOAT)				
a. Recognizes the influence and impact of transportation technology on people's way of life and surroundings	✔	✔	✔	✔
E. TECHNIQUES AND INSTRUMENTATION				
2. USE OF SIMPLE MACHINES				
a. Appropriately uses simple machines (lever, inclined plane, screw, pulley, winch, wheel)	✔	✔	✔	✔
F. APPROPRIATE LANGUAGE				
1. TERMINOLOGY RELATED TO AN UNDERSTANDING OF THE MATERIAL WORLD				
a. Appropriately uses terminology related to the material world	✔	✔	✔	✔
b. Distinguishes between the meaning of a term used in a scientific or technological context and its meaning in everyday language (e.g., source, matter, body, energy, machine)	✔	✔	✔	✔

EARTH AND SPACE

	Grade 3	Grade 4	Grade 5	Grade 6
B. ENERGY				
1. SOURCES OF ENERGY				
b. Identifies natural sources of energy (sun, moving water, wind)	✔	✔		
c. Identifies fossil fuel-based energy (e.g., oil, coal, natural gas)			✔	✔
3. TRANSFORMATION OF ENERGY				
d. Describes what nonrenewable energy is			✔	✔
e. Explains that fossil fuels are nonrenewable sources of energy			✔	✔
f. Names fuels derived from petroleum (e.g., gasoline, propane, butane, fuel oil, natural gas)			✔	✔
C. FORCES AND MOTION				
2. THE TIDES				
a. Describes the ebb and flow of the tides (rise and fall of sea levels)			✔	✔
F. APPROPRIATE LANGUAGE				
1. TERMINOLOGY RELATED TO AN UNDERSTANDING OF THE EARTH AND THE UNIVERSE				
a. Appropriately uses terminology related to an understanding of the Earth and the universe	✔	✔	✔	✔
b. Distinguishes between the meaning of a term used in a scientific or technological context and its meaning in everyday language (e.g., space, revolution)	✔	✔	✔	✔

Note: the exhibition also touches on concepts related to the social sciences.

PRE-VISIT ACTIVITY

SHIPS

LEVEL

Cycles 2 and 3

DURATION

30 minutes

OBJECTIVE

Introduce students to various types of ships.

REPLICABLE MATERIALS

Question sheet P. 10-12

WORK METHOD

Individual or in pairs

ANSWER KEY

P. 13-17

PROGRESSION DES APPRENTISSAGES

MATERIAL WORLD
D. SYSTEMS AND INTERACTION
6. TRANSPORTATION TECHNOLOGY
a. Recognizes the influence and impact of transportation technology on people's way of life and surroundings
F. APPROPRIATE LANGUAGE
1. TERMINOLOGY RELATED TO AN UNDERSTANDING OF THE MATERIAL WORLD
a. Appropriately uses terminology related to the material world
b. Distinguishes between the meaning of a term used in a scientific or technological context and its meaning in everyday language (e.g., source, matter, body, energy, machine)

INSTRUCTIONS

This activity introduces students to the various types of ships one might see at the Port of Montreal and helps them better understand their functions.

STEPS

- Have the students match each ship name with its description.
- Then have them find the matching image for each name/description combination.

Matching game: Ships

1- Draw a line between each ship name and its corresponding description.

2- Find the picture below that goes with each combination.

Roll-on/roll-off ship •

Dredger •

Tanker •

Icebreaker •

- Used solely to transport liquid cargo stored in tanks.
- Breaks ice in the winter so that other ships can travel through icy waters.
- Used to maintain the seabed around a port. This ship removes sediments that could hinder navigation.
- Has an opening in its hull used to load and unload wheeled vehicles, which are stored in its hold.

Tugboat •	• Flat-bottomed vessel, often lacking any engines, used to transport various types of cargo on rivers.
Barge •	• Has a single deck used to carry bulk cargo (e.g., ore or grain) as long as it is solid.
Bulk carrier •	• Ensures shipping safety and the protection of marine and freshwater environments. Facilitates commerce, trade, and maritime accessibility.
Container ship •	• Carries containers filled with manufactured products (e.g., electronic goods, furniture) and refrigerated goods (e.g., fruits and vegetables, meats).
Coast-Guard ship •	• Small but very powerful boat, generally powered by a diesel engine, able to tow all types of ships.


U A S C
FREJ
SAHİL GÜVENLİK
COAST GUARD
FOUR WIND

ANSWER KEY

1- Draw a line between each ship name and its corresponding description.

2- Find the picture below that goes with each combination.

Roll-on/roll-off ship

Dredger

Tanker

Icebreaker

Used solely to transport liquid cargo stored in tanks.

Breaks ice in the winter so that other ships can travel through icy waters.

Used to maintain the seabed around a port. This ship removes sediments that could hinder navigation.

Has an opening in its hull used to load and unload wheeled vehicles, which are stored in its hold.

Tugboat

Barge

Bulk carrier

Container ship

Coast-Guard ship

Flat-bottomed vessel, often lacking any engines, used to transport various types of cargo on rivers.

Has a single deck used to carry bulk cargo (e.g., ore or grain) as long as it is solid.

Ensures shipping safety and the protection of marine and freshwater environments. Facilitates commerce, trade, and maritime accessibility.

Carries containers filled with manufactured products (e.g., electronic goods, furniture) and refrigerated goods (e.g., fruits and vegetables, meats).

Small but very powerful boat, generally powered by a diesel engine, able to tow all types of ships.

Merchant ships

There are many types of merchant ships, each with its own specific role. Here are the main types:

Container ship

Container ships transport manufactured goods such as electronic equipment and furniture, as well as refrigerated goods such as fruit, vegetables, and meat. These goods are placed in identically sized metal cases called "containers." Small container ships often have their own cranes that can load and unload containers, while larger ships use immense land-based cranes.

Bulk carrier

Bulk carriers have a single deck, with no lower levels. They are used to transport bulk cargo– primarily solid goods such as ore or grain–while liquid cargo is transported in tanker ships.

Tanker

Tanker ships are used solely to transport liquid cargo stored in tanks. They can transport various types of liquids, such as fuel, liquified gas, or molasses, to name a few. These ships make it possible to transport oil from the extraction site to refineries.

Roll-on/roll-off ship

Roll-on/roll-off ships have openings in their hulls so that wheeled vehicles can roll directly from the dock into their storage spaces in the hold. These are often vehicles such as automobiles, tractors, and trucks. Wheeled vehicles such as trucks or fork lifts are used to unload them, rather than cranes. They are commonly called ROROs.

Service vessels

These ships do not transport cargo but are nevertheless vital to shipping. They allow cargo ships to travel in the Port of Montreal and on the St. Lawrence safely and efficiently. They play various roles; here are a few of them.

Tugboat

Tugboats are small, extremely powerful vessels, generally equipped with diesel engines. With that power, they can tow all types of ship. Their main function is to guide ships as they enter the port and assist them in maneuvering to their berth. They may also be used in other situations, such as if mechanical problems compromise a ship's seaworthiness.

Barge

A barge is a flat-bottomed vessel, often lacking engines, used to transport various types of cargo on rivers. Because they are not adapted to wind and waves, they cannot sail on the open ocean. If they lack their own propulsion systems, they are pulled by tugboats.

Dredger

Dredgers are ships used to maintain the seabed. They extract and move sediments around a port. Sediment accumulation is dangerous because it reduces water depth and could damage ships.

Icebreaker

Icebreakers open shipping lanes in winter, allowing other ships to travel through icy waters. To open a path, icebreakers literally break the ice using their weight, reinforced hull, and powerful engines. This would be far too dangerous for an ordinary ship.

Coast-Guard ship

The Canadian Coast Guard is in charge of marine search and rescue, maintaining navigation aids, and marine pollution response. It also supports maritime science and maritime priorities of the federal government. It enforces maritime regulations in matters of maritime safety and the protection of maritime and freshwater environments. But coast guard officers are not police or peace officers. To enforce the law on the St. Lawrence, the coast guard works in partnership with the Sûreté du Québec and the Royal Canadian Mounted Police.

