

## **Sea-less gulls: Only a nuisance at the local Walmart or equal opportunity annoyers?**

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### **Background/Special Circumstances**

This Problem-Based Learning unit was designed to fit within an existing year-long, interdisciplinary, PBL, Inquiry, STEM initiative for the 7<sup>th</sup> grade at Colonial Heights Middle School. The presentation skills and life science portions of this unit are integral to the larger STEM initiative. The problem addressed by this unit, using the Hummingbird Robotics Kits, complements the larger STEM initiative. The STEM initiative is entitled “See Less Sea-Less Seagulls” and includes interdisciplinary research and activities in 7<sup>th</sup> grade Math, Science, and English classes culminating in student groups designing plans for the repurposing of a 63 acre brownfield that is the location of a former landfill in Colonial Heights, VA. Goals for the designs are to encourage native species, discourage the seagulls attracted by a nearby open landfill, and provide for human use of the area.

### **Problem**

Is the abundance of seagulls in the shopping area of a community located 100 miles from the ocean a local problem that should be addressed or just a typical amount for the region? The local government needs data to decide if action is advisable.

### **Lesson Summary**

Students will work in groups of three or four serving as employees of engineering firms who will design and build robotic data collection devices to count seagulls in various locations for specific periods of time. They will present and demonstrate their devices to their teacher(s) and classmates. The students will analyze simulated data by constructing a histogram.

### **Major Topic and SOL**

Math SOL (2009)

7.5b, 7.11

Science SOL (2010)

LS1a, LS1d, LS1e, LS1i, LS1j, LS8, LS 9, LS11b, LS12b, LS12c, LS12d, LS12e

Language Arts SOL (2010)

7.1, 7.2, 7.3

### **Length of Time**

Students must complete the presentation skills and life science portions of the unit before working on the problem and solution working with the Hummingbird Robotics Kits.

**STEM Oral Presentation Performance - Knowledge and Skills  
(Language Arts)**

6 hours spread over 4 – 9 weeks (See Potential Lesson Schedule.)

**Life Science – Estimating Populations**

4 – 90 minute block days = 6 hours = 360 minutes

**Math (Engineering Design Task with Hummingbird Robotics Kits and Data Analysis)**

5 – 90 minute block days = 7.5 hours = 450 minutes

**Student Objectives**

**STEM Oral Presentation Performance – Knowledge and Skills (Language Arts)**

- Students will be able to **identify** the terms and definitions used to critique oral presentations performances.
- Students will be able to **describe** the characteristics of effective oral presentations performances.
- Students will be able to **critique** oral presentations performances for strengths and weaknesses using appropriate and positive terms.
- Students will be able to **deliver** effective oral presentations performances from a script.
- List the student objectives here.

**Life Science – Estimating Populations**

- Students will be able to define, explain and give examples of competition and cooperation
- Students will be able describe relationships that involve producers, consumers, decomposers, predators, prey, symbiosis, and niches in food webs, especially local examples.
- Students will be able to analyze graphs that show population estimates.
- Students will be able to compare and contrast habitats with and without human activity.
- Students will be able to explain how limiting factors affect a population.
- Students will be able to name and describe four methods of estimating a population in its natural habitat.
- Students will be able to sample and estimate a population with a quadrat.
- Students will examine indirect evidence of an organism (owl pellet) and draw conclusions about the numbers of that organism and the food web.
- Students will be able to dissect an owl pellet, reconstruct the skeleton of the prey eaten and draw conclusions about the ecosystem where the owl lives.

**Math (Engineering Design Task with Hummingbird Robotics Kits and Data Analysis)**

- Students will be able to properly connect single LED lights and the distance sensor to the Hummingbird Robotics controller, and connect the controller to a computer via the USB Cable.

- Students will be able to use the Create Lab Visual Programmer software, with the assistance of the teacher to code expressions for the LED lights and a simple sequence using the distance sensor to trigger the LED light expressions.
- Students will be able to estimate the minimum length, width, and height needed to make a rectangular prism that can house the parts of the Hummingbird Robotics Kits needed to make the “Critter Counter” prototype device.
- Students will be able to construct a pattern for a rectangular prism that fits within certain size parameters, by creating a NET for the prism.
- Students will be able to use a NET for a rectangular prism to construct their “Critter Counter” prototype device.
- Students, with teacher assistance, will be able to test their “Critter Counter” device, troubleshoot, and resolve any malfunctions.
- Students will be able to calculate the volume and surface area of their “Critter Counter” device.
- Students will be able to demonstrate and present their “Critter Counter” devices to the class and justify how their design would fit in to the placement on top of a work truck without looking “out of place”.
- Students will be able to construct a histogram for teacher supplied data, and use this to determine if the data for the Colonial Heights location differs enough from other area locations to warrant further action by the City Government.

### 21<sup>st</sup> Century Skills

- Critical-Thinking and Problem Solving
- Communication
- Creativity and Innovation
- Collaboration
- Information and Media Literacy
- Contextual Learning

### Assessment Evidence

#### STEM Oral Presentation Performance – Knowledge and Skills (Language Arts)

- **PRE-ASSESSMENT:**
  - Distribute to all students a resource titled, **KWL Chart**
  - Ask students to title it “Oral Presentation Performances” and to complete the “K” and “W” sections of the chart.
  - Circulate room as students work to observe/take notes of students’ accuracy and levels of completion.
  - Lead a whole class discussion and record correct responses from students onto a very large KWL chart that all students can see. (Suggestion: use an interactive white board so that during each class, the KWL chart and responses may be saved easily for later use. Open each saved file again at the end of the unit when students are asked to complete the “L” column of the chart.)
  - Tell students to file KWL chart in their binders because they will use it again at the end of the unit.

