

DOLPHIN RESEARCH CENTER

Marine Mammal Meals

Grade Level: 6th-8th

Objectives: Students will be able to use various mathematical operations to calculate the amounts and costs of food necessary to sustain a marine mammal colony in human care. Students will also be able to graph fluctuations in food requirements throughout the year.

Florida Sunshine State Standards:

Science

SC.F.1.3.7 The student knows that behavior is a response to the environment and influences growth, development, maintenance, and reproduction.

Mathematics

Placing a Fish Order Handout

MA.A.3.3.1 The student understands and explains the effects of addition, subtraction, multiplication, and division on whole numbers, fractions, including mixed numbers, and decimals, including the inverse relationships of positive and negative numbers.

Determining Dolphin Diets Handout

MA.D.2.3.1 The student represents and solves real-world problems graphically, with algebraic expressions, equations, and inequalities.

Graphing Sea Lion Diets Handout

MA.E.1.3.1 The student collects, organizes, and displays data in a variety of forms, including tables, line graphs, charts, bar graphs, to determine how different ways of presenting data can lead to different interpretations.

National Science Education Standards:

Content Standard A (5-8) - Abilities Necessary to do Scientific Inquiry: Use mathematics in all aspects of scientific inquiry.

Content Standard C (5-8) - Regulation and Behavior: All organisms must be able to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment.

Background: Dolphin Research Center is currently home to sixteen Atlantic bottlenose dolphins and two California sea lions. The main focus at DRC is providing excellent care to the animals that call DRC home. Animal husbandry refers to the science and practice of breeding and caring for animals. This includes everything from meeting nutritional needs to providing medical care to maintaining habitats. Meeting all of these needs requires collaboration between the medical staff, animal training staff, and animal care staff at a facility.

Key Terms

Animal husbandry: The science and practice of breeding and caring for animals.



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Marine Mammal Meals

At Dolphin Research Center, preparing marine mammal meals is no simple task. The food preparation takes place in a building called the Fish House. Every morning, trainers and interns get to work weighing fish to be placed in individual buckets for each of our dolphins and sea lions. Most of the eighteen animals receive three meals a day; this means staff and interns have the daunting task of preparing at least 54 buckets every day!

Herring and capelin are the two types of fish that are commonly used at Dolphin Research Center. In addition to these two, other kinds of fish are incorporated into the animals' diets on a rotating basis to provide variety. Some of the other types of fish used include smelt, silversides, sardines, and squid.

The fish used to feed the marine mammals is ordered from suppliers in other parts of the United States and shipped to Dolphin Research Center. As soon as the fish is caught, it is frozen in a process called flash freezing. Flash freezing preserves the freshness of the fish, kills parasites that may be present, and prevents the growth of bacteria. The frozen fish is shipped to Dolphin Research Center and stored in an on-site freezer. The freezer typically contains 20,000-30,000 pounds of fish, which is approximately a two-three month supply. Staff members will pull fish from this freezer on a daily basis and allow it to thaw prior to using it to prepare buckets.

The first thing that goes into each bucket is a layer of ice. The ice keeps the fish cool and fresh but it also keeps the fish above the bottom so it doesn't sit in the liquid from the thawing fish. If the fish sits in liquid, it can increase the risk of bacteria growth. A plastic tray is then placed on top of the ice, also to make sure that the fish are not sitting in liquid. Staff members then refer to a poundage chart, which indicates how many pounds of each type of fish go in each animal's buckets. All the animals are listed on the chart, and each meal is different based on the number of calories required by each animal. As staff members weigh out the proper amounts, they individually inspect each fish. They will look to make sure the fish meet a certain set of criteria, including the presence of both eyes and no body tears. We only use fish that are of high enough quality for human consumption. Any fish that do not meet the criteria are not placed in the buckets. Once the buckets are prepared, they go into a refrigerator until the trainers are ready to use them that day. The fish house then undergoes a thorough cleaning and disinfecting process, keeping the dolphin's kitchen cleaner than the kitchens in most average households.

The Fish House Manager is responsible for overseeing the day-to-day functioning of the fish house, as well as for ordering the fish supply. For every new shipment that comes in, laboratory testing must be done to determine the health and caloric content of the fish. Diets must be adjusted according to the number of calories in each type of fish. The Fish House Manager must be highly proficient in mathematics in order to successfully carry out all of these job responsibilities.

Materials:

For the class:

- Photographs or diagrams of the various fish species discussed in the lesson

For each student:



Marine Mammal Meals

- Handout
- Calculator (optional)

Teacher Prep Notes: Prior to introducing these activities, students will need to have a basic understanding of the mathematical principles covered in the selected activity. Once the students have a basic understanding of the mathematical principles involved, these activities are an excellent way to show how these skills are used in everyday life at a marine mammal facility. Copy the appropriate handout(s) for each student in the class. Find photographs or diagrams of the fish species discussed in the lesson (herring, capelin, marine smelt, and Venezuelan sardines). Fish identification guides and Internet sites are good resources.