PRE-VISIT ACTIVITY

SAILOR SPEAK

LEVEL

Cycles 2 and 3

DURATION

30 minutes

OBJECTIVE

Enrich students' vocabulary and familiarize them with port and shipping activities.

REPLICABLE MATERIALS

Question sheet P. 19-21

WORK METHOD

Individual, in groups, or with the whole class

ANSWER KEY

P. 22-27

PROGRESSION OF LEARNING

MATERIAL WORLD
D. SYSTEMS AND INTERACTION
6. TRANSPORTATION TECHNOLOGY
a. Recognizes the influence and impact of transportation technology on people's way of life and surroundings
F. APPROPRIATE LANGUAGE
1. TERMINOLOGY RELATED TO AN UNDERSTANDING OF THE MATERIAL WORLD
a. Appropriately uses terminology related to the material world
b. Distinguishes between the meaning of a term used in a scientific or technological context and its meaning in everyday language (e.g., source, matter, body, energy, machine)

INSTRUCTIONS

In this activity, students get a real sense of the fascinating vocabulary of the shipping and port industry.

STEPS

- Print out a question sheet for each individual or team, or project it onto a whiteboard to do the activity with the whole class.
- Have the students answer the questions individually or in teams, or do a quiz with the entire class.
- Project the answer key onto the whiteboard to reveal the correct answers. Certain answers have visual aids to provide a better explanation/extension of knowledge. If using a quiz format, points could be awarded for each correct answer.

REPLICABLE MATERIALS – QUESTION SHEET

1. The Gold-Headed Cane is...

A. A maple-flavoured treat eaten by sailors.
B. A trophy coveted by ship captains.
C. A clothing accessory for ceremonial use.

2. A longshore worker is...

A. A port worker who loads and unloads cargo.
B. Someone who combs the shore for treasure.
C. A person who keeps the beaches clean.

3. A nautical knot...

A. is used to tie the laces of the boots worn by sailors in bad weather.
B. measures the speed at which ships travel.
C. is a bow tie that ship captains wear when they arrive at their destinations.

4. A laker is...

A. A tree floating in the water that is sometimes used to repair ships.
B. A sailor who only sails on lakes.
C. A ship designed especially for sailing on the Great Lakes.

5. A nautical mile is...

A. A running race that sailors compete in.
B. The distance between the port and the nearest restaurant.
C. A unit of nautical measurement.

6. To get underway means...

A. that all the sailors put on their uniforms for the ship to leave.
B. preparing the ship to leave port.
C. repairing the machinery used to move cargo.

7. What is a forepeak?

A. A space on a ship used for storage.
B. The brim on the hat worn by the ship's captain.
C. A tool used by sailors to repair the ship's hull.

8. What does starboard mean?

A. A chart showing the important stars used in navigation.
B. A bulletin board that features the crew member of the week.
C. The right side of a ship.

9. In the expression "from stem to stern," what does "stern" mean?

A. A special kind of hat worn by sailors in hot weather.
B. A very harsh and strict captain.
C. The rear part of the ship.

10. What is "transshipment"?

A. It's when a ship takes on water during a storm.
B. It's when the hold of a ship is overloaded.
C. It's when cargo is transferred.

11. A hatch is...

A. Protective gear covering the elbows.
B. A small tool used to repair the rudder.
C. An opening in a ship's deck.

12. What is the bridge?

A. A weekly card game played by the ship's crew.
B. The area of the ship where steering maneuvers are made.
C. An inadvisable and dangerous maneuver.

13. What is windage?

A. The effect of the wind that a ship must counteract when navigating.
B. The action of coiling up all the ship's ropes.
C. The actions taken by the ship's pilot when the ship is drifting.

14. What does "anchorage" refer to?

A. When the old anchor is replaced with a new one.
B. A calm and safe place to moor the ship.
C. The place in the ship where the anchors are kept.

15. In the expression "cast off the moorings," what do "moorings" refer to?

A. The cables that hold a ship to the quay or dock.
B. Extra cargo that must be removed from an overloaded ship.
C. Crew members who have finished their time at sea.

16. A draught (or draft) survey is...

A. A forecast of the sailing weather.
B. A calculation of the volume of cargo a ship can carry.
C. A count of the number of containers a container ship can carry.

ANSWER KEY

1. The Gold-Headed Cane is...

A. A maple-flavoured treat eaten by sailors.

B. A trophy coveted by ship captains.

C. A clothing accessory for ceremonial use.

Source
https://www.port-montreal.com/en/gold-headed-cane-community.html

The Gold-Headed Cane is awarded to the captain of the first ocean-going ship every year to reach the Port of Montreal. This tradition has been a source of pride for ship captains from around the world for over one hundred years.

2. A longshore worker is...

A. A port worker who loads and unloads cargo.

B. Someone who combs the shore for treasure.

C. A person who keeps the beaches clean

Source
https://fr.wikipedia.org/wiki/Fichier:Stevedores_ny_1912.jpg

In the past, longshore workers, or stevedores, required a lot of strength and stamina because they loaded and unloaded cargo by hand. And although their work is still taxing, today's longshore workers use cranes and other equipment that allow them to move more and much heavier cargo than ever before.

3. A nautical knot...

A. is used to tie the laces of the boots worn by sailors in bad weather.

B. measures the speed at which ships travel.

C. is a bow tie that ship captains wear when they arrive at their destinations.

The knot is the unit of measurement used to indicate a ship's speed. One knot is equivalent to one nautical mile (1,852 metres) per hour, or approximately 0.514 metres per second.

4. A laker is...

A. A tree floating in the water that is sometimes used to repair ships.

B. A sailor who only sails on lakes.

C. A ship designed especially for sailing on the Great Lakes.

Source :
https://fr.m.wikipedia.org/wiki/Fichier:Welland_canal_john_b_aird.JPG

Lakers are ships built especially to sail on the Great Lakes and the St. Lawrence River. They are long and low, and they generally transport bulk cargo such as ore and grain. They are a type of bulk carrier.

5. A nautical mile is...

A. A running race that sailors compete in.

B. The distance between the port and the nearest restaurant.

C. A unit of nautical measurement.

In the marine sector, a nautical mile is the unit of distance measurement. It is equal to 1,852 metres, or 1.85 kilometres (6,076.412 feet). It is also used in the aeronautical and meteorological sectors.

6. To get underway means...

A. that all the sailors put on their uniforms for the ship to leave.

B. preparing the ship to leave port.

C. repairing the machinery used to move cargo.

In the marine sector, a nautical mile is the unit of distance measurement. It is equal to 1,852 metres, or 1.85 kilometres (6,076.412 feet). It is also used in the aeronautical and meteorological sectors.

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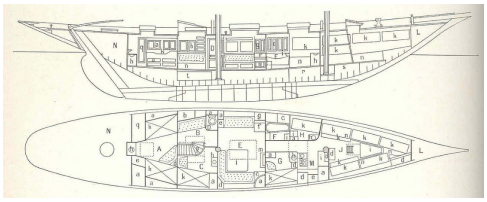


Source :
https://fr.wikipedia.org/wiki/Fichier:FMIB_37407_Amenagements_d%27un_Goelette_de_croisiere_de_100_tonneaux_(coupe_et_plan).jpeg

In the marine sector, a nautical mile is the unit of distance measurement. It is equal to 1,852 metres, or 1.85 kilometres (6,076.412 feet). It is also used in the aeronautical and meteorological sectors.

8. What does starboard mean?

A. A chart showing the important stars used in navigation.

B. A bulletin board that features the crew member of the week.

C. The right side of a ship.

When a sailor says "to starboard!" they are referring to the right side of the ship when looking forward, while "port" refers to the left side of the ship. A good way to remember which is which is that in the alphabet, the letter "R" (right) comes before the letter "S" (starboard).

Did you know that these terms are also used in the railroad industry?