- **FORMATIVE ASSESSMENT:**
- **Declarative Knowledge of Oral Presentation Terms and Definitions**
  - Distribute to all students a resource titled **“Oral Presentation Performance Rubric”** Discuss the vocabulary and meanings found on the rubric. Demonstrate examples as needed. Repeat during multiple class meetings as needed.
  - Explain to students that in order to assess their declarative knowledge of oral presentation performance terms and definitions, they will have a choice:
  - Take the **“Quiz on Oral Presentation Performance Terms and Definitions”** or
  - Create an original mini-project that will demonstrate understanding of oral presentation terms and definitions. Students may create a poster, flipbook, or use another medium pre-approved by the teacher. Distribute to interested students the resource titled **“Alternative Assessment of Oral Presentation Performance Terms and Definitions Rubric”** Discuss the rubric with students. Use it to evaluate the mini-projects.
- **SUMMATIVE ASSESSMENT:**
  - Students give their presentation performances before the entire class. Teacher evaluates each student using the **“Oral Presentation Performance Rubric”**
  - Distribute to all students a resource titled **“Oral Presentation Reflection”** and tell them to follow the directions, or ask students to write reflections in their **Writer’s Notebooks** in response to the following prompt: “Discuss your strengths and weaknesses when performing oral presentations? What will you do to improve your weaknesses?”
  - Ask students to complete the “L” column of their **KWL charts** and submit them for a grading.

#### **Life Science – Estimating Populations**

- Students check their answers on the handouts and discuss results with the rest of the class.
- Teacher will assess the student knowledge with questions and sample problems during the population power point.
- Teacher uses rubric to grade owl pellet lab.

#### **Math (Engineering Design Task with Hummingbird Robotics Kits and Data Analysis)**

- “Critter Counter” device testing.
- Teacher uses rubric to grade presentation of the “Critter Counter” devices.

#### **Supplies/Materials/Technology**

##### **STEM Oral Presentation Performance – Knowledge and Skills – (Language Arts)**

- KWL Chart
- Oral Presentation Performance Rubric
- Quiz (and key) on Oral Presentation Performance Terms and Definitions
- Alternative Assessment of Oral Presentation Performance Terms and Definitions Rubric
- Live Volunteer Presenters (or Videos of Presentations)
- Presentation Scripts (each student will choose one)
  - “The Gettysburg Address”
  - “All the World’s a Stage”
  - “Farewell to Baseball Address”

-- “Friends, Romans, Countrymen”

- Oral Presentation Reflection
- Poem, “Annabel Lee” for Volunteer Presenters, if needed
- Oral Presentation Error Sheet
- Video cameras or student devices that include video capabilities – one camera for every two students.

### **Life Science – Estimating Populations**

*Lesson 1 Counting Populations \*\* means they are separate documents that are included*

- Life science textbook
- Computer with internet access
- Gizmo ecology lesson on food chains and population numbers  
<http://www.explorellearning.com/index.cfm?method=cResource.dspView&ResourceID=381&ClassID=2061656>
- Power point on estimating populations and note taking handout for the powerpoint\*\*
- AIMS census takers activity online download (2 dollars):  
<http://www.aimsedu.org/item/da1081/census-takers/1.html>
- Counting populations  
[http://www.biotopics.co.uk/newgcse/measuring\\_population\\_sizes.html](http://www.biotopics.co.uk/newgcse/measuring_population_sizes.html)
- Handouts (Bugs to count and data sheet) for Random Sampling AIMS Lesson (Census Takers)\*\*

*Lesson 2 Ecosystems and Owl Pellets (Three 90 minute lessons)*

- Study of owl pellets  
[http://www.rspb.org.uk/youth/makeanddo/do/pellet/why\\_study.aspx](http://www.rspb.org.uk/youth/makeanddo/do/pellet/why_study.aspx)
- Virtual lab: owl pellet  
<http://www.kidwings.com/owlpellets/flash/v4/index.htm>
- Rubric for grading owl pellet (First page of the handout for lab) \*\*
- Video on owl pellets  
<https://www.youtube.com/watch?v=FENowCc-A8M>
- Owl pellets (from Carolina Biological) 1 per 2 students
- Computer with internet access
- Dissecting kit (includes goggles) for owl pellet
- Gizmo ecology lesson on food chains and population numbers  
<http://www.explorellearning.com/index.cfm?method=cResource.dspView&ResourceID=381&ClassID=2061656>
- Elmer’s glue
- Cardstock
- Permanent markers
- Zip lock bags for storing owl pellet between classes
- Life Science Textbook
- Handout for discussion of interactions of organisms \*\*
- Handout for discussion of symbiosis \*\*

- Handout with instructions for the owl pellet lab \*\*
- Owl pellet video <https://www.youtube.com/watch?v=VL5yWF4bfG4>

**Math (Engineering Design Task with Hummingbird Robotics Kits and Data Analysis)**

- Hummingbird Robotics Kits (one per student group)
- At least one computer with Create Lab Visual Programmer Software (preferably one computer per student group)
- Hummingbird Kit website <http://www.hummingbirdkit.com/>
- One standard size poster board per group
- One inch or one centimeter grid paper
- Scissors
- Clear Tape
- “Critter Counters” handout
- A seagull “testing device”; use a meter or yardstick and attach two seagull cutouts at one end that will “flap” their wings when the stick is moved.
- Learning about Histograms handout
- Histogram Data
- Graph Paper
- Colored pencils
- Evaluation Rubric

**LESSON PLANS:**

**STEM Oral Presentation Performance – Knowledge and Skills (Language Arts) (Preparation for the Communication of Findings Portion of the Engineering Design Process):**

**OVERVIEW:**

Critiquing, performing, and writing an oral presentation require distinctive skills that should be learned and developed separately. The focus of this unit is to develop the knowledge and skills needed to critique an oral presentation and to perform an oral presentation. A follow-on separate unit in which students learn to critique, analyze, and write presentation scripts is recommended.

