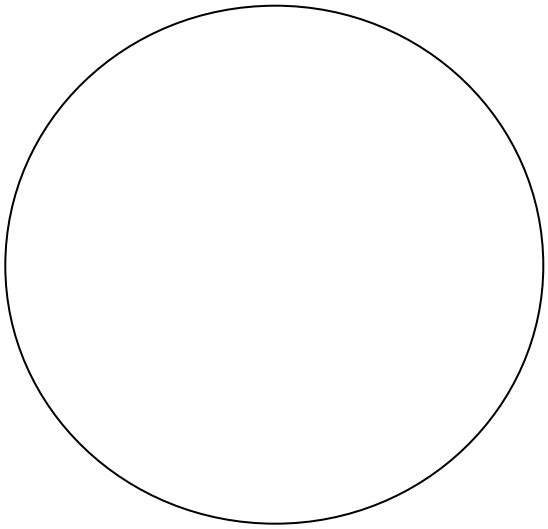
Name: _____ **Lab Sheet A**
Date: _____ **Population Sampling**

Calculating the Population Density

Introduction: *Dr. Bowser's team dives beneath the ice in Antarctica to study foraminifera. Scientists are interested in the* ***population****, or the number of organisms of the same species that live in the area. They also try to calculate the* ***population density****, or the number of individual organisms that share the same living space. Since Dr. Bowser can't count each foraminifera that lives in specific areas near Explorers Cove, he must rely on a method called* ***population sampling*** *to estimate the number of foraminifera in the area. Dr. Bowser takes several core samples from the bottom of the ocean in an area about the size of our gym. The core sample has an opening about the size of an orange juice can. This skittle core lab will give you an idea of what Dr. Bowser does in Antarctica, and why core samples are important for his research. The different colored skittles represent different species of foraminifera.*

1.) Finding the Area of the Core Sample:

A. Draw the **diameter** across the center of the orange juice can (below) and **record the diameter** and **the radius** to the **nearest centimeter** on the lines provided. This is the size of the **core sample**.



B. Diameter: _____ cm **Radius**: _____ cm
(radius= half the diameter)

C. What is **the formula** to find the **area of a circle**? **Area =** _____

D. Find the area for this circle (**core sample)**

A= _____
A= _____ **sq. cm**

Why do you think it is important for Dr. Bowser to know how many foraminifera live in an area? _____
_____
_____

2.) Sample Area:

A. In order to estimate how many foraminifera could be in the sampling area, you must first compare the area of the sample size to the area of the whole cake.

- **Area** of **core sample**: **A=** _____ (Refer back to **1D**)

(Area of a rectangle = Length x Width)

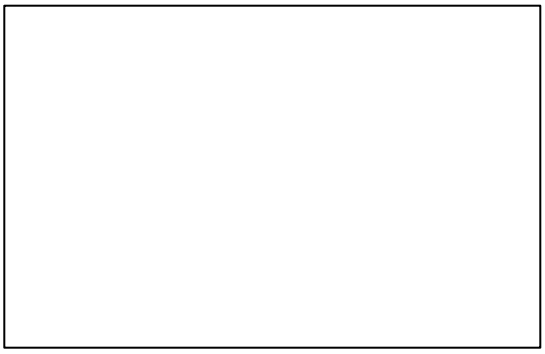
(***Length*** of cake: _____ cm; ***Width*** of cake: _____ cm)

- **Area** of the **whole cake**: **A=** _____ sq. cm

B. Next, we need to ***find out how many times bigger the whole cake is than the core sample***. We find this "**factor"** by dividing the **area of the cake** by the **area of the core sample.**

_____ , _____ **= ____ (factor),** therefore the cake is **____** times bigger than the core sample. This factor will be needed in step 4 to help determine how many forams are in your whole cake.

3.) Core Samples: x,y coordinates: As each core sample is taken from your cake, please note and label these cores within the box to indicate the location of each core. Then work as a group to find the x, y coordinates of each core sample. Record the x,y coordinates for "your" sample core on the lines provided. Don't forget to identify your core sample #.