9. In the expression "from stem to stern," what does "stern" mean?

A. A special kind of hat worn by sailors in hot weather.

B. A very harsh and strict captain.

C. The rear part of the ship.

Source :
https://pixabay.com/fr/photos/transport-france-sète-sabord-3278843/

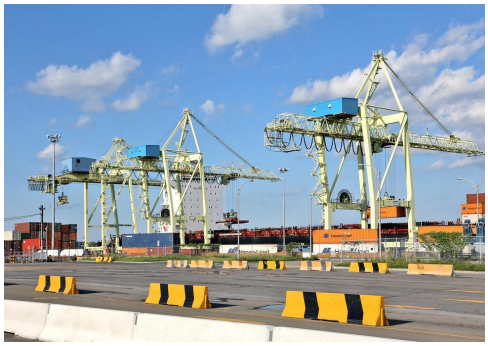
The rear (or aft) part of a ship is called the "stern." In old wooden sailing ships, the "stem" was the furthest extension of the ship's keel, located at the front of the ship (the bow). So "from stem to stern" means from the very front of the ship to the very back.

10. What is "transshipment"?

A. It's when a ship takes on water during a storm.

B. It's when the hold of a ship is overloaded

C. It's when cargo is transferred.



Source :
https://www.flickr.com/photos/parcoursriverain/36037285272

In merchant shipping, transshipping refers to transferring cargo from one ship to another, or from a ship to a train, for example. One could also talk about transshipping passengers when they are moving from one ship to another.

11. A hatch is...

A. Protective gear covering the elbows.

B. A small tool used to repair the rudder.

C. An opening in a ship's deck.

Source :
https://commons.wikimedia.org/wiki/File:Mini-bulker_loading_scrap_iron.jpg

A loading hatch is a relatively large opening in the deck of a ship used to conveniently load, store, and transport goods, often bulk cargo.

12. What is the bridge?

A. A weekly card game played by the ship's crew.

B. The area of the ship where steering maneuvers are made.

C. An inadvisable and dangerous maneuver.

Source : http://lehublot.port-montreal.com/content/uploads/2017/03/26_haut_3.jpg

The bridge is the cabin, usually windowed and raised, where the helmsman operates the helm, or tiller, which is connected to the ship's rudder. Sometimes called the wheelhouse, the bridge also houses all the measurement instruments required for safe navigation.

13. What is windage?

A. The effect of the wind that a ship must counteract when navigating.

B. The action of coiling up all the ship's ropes.

C. The actions taken by the ship's pilot when the ship is drifting.

Windage is the effect of the wind's resistance, which the ship must counteract. When windage becomes too great, the ship can deviate from its course, or even drift off course.

14. What does "anchorage" refer to?

A. When the old anchor is replaced with a new one.

B. A calm and safe place to moor the ship.

C. The place in the ship where the anchors are kept.

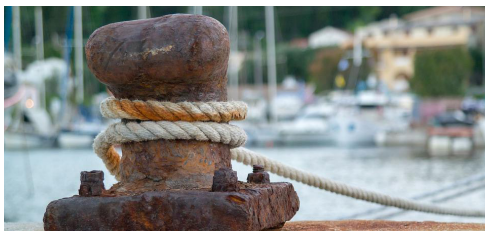
An anchorage is a safe area where a ship can drop anchor or moor temporarily. They are places to take shelter in bad weather or to wait before entering port for loading or unloading.

15. In the expression "cast off the moorings," what do "moorings" refer to?

A. The cables that hold a ship to the quay or dock.

B. Extra cargo that must be removed from an overloaded ship.

C. Crew members who have finished their time at sea.



Source :
https://pixabay.com/fr/photos/amarres-port-navire-bateau-4226727/

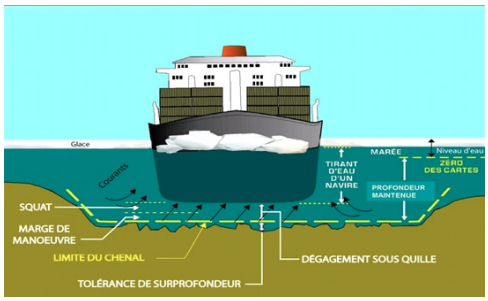
The expression "cast off the moorings" means that the ship is ready to leave port and so no longer needs to be tied to the dock. Another way to say this is to "weigh (or raise) anchor," because the anchor is what holds the ship in place.

16. A draught (or draft) survey is...

A. A forecast of the sailing weather.

B. A calculation of the volume of cargo a ship can carry.

C. A count of the number of containers a container ship can carry.



Source :
https://www.port-montreal.com/en/draft-survey-community.html

A draught survey (or draft survey) is a determination of the amount of cargo a ship can carry. It takes two factors into consideration: the depth of the water through which the ship must travel (a channel, for example), and the ship's draught, or how deep it sits in the water, given its weight and size. Many ships have graduated draught markings painted on their hulls to indicate this critical measurement.

BROUGHT TO YOU BY SHIP

LEVEL

Cycles 2 and 3

WORK METHOD

Individual or in teams

OBJECTIVE

Help students understand the chain of transportation of goods transiting through the port and leaving it through the importing and exporting process.

DURATION

30 minutes or more

*The game **Brought to You by Ship** has an accompanying teacher's guide, student workbook, and tutorials. These resources draw on the concepts covered in the video game and link them to the English language arts, mathematics, science and technology, geography, history, and citizenship curricula of the Québec Education Program.*

MATERIAL WORLD
D. SYSTEMS AND INTERACTION
6. TRANSPORTATION TECHNOLOGY
a. Recognizes the influence and impact of transportation technology on people's way of life and surroundings

INSTRUCTIONS

The game **Brought to You by Ship** is suggested as a pre-visit activity and provides a good overview of the content covered in the exhibition **All Aboard!**

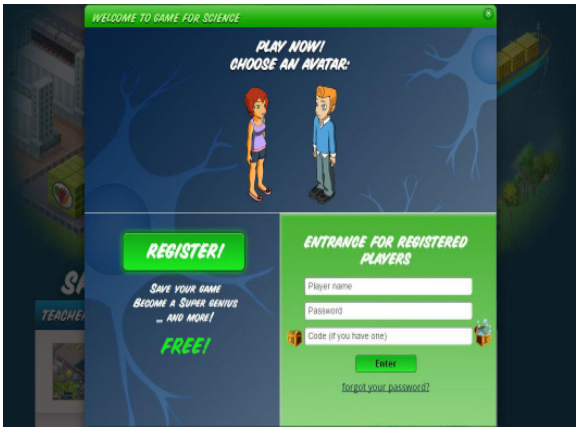
The game is designed for elementary cycle 2 and 3 students and gives them a chance to run a shipping company, using their logistics skills to manage its growth, profitability and environmental impact.

STEPS

Instructions for accessing the video game:

- Access the Brought to You by Ship website through the link: http://www.gameforscience.com/broughttoyoubyship, and click on "Play! Click here".

- If the player has already registered for Game for Science: Complete the "Entrance for registered players" section.
- If the player has not yet registered for Game for Science: Click on "Register!" and complete the identification information.



- Accept Captain Habor's quest.

- Do the tutorial to understand how the game works.

- The port evolves with play.
- Once a player has 200 points, the bulk loading dock becomes available and new terminals (iron, road salt, wood pellets) and a new ship (bulk carrier) are unblocked.

- New destinations become accessible based on the player's level as follows:
  - Cabin boy: *Gourmania*
  - Sailor: *Mathematicos*
  - Second Officer: *Rana*
  - First Officer: *Vitalis*
  - Captain: *Genomia*

- The player's level is shown here:

- Throughout the game, drills and practice exercises on fractions, the Cartesian plan and angles allow the students to move ahead in developing their shipping company.
- These interactive activities can also be accessed at all times by clicking on this icon:

EXPLORATION RALLY

LEVEL

Cycles 2 and 3

DURATION

30–45 minutes

OBJECTIVE

Enhance the exhibition tour and encourage students to explore all the content, not just the interactive games. Increase visit duration and elicit engagement.

REPLICABLE MATERIALS

Question sheet P. 32-33

WORK METHOD

In pairs or individually

ANSWER KEY

P. 34

INSTRUCTIONS

Students are invited to take part in an exploration rally, either individually, in teams, or as a family. As they tour the exhibition, they must find the answers to the 16 multiple-choice questions on their sheet—two questions for each station. They will often have to examine elements of the exhibition (texts, photographs, audiovisuals, etc.) to find the correct answers.