**PRE-ASSESSMENT:**

1. Distribute to all students a resource titled, **KWL Chart**
2. Ask students to title it “Oral Presentation Performances” and to complete the “K” and “W” sections of the chart.
3. Circulate room as students work to observe/take notes of students’ accuracy and levels of completion.
4. Lead a whole class discussion and record correct responses from students onto a very large KWL chart that all students can see. (Suggestion: use an interactive white board so that during each class, the KWL chart and responses may be saved easily for later use. Open each saved file again at the end of the unit when students are asked to complete the “L” column of the chart.)
6. Tell students to file KWL chart in their binders because they will use it again at the end of the unit.

**FORMATIVE ASSESSMENT:**

**Declarative Knowledge of Oral Presentation Terms and Definitions**

1. Distribute to all students a resource titled **“Oral Presentation Performance Rubric”**

Discuss the vocabulary and meanings found on the rubric. Demonstrate examples as needed. Repeat during multiple class meetings as needed.

2. Explain to students that in order to assess their declarative knowledge of oral presentation performance terms and definitions, they will have a choice:

A. Take the **“Quiz on Oral Presentation Performance Terms and Definitions”** or

B. Create an original mini-project that will demonstrate understanding of oral presentation terms and definitions. Students may create a poster, flipbook, or use another medium pre-approved by the teacher. Distribute to interested students the resource titled **“Alternative Assessment of Oral Presentation Performance Terms and Definitions Rubric”** Discuss the rubric with students. Use it to evaluate the mini-projects.

**Procedural Knowledge of Performing Oral Presentations**

1. “I Do.” As the teacher, give a sample oral presentation that includes multiple errors identified on the **“Oral Presentation Performance Rubric”** Refer to **“Error Sheet”** for suggestions. (Alternatively, show a prepared video of an oral presentation in which the presenter makes multiple errors.) Afterward, use the “think aloud” strategy and complete a rubric displayed on an interactive white board or a projector screen.

2. “We Do Together.” (Part 1) Assign students to small groups (3-5 students.) Distribute to each student a new copy of the **“Oral Presentation Performance Rubric”** Arrange for another oral presentation that includes multiple presentation errors. (Alternately, show a prepared video of an oral presentation.) Ask groups to discuss the presentation and to complete the **“Oral Presentation Performance Rubric”** Rotate among the groups to listen to their conversations and to redirect as needed. Lead a whole class discussion of the presentation and rubric ratings. Use an interactive white board or projector screen to show the scoring.

3. “We Do Together.” (Part 2) Distribute to each student a new copy of the **“Oral Presentation Performance Rubric”** Arrange for another oral presentation that is more polished than the previous presentations, but still has errors. (Alternately, show a prepared video that has fewer errors.) Afterward, ask students to score the presentation independently. Next ask students to share their scores with a partner. Tell students that their discussions should focus on the criteria and scores that are wide apart. Encourage students to change their scores if they change their minds during the discussions. Finally, conduct a whole class discussion of the scoring. Use an interactive white board or projector screen to show the scoring.

4. “You Do Alone.” Distribute to each student a new copy of the **“Oral Presentation Performance Rubric”** Arrange for another oral presentation that is more polished than early presentations, but still has errors. (Alternately, show a prepared video that has fewer errors.) Afterward, ask students to score the presentation independently. Collect the rubrics and grade for completion. Identify the students whose ratings do not reflect understanding. Provide conferences and/or additional support for those students.

### **Procedural Skills for Performing Oral Presentations**

1. Assign students to pairs (or trios, if necessary.)
2. Give each student two (three, if necessary) new copies of the **“Oral Presentation Performance Rubric”**
3. Ask students to select one of the following **Performance Scripts**
  - **“The Gettysburg Address”**
  - **“All the World’s a Stage”**
  - **“Farewell to Baseball Address”**
  - **“Friends, Romans, Countrymen”**
4. Explain to students that they will practice and then record their oral presentations skills while using the script selected. Explain that they will take turns performing and recording each other. Afterward, the students will work with the same pairs/trios to view and critique their recorded presentations using the **Oral Presentation Performance Rubric**

### **SUMMATIVE ASSESSMENT:**

1. Students give their presentation performances before the entire class. Teacher evaluates each student using the **“Oral Presentation Performance Rubric”**
2. Distribute to all students a resource titled **“Oral Presentation Reflection”** and tell them to follow the directions, or ask students to write reflections in their **Writer’s Notebooks** in response to the following prompt: “Discuss your strengths and weaknesses when performing oral presentations? What will you do to improve your weaknesses?”
3. Ask students to complete the “L” column of their **KWL charts** and submit them for a grading.

### **LESSON WRAP-UP:**

Display class **KWL Chart** from beginning of unit. Ask students to share what they have learned about oral presentations and write it in the L column. Lead a whole class discussion with students about their personal growth in their abilities to give and to critique oral presentations.