Procedures:

1. Provide students with a definition of the term “animal husbandry”. Explain that animal husbandry is an integral part of what staff members at zoos and aquariums do on a daily basis.
2. Ask students to brainstorm what types of things would be considered animal husbandry. Possible answers include monitoring animal health, providing the appropriate diet for each animal, placing animals in living situations in order to allow for appropriate socialization and breeding, etc.
3. Elaborate on the element of animal husbandry pertaining to the animal’s diet. Ask students what would be included, and how math skills allow staff members to perform these tasks.
4. As part of your discussion, you can show students the pictures of the different fish species used to feed the marine mammals at Dolphin Research Center.
5. Distribute the handout(s) you have selected to reinforce mathematical concepts that the students are currently learning.
6. Read the introduction aloud. Discuss the examples, and instruct students as necessary.
7. Allow students time to complete the calculations independently or in groups.

Wrap Up: Discuss and correct student responses.

Taking it Further:

- Have students do additional research on animal husbandry and design their own marine mammal math problems.
- Take students to the computer lab and ask them to generate animal husbandry graphs using the computer.



Marine Mammal Meals

Placing a Fish Order (English System) - Answer Key

1. Herring(1): 61lbs, Herring(2): 19lbs, Smelt: 60lbs, Capelin: 70lbs, Sardines: 23lbs
2. Herring(1): 5,490lbs, Herring(2): 1,710lbs, Smelt: 5,400lb, Capelin: 6,300lbs, Sardines: 2,070lbs
3. Herring(1): 125 cases, Herring(2): 69 cases, Smelt: 216 cases, Capelin: 191 cases, Sardines: 42 cases
4. Herring(1): \$1,650, Herring(2): \$1,035, Smelt: \$4860, Capelin: \$1701.81, Sardines: 1,365, Total: \$10,611.81
5. Yes. This three-month order cost \$10,611.81. There are 12 months in a year, so the total cost would be \$42,447.24 for the year. (You might want to explain to students that the prices and amounts of fish vary throughout the year, so this calculation for the yearly cost may be different from the actual yearly cost.

Placing a Fish Order (Metric System) - Answer Key

1. Herring(1): 28kg, Herring(2): 8kg, Smelt: 27kg, Capelin: 32kg, Sardines: 10kg
2. Herring(1): 2,520kg, Herring(2): 720kg, Smelt: 2,430kg, Capelin: 2,880kg, Sardines: 900kg
3. Herring(1): 126 cases, Herring(2): 66 cases, Smelt: 221 cases, Capelin: 192 cases, Sardines: 40 cases
4. Herring(1): \$1663.20, Herring(2): \$990, Smelt: \$4972.50, Capelin: \$1710.72, Sardines: \$1300, Total: \$10,636.42
5. Yes. This three-month order cost \$10,636.42. There are 12 months in a year, so the total cost would be \$42,545.68 for the year. (You might want to explain to students that the prices and amounts of fish vary throughout the year, so this calculation for the yearly cost may be different from the actual yearly cost.



Marine Mammal Meals

Determining Dolphin Diets (English System) - Answer Key

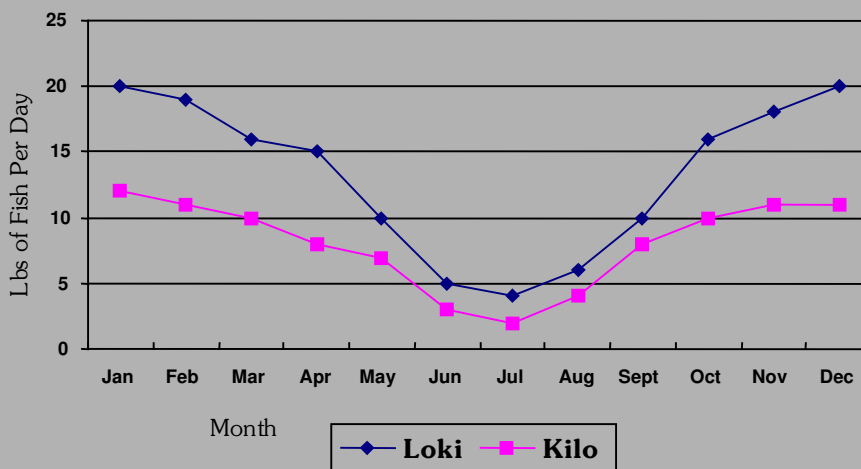
- | | | |
|----------------------|--------------------------------|----------------------------------|
| 1. 2,913 calories | 7. 20.9% capelin, 14.5% smelt, | 10. a. 6,525 calories |
| 2. a. 6/33 of a case | 49.2% herring(1), 15.4% | b. 1.6lbs |
| b. 0.18 of a case | sardines | 11. a. 4lbs |
| 3. 7,235.5 calories | 8. 20.2% capelin, 15.0% smelt, | b. 4.9lbs |
| 4. a. 4/25 of a case | 13.0% herring(1), 40.6% | 12. a. 4.5lbs herring(1), 3.9lbs |
| b. 0.16 of a case | herring(2), 11.2% sardines | capelin, 1.8lbs sardines |
| 5. 31.7% | 9. 5.5lbs herring(1), 6.1lbs | b. 4.3lbs herring(1), 4.5lbs |
| 6. 14.1% | capelin | capelin, 1.8lbs sardines |