Students may answer the questions in any order between stations 1 and 8.

STEPS

- Print a rally sheet for each student and provide them with a pencil (no pens, please).
- Tell them that they can come to you if they get stuck.
- Check their answers when everyone comes together at the end of the activity.

REPLICABLE MATERIALS – QUESTION SHEET

Your challenge: It's incredible how many steps merchandise has to take to reach its destination! Answer the questions below to reveal the route it takes.

- First, locate the station associated with the question.
- Watch or read to find the answers to the two questions.
- Then pick another station to go to.

Station 1 - All Aboard!

1. Molasses falls into which category of merchandise?

   A. Dry bulk
   B. Liquid bulk
   C. Sweet cargo

2. Sending merchandise to a foreign country is called:

Answer : _____

_____

Station 2 – Marine Transportation

3. Find the image of the sailing ship, then read the sentence and insert the missing information.

   "During the age of sale, it took ships____ weeks to cross the Atlantic, while today it only takes ____ days."

4. The weight of all the cargo that transits the Port of Montreal in a year is equivalent to how many elephants?

   A. 2,340 million
   B. 6 million
   C. 582 million

Station 3 - Navigation

5. What is depicted in this image?

Answer : _____

_____

6. To connect two ropes of the same size, you would use a...

   A. hitch knot
   B. same-size knot
   C. sheet bend

Station 4 - Longshoring

7. Play the game on the interactive station. What type of crane is used to unload a container ship?

   A. ship-to-shore gantry crane
   B. mobile crane
   C. sandhill crane

8. An oil tanker docks at the port. To unload it, the longshore worker will use...

   A. a connection hose
   B. a super-pump
   C. a bucket brigade

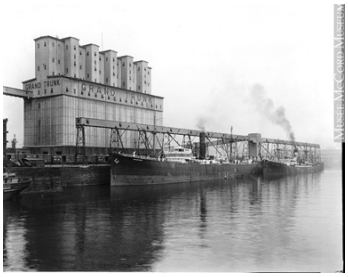
Station 5 – Port Installations

9. On the panel showing old maps of the port, find out who drew this image. What was his profession, and what was the map used for?

Answer : _____

_____

10. This large building was built in the 1920s and still exists. What was its original purpose?



A. luxury hotel
B. cold-storage warehouse
C. grain silo

Station 6 - Environment

11. Enter the container and find the truck back-up alarms. What is special about these alarms at the Port of Montreal?

A. They are louder than ordinary alarms so they can be heard in the noisy environment.
B. They are quieter to avoid disturbing the surrounding neighbourhood.
C. They play music and bird calls.

12. Find the big electrical outlet nearby. What is it for?

Answer : _____

_____

Station 7 – Land transportation

13. Play the interactive game. What kinds of ground transportation can you transfer your cargo to?

A. mobile cranes
B. conveyor belts
C. trucks and trains

14. What is Sylvain Boisvert's job?

Answer : _____

_____

Station 8 - Merchandise

15. Locate this image.

What kind of food shipment is arriving at the Port of Montreal more and more?

A. exotic fruit
B. barbeque
C. icing sugar

16. Play the interactive game. What percentage of the goods we encounter every day probably passed through the port?

Answer : _____

_____

ANSWER KEY

1. B. Liquid bulk
2. Exporting
3. During the age of sale, it took ships 10–12 weeks to cross the Atlantic, while today it only takes 9–12 days.
4. B. 6 million
5. Lighted buoy, or light buoy
6. C. sheet bend
7. A. ship-to-shore gantry crane
8. A. a connection hose
9. Spy. The map was used to plan the city's invasion by the English.
10. C. grain silo
11. B. They are quieter to avoid disturbing the surrounding neighbourhood.
12. To supply electricity for over-wintering ships.
13. C. trucks and trains
14. Locomotive operator
15. A. exotic fruit
16. 80%

POST-VISIT ACTIVITY

JOBS AT THE PORT

LEVEL

Cycles 2 and 3

DURATION

1 hour

OBJECTIVE

Consolidate students' knowledge of the cargo transportation sequence and the occupations involved.

REPLICABLE MATERIALS

Job-description cards and Sequence cards P. 38–42

WORK METHOD

Entire class, in teams

ANSWER KEY

Answers accompany each situation P. 43–47

PROGRESSION DES APPRENTISSAGES

MATERIAL WORLD
D. SYSTEMS AND INTERACTION
6. TRANSPORTATION TECHNOLOGY
a. Recognizes the influence and impact of transportation technology on people's way of life and surroundings

Instructions

Using the materials in this guide, set up a role-playing game in which each student embodies a profession involved in the chain of transporting cargo from its production site to the consumer.

Part one: role-playing game

Hand out a job-description card to each student (see printable material below). On each card is a job title and description. The guide also has "sequence cards" that should be posted on the board or wall. These represent the sequence of events involved in transporting cargo from its point of departure to its destination.

Since each job works within a team, students must find out which team their job belongs to and, using clues on the cards, determine which stage of the journey their team is involved in. For example, team 2 is involved at two points in the sequence: during the ground transportation stages (2 and 6).

When the teams are assembled, select an object from everyday life to represent the merchandise to be transported. Regardless of the object, it will travel by ship in over 90 percent of cases. Have the object pass from team to team so that each team and team member can explain their role in the transport chain.

Part two: Situation game

Once each team has found its place in the timeline, unexpected events begin to occur. The students play a situation game in which team members must work together to be effective. Students must identify which team should act in each situation and determine how to resolve it.

Steps

- Print out the job-description cards and transport sequence cards.
- Cut out the job-description cards and sequence cards.
- Hand out a random job-description card to each student.
- Have students find their team by reading the clues on their job-description cards.
- Select an object from everyday life that the teams must transport from the start of the game to the end.
- Read the description of the first sequence card so that the corresponding team can come forward.
- Once the correct team has been determined, post the first sequence card on the board.
- Repeat with the remaining sequence cards. Once all the cards in the transport sequence have been posted, play the situation game with the teams.

Suggestion : Have the students gather by team under each sequence card. You can have them do this immediately or after a few minutes.

Note about the clues on the job-description cards:

There are three types of clue, each of which is represented differently:

- **Bold**: Indicates **jobs on the same team.**
- Underline: Indicates where the stage in the sequence of operations occurs.
- *Italic*: Indicates *members of related teams.*

List of stages in the sequence of operations and related teams

	Jobs involved
Stage 1 : Product sale/purchase and route planning	• Producer • Purchaser • Transport logistician
Stage 2 : Ground transportation of merchandise by producer to port	• Truck driver • Train operator
Stage 3 : Arrival of merchandise at exporting port and loading onto ship	• Ship inspector • Shipping agent • Shipowner • Port safety officer • Environmental inspector • Longshore worker • Customs agent • Ship superintendent • Cargo inspector • Tugboat captain • Coast guard
Stage 4 : Sea voyage of merchandise	• Ship captain • Marine pilot • Engineering officer • Navigation officer • Deck crew member • Helmsman/Helmswoman • Engine room crew member • Ship's cook • Ship's electrician
Stage 5 : Arrival of merchandise at receiving port and unloading	• Same team as Stage 3
Stage 6 : Ground transport of merchandise to purchaser	• Same team as Stage 2
Stage 7 : Reception of merchandise by purchaser	• Purchaser

Transport logistician

I do my job before the merchandise is transported. I plan its complete route with *truck drivers*, the *train operator*, and the shipowner, and I negotiate shipping rates with the **producer** and the **purchaser**.

Producer

I am the person who produced the merchandise and who wishes to sell my product to a **purchaser**. I set the terms of the sale before the merchandise leaves.

Purchaser

I am the person who has purchased a product from a **producer**. I enter into a sales agreement before the merchandise leaves.

Ship inspector

I am the person who inspects the ships and ensures that they are safe. I work on the dock and communicate my results to the team of **longshore workers** and to the *ship captain*.