**POTENTIAL LESSON SCHEDULE : (STEM Oral Presentation Performance – Knowledge and Skills) (Language Arts) (Preparation for the Communication of Findings Portion of the Engineering Design Process):**

#### **Lesson 1: 15 minutes**

- **KWL chart**
- Whole class discussion and chart completion for “K” and “W” columns

#### **Lesson 2: 30 minutes**

- Distribute and discuss terms and definitions on **Oral Presentation Performance Rubric**.
- Demonstrate the different criteria named on the rubric.

#### **Lesson 2: 20 minutes**

- Review terms and definitions from **Oral Presentation Performance Rubric**.
- Announce date for **Quiz on Oral Presentation Terms and Definitions or Alternative Assessment (mini-projects.)**
- Distribute and explain **Alternative Assessment of Oral Presentation Performance Terms and Definitions Rubric**. Discuss options.



**Lesson 3: 10 minutes**

- Review terms and definitions from **Oral Presentation Performance Rubric**.
- Remind students of date for **Quiz on Oral Presentation Terms and Definitions or Mini-Projects**.

**Lesson 4: 10 minutes**

- Same as Lesson 3

**Lesson 5: 15 minutes**

- Students take **Quiz for Oral Presentation Terms and Definitions** or submit **mini-project**

**Lessons 6 – 9: 30 minutes each**

- “I Do” – teacher modeling
- “We Do Together” (Part 1) – small group work
- “We Do Together” (Part 2) – individual and pairs work
- “You Do Alone” – individual work.

**Lesson 10: 45 minutes**

- Script performance practice – videotaping and partner/trio analysis

**Lesson 11 - 13: 45 minutes**

- Script performances in front of entire class

**Lesson 14: 45 minutes**

- Students write self-reflection on oral presentation strengths and weaknesses using reflection form or Writer’s Notebooks.
- Students complete **KWL Chart** from beginning of unit and submit for grading.
- Teacher leads unit wrap-up by leading a whole class discussion about student growth in their abilities to give and to critique oral presentations.

**Life Science – Estimating Populations**

**Lesson 1: (1-90 minute class)    *Counting Populations***

- Show the Estimating Populations power point to guide a discussion. This would include why scientists would count a population. Project and share answers with the students. Students can write information in their notes. (See power point and handout for note taking)
- Use the AIMS (Activities Integrating Math and Science) activity for estimating a population. This technique uses a “quadrat” and averages.  
<http://www.aimsedu.org/item/da1081/census-takers/1.html>
- Students cut the “quadrat” out of the corner of the handout. This creates a picture frame for taking samples of the population of bugs. (Refer to Census Takers power point to demonstrate this)

- Quadrats are dropped 5 times at random to identify a sample of bugs. When counting how many bugs are in the quadrat, only count bugs that are half or more. Less than half are not counted. This number is recorded in the data table the teacher will provide.
- The teacher guides the students through the math involved. Since there are 5 samples an average requires the sum of the 5 samples to be divided by 5.
- Show that 9 quadrats will fit down the sheet of bugs and 7 across the top. Thus the area covered is 63 quadrats.
- Multiply the average of the samples times 63 to get the total possible bugs on the page.
- Graph this result in a bar graph. Students also include other student data in the graph.
- Count the actual number of bugs and students then answer the conclusion questions. (This could be assigned as homework- to go over the next day in class.)

### **Lesson 2: (3- 90 minute classes) Owl Pellet Lab and ecosystem dynamics**

- Before dissecting the Owl pellet, review with the students concepts of food chains and food webs. Point out in the diagrams in their textbook in which organisms are producers decomposers, and consumers. Discuss predator and prey examples in nature and how it affects populations. As predator numbers increase then the prey population decreases.
- Give students the handouts on interactions and symbiosis. Discuss these ideas and fill in the worksheets. Vocabulary like symbiosis, competition, and cooperation are found on these handouts. In a good life science textbook, these topics are usually discussed and explained in the chapter on ecology.
- If you can purchase the Gizmo program online, there are several really good virtual labs that demonstrate these relationships. There are Gizmo ecology lessons on food chains and population numbers.  
<http://www.explorellearning.com/index.cfm?method=cResource.dspView&ResourceID=381&ClassID=2061656>
- Show the video to the class that demonstrates the dissection of an owl pellet and what an owl pellet is. <https://www.youtube.com/watch?v=FENowCc-A8M>
- Another good source of information is this website for kids.  
[http://www.rspb.org.uk/youth/makeanddo/do/pellet/why\\_study.aspx](http://www.rspb.org.uk/youth/makeanddo/do/pellet/why_study.aspx)
- Pass out the handouts for dissecting an owl pellet. This includes a rubric on the first page for students and teacher to evaluate the dissection and analysis of the lab.
- Show the students the owl pellets and read the background information in the packet together. Give students a few minutes to answer the questions with their lab partner, then discuss the answers as a class.
- Go through the lab packet and discuss what the students will be doing and how scientists use this indirect information to study an ecosystem.
- Instruct the class to put their goggles on. In the past I have had students get hair from the pellet in their eyes. This can cause irritation, so all my students wear goggles until the hair is off the bones.

