Feeding Time

Objectives

Students make decisions about how to solve a complex real-life problem by breaking it down into simpler parts.

Materials

- ❑ paper and pencils
- ❑ calculators
- ❑ Ocean Animals cards
- ❑ wholesale seafood costs (below)

Background

The animals at each SeaWorld park eat about 4,000 pounds of food daily. Animal care specialists weigh the food before distributing it to the marine animals, and they keep careful records of each animal's daily food intake. In this exercise, students take on the role of animal care specialists. They use the seafood costs given at left and the Ocean Animals information cards to solve a complex problem. Before you begin, copy the table at right onto the board.

WHOLESALE SEAFOOD COSTS

food item price per pound

capelin 0.45
clams 1.65
crabs 1.20
herring 0.40
mackerel 0.40
sea urchins 1.40
shrimp 3.50
squid 0.35
smelt 0.35

Action

1. Pose the following problem to your students:

   Estimate the animal food order and cost to feed 5 sea otters, 10 bottlenose dolphins, 19 California sea lions, 6 killer whales, and 8 emperor penguins for one day.

2. Students work through the problem individually or in learning groups. Ask them to state their assumptions before they begin their calculations.
3. When students have completed their work, discuss the problem together. How did they tackle the problem?

ANSWERS

Given that for most animals there is a range of sizes and a range of food intake, students will have to make and state their assumptions on the size of the animals and on how much the animals eat. The solution below is correct given the following assumptions.

sea otter weight is 25 kilograms, daily food intake is 25% body weight
bottlenose dolphin weight is 300 kilograms, daily food intake is 5% body weight
California sea lion weight is 300 kilograms, daily food intake is 7% body weight
killer whale weight is 3,000 kilograms, daily food intake is 4% body weight
emperor penguin weight is 40 kilograms, daily food intake is 4% body weight

Converting from metric to pounds: Students must convert metric weights to pounds. They can either convert the animal's weights or they can convert the amount of food each animal eats. For this solution we will start by converting each animal's weight to pounds. *(Numbers are rounded to the nearest pound.)*

sea otter	25 kg x 2.2046 kg/lb. = 55 lb.
bottlenose dolphin	300 kg x 2.2046 kg/lb. = 661 lb.
California sea lion	300 kg x 2.2046 kg/lb. = 661 lb.
killer whale	3,000 kg x 2.2046 kg/lb. = 6,614 lb.
emperor penguin	40 kg x 2.2046 kg/lb. = 88 lb.

Calculating amount of food eaten per day:

sea otter	55 lb. x .25 = 14 lb.
bottlenose dolphin	661 lb. x .05 = 33 lb.
California sea lion	661 lb. x .07 = 46 lb.
killer whale	6,614 lb. x .04 = 265 lb.
emperor penguin	88 lb. x .04 = 4 lb.

Cost of feeding 5 sea otters:

55% clams	14 x .55 x 1.65	=	$12.71
30% shrimp	14 x .30 x 3.50	=	14.70
10% crabs	14 x .10 x 1.20	=	1.68
5% sea urchins	14 x .05 x 1.40	=	.98
TOTAL			$30.07
			X 5
			= $150.35

Cost of feeding 6 killer whales

50% herring	265 x .50 x .40	=	$ 53.00
30% smelt	265 x .30 x .35	=	27.83
10% squid	265 x .10 x .35	=	9.28
10% mackerel	265 x .10 x .40	=	10.60
TOTAL			$100.71
			X 6
			= $604.26

Cost of feeding 10 bottlenose dolphins

60% smelt	33 x .60 x .35	=	6.93
20% herring	33 x .20 x .40	=	2.64
15% squid	33 x .15 x .35	=	1.73
5% mackerel	33 x .05 x .40	=	.66
TOTAL			$11.96
			X 10
			= $119.60

Cost of feeding 8 emperor penguins

80% herring	4 x .80 x .40	=	$ 1.28
20% capelin	4 x .20 x .45	=	.36
TOTAL			$ 1.64
			X 8
			= $ 13.12

