

## Acknowledgements

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### Special Note to Teachers:

This curriculum packet consists of four topical worksheets for use in the classroom and a two-page zoo visit worksheet designed to be used during a field trip to the Minnesota Zoo. The four primary covered by the classroom worksheets are Feeding Animals at the Zoo, Animal Speeds, Animal Shapes, Sizes and Weights and Zoo Exhibit Design. Topic information sheets are included in the packet to provide a background for discussion of each topic. An answer key is also provided.

Several extension questions have also been included on each worksheet to provide further opportunities for exploring a topic. They are denoted with an asterisk ( \* ) in front of the question number.

The Minnesota Graduation Standards were considered carefully during the development of this packet. The math standards supported by these worksheets include:

#### Grades 5-6

*Number Sense: Use number concepts, relationships and computational procedures to communicate, solve problems and evaluate results.*

*Shape, Space, Measurement: Apply concepts of shape and space to describe and measure the physical world to solve problems.*

*Chance and Data Handling: Apply concepts of randomness and uncertainty to make critical judgements, predictions, and decisions about probabilistic situations.*

Several Inquiry and Life Science Standards are also supported.

We hope that you will find these packets useful for your classroom. If you have any questions or comments please contact us at: School Programs, Minnesota Zoo, 13000 Zoo Blvd., Apple Valley, MN 55124-8199.

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1. The moose is the largest member of the deer family. A bull moose (an adult male) weighs approximately 1200 pounds. Its antlers can be 60 to 70 inches wide and weigh 60 pounds.
  - a. What percent of the total body weight is the weight of the antlers?
  
  - b. How tall are you?
  
  - c. Are you taller or shorter than the width of the antlers?
  
  - d. How much taller or shorter?
  
2. Most mammals take 330 million breaths and have 1.2 billion heartbeats in a lifetime. Smaller mammals tend to breathe more often and have faster heart rates than larger mammals.
  - a. Knowing this information, which animal would live longer than the other?

Shrew	Heartrate = 800 beats per minute
Blue Whale	Heartrate = 20 beats per minute
  
  - b. How many times does a shrew's heartbeat in one day?
  
  - c. How long would it take for the whale's heart to beat the same number of times that a shrew's heart beats in one minute?
  
  - \*d. Using the above information approximate how long each animal would live.*

3. Here are the lengths of different fish that can be seen at the coral reef exhibit. Fill in the chart below with this information and then answer the questions that follow:

Milk Fish	46 cm	Batfish	41 cm
Foxface Rabbitfish	20 cm	Sweet Lips	61 cm
Clown Triggerfish	25 cm	Sharpnose Puffer	8 cm

Milk Fish																			
Foxface Rabbitfish																			
Clown Triggerfish																			
Batfish																			
Sweet Lips																			
Sharpnose Puffer																			

Length in centimeters (each grid line represents 4 cm)

- The Batfish is how many times longer than the Sharpnose Puffer?
  - If you laid one of each fish end to end, what would the total length be?
  - What is the average length of this group of fish?
  - What is the difference between the largest and smallest fish?
- \*e. One inch is approximately 2.5 centimeters. About how long in inches is the longest fish?*
4. The average mouse is 4 inches long and weighs about one ounce. The average squirrel is 8 inches long and weighs eight ounces.
- How many squirrels would it take to equal the length of 20 mice?
  - The squirrel weighs one ounce per inch of length. How much does the mouse weigh per inch of length? Express your answer as a decimal.
  - Which weighs more per inch of length, the mouse or the squirrel?

1. There is an almost circular path around the Northern Trail. If the distance from the northernmost point of the trail to the southernmost point is 0.24 miles, give a good estimate for the length of this path. (Remember  $C = \pi D$ , where  $C$  is the circumference and  $D$  is the diameter. You can use 3.14 for  $\pi$  if you do not have a calculator with a  $\pi$  key.) Round your answer to two decimal places.
  