- Provide the class additional pictures of the bones of possible prey animals of the owl. You can purchase posters from Carolina Biological of these animals.
- Give each group of 2 students an owl pellet. I find it is best if they reach in a bag and get their own. Gloves are not necessary for this lab. It is a good idea to have everyone wash their hands at the end of class. The pellets have been sanitized, but the hair again is an issue and can get in their eyes.
- Provide each team of “scientists” with a ziploc bag to put their name and class period on with a permanent marker. They need to keep the bones of any prey animals they find in the bag.
- Students should make observations of the outside of the pellet and record the length and width in centimeters in the data chart provided.
- THIS IS PROBABLY THE END OF THE FIRST LESSON
- Collect the bags with the bones the students have sorted and any hair that may still have bones in it. Students should throw away the fur that is not needed in a designated place.
- When students return, pass out the bags with the bones and fur. Explain to the students the objective of today’s lesson is to totally isolate the bones from the hair and to count how many prey were in one pellet.
- When they finish that, they need to sort the bones by type. All femurs together, all scapulas together and so on. They have a chart in which to draw a sample bone and how many of that type they found in their pellet.
- After about 30 minutes, stop the class from working and find out how many prey (count the skulls) each owl pellet contained. Everyone records this in the data table provided. As a class work through the math. Find the class average. If an owl produces 2 pellets a day, students are to calculate the number of prey needed in a week, month and year. This reinforces the idea there are many prey animals for one predator.
- Collect the bags with the bones the students have sorted.
- THIS IS PROBABLY THE END OF THE SECOND LESSON
- When students return pass out the bags of bones. Explain to the students the objective today is to reconstruct the bones into one prey animal. If bones are missing, students will draw the missing part.
- Elmer’s glue and cardstock are given to students as they need it. They should be given a picture of the bones of a vole (field mouse.) They can lay their bones in the correct location on this handout. The teacher needs to check if the students are correct before they glue the bones in place on the separate cardstock.
- Students are to use the dichotomous key provided in the packet to identify the prey animal.
- On the card of glued bones, students label the bones, write the scientific name and common name of the prey animal, and draw in any missing bones.
- Students turn in their answers to the concluding questions about the owl pellet lab.

### **Math (Engineering Design Task with Hummingbird Robotics Kits and Data Analysis)**

#### **Lesson 1: The Problem** (Introduction of the Problem, Its Context, the Need, and the Specifications.)

##### **Generate Design Solutions – Part I.**

- Introduce the problem of citizen complaints about the number of seagulls at the local shopping mall and the need for the city government to determine if the conditions really differ from those of surrounding communities.
- Describe the close proximity of the local shopping mall to an active landfill, which definitely attracts seagulls, as well as the long history of landfills in the immediate area of which one closed landfill remains a brownfield.
- Briefly review counting populations through Direct Observation
- Brainstorm as a class about how robotics and computer technology could count a seagull population by direct observation (i.e. identify technology required)
- Teacher introduces the Hummingbird Robotics Kits and helps students determine which sensor could be used to identify that a bird is flying overhead and that LED lights could be used to simulate that a camera has taken a picture and that sensors have measured the object flying overhead and sent the data to a remote computer via wireless communications.
- Teacher uses Hummingbird Robotics Kit website <http://www.hummingbirdkit.com/>, a Hummingbird Robotics Kit, and computer with Create Lab Visual Programmer Software to demonstrate connecting components and basic programming functions.

##### **Lesson 2: Generate Design Solutions – Part II.**

- Student groups of 3 or 4 will determine group roles:
    - the designers/builders will work in each group to design the rectangular prism that will hold the Hummingbird robotics components and create a NET pattern;
    - the technician from each group will work as one group with the teacher to assemble and program the Hummingbird robotics components.
  - Groups will determine the minimum size needed for the case to house the robotics.
  - Then groups will determine a size and characteristics for the case that will fit within the rungs of a ladder on top of a work van and look like a natural storage device.
- Information on the design specifications is provided by the **“Critter Counters”** **handout**.

##### **Lesson 3: Create and Improve Models:**

- Designer builders will create nets for patterns (using one inch or one centimeter grid paper to make the “Critter Counter” Case, construct the case from poster board, create an opening at the top for the distance sensor, and create a side “window” that will open so that the LED lights can be observed.
- Technician will work as a group with the teacher to connect the distance sensor, orange, red, and green LED sensors and a program with the Create Lab Visual Programming software that will display the yellow LED when no flying object is detected, trigger the green LED when an object is detected to indicate that size and speed dimensions are being measured and transmitted to a computer, and trigger the red LED to indicate that

a picture of the object is being taken and transmitted to a computer. When the flying object is no longer detected, the yellow LED will display.

- Technicians will test the Hummingbird “Critter Counter” Components before they are installed in the case and trouble shoot any problems.
- The Hummingbird Components will be installed in the “Critter Counter” Cases.

**Lesson 4: Final Testing Communicate Findings :**

- Students will test each assembled “Critter Counter”.
- Students will determine the surface area and volume of the “Critter Counter” case.
- Students will present their “Critter Counters” to the class acting in the role of consultants to the city government and report:
  - The functionality of their “Critter Counters”
  - How the design of the cases will “look natural” on top of the work van and fit within the ladder rungs
  - The surface area and volume of the case (which would affect manufacturing cost)
- Teacher will evaluate presentation using Rubric

**Lesson 5: Data Analysis of Simulated Data:**

- Teacher will review histograms and how to create them using the **Learning about Histograms handout**.
- Working in their groups, students will construct a histogram using teacher supplied data about seagull counts from various shopping locations in the area with a variety of distances from active landfills.
- Class will brainstorm using the histograms to determine if the local shopping mall has a greater issue with the number of seagulls than other shopping areas in surrounding communities.