Cost of feeding 19 California sea lions

40% herring	46 x .40 x .40	=	7.36
20% mackerel	46 x .20 x .40	=	3.68
20% smelt	46 x .20 x .35	=	3.22
20% squid	46 x .20 x .35	=	3.22
TOTAL			$17.48
			X 19
			= $332.12

Total for all animals:

$150.35
119.60
332.12
604.26
+ 13.12
= $1,219.45

Ocean Animals

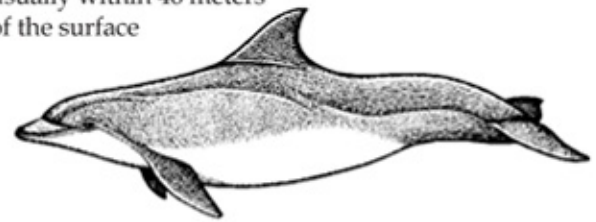
When we describe ocean animals we often use numbers; numbers describe how big an animal is, how fast it swims, or how much it eats. Numbers can also describe an animal's population or life span. These cards use numbers to describe several ocean animals.

Some of the activities in this Teacher's Guide require the use of the information in these cards. Here are some other ideas for ways to use these cards in your classroom:

- Use the facts on the cards to help you prepare lessons and lead discussions in class.
- Copy and cut apart the cards. Distribute a different card to each cooperative learning group or to each student. Visit the school library to learn more about the animals.
- Encourage students to use the information on these cards to develop their own story problems to share with their classmates.

bottlenose dolphin
Tursiops truncatus

adult size:	2.5 to 3.7 meters and 190 to 454 kilograms, females slightly smaller than males
food intake:	4% to 6% of body weight per day
typical diet at SeaWorld:	60% smelt, 20% herring, 15% squid, 5% mackerel
population:	unknown, not endangered
swimming speed:	usually 5 to 11 kilometers per hour, as fast as 35 kilometers per hour
diving depth:	usually within 46 meters of the surface



killer whale
Orcinus orca

adult size:	males 5.8 to 6.7 meters and 3,628 to 5,442 kilograms, females 4.9 to 5.8 meters and 1,361 to 3,628 kilograms
food intake:	about 3% to 4% of body weight per day
typical diet at SeaWorld:	50% herring, 30% smelt, 10% squid, 10% mackerel
population:	unknown, not endangered
swimming speed:	usually 3 to 10 kilometers per hour, but as fast as 48 kilometers per hour
diving depth:	usually within 60 meters of the surface

blue whale
Balaenoptera musculus

adult size:	about 21 meters and 64,000 kilograms
food intake:	about 4% of body weight per day during a feeding season that lasts about 120 days
population:	about 11,000
swimming speed:	to 18 to 22 kilometers per hour
diving depth:	unknown

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California sea lion
Zalophus californianus

adult size: males 2.25 meters and 200 to 400 kilograms, females 1.5 to 2 meters and 50 to 110 kilograms

food intake: about 5% to 8% of body weight per day

typical diet at SeaWorld: 40% herring, 20% mackerel, 20% smelt, 20% squid

population: about 200,000

swimming speed: as fast as 19 kilometers per hour, usually slower

diving depth: usually within 74 meters of the surface

Pacific walrus
Odobenus rosmarus divergens

adult size: males 2.7 to 3.6 meters and 800 to 1,700 kilograms, females 2.3 to 3.1 meters and 400 to 1,250 kilograms

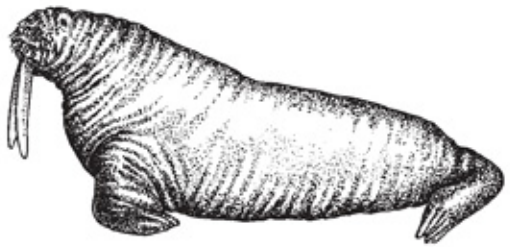
food intake: 4% to 6% of body weight per day

typical diet at SeaWorld: 45% herring, 15% clams, 15% capelin, 10% mackerel, 10% sardines, 5% squid

population: about 200,000

swimming speed: usually about 7 kilometers per hour, as fast as 35 kilometers per hour in short bursts

diving depth: usually within 80 meters of the surface



Florida manatee
Trichechus manatus latirostris

adult size: about 3 meters and 363 to 544 kilograms (Females are usually larger than males.)