2. There are four saltwater exhibits in Discovery Bay. The Shark Reef, Dolphin Lagoon, Tide Pool and Estuary have approximately 1.2 million gallons of water in total.
  - a) If the Estuary Pool is only 0.5% of the total, how many gallons of water does it have?
  
  - b) To keep the amount of salt in the water at the proper concentration, the zookeepers add a powdered chemical called "Instant Ocean<sup>®</sup>". For every two hundred gallons of water they add one box of Instant Ocean<sup>®</sup>. How many boxes of Instant Ocean<sup>®</sup> would the zookeepers need for the Estuary Pool? Show your work.

3. The cottontail rabbit, sawhet owl and flying squirrels shared an exhibit in the nocturnal part of the old Minnesota Trail. The exhibit measured six feet from the window to the back of the exhibit and nine feet long. There was a mirror on the right side of the exhibit to make it appear larger.



cottontail rabbit



sawhet owl



flying squirrel

- What was the actual area of this exhibit?
- What would the area of the exhibit been as seen in the mirror?
- What was the perceived perimeter of the exhibit?



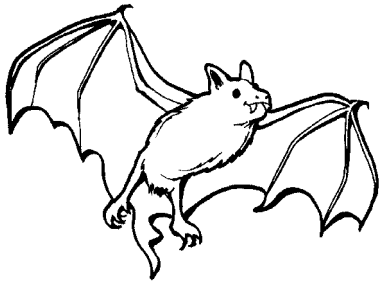
4. The Komodo Dragon is the largest living lizard on the planet. This species lives in Indonesia where the daytime temperature can reach  $122^{\circ}\text{F}$  and the evening lows get down to  $72^{\circ}\text{F}$ .

- What is the temperature range for the dragon's natural habitat?
- The temperature on the Tropics Trail is set for  $72^{\circ}\text{F}$ . On sunny days the temperature can increase as much as 8%. What would the temperature be on a sunny day? Round you answer to the closest whole number.
- The water in the pool of the Komodo Dragon exhibit is  $88^{\circ}\text{F}$ . How much warmer is the water temperature than the air? Express your answer as a percentage.

**Feeding Animals at the Zoo: Grades 5-6      Name:**

The natural habitat of the Greater Indian Fruit Bat (also called the Indian Flying Fox) is in India, Pakistan, Myanmar and Sri Lanka. In the wild, it feeds on juice from fruits such as mangos, bananas, papayas, figs, sapotes and guavas. If you were a zookeeper this is one possible menu you might use in the preparation and feeding of the bat colony:

Fruit Bat Menu



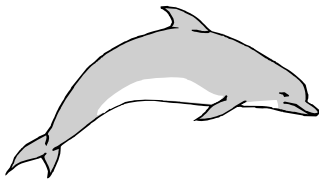
dry primate biscuit	1300g
cut oranges	1500g
peach nectar	3 ½ cans
A-Z vitamin, crushed	(½ tsp or ¼ tbsp)
vitamin E liquid	(add in AM, two pumps)

(the above amount feeds 20 bats per day)

1. Write the amount of peach nectar and A-Z vitamin used in decimal form. Label each decimal answer with the food name.  
(example: 2 ¼ c. apples = 2.25 c. apples)
  
2. Note the amount of dry primate biscuit and cut oranges in the menu. If these two foods come in 10 kilogram (kg) packages, what per cent of the whole package would the zookeeper use in one day? Show your work and label answers for each food.

3. The colony of fruit bats has dramatically increased in size! It has gone from 20 bats to 60 bats.
- Using estimation, what would be a reasonable answer for the amount of peach nectar needed to feed sixty bats?
  - Use your calculator to design a menu for this colony of sixty bats.
4. a. What operation (+, -, x, divide) would you use to determine how much food it would take to feed 60 bats instead of 20? \_\_\_\_\_
- b. Use more than one computation method to solve this problem. Show your work for each method below. Use the oranges as an example.