Name \_\_\_\_\_ Block \_\_\_\_\_ Date \_\_\_\_\_

## Quiz on Oral Presentation Performance Terms and Definitions

**DIRECTIONS:** For each statement below, circle the letter in front of the one best answer to complete the sentence.

1. When discussing oral presentations, **eye contact** refers to
  - A. the speaker putting his/her fingers or hands near his/her eyes.
  - B. the speaker looking at the eyes of the listeners.
  - C. small pieces of plastic worn instead of eye glasses to correct vision.
  - D. an electronic device similar to an iphone.
2. When discussing oral presentations, **voice** refers to
  - A. a popular singing competition TV show.
  - B. whether a speaker is a bass, tenor, alto, or soprano.
  - C. the speaker's opinion about a specific topic.
  - D. the clarity, fluency, and inflection used when words are spoken.
3. When discussing oral presentations, **volume** refers to
  - A. the loudness and/or softness of spoken words.
  - B. a very large book.
  - C. the measure of the amount of space used in a solid figure.
  - D. the buttons on the side of a cell phone used to control how loud it rings.
4. When discussing oral presentations, **pacing** refers to
  - A. walking back and forth, but not really going anywhere.
  - B. the gait of a horse in which the legs move forward laterally.
  - C. the rate or speed in which a speaker talks, including pauses.
  - D. when a speaker can't think of anything to say and just stares at the audience.
5. When discussing oral presentations, **posture and gestures** refer to
  - A. the way the speaker stands and uses his/her hands.
  - B. when a speaker has a negative attitude and/or acts tough.
  - C. when a speaker sits down while talking.
  - D. when a speaker seems confused

**DIRECTIONS:** For each term shown below, circle the letter in front of the one correct description for a “consistent” rating (the highest rating) from the “Oral Presentation Rubric.”

**6. Eye contact**

- A. Eye contact is frequent and includes most of the audience.
- B. Eye contact is rare or limited to part of the audience.
- C. Eye contact is occasional and/or includes only part of the audience.

**7. Voice**

- A. Words are not pronounced clearly. Mostly, voice is monotone with little or no vocal inflection. Fillers such as “ah” or “um” are used frequently.
- B. Occasionally, words are not pronounced clearly. Occasionally, voice is monotone with little or no vocal inflection. Occasionally, fillers may be used.
- C. Words are pronounced clearly and are easily understood. Consistently, vocal inflection is used. Fillers are used rarely or not at all.

**8. Volume**

- A. Occasionally, volume is too soft to heard, or volume is uncomfortably loud. At times, the listener strains to hear what is being said.
- B. Volume is consistently loud enough to be heard easily by the listener.
- C. Mostly, volume is too soft to be heard, or volume is uncomfortably loud.

**9. Pacing**

- A. Often, pace of speaking may be rushed, too slow, or both. Speaking may include frequent awkward pauses. Often, pace of speaking is inconsistent, distracting, and/or ineffective.
- B. Occasionally, pace of speaking is rushed, too slow, or both. Speaking may include some awkward pauses and/or some effective pauses. Occasionally, pace of speaking may be inconsistent, distracting, or ineffective.
- C. Pace of speaking is slightly slower than used in normal conversation. Occasional pauses are used effectively.

**10. Posture and Gestures**

- A. Body movements and/or gestures are inconsistent in support of the presentation. Stance may include occasional slouching, swaying, leaning, or fidgeting. Gestures used are mostly appropriate and effective, but occasionally may be awkward.
- B. Body movements and/or gestures support and/or enhance the presentation. Stance includes steady, straight posture with shoulders directed toward the audience. Gestures are appropriate and effective.
- C. Body movements and/or gestures detract from the presentation. Stance may include slouching, swaying, leaning, or fidgeting. Shoulders may be directed away from audience. Gestures are awkward or absent.

## **Key for Quiz on Oral Presentation Performance Terms and Definitions**

- 1. B**
- 2. D**
- 3. A**
- 4. C**
- 5. A**
- 6. A**
- 7. C**
- 8. B**
- 9. C**
- 10. B**



## **Oral Presentation Scripts for Grading (choose one)**

**“The Gettysburg Address”  
by Abraham Lincoln**

Four score and seven years ago our fathers brought forth on this continent a new nation, conceived in liberty and dedicated to the proposition that all men are created equal. Now we are engaged in a great civil war, testing whether that nation or any nation so conceived and so dedicated can long endure. We are met on a great battlefield of that war. We have come to dedicate a portion of that field as a final resting-place for those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this. But in a larger sense, we cannot dedicate, we cannot consecrate, we cannot hallow this ground. The brave men, living and dead who struggled here have consecrated it far above our poor power to add or detract. The world will little note nor long remember what we say here, but it can never forget what they did here. It is for us the living rather to be dedicated here to the unfinished work which they who fought here have thus far so nobly advanced. It is rather for us to be here dedicated to the great task remaining before us—that from these honored dead we take increased devotion to that cause for which they gave the last full measure of devotion—that we here highly resolve that these dead shall not have died in vain, that this nation under God shall have a new birth of freedom, and that government of the people, by the people, for the people shall not perish from the earth.