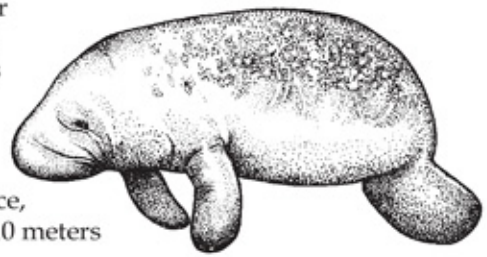
food intake: 4% to 9% of body weight per day

typical diet at SeaWorld: 61% romaine lettuce, 21% other types of lettuce, 10% spinach, 7% cabbage, 1% carrots and apples

population: probably less than 3,000

swimming speed: usually 3 to 10 kilometers per hour, as fast as 24 kilometer per hour in short bursts

diving depth: usually within 3 meters of the surface, as deep as 10 meters



California sea otter
Enhydra lutris nereis

adult size: males about 1.5 meters and 29 kilograms, females about 1.2 meters and 20 kilograms

food intake: 20% to 30% of body weight per day

typical diet at SeaWorld: 55% clams, 30% shrimp, 10% crab, 5% sea urchins

population: probably less than 2,000

swimming speed: about 9 kilometers per hour under water and 12.5 kilometers per hour at the surface

diving depth: usually within about 20 meters of the surface

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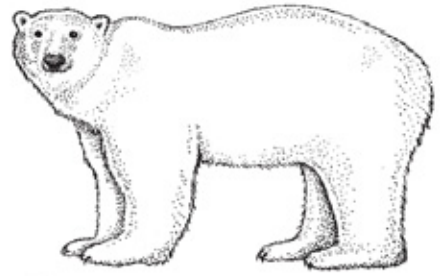
emperor penguin
Aptenodytes forsteri

adult size:	about 1.1 meter and 27 to 41 kilograms
food intake:	on average, about 4% of body weight per day
typical diet at SeaWorld:	80% herring, 20% capelin
population:	about 436,200 mature adults
swimming speed:	usually 10 kilometers per hour or less
diving depth:	mostly within 21 meters of the surface, as deep as 534 meters

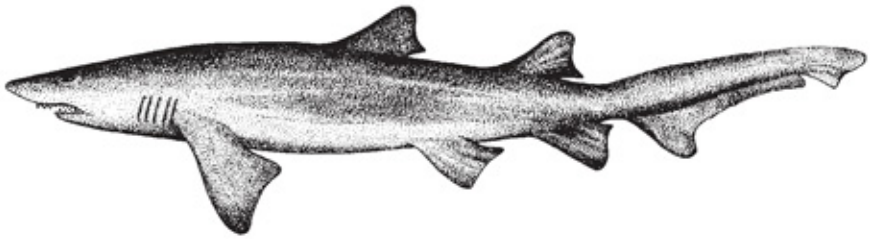
polar bear
Ursus maritimus

adult size:	males 2.5 to 3 meters and 350 to 650 kilograms, females 2.0 to 2.5 meters and 150 to 250 kilograms
food intake:	about 2% of body weight per day
typical diet at SeaWorld:	30% polar bear biscuits, 25% meat, 20% capelin, 15% herring, 10% fruits and vegetables
population:	21,000 to 28,000
swimming speed:	as fast as 10 kilometers per hour, usually slower
diving depth:	usually within 4.5 meters of the surface



sandtiger shark
Carcharias taurus

adult size:	2.2 to 3.2 meters and about 140 kilograms
food intake:	1% to 10% of body weight per week
typical diet at SeaWorld:	50% blue runner, 40% mackerel, 10% squid
population:	unknown
swimming speed:	unknown
average depth:	to 191 meters



leatherback sea turtle
Dermochelys coriacea

adult size:	1.2 to 1.9 meters and 200 to 506 kilograms (the largest of the sea turtles)
food intake:	unknown
population:	less than 115,000 females (Only mature females are counted, when they come ashore to lay eggs.)
swimming speed:	1.5 to 9.3 kilometers per hour
diving depth:	305 meters in routine dives, as deep as 1,190 meters