Shipping agent

I work for the **shipowner**. I work on the dock and make sure the ship has everything it needs when it comes to port. I also make sure that **tugboat captains** are ready to maneuver the ship, that the ship is refuelled, and that the team of **longshore workers** are in place. I work closely with the *ship captain*.

Shipowner

I am the owner of a shipping company, and I operate several ships and a section of the port's docks. I am responsible for making sure my company is profitable. I receive the team of **longshore workers** on my territory.

Truck driver

I transport merchandise on the ground, on roads. I arrange my work from the start with the *transport logistician*. I collect the merchandise directly from the *producer* or bring it to the *purchaser*'s door. I often interact with the **train operator** to load or unload the merchandise onto or off of the train.

Train operator

I transport the merchandise on the ground, by rail. I arrange my work from the start with the *transport logistician*. I sometimes collect the merchandise directly from the *producer* or send it directly to the *purchaser*, but I often need to work with the **truck driver** to ensure that the merchandise gets to its destination.

Port safety officer

I am responsible for safety around the docks. I intervene immediately if there is an incident and direct my support teams to help anyone who needs assistance. The fundamental purpose of my job is to ensure that the **longshore workers**, **environmental inspector**, *truck drivers*, and *train operators* work appropriately and safely.

JOB-DESCRIPTION CARDS (TO PRINT)

Environmental inspector

I am in charge of protecting the environment at the port. I work at the docks but also on the water around the docks, and I act immediately to remedy any incident that could harm the environment on land or in the water. I work with the **port safety officer**.

Longshore worker

I transfer merchandise from the dock to the ship or vice-versa. I receive merchandise directly from the *truck driver* or *train operator*. I work directly with the **ship superintendent**.

Customs agent

I inspect the merchandise that transits the port. I work at the docks and I am authorized to search any merchandise that I feel is suspect or improperly documented. I work with the **longshore workers** and the **port safety officer**.

Ship superintendent

I organize and supervise the loading and unloading of merchandise when a ship is moored at the dock. I work closely with the **longshore workers**, the **cargo inspector**, and the *deck crew* to ensure that the work goes smoothly.

Cargo inspector

I inspect the cargos carried by ships. I work at the dock and directly observe loading and unloading operations. I take an inventory of the merchandise and am in constant contact with the **longshore workers** and the **ship superintendent** to ensure that the work goes smoothly.

Tugboat captain

I am responsible for making sure that commercial ships arrive without incident at the dock. I work in the water around the dock, aboard a tugboat, and my job is to push ships safely toward their berth. My ship is small, agile, and extremely powerful. I work with the **longshore workers** and the *ship captain.*

Ship captain

I am the person in charge of overall operations on board the ship. I am responsible for maneuvering the ship and preparing for emergencies. I coordinate with the **navigation officer**, the **engineering officer**, the **marine pilot**, and the **helmsman/helmswoman** to ensure that the ship operates smoothly at sea.

St. Lawrence marine pilot

I know the St. Lawrence like the back of my hand, and I am responsible for guiding all ships that sail in the river. I come on board the ship as soon as it enters the St. Lawrence, and I advise the **navigation officer**, the **ship's captain** and the **helmsman/helmswoman** in order to avoid all hazards.

Engineering officer

I am in charge of making sure all the machinery on board the ship functions properly. This includes electrical equipment, water and steam pipes, and the engines. I coordinate with the **deck crew** and **engine room crew** to ensure that everything is running smoothly.

JOB-DESCRIPTION CARDS (TO PRINT)

Navigation officer

I am in charge of operations on board the ship and of safety at sea. I also oversee the work of the *longshore workers* during loading and unloading. I work with the **deck crew**, the **captain**, the **marine pilot**, and the **helmsman/helmswoman** to ensure the ship is running smoothly.

Deck crew member

I do all handling, repair, and maintenance duties on board the ship. I work with the **navigation officer** to plan my duties.

Helmsman/Helmswoman

I am responsible for steering the ship. I work on board the ship, in the bridge. I work closely with the **ship's captain**, the **navigation officer**, and the **marine pilot** to steer the ship safely.

Engine room crew member

I do all maintenance and repairs on equipment in the engine room on board the ship. I work with the **engineering officer** to plan my duties

Ship's cook

I manage the food stores on board the ship and cook healthy and varied meals for the crew. I coordinate the duties of everyone working in the galley (the ship's kitchen).

Ship's electrician

I work with the **engineering officer** to coordinate the maintenance and operation of the electrical systems on board the ship. I am responsible for detecting electrical problems and for reacting quickly to resolve any issues or make repairs.

Coast guard

I am responsible for navigation safety both along the coast and on waterways. I work on board a patrol boat, and I intervene as quickly as possible when an accident takes place. I may be required to work near a dock or at sea and to communicate with **captains**, **officers**, and *environmental inspectors*, as the case may be.

JOB-DESCRIPTION CARDS (TO PRINT)

Stage 1

Product sale/purchase and route planning

The sales/purchase agreement of a product and the planning of the merchandise's route take place well before any actual transport operations occur.

Stage 2

Ground transportation of merchandise by producer to port

The merchandise leaves the producer's warehouse and is loaded onto a truck or train, travelling on the ground to the port, where it will be loaded onto the ship.

Stage 3

Arrival of merchandise at exporting port and loading onto ship

Upon its arrival at the dock, the merchandise is registered and loaded onto the ship selected for sea transport.

Stage 4

Sea voyage of merchandise

Once loaded, the merchandise crosses the ocean on board the ship for delivery to its destination.

SEQUENCE CARDS (TO PRINT)

Stage 5

Arrival of merchandise at receiving port and unloading

Upon arrival at the port, the merchandise is received and unloaded from the ship at the dock for transfer to a mode of ground transport.

Stage 6

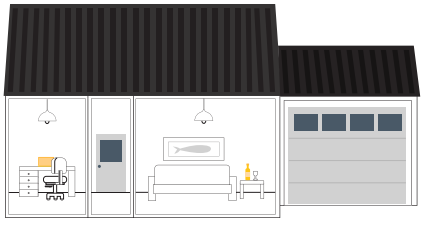
Ground transport of merchandise to purchaser

Once transferred, the merchandise leaves the port, travelling on the ground by truck or train for delivery to its destination.

Stage 7

Reception of merchandise by purchaser

Once the merchandise arrives at its destination, it is checked and unloaded for reception by the purchaser.



CARTES-ÉTAPES (À IMPRIMER)

Situation game

The game has two objectives:

1. That the correct team comes forward for each scenario.
2. That the team determines which occupations can resolve the situation.

Steps

- Read a scenario aloud.
- Have the teams determine which of the teams is involved.
- Have the team involved determine which occupations should take action.
- Guide the students by giving them clues from scenario answers.

Situations

Scenario 1	*Upon reception, a small part of the merchandise is missing. What should be done?*
Answer	
Team involved	Stage 7
Occupations involved	Purchaser, transport logistician, producer
Actions required	The purchaser must contact the transport logistician to ensure that all the merchandise has been delivered. They must also contact the producer to have a replacement delivered.

Scenario 2	*A major electrical failure occurs in the ship's galley. The electric ovens and the refrigerators are not working. What should be done?*

Answer

Team involved	Stage 4
Occupations involved	Ship's cook, ship's electrician, engineering officer.
Actions required	First, the cook must inform the ship's electrician, who must investigate the source of the problem. He or she must then work with the engineering officer to ensure that the failure has not caused any mechanical breakdowns.

Scenario 3	*Two maintenance vehicles operating on the dock have collided, leading to an oil leak in the dock area. What should be done?*

Answer

Team involved	Stage 3
Occupations involved	Port safety officer, environmental inspector
Actions required	The port safety officer must immediately check on the health of the vehicle occupants. He or she must also take note of the oil leak and quickly contact the environmental inspector. The inspector must assess the situation and take measures to recover the oil and make sure that it does not infiltrate the soil or pollute the water.