“All the World's a Stage”  
speech from play, *As You Like It* (Act 2, Scene 7)  
written by William Shakespeare

JAQUES:

All the world's a stage,  
And all the men and women merely players:  
They have their exits and their entrances;  
And one man in his time plays many parts,  
His acts being seven ages. At first the infant,  
Mewling and puking in the nurse's arms.  
And then the whining school-boy, with his satchel  
And shining morning face, creeping like snail  
Unwillingly to school. And then the lover,  
Sighing like furnace, with a woeful ballad  
Made to his mistress' eyebrow. Then a soldier,  
Full of strange oaths and bearded like the pard,  
Jealous in honour, sudden and quick in quarrel,  
Seeking the bubble reputation  
Even in the cannon's mouth. And then the justice,  
In fair round belly with good capon lined,  
With eyes severe and beard of formal cut,  
Full of wise saws and modern instances;  
And so he plays his part. The sixth age shifts  
Into the lean and slipper'd pantaloon,  
With spectacles on nose and pouch on side,  
His youthful hose, well saved, a world too wide  
For his shrunk shank; and his big manly voice,  
Turning again toward childish treble, pipes  
And whistles in his sound. Last scene of all,  
That ends this strange eventful history,  
Is second childishness and mere oblivion,  
Sans teeth, sans eyes, sans taste, sans everything.

“Farewell to Baseball Address”  
by Lou Gehrig, delivered on 4 July 1939, New York

Fans, for the past two weeks you have been reading about a bad break I got. Yet today I consider myself the luckiest man on the face of the earth.

I have been in ballparks for seventeen years and have never received anything but kindness and encouragement from you fans. Look at these grand men. Which of you wouldn't consider it the highlight of his career just to associate with them for even one day?

Sure I'm lucky.

Who wouldn't consider it an honor to have known Jacob Ruppert? Also, the builder of baseball's greatest empire, Ed Barrow? To have spent six years with that wonderful little fellow, Miller Huggins? Then to have spent the next nine years with that outstanding leader, that smart student of psychology, the best manager in baseball today, Joe McCarthy?

Sure I'm lucky.

When the New York Giants, a team you would give your right arm to beat, and vice versa, sends you a gift - that's something. When everybody down to the groundskeepers and those boys in white coats remember you with trophies -- that's something.

When you have a wonderful mother-in-law who takes sides with you in squabbles with her own daughter -- that's something.

When you have a father and a mother who work all their lives so you can have an education and build your body -- it's a blessing.

When you have a wife who has been a tower of strength and shown more courage than you dreamed existed -- that's the finest I know.

So, I close in saying that I might have been given a bad break, but I've got an awful lot to live for.

“Friends, Romans, countrymen”  
speech from play, *Julius Caesar*, (Act 3, Scene 2)  
written by William Shakespeare

Mark Antony:

Friends, Romans, countrymen, lend me your ears;  
I come to bury Caesar, not to praise him;  
The evil that men do lives after them,  
The good is oft interred with their bones,  
So let it be with Caesar ... The noble Brutus  
Hath told you Caesar was ambitious:  
If it were so, it was a grievous fault,  
And grievously hath Caesar answered it ...  
Here, under leave of Brutus and the rest,  
(For Brutus is an honourable man;  
So are they all; all honourable men)  
Come I to speak in Caesar's funeral ...  
He was my friend, faithful and just to me:  
But Brutus says he was ambitious;  
And Brutus is an honourable man....  
He hath brought many captives home to Rome,  
Whose ransoms did the general coffers fill:  
Did this in Caesar seem ambitious?  
When that the poor have cried, Caesar hath wept:  
Ambition should be made of sterner stuff:  
Yet Brutus says he was ambitious;  
And Brutus is an honourable man.  
You all did see that on the Lupercal  
I thrice presented him a kingly crown,  
Which he did thrice refuse: was this ambition?  
Yet Brutus says he was ambitious;  
And, sure, he is an honourable man.  
I speak not to disprove what Brutus spoke,  
But here I am to speak what I do know.  
You all did love him once, not without cause:  
What cause withholds you then to mourn for him?  
O judgement! thou art fled to brutish beasts,  
And men have lost their reason.... Bear with me;  
My heart is in the coffin there with Caesar,  
And I must pause till it come back to me.



Annabel Lee  
- Edgar Allan Poe

It was many and many a year ago,  
In a kingdom by the sea,  
That a maiden there lived whom you may know  
By the name of ANNABEL LEE;  
And this maiden she lived with no other thought  
Than to love and be loved by me.

I was a child and she was a child,  
In this kingdom by the sea;  
But we loved with a love that was more than love-  
I and my Annabel Lee;  
With a love that the winged seraphs of heaven  
Coveted her and me.

And this was the reason that, long ago,  
In this kingdom by the sea,  
A wind blew out of a cloud, chilling  
My beautiful Annabel Lee;  
So that her highborn kinsman came  
And bore her away from me,  
To shut her up in a sepulchre  
In this kingdom by the sea.

The angels, not half so happy in heaven,  
Went envying her and me-  
Yes!- that was the reason (as all men know,  
In this kingdom by the sea)  
That the wind came out of the cloud by night,  
Chilling and killing my Annabel Lee.

But our love it was stronger by far than the love  
Of those who were older than we-  
Of many far wiser than we-  
And neither the angels in heaven above,  
Nor the demons down under the sea,  
Can ever dissever my soul from the soul  
Of the beautiful Annabel Lee.

For the moon never beams without bringing me dreams  
Of the beautiful Annabel Lee;  
And the stars never rise but I feel the bright eyes  
Of the beautiful Annabel Lee;  
And so, all the night-tide, I lie down by the side  
Of my darling- my darling- my life and my bride,  
In the sepulchre there by the sea,  
In her tomb by the sounding sea.

