MINNESOTA ZOO®

EXHIBIT DESIGN

Grades 7–12

NAME_____

Directions: Answer the following questions using the information provided. Show your work. If additional space is needed, please attach a separate piece of paper and correctly identify the problem it correlates to. If you are creating a table or graph, be sure to include titles and labels.

1) Suppose that the outdoor exhibits on the Northern Trail are laid out in the shape of rectangles of varying sizes. The enclosure that exhibits both the bison and the pronghorn together is 3.7 acres. There are six bison and four pronghorn in this exhibit. Use this information to answer the following questions:

a) How large is this enclosure in square miles? Round your answer to the thousandths place.
(1 square mile = 640 acres)

b) Using your answer from part (a), determine the amount of fencing required to completely enclose this exhibit. Draw a picture to help you. (Remember: the enclosure is a rectangle or a square.) Express your answer in miles and feet. Use two decimal places where necessary.
(1 mile = 5280 feet)

c) Let "b" represent the combined weight of the bison in pounds and let "p" represent the combined weight of the pronghorn in pounds. Assume that each animal requires 0.0003 acres per pound of weight. Express this information in an algebraic equation to determine the total number of acres required for this exhibit. Let "t" represent the total number of acres, even though we know the actual value.

d) Now use 3.7 acres and an average bison weight of 1800 lb. to determine the combined weight of the pronghorn. Round your answer to the closest whole number.

e) If each pronghorn in the exhibit only weighs 120 pounds, how many more pronghorn could comfortably fit in this exhibit? Round up to the nearest whole number.

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2) The moat and waterfall in the Amur Tiger exhibit contain 90,000 gallons of water at any given moment. The water is pumped at a rate of 240 gallons per minute.

a) How many minutes does it take to completely recycle the entire amount of water?

b) Express your answer from part (a) in both hours and days. Round answers to two decimal places.

c) A chemical agent called Aquashade® is added to the water to inhibit the growth of algae. It is only required in an amount of 1 part per million. How much of this agent is required for a single dose? Express your answer in exponential form.

d) Aquashade® is sold in a 3 gallon bottle and a 4 gallon bottle. It expires 12 months after the initial bottling date and must be disposed. If the keepers need to add 1 part per million every second week, how much of this agent will they actually need in one year? Which bottle would be the wiser purchase and why?

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3) Komodo dragons are the largest living lizards on earth. They come from Indonesia and are an endangered species. In their natural habitat these lizards experience temperatures ranging from 122°F during the day down to 72°F in the evening. In their habitat at the zoo there is an artificially constructed log that is kept heated by special coils. There is also a heated pool of water, and a "shady" area in the exhibit that is kept at the natural low evening temperature.

a) In Indonesia the metric system is used, where temperature is measured in degrees Celsius. Determine the difference between the daytime high and the evening low temperatures. Convert your answer into Celsius. You will need to use this formula: °C = (5/9) X (°F - 32).

b) The pool of water is heated to 26°C. What is this value in degrees Fahrenheit? Round your answer to one decimal place.

c) Assume the power failed temporarily during a storm. The log would have to be reheated from a temperature of 69°F at a rate of 1.2° Celsius per hour. How long would it take to get up to 122°F? Express your answer in hours and minutes.

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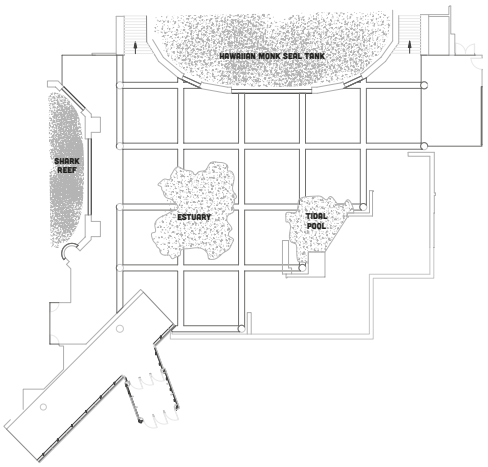
4) Discovery Bay contains four large saltwater exhibits listed below:

Tide Pool -	6,000 gallons
Estuary -	7,000 gallons
Shark Reef -	218,000 gallons
Monk Seal Habitat-	910,000 gallons



In nature, seawater contains roughly 3.5 % dissolved minerals or "salts." The zoo must also maintain this percentage in order to keep all the inhabitants of the saltwater exhibits healthy.

a) What percentage of the total amount of saltwater in these four exhibits does the Monk Seal Habitat represent? Round your answer to the nearest whole number.

b) What is the total amount of dissolved salts present in all four exhibits? In the Hawaiian Monk Seal Habitat only? Express your answers in gallons.

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c) The Minnesota Zoo uses a synthetic salt mixture, Instant Ocean®, to create the proper salinity level in the exhibits. One cup of Instant Ocean® is used for every two gallons of water. How many cups of Instant Ocean® would it take to make the saltwater in the Shark Reef?

d) Instant Ocean® is packaged in sixty-four pound boxes. Each box makes two hundred gallons of saltwater. It costs nine cents per pound. Assume we are making the saltwater for all four tanks as if they were empty. How many boxes would it take to fill the exhibits? How much would it cost to create the total amount of seawater for all four tanks?