*\*5. You must present your menu for the larger colony of bats to a class of 7th grade students visiting the Zoo. Design a chart with pictures for each food or ingredient. It should make an attractive, eye-catching display to illustrate how zookeepers design and prepare menus for their animals.*



1. The bottlenose dolphin's powerful up and down motion of its tail flukes propel it through the water. It can travel at speeds up to 20 mph.

a. At this rate, how far could it go in 45 minutes?  
2 Hours?

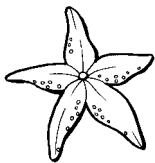
b. How long would it take for the dolphin to travel 35 miles at top speed?

\*c. *How long would it take a dolphin to swim through the Gulf of Mexico from St. Petersburg, FL to Key West, FL? (Start by using an atlas or class map and estimate the distance between these cities.)*

2. In the past, dolphins have tricked researchers into thinking they are much faster, keeping pace with navy ships going about 48 mph. They do this by riding the bow waves of the ships. The bow wave is created in the front of a boat or ship as it moves through the water. The dolphin can glide along, not needing to swim, in the pressure wave created by the boat's forward motion.

a. A dolphin rides the bow wave of a ship for 36 miles. How long does the trip take?

b. During a 64 mile trip, a dolphin rides a bow wave for 24 miles and swims alone for the remaining miles. How long does its trip take?  
Show your work.

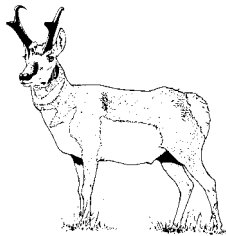


3. A sea star moves about 6 inches a minute. Complete the following table.

_____ 6	inches a minute
_____	inches an hour
_____	feet an hour
_____	miles per hour (1 mile = 5280 feet)
	(express as a decimal)



4. The fastest animal in the world is the cheetah, which can run up to 70 mph in short spurts. The pronghorn antelope is the fastest animal in North America and at the Minnesota Zoo. In bursts, it can go 60 mph.



a. At this rate how far would the pronghorn travel in 2 minutes?

b. It can maintain a speed of 45 mph for four miles. How long would this take?

5. Is it true that some animals have uniforms? Some species of wrasse have black or electric blue stripes that are signs of their profession. Their job is to remove annoying parasites that irritate the skin, mouth and gills of larger fishes. Their payment is to eat the parasites! One cleaner wrasse treated 300 fish in six hours! In comparison, a dental hygienist might clean the teeth of twelve human patients in one hour.

a. How many more clients can the wrasse serve than the hygienist in an hour?

*\*b. How many hygienists would be needed to serve 300 clients in 6 hours?*



6. The sloth is the slowest mammal, traveling only 5.2 feet per hour, or one mile in 42 days! However, it is much faster in trees, reaching speeds of 1.25 miles per hour.

a. How far could the sloth travel in twelve hours at its ground speed?  
Express your answer in feet.

b. If it traveled through trees, how far could it travel in twelve hours?  
Express your answer in miles.

*\*c. Give the answer to part (a) in miles, to the nearest hundredth.*

Tropics Trail

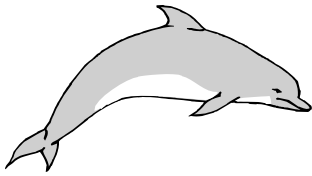
1. A treat for the sun bear includes  $\frac{3}{4}$  cup of raisins and 1 cup of frozen crickets.
  - a. What fraction of this bear's diet is made up of raisins?
  
  
  
  
  
  
  
  
  
  
  - b. The keepers sometimes hide food in parts of the exhibit to keep the bear active. Look at the exhibit. Where might they hide the food?

1. Gibbons are a type of ape with extremely long arms. They move through the tropical forest 100 feet above the ground by swinging from branch to branch.



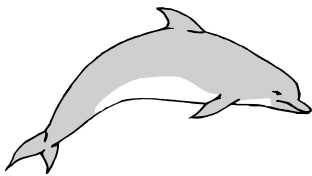
- a. The term for this type of movement can be found by the exhibit. See if you can find it. What is the word?
  
