

Your Proposal to Colossal Shipping

Using the data you collected from experiment #1 & #2 and the conclusions you came to in experiment #2 make a proposal to the CEO of Colossal Shipping to meet his needs for a new floor for his containers. Be sure to review his proposal earlier in this booklet and address each of his concerns.

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State of Connecticut Embedded Task

January 2015

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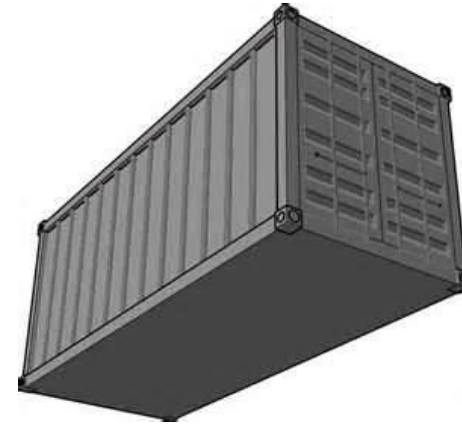
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Experiment #2

Conclusions (1 – 2 Paragraphs)

What conclusions can you make on your data? Write a brief report describing your experiment, findings, and how they compare to your prediction. Your report should include . . .

- a. The question you were investigating
- b. A summary of your procedure
- c. A reasonable conclusion with supporting data
- d. A scientific explanation of your findings (see Friction)
- e. Suggestions for making improvements
- f. New questions that have arisen about factors which might influence sliding friction.



A Call for Proposals

The Colossal Shipping Company has been asked to ship a container of the newest super-high definition televisions from Japan to the United States. Each television will sell at retail for \$16,000. All Colossal Shipping containers have a solid steel floor on which the products rests. The CEO of Colossal Shipping is concerned that their current containers provide insufficient friction to secure the safety of these valuable products. He has asked your Engineering Consulting Firm to propose a new container floor covering that will provide sufficient friction to keep these valuable televisions from sliding around even in the turbulent seas expected during the crossing of the Pacific Ocean. The CEO will bring your proposal to his board but will require experimental data to support your proposal.

Experiment #2

Data

Create a table below to show the materials you tested and how much friction they created. You may use the table horizontally or vertically. It may not be necessary to use all table cells to complete your task.

perched atop the seaweed at the southwest end of Gooch's Beach near the entrance to Kennebunk Harbor in Maine. She stopped and crouched. Its body was approximately the size and shape of a bar of soap, its head the size of a Ping-Pong ball. A brand name, THE FIRST YEARS, was embossed upon its belly. The plastic was "white, incredibly weathered, and very worn," Hagens would later recall. The thing looked as though it had crossed the ocean. It was fun to imagine, a lone duck, drifting across the Atlantic, like something out of a fairy tale or a children's book—fun but also preposterous. Sensibly, she had left the toy where they found it and walked on.

The classified ads in the July 14, 1993, edition of the Sitka *Daily Sentinel* do not make for exciting reading, though they do convey something of what summertime in Alaska's maritime provinces is like. That week, the Tenakee Tavern "in Tenakee" was accepting applications "for cheerful bartenders." The Baranof Berry Patch was buying berries—"huckleberries, blueberries, strawberries, raspberries." The National Marine Fisheries Service gave notice that the winners of the 1992 Sablefish Tag Recovery Drawing, an annual event held to encourage the reporting of tagged sablefish, would be selected at 1:00 p.m. on July 19 at the Auke Bay Laboratory. Then, under the ambiguous heading of "Announcements," between "Business Services" and "Boats for Sale," an unusual listing appeared.

ANYONE WHO has found plastic toy animals on beaches in Southeast please call the Sentinel at 747-3219.

The author of the ad was Eben Punderson, a high school teacher who moonlighted as a journalist. On Thanksgiving Day, 1992, a party of beachcombers strolling along Chichagof Island had discovered several dozen hollow plastic animals amid the usual wrack of bottlecaps, fishing tackle, and driftwood deposited at the tide line by a recent storm. After ten months at sea, the ducks had whitened and the beavers had yellowed, but the frogs were still as green as ever, and the turtles were still blue.

In subsequent weeks beachcombers on other islands found more of the toys, and new ones kept washing ashore. Laurie Lee of South Baranof Island filled an unused skiff with the horde she'd scavenged. Signe Wilson filled a hot tub. Betsy Knudson had so many to spare she started giving them to her dog. It appeared that even the sea otters of Sitka Sound were collecting them: one toy had been plucked from an otter's nest. On a single beachcombing excursion with friends, Mary Stensvold, a botanist with the U.S. Forest Service who normally spends her days hunting rare varieties of liverwort, gathered forty of the animals. Word of the invasion spread. Dozens of correspondents answered the *Sentinel's* ad. Toys had been found as far north as Kayak Island, as far south as Coronation Island, a range of tide line extending for hundreds of miles. Where had they come from?

Thousands more were yet to be accounted for. Where had they gone? Into the Arctic? Around the globe? Were they still out there, traveling the currents of the North Pacific? Or did they lie buried under wrack and sand along Alaska's wild, sparsely populated shores? Or, succumbing to the elements—freezing temperatures, the endless battering of the waves, prolonged exposure to the sun—had they cracked, filled with water, gone under? All 28,800 toys had emerged from that sinking container into the same acre of water. Each member of the four species was all but identical to the others—each duck was just as light as the other ducks, each frog as thick as the other frogs, each beaver as aerodynamic as the next. And yet one turtle had ended up in Signe Wilson hot tub, another in the jaws of Betsy Knudson's 6abrador, another in the nest of a sea otter, while a fourth had floated almost all the way to Russia, and a fifth traveled south of Puget Sound. Why? What tangle of causes and effects could explain—or predict—such different fates?