X = _____cm (across)

Y = _____ cm (up)

Sample # ____= (_____ , _____)

4. (a) Each student will collect and **record data** from their core. **(b.)** Then **find the %** for each species**. (c.) F**ind the **estimated number of each foram species in the cake** by multiplying the **factor** (Step 2B) times the number for each foram species found in the core sample.

Colors	Representative Foraminifera Species	# in Core	%	Estimate (cake)
Red	*Astrammina rara*			
Yellow	*Pyrgo peruviana*			
Green	*Crithionina delacai*			
Orange	*Cornuspira antarctica*			
Purple	*Notodendrodes hyalinosphaira*			
	Total:			

Summary: Work as a team and compare the six core samples in your cake.

5.) Using Statistics to Understand the Science: Record the number of "forams" found in each core sample in your cake to find the total number of "forams" in your area (whole cake). Then calculate the **mode, median, and mean** for each.

	(Core Samples: 1-6)							(Statistics)		
Foram Species	**__1**	**__2**	**__3**	**__4**	**__5**	**__6**	**Total**	**Mode**	**Median**	**Mean**
Red										
Yellow										
Green										
Orange										
Purple										
Total								XXX	XXX	XXX

6.) Using this data, find the average (mean) number of "foram" specimens per core. Use the chart above, and then divide the "Total" specimens per cake by number of cores.

_____ ÷ _____ = Average # _____ per core

7.) Why do you think it is important for scientists to take more than one core sample in an area? _____
_____
_____

8.) What are the limiting factors (biotic or abiotic) that could affect the foraminifera in Explorers Cove, Antarctica?

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

9.) Why do you think it is important for Dr. Bowser to take core samples from the same areas from one year to the next? _____

_____

_____

10.) Dr. Bowser collects core samples from an area about the size of the gym. Use your data from the "Skittle Core Activity" to help you better understand how calculations could help Dr. Bowser estimate the population of foraminifera in specific regions on the ocean floor in Explorers Cove, Antarctica. **Make a prediction** and **record** on line below.

- Based on data from your core samples, **how many foraminifera do you think would fit into an area the size of the gym?** _____

Refer back to the first page (**1D**) to find the area of the core sample.

10a.) The area of the core sample is _____ sq. cm

Next, find the area of the Gym Floor: (Area = Length x Width), Remember to convert meters to centimeters.

L= _____cm; W= _____cm; (Round to nearest cm)

10b.) Area of the Gym Floor = _____ sq. cm

10c.) Number of *Core samples that would fit into the gym* = _____

(Calculate how many core samples could fit in the gym by dividing the area of the gym floor by the area of the core sample.) *This information will be needed for step 11*.

11.) Record the "M**ean"** (**Step 5)** and the **"Population"** for each species on the chart below. To estimate the **population of forams** in this area, ***multiply the* mean** by the ***number of core samples that would fit into the gym*** (Refer back to **10 c**)

Colors	Representative Foraminifera Species	Mean	Population
Red	*Astrammina rara*		
Yellow	*Pyrgo peruviana*		
Green	*Crithionina delacai*		
Orange	*Cornuspira antarctica*		
Purple	*Notodendrodes hyalinosphaira*		
	Total Population Sampling for these five species.	XXX	

12.) To **find the population density** for these forams, **divide the total population sampling** (from the chart in step 11) by the **area of the gym floor (Refer back to 10 b)**. The population density for these five foram species per sq. centimeter = _____.

Population density helps scientists determine if organisms are clustering (clumping) together. Record and compare the difference between the population and population density:

Total Population (number of forams) in the gym: _____

Population Density of forams per square cm in the gym: _____

Population and Population density show two different things. **Population** tells how many live in the area, while **population density** tells how many live per square unit of space. Think about this: If you took 30 students in your classroom and put the same population in the gym, the population would stay the same, but the living space (population density) would change.