Scenario 4	*There is a lot of congestion on the railroads, and you must stop your train many times during your voyage. What should be done?*

Answer

Team involved	Stage 2
Occupations involved	Train operator, transport logistician
Actions required	The train operator must contact the transport logistician to inform him or her of the delays caused by the congestion. The logistician can then adjust the route planning accordingly.

Scenario 5	*While the ship is sailing on the St. Lawrence, an engine overheats. What should be done?*

Answer

Team involved	Stage 4
Occupations involved	Engineering officer, ship captain, navigation officer, marine pilot, helmsman/ helmswoman, engine room crew
Actions required	The engineering officer must inform the ship's captain that the engine must be stopped so it can be repaired. The captain must work with the navigation officer and marine pilot to find a suitable place to anchor and instruct the helmsman/ helmswoman to proceed to this location. Once the engine is stopped, the engineering officer must direct the engine room crew to inspect the engine and make the necessary repairs.

Scenario 6	*The bucket of an unloading crane has closed incompletely and a portion of the bulk cargo has spilled onto the ground and in the water. What should be done?*

Answer

Team involved	Stage 5
Occupations involved	Ship superintendent, longshore workers, environmental inspector
Actions required	The ship superintendent must contact the team of longshore workers to coordinate the recovery of the spilled bulk cargo. He or she must also report the spill into the water to the environmental inspector so that he or she can determine if it represents an environmental hazard.

Scenario 7	*A major engine problem forces you to stop your truck. What should be done?*

Answer

Team involved	Stage 6
Occupations involved	Truck driver, transport logistician, purchaser
Actions required	The truck driver must have the truck repaired and inform the transport logistician so that he or she can notify the purchaser that delivery of the merchandise will be delayed.

Scenario 8	*A rogue wave has swept over the ship's deck and carried a member of the deck crew overboard.*

Answer

Team involved	Stage 4
Occupations involved	Ship captain, navigation officer, deck crew member, coast guard
Actions required	The ship's captain must immediately send a distress call and mobilize the navigation officers and other deck crew to initiate rescue operations. This includes sending a life buoy and trying to rescue the crew member with special booms (poles). The coast guard must answer the distress call and provide assistance.

Scenario 9	*A ship moored at the dock has been found to have substandard maintenance and cargo practices. What should be done?*

Answer

Team involved	Stage 3
Occupations involved	Ship inspector, ship owner, cargo inspector, customs agent.
Actions required	The ship inspector must contact the ship owner so that the maintenance situation is resolved. He or she must also contact the cargo inspector and customs agent to provide authorization to inspect the cargo and ensure that it can be shipped properly.

Scenario 10	*The meteorological service is forecasting a storm at sea. This severe storm is developing about 100 kilometers directly ahead of you. What should be done?*

Answer

Team involved	Stage 4
Occupations involved	Navigation officer, ship captain, helmsman/helmswoman, deck crew
Actions required	The navigation officer must inform the ship's captain about the forecast and, together, they must decide to change course to avoid the worst of the storm. They must inform the helmsman/helmswoman of the change in course and, for safety purposes, the deck hands must secure all containers on the deck to prevent the wind from shifting them.

Scenario 11	*After its sea voyage, garbage has accumulated aboard the ship and must be unloaded. What should be done?*

Answer

Team involved	Stage 5
Occupations involved	Ship captain, shipping agent, deck crew
Actions required	The ship's captain must contact the shipping agent, who arranges the garbage collection service. The garbage is unloaded, working with the deck crew.

POST-VISIT ACTIVITY

IN BULK !

The activity *In bulk!* is from the teacher's guide to the game **Brought to You by Ship**, produced by CREO for SODES.
http://www.gameforscience.com/broughttoyoubyship/

LEVEL
Cycles 2 and 3

DURATION
30 minutes + playing time

CONCEPTS
Solubility and buoyancy

REPLICABLE MATERIALS
P. 50-52

WORK METHOD
Variable

ANSWER KEY
P. 53-54

PROGRESSION OF LEARNING

MATERIAL WORLD
A. MATTER
1. PROPERTIES AND CHARACTERISTICS OF MATTER
h. Associates the buoyancy of a volume of liquid in an identical volume of a different liquid with the densities of these liquids (relative density)
i. Explains the buoyancy of a substance in another substance, using their respective densities (relative density)
j. Describes various other physical properties of an object, a substance or a material (e.g. elasticity, hardness, solubility)
k. Recognizes the materials of which an object is made

Instructions

- This activity can be done individually, in teams, or with the whole class.
- Read the scenario with the students.
- The text in boxes contains theoretical concepts. They can be used to:
    - initiate an examination of the concepts with the students.
    - review the concepts before continuing with the activity.
- Have the students play **Brought to You by Ship** (see P. 28–30).

    Note: To carry out the activity, the students must achieve Sailor level. If they have not reached the level:

    - have them to achieve this level as homework,
    - project the game and play it to the desired level in front of the class,
    - project or print the "Game Interface" appendix.
- Have the students complete the worksheet.
- Note that the worksheet's last question is more complex because it introduces the concept of average density. If need be, prepare the students using the additional information provided in the answer key (P. 53–54).
- Discuss the activity with the students.

Solubility and buoyancy

The **Brought to You by Ship** port has three terminals containing bulk goods. Those goods have well-defined characteristics. Their transportation is provided by bulk carriers.

Each material has its own specific characteristics or properties. The following are examples of properties:

- Density
- Buoyancy
- Solubility
- Permeability
- Impermeability
- Etc.

1. Draw a line from each property to its definition.

Property of a substance that dissolves in a liquid.	Solubility	Property of a substance that floats, remaining on the surface of a liquid.
	Buoyancy	

The buoyancy of a substance depends on its density, i.e. the mass of one cubic centimetre of the substance.

The density of water is 1 g/cm3. If a substance has a lower density than water, it will float on water. If a substance has a higher density than water, it will sink in water.

2. In **Brought to You by Ship**, locate the three bulk terminals and write down the goods that are stored in them.

_____ _____ _____

3. One of these three substances is soluble in water. Which one?

_____

_____

4. Explain how you could verify your answer to Question 3.

_____

_____

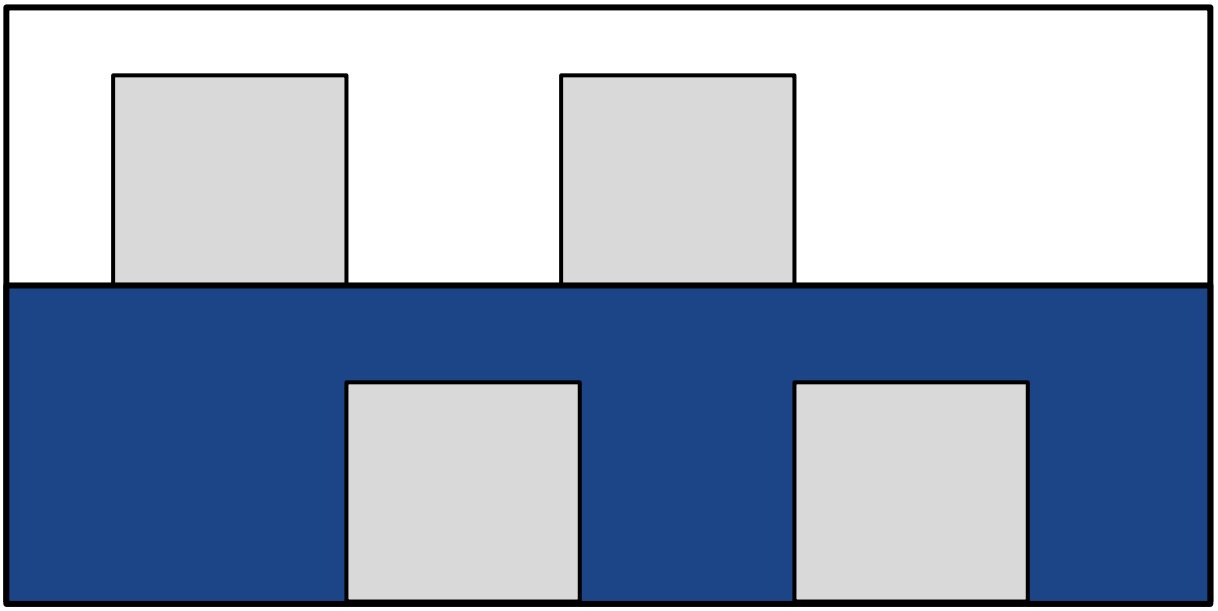
_____

_____

5. The following boxes indicate the density of certain substances. Complete the two boxes with the names of two of the substances you wrote down for Question 2.