There were other reasons why the story of the toys kept going, reasons that had nothing to do with oceanography and everything to do with the human imagination, which can be as powerful and as inscrutable as the sea. In making sense of chaotic data, in following a slightly tangled thread of narrative to its source, Eben Punderson had set the plastic animals adrift all over again—not upon the waters of the North Pacific but upon currents of information. The Associated Press picked up the story. Newspapers across the country ran it. The Floatees eventually made brief appearances in *The Guardian* and *The New York Times Magazine*, and a considerably longer appearance in *The Smithsonian*. Like migrating salmon, they returned almost seasonally to the pages of *Scholastic News*, a magazine for kids, which has reported on the story seven times. They were spotted in the shallows of *People* and MSNBC, and in the tide pools of *All Things Considered*. They swirled around the maelstrom of the Internet and bobbed up in such exotic waters as an oceanography textbook for college undergraduates and a newsletter for the collectors of duck-themed stamps.

These travels wrought strange changes. Dishwasher safe the toys may have been, but newspaper safe they were not. By the time they drifted into my own imagination, the plastic animals that had fallen into the Pacific in 1992 were scarcely recognizable. For one thing, the plastic had turned into rubber. For another, the beavers, frogs, and turtles had all turned into ducks. It had begun the day Eben Punderson published an unusual ad in the pages of the Sitka *Daily Sentinel*—the metamorphosis of happenstance into narrative and narrative into myth.

Shipping & Sliding Experiment #2

From your earlier analysis of friction, you have made some assumptions as to which materials might increase the force of friction. Use that information to design an experiment to test which material creates the most friction.

What is your prediction and why? _____

Describe the procedure you will be employing to test your prediction. Be accurate and thorough.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

Shipping & Sliding Experiment #1

Establishing a Control

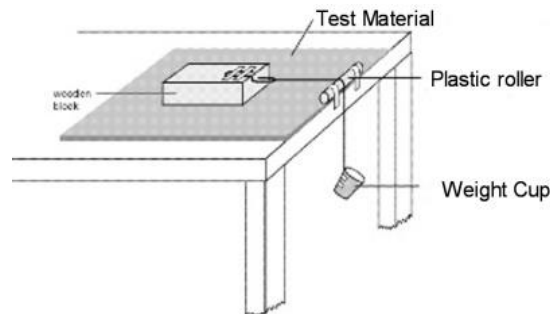
Procedure:

1. Construct a model shipping crate like the one in the diagram below.



2. Use the tabletop as a model of a cargo room floor.
3. Tape a plastic cylinder along the edge of your work table. Place a piece of metal on the work table near the plastic cylinder.

4. Tie a piece of string to a plastic cup. Tie the other end to the paper clip taped to your block. Suspend the cup over the plastic cylinder as shown below.



5. Slowly add sand to the plastic cup until the wooden block begins to move freely.

6. Repeat the procedure 3 times and then take an average to improve your accuracy.

	Trial 1	Trial 1	Trial 1	Average
Mass of Sand				

7. Measure the mass of the sand in the cup. Record the Average mass here _____ grams

8. This is your control. The Colossal Shipping Company uses containers with metal floors. You will use the data collected here to compare the friction created by other materials. This will help you make your proposal to the CEO.

Story Analysis

1. Where were the ducks being shipped from _____, where were they heading? _____.

2. Why did the ducks end up in the water? _____

3. Sitka Alaska is on the shores of which ocean? _____

4. Kennebunk Maine is on which ocean? _____

5. How could these duck travel so far? _____

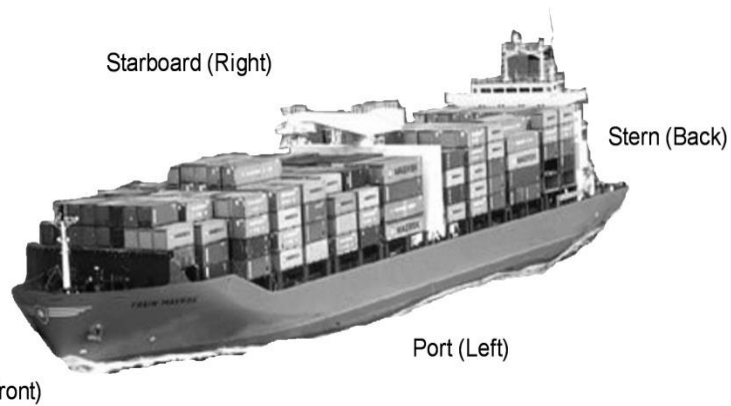
6. If the company that made the packages of ducks (& other bath toys) planned to sell them for \$10 at stores in America, how much money did they lose when their cargo was lost at sea? **SHOW YOUR CALCULATIONS**

7. How might a shipping company keep their cargo containers from sliding off the deck of their ships even in the roughest of seas? _____

Friction

Use you Physical Science text book to write an accurate definition of Friction.

Friction: _____



If a cargo container on a ship were sliding toward the bow, in which direction would friction be acting? _____

What if the container slid to Port? _____

Using the materials provided, organize them into the two categories below.

Materials with Low Friction	Materials with High Friction

From your analysis, describe

a. What properties of a surface increase friction? _____

b. What properties of a material might decrease friction? _____

When are hands (or any surfaces) are rubbed together, friction causes . . . _____