  
  
  
  
  
  
  
  
  
  - b. If one story in a typical building is ten feet high, how many stories off the ground do gibbons live in the wild?
  
  
  
  
  
  
  
  
  
  
  - c. With each swing a gibbon can travel as much as 30 feet. How many swings would a gibbon have to make to travel one mile? (1 mile = 5280 feet)
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3. Look at the sign for the Asiatic Tapir. The term *gestation period* means the length of time it takes a baby to develop inside its mother.
    - a. What is the tapir's gestation period?
  
  
  
  
  
  
  
  
  
  
    - b. The tapir's gestation period is what percent of a human's gestation period?

Discovery Bay



4. Each dolphin receives a different amount of fish every day. Let's say the amounts for 4 Atlantic bottlenose dolphins are 26, 35.5, 15 and 25 pounds of fish.

- a. Can you name of our Atlantic bottlenose dolphins?
- b. What is the range for the amount of food given to the dolphins in pounds?
- c. What is the mean amount of food fed to the dolphins?
- d. Why do you think they get different amounts? Which dolphin do you think would receive the most food? Why?



5. Choose one bottlenose dolphin to watch. Work with a partner. Record what the dolphin is doing every thirty seconds for five minutes by marking the ethogram below. Use a tally mark (/).

Behaviors	:00	:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
Swims alone											
Swims with other dolphins											
Rests at surface											
Fight/ play											

- a. What was the most popular activity?
- b. What was the second most popular activity?
- c. What was the most interesting thing you observed your dolphin doing?

## Zoo Visit: Grades 5-6 continued

### Minnesota Trail

6. Find the bull snake and rattlesnake exhibit. There are four bull snakes at the zoo. Each bull snake receives 170 grams of mice at a feeding. Each mouse weighs about 100 grams. From April through October they eat every other week and from November through March they only eat once a month.

a. How many whole mice would the zoo need in July to feed all the bull snakes?

b. How many whole mice would the zoo need this month to feed the bull snakes?

*\*c. How many whole mice does the zoo need in a year to feed the bull snakes?*

7. A rattlesnake adds a ring to its tail every time it sheds its skin. Count the rings on our rattlesnake's tail.

a. How many times has it shed its skin?

b. If it sheds an average of two times a year, how old is our rattlesnake?

c. This rattlesnake is 18 years old. How many rings have accidentally broken off its tail?

### Northern Trail / Monorail

8. The non-stop narrated ride on the monorail takes approximately 25 minutes and is one and a quarter miles long.
  - a. There are three monorail trains at the Zoo. If all three trains are out on one day, and each train takes five trips, how many minutes in total are the monorails run on that day?
  - b. Find out how many cars there are on each train. If each car holds approximately sixteen people, how many people can ride on one train?
  - c. How many people would be carried for the entire day using the information from part (a)?

Animal Shapes, Sizes and Weights

1.
  - a)  $60 / 1200 = 6 / 120 = 0.05 = 5\%$
  - b) Answers will vary.
  - c) Answers will vary.
  - d) Answers will vary.
2.
  - a) The blue whale would probably live much longer than the shrew.
  - b)  $800 \text{ beats per minute} \times 60 \text{ minutes per hour} \times 24 \text{ hours per day} = 1,152,000 \text{ beats per day}$
  - c)  $800 \text{ beats} / (20 \text{ beats per min}) = 40 \text{ minutes for whales' heart to beat 800 times}$
  - d)\* *Each animal has approximately 1.2 billion heartbeats in a lifetime,*  
 for the shrew:  $1.2 \times 10^9 \text{ beats} / 1,152,000 \text{ beats per day} = 1042 \text{ days}$   
 or  $1042 \text{ days} / 365 \text{ days per year} = 2.85 \text{ years}$   
 for the whale:  $20 \text{ beats per min} \times 60 \text{ min per hour} \times 24 \text{ hours per day} = 28,800 \text{ beats per day}$   
 $1.2 \times 10^9 \text{ beats} / 28,800 \text{ beats per day} = 41667 \text{ days}$   
 or  $41667 \text{ days} / 365 \text{ days per year} = 114 \text{ years for the whale}$

(There have been blue whales whose age has been estimated between 80 to 100 years. It is not unreasonable to assume that a blue whale could potential live to be 114 years old if it were not disturbed by illness or other negative factors.)