1	2	3	4
_____	Cork	Olive oil	_____
7,9 g/cm^3	0,23 g/cm^3	0,92 g/cm^3	1,1 g/cm^3

6. In the pool of water below, indicate which substances from Question 5 will float and which will sink.



7. Container ships and bulk carriers float on water. What can you conclude about the average density of those ships?

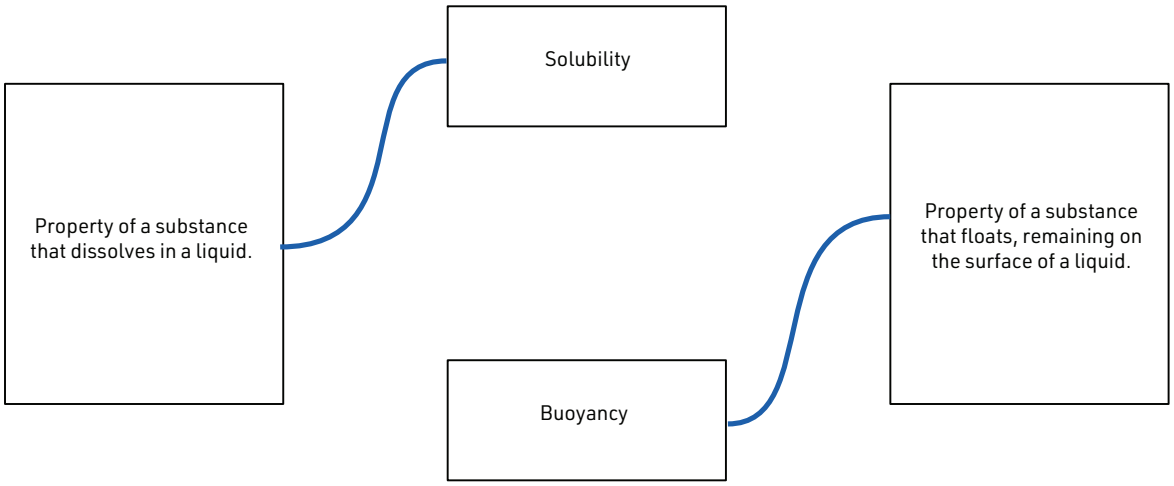
_____

_____

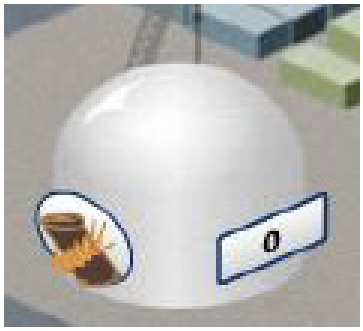
_____

Solubility and buoyancy

1. Draw a line from each property to its definition.



2. In **Brought to You by Ship**, locate the three bulk terminals and write down the goods that are stored in them.



Wood pellets

Iron

Road salt

3. One of these three substances is soluble in water. Which one?

   Road salt is a water-soluble substance.

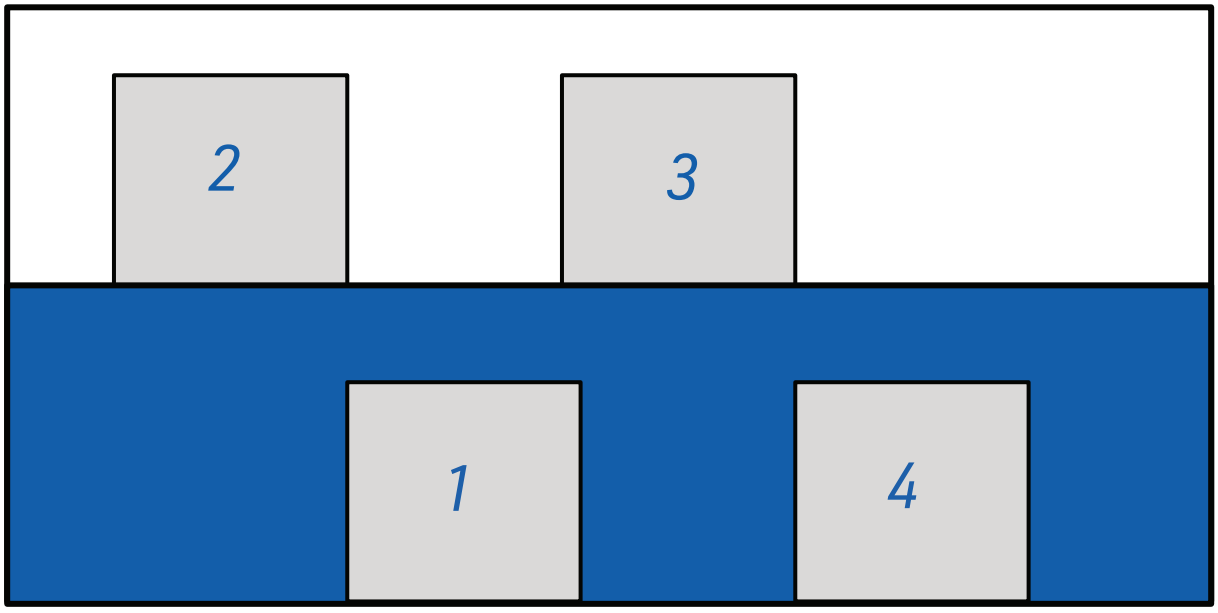
4. Explain how you could verify your answer to Question 3.

   To verify my answer, I could take a sample of the substance, immerse it in a beaker of water, stir and observe whether the sample is still visible in the water.

5. The following boxes indicate the density of certain substances. Complete the two boxes with the names of two of the substances you wrote down for Question 2.

1	2	3	4
Iron	Cork	Olive oil	*Wood Pellet*
7,9 g/cm^3	0,23 g/cm^3	0,92 g/cm^3	1,1 g/cm^3

6. In the pool of water below, indicate which substances from Question 5 will float and which will sink.



7. Container ships and bulk carriers float on water. What can you conclude about the average density of those ships?

   We can conclude that the average density of container ships and bulk carriers is lower than that of water (1g/cm^3).

   Note: Ships are made of various materials. The density of most of these materials is higher than that of water. However, ships also contain a lot of air, whose density is very low. By combining the density of everything that makes up a ship, the result is lower than the density of water. That is why a ship floats.

POST-VISIT ACTIVITY

HIGH TIDE, LOW TIDE

The activity *High tide, low tide* is from the teacher's guide to the game **Brought to You by Ship**, produced by CREO for SODES.
http://www.gameforscience.com/broughttoyoubyship/

NIVEAU	DURATION
Cycle 2 and 3	20 minutes
CONCEPT	**REPLICABLE MATERIALS**
Tides	P. 56-58
WORK METHOD	**ANSWER KEY**
Variable	P. 59-60

PROGRESSION DES APPRENTISSAGES

EARTH AND SPACE
C. FORCES AND MOTION
2. TIDES
a. Describes the ebb and flow of the tides (rise and fall of sea levels)

Instructions

- This activity can be done individually, in teams, or with the whole class.
- Read the scenario with the students.
- The text in the box contains theoretical concepts. It can be used to:
    - initiate an examination of the concept with the students.
    - review the concept before continuing with the activity.
- Have the students complete the worksheet.
- Note that additional information about draught and waterways is provided in the answer key.
- Discuss the activity with the students.

Tides

When a ship travels on a waterway or in a bay, or when it wants to dock in a port, it requires an adequate water level. In this activity, you will learn more about tides.