Determining Dolphin Diets (Metric System) - Answer Key

- | | | |
|----------------------|--------------------------------|--------------------------------|
| 1. 2,913 calories | 7. 20.9% capelin, 14.5% smelt, | 10. a. 6,525 calories |
| 2. a. 1/5 of a case | 49.2% herring(1), 15.4% | b. 0.8kg |
| b. 0.20 of a case | sardines | 11. a. 2kg |
| 3. 7235.5 calories | 8. 20.2% capelin, 15.0% smelt, | b. 2.5kg |
| 4. a. 2/11 of a case | 13.0% herring(1), 40.6% | 12. a. 2.3kg herring(1), 2.0kg |
| b. 0.18 of a case | herring(2), 11.2% sardines | capelin, 0.9kg sardines |
| 5. 31.7% | 9. 2.8kg herring(1), 3.0kg | b. 2.1kg herring(1), 2.2kg |
| 6. 14.1% | capelin | capelin, 0.9kg sardines |

Graphing Sea Lion Diets (English System) - Answer Key

1. Average Pounds of Fish Eaten by Kilo and Loki Per Day



2. The sea lions eat the largest amounts of food during the cooler winter months. They eat the smallest amounts of food during the warmer summer months.

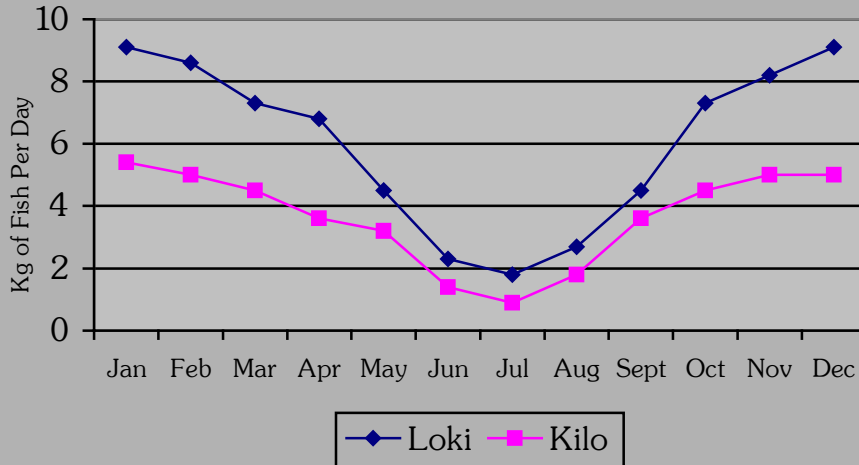
3. Sea lion diets fluctuate with water temperature. Sea lions will eat more during cooler months, and less during warmer months. Also, males stay on shore for the duration of breeding season (May-July) and eat very little (if at all) during this time.
4. Throughout the year, Loki eats larger amounts of fish than Kilo.
5. Kilo is still young and doesn't require as many calories as Loki. However, as Kilo gets older his diet will start to more closely resemble that of Loki.



Marine Mammal Meals

Graphing Sea Lion Diets (Metric System) - Answer Key

1. Average Kilograms of Fish Eaten by Kilo and Loki Per Day



2. The sea lions eat the largest amounts of food during the cooler winter months. They eat the smallest amounts of food during the warmer summer months.

3.. Sea lion diets fluctuate with water temperature. Sea lions will eat more during cooler months, and less during warmer months. Also, males stay on shore for the duration of breeding season (May-July) and eat very little (if at all) during this time

4. Throughout the year, Loki eats larger amounts of fish than Kilo.

5. Kilo is still young and doesn't require as many calories as Loki. However, as Kilo gets older his diet will start to more closely resemble that of Loki.