3. Check graphs
  - a. The Batfish is five (5) times longer than the Sharpnose Puffer.
  - b. 200 cm would be total length
  - c.  $(200 \text{ cm}) / 6 \text{ fish} = 33.3 \text{ cm}$  is average length of fish
  - d.  $61 \text{ cm} - 8 \text{ cm} = 53 \text{ cm}$  difference
  - \*e.  $61 \text{ cm} / 2.5 \text{ cm per inch} = 24.4 \text{ inches long}$
4.
  - a.  $20 \text{ mice} \times 4 \text{ inches per mouse} = 80 \text{ inches}$ ;  $80 \text{ inches} / 8 \text{ inches per squirrel} = 10 \text{ squirrels}$
  - b.  $1.0 \text{ oz} / 4 \text{ inches} = 0.25$  or  $\frac{1}{4} \text{ oz per inch}$
  - c. The squirrel weight more per inch of length (0.75 oz more per inch)

Zoo Exhibit Design

1. Diameter (D) = 0.24,  $3.14 \times 0.24 = 0.75$ , so the path is about  $\frac{3}{4}$  of a mile in distance.
2.
  - a.  $1.2 \text{ million gallons} \times 0.005 = 6000 \text{ gallons in estuary}$
  - b.  $6000 \text{ gallons} / 200 \text{ gallons per box} = 30 \text{ boxes of Instant Ocean}$
3.
  - a. Actual area is  $6 \text{ ft} \times 9 \text{ ft} = 54 \text{ sq. ft.}$
  - b. Still 6 feet wide but 18 feet long
  - c. perceived perimeter :  $6+6+18+18 = 48 \text{ feet}$
4.
  - a.  $122^\circ\text{F} - 72^\circ\text{F} = 50^\circ\text{F}$
  - b.  $72^\circ\text{F} \times 0.08 = 5.76^\circ\text{F}$ ,  $72^\circ\text{F} + 5.76^\circ\text{F} = 78^\circ\text{F}$  (rounded off)
  - c.  $88^\circ\text{F} - 72^\circ\text{F} = 16^\circ\text{F}$ ,  $(16^\circ\text{F} / 88^\circ\text{F}) \times 100 = 18\%$

Feeding Animals

1.
  - a.  $3 \frac{1}{2} \text{ cans of peach nectar} = 3.5 \text{ cans of peach nectar}$
  - b.  $\frac{1}{2} \text{ tsp. of A-Z vitamin} = 0.5 \text{ tsp. of A-Z vitamin}$
  - c. OR  $\frac{1}{4} \text{ tbsp. of A-Z vitamin} = 0.25 \text{ tbsp. of A-Z vitamin}$
2.
  - a. For dry biscuit - would use 13% in one day  $[(1.3 \text{ kg} / 10 \text{ kg}) \times 100]$
  - b. For oranges - would use 15% of bag in one day  $[(1.5 \text{ kg} / 10 \text{ kg}) \times 100]$
3.
  - a. About  $10 \frac{1}{2} \text{ cans of peach nectar}$
  - b. Biscuit =  $1300 \text{ g} \times 3 = 3900 \text{ g}$   
 Oranges =  $1500 \text{ g} \times 3 = 4500 \text{ g}$   
 Peach nectar =  $3.5 \times 3 = 10.5 \text{ cans}$   
 A-Z vitamin =  $0.5 \text{ tsp.} \times 3 = 1.5 \text{ tsp.}$  or  $0.25 \text{ tbsp.} \times 3 = 0.75 \text{ tbsp.}$   
 Vitamin E liquid =  $2 \text{ pumps} \times 3 = 6 \text{ pumps}$
4.
  - a. Multiplication
  - b. Answers will vary. Teacher will need to check for accuracy.