Tide is the phenomenon by which sea levels rise and fall, due to the gravitational attraction of the Moon and Sun.

The Moon and Sun attract the oceans. Since the Moon is closer to the Earth than the Sun, its attraction is stronger. But the Sun also plays a role in the phenomenon of tides. The position of the Moon, Earth and Sun determines if tides are high or not.

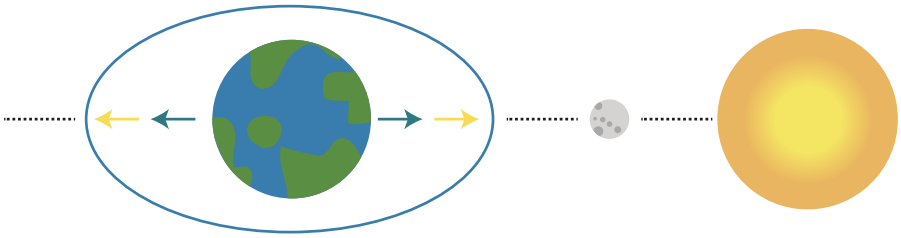
If the Moon, Earth and Sun are aligned:

- Combined attraction of the Moon and Sun;
- High tides;
- Name: spring tides.

If the Moon, Earth and Sun form a 90° angle:

- Uncombined attraction of the Moon and Sun;
- Low tides;
- Name: neap tides.

1. In the diagram below, indicate the positions of the Moon, Earth and Sun.



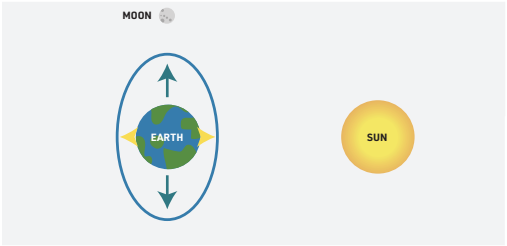
2. Does the diagram from Question 1 illustrate a spring tide or a neap tide? Explain your answer.

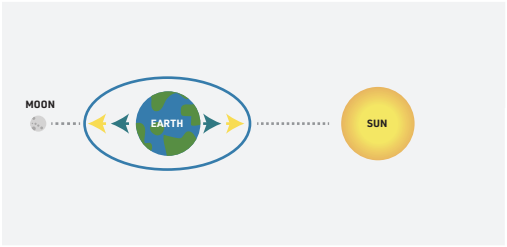
_____

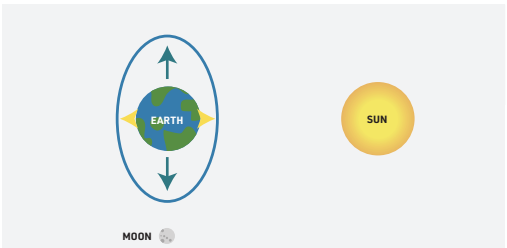
_____

_____

3. Connect the diagrams to the type of tides to which they correspond.







- Spring Tide
- Neap Tide

4. A ship bound for the port of Gourmania consults the following tide table.

July 18 – The Port of Montreal	
Time	Water height (metre)
00:14	2,8
06:15	0,8
12:29	3,1
18:47	0,7

A. At what times do low tides (lowest water level) occur?

_____

B. At what times do high tides (highest water level) occur?

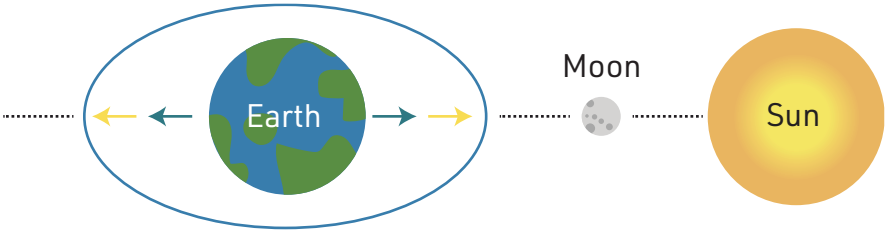
_____

C. Is it better if the ship approaches the port at high tide or at low tide? Explain your answer.

_____

Tides

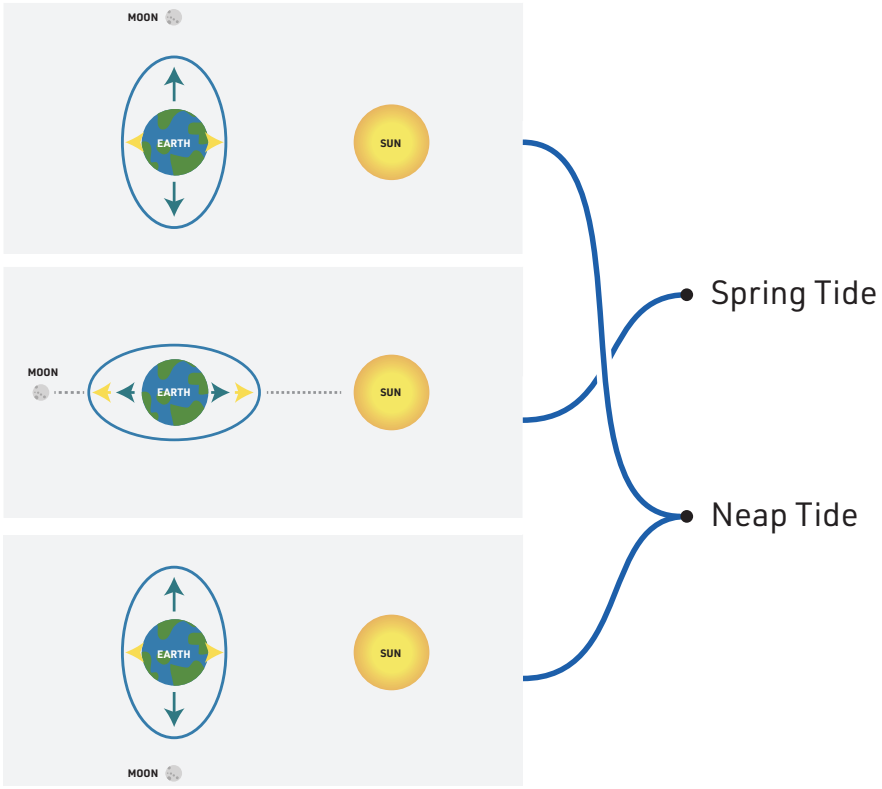
1. In the diagram below, indicate the positions of the Moon, Earth and Sun.



2. Does the diagram from Question 1 illustrate a spring tide or a neap tide? Explain your answer.

   The diagram illustrates a spring tide, because the Moon, Earth and Sun are aligned.

3. Connect the diagrams to the type of tides to which they correspond.



4. A ship bound for the port of Gourmania consults the following tide table.

July 18 – The Port of Montreal	
Time	Water height (metre)
00:14	2,8
06:15	0,8
12:29	3,1
18:47	0,7

A. At what times do low tides (lowest water level) occur?

The low tides occur at 6:15 a.m. and 6:47 p.m.

B. At what times do high tides (highest water level) occur?

The high tides occur at 12:14 a.m. and 12:29 p.m.

C. Is it better if the ship approaches the port of Gourmania at high tide or at low tide? Explain your answer.

The ship must approach the port of Gourmania at high tide. When the water level is low, at low tide, navigation is more difficult. For example, the risk of the ship's underside touching the bottom increases.

Additional resources

Many of the references come from the Port of Montreal website (https://www.port-montreal.com/) and the sister site Port Window (http://lehublot.port-montreal.com/en/). As the website creators note, Port Window "...lets us tell the stories of people who are at the heart of our world." Some content of Logbook, the magazine published on the Port's website, have been adapted to provide a better experience on mobile devices. The platform is regularly updated with new port- and maritime-themed portraits and articles.

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https://www.youtube.com/watch?v=cd822wv-dvA

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Thierry Sirois-Miron (dir.). (2018). Insubmersible [documentary film]. Montréal, Casadel Films.
https://vimeo.com/285558077

Ville de Québec (prod.). (2014). Le pilote du Saint-Laurent .
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