\*5. Extension question - teachers discretion

### Animal Speed

1.
  - a. 15 miles in 45 min, 50 miles in 2.5 hours.
  - b. 1 3/4 hours or 1 hour and 45 minutes
  - c. It is about 250 miles,  $250 \text{ miles} \div 20 \text{ mph} = 12.5 \text{ hours}$
2.
  - a. 0.75 hours or 45 minutes
  - b. It went 24 miles at 48 mph, so that took 1/2 hour. It went the remaining 40 miles at 20 mph, so that took 2 hours. 2 1/2 hours total.
  - \*c. Answers will vary depending on map used and method of estimation.
3. 360, 30, 0.006
4.
  - a. 2 miles
  - b.  $4 \text{ miles} / 45 \text{ mph} = 0.09 \text{ hours}$ ,  $0.09 \text{ hours} \times 60 \text{ min. per hour} = 5.4 \text{ minutes}$ , or about 5 minutes
5.
  - a.  $300 \div 6 = 50 \text{ fish in an hour}$ ,  $50 - 12 = 38 \text{ more clients!}$
  - \*b. *12 clients in 1 hour, so  $12 \times 6 = 72 \text{ clients in 6 hours}$ ,  $300 \div 72 = 4.166666$ . You would need more than 4 hygienists; you would round up to 5 hygienists!*
6.
  - a.  $5.2 \text{ feet} \times 12 \text{ hours} = 62.4 \text{ feet}$
  - b.  $12 \text{ hours} \times 1.25 \text{ mph} = 15 \text{ miles}$
  - \*c.  $62.4 \text{ feet} \div 5280 \text{ feet} = 0.01 \text{ miles}$

### Zoo Visit

1.
  - a. Total food = 7/4 of a cup,  $[(3/4) / (7/4)] = [(3/4) \times (4/7)] = 3/7$  of total
  - b. In notches of the tree, corners of the exhibit, answers will vary.
2.
  - a. Brachiation
  - b.  $100 \text{ feet} / 10 \text{ feet per story} = 10 \text{ stories high}$
  - c.  $5280 \text{ feet per mile} \div 30 \text{ feet per swing} = 176 \text{ swings per mile}$
3.
  - a. 13 months
  - b.  $13 / 9 = 1.67$ ,  $1.67 \times 100 = 167\%$ , therefore tapirs' gestation is 167% of humans.
4.
  - a. Semo, Rio, Ayla and DJ
  - b. Range is  $35.5 - 15 = 20.5 \text{ pounds}$
  - c. Mean amount =  $(15 + 25 + 26 + 35.5) / 4 = 101.5 / 4 = 25.4 \text{ lbs.}$
  - d. Sample: they are different sizes so therefore the larger dolphins would need bigger amounts than the smaller dolphins, also nursing mothers (like Rio) need more food to provide for their calves.
5. Answers will vary for all parts of question.
6.
  - a.  $4 \text{ snakes} \times 2 \text{ feedings/month} \times 170 \text{ grams mice per snake} / [100 \text{ grams per mouse}] = 13.6$  mice or almost 14 mice for July
  - b. Answers will either be same as above or half as much, exactly 6.8 or almost 7 mice (from November through March)
  - c.  $(5 \times 6.8) + (7 \times 13.6) = 129.2$  mice for the year
7. Answers will vary for all parts.
8.
  - a.  $3 \text{ trains} \times 5 \text{ trips per train} \times 25 \text{ minutes per trip} = 375 \text{ minutes total time}$
  - b. Six cars on monorail,  $6 \text{ cars} \times 16 \text{ people per car} = 96 \text{ people total}$
  - c.  $3 \text{ trains} \times 5 \text{ trips per train} \times 96 \text{ people per trip} = 1440 \text{ people}$