# Oral Presentation Error Sheet

*Here are some suggestions for “errors” to make during an oral presentation:*

## **PRESENTATION #1**

- Look down at paper/book most of the time
- Lose your place in what you are saying and create a long, awkward pause before speaking. Look through notes or just stare into space without talking.
- Talk very quickly through a few sections.
- Sit down on a chair or desk. Lean against a wall.

## **PRESENTATION #2**

- For most of the presentation, look at the center of the audience only. Very rarely make eye contact with left or right side of the audience.
- Speak very softly, so you are barely heard.
- Pause and say, “ah” or “um” several times.
- Speak in a loud, monotone voice that sounds like a robot reading the words

## **PRESENTATION #3**

- Look mostly at one or two members of the audience. Occasionally, look at the rest of the audience.
- Run your fingers through your hair or twirl your hair frequently.
- Pace back and forth rapidly during part of the presentation

## **PRESENTATION #4**

- Look rapidly at everyone in the audience as if searching for someone. Do this several times.
- Sway back and forth or rock from foot to foot
- Mumble some words so that they are not understood.

Name \_\_\_\_\_ Topic \_\_\_\_\_

<div>K</div> <div>What I Know</div>	<div>W</div> <div>What I Want to Know</div>	<div>L</div> <div>What I Learned</div>



## Alternate Assessment of Oral Presentation Performance Terms and Definitions Rubric

You have a choice. You may take the **Quiz on Oral Presentation Performance Terms and Definitions**, or you may choose to create a poster, flipbook, or use another medium pre-approved by your teacher that demonstrates your understandings of **Oral Presentation Performance Terms and Definitions**. If you choose the alternate assessment, the rubric below will be used to grade your work. The due date is \_\_\_\_\_.

CRITERIA	DESCRIPTION	POINTS
<b>Eye Contact</b>  <b>(18 pts.)</b>	An appropriate image is used to convey the meaning of “eye contact.” Clearly displayed with the image is the sentence, <b><i>“Eye contact is frequent and includes most of the audience.”</i></b> Most of the above criteria have been met (13-18 pts.) Some of the above criteria have been met (7-12 pts.) Much of the above criteria have not been met (0-6 pts.)	
<b>Voice</b>  <b>(18 pts.)</b>	An appropriate image is used to convey the meaning of “voice.” Clearly displayed with the image are the sentences, <b><i>“Words are pronounced clearly and are easily understood. Consistently, vocal inflection is used. Fillers are used rarely or not at all.”</i></b> Most of the above criteria have been met (13-18 pts.) Some of the above criteria have been met (7-12 pts.) Much of the above criteria have not been met (0-6 pts.)	
<b>Volume</b>  <b>(18 pts.)</b>	An appropriate image is used to convey the meaning of “volume.” Clearly displayed with the image is the sentence, <b><i>“Volume is consistently loud enough to be heard easily by the listener.”</i></b> Most of the above criteria have been met (13-18 pts.) Some of the above criteria have been met (7-12 pts.) Much of the above criteria have not been met (0-6 pts.)	
<b>Pacing</b>  <b>(18 pts.)</b>	An appropriate image is used to convey the meaning of “pacing.” Clearly displayed with the image are the sentences, <b><i>“Pace of speaking is slightly slower than used in normal conversation. Occasional pauses are used effectively.”</i></b> Most of the above criteria have been met (13-18 pts.) Some of the above criteria have been met (7-12 pts.)	

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	Much of the above criteria have not been met (0-6 pts.)	
<b>Posture and Gestures</b> <b>(18 pts.)</b>	An appropriate image is used to convey the meaning of “posture and gestures.” Clearly displayed with the image are the sentences, <i>“Body movements and/or gestures support and/or enhance the presentation. Stance includes steady, straight posture with shoulders directed toward the audience. Gestures are appropriate and effective.”</i> Most of the above criteria have been met (13-18 pts.) Some of the above criteria have been met (7-12 pts.) Much of the above criteria have not been met (0-6 pts.)	
<b>Presentation</b> <b>(10 pts.)</b>	All information is neat, colorful, and correct. Images used may be hand-drawn or be derived from clipart or photos. No graphite pencil lines are visible. Images and words fill most of each presentation page. Words are typed or neatly written and are easily read. Each of the five criteria is displayed with equal amount of space. Most of the above criteria have been met (8-10 pts.) Some of the above criteria have been met (3-7 pts.) Much of the above criteria have not been met (0-2 pts.)	
<b>TOTAL</b>		

Comments:

Name \_\_\_\_\_ Block \_\_\_\_\_ Date \_\_\_\_\_

## Oral Presentation Performance Rubric

	Limited (0-7 pts.)	Emerging (8-15 pts.)	Consistent (16-20 pts.)	Points Possible	Points Earned
<b>Eye Contact</b>	Eye contact is rare or limited to part of the audience.	Eye contact is occasional and/or includes only part of the audience.	Eye contact is frequent and includes most of audience.	20	
<b>Voice</b>	Words are not pronounced clearly. Mostly, voice is monotone with little or no vocal inflection. Fillers such as “ah” or “um” are used frequently.	Occasionally, words are not pronounced clearly. Occasionally, voice is monotone with little or no vocal inflection. Occasionally, fillers may be used.	Words are pronounced clearly and are easily understood. Consistently, vocal inflection is used. Fillers are used rarely or not at all.	20	
<b>Volume</b>	Mostly, volume is too soft to be heard, or volume is uncomfortably loud.	Occasionally, volume is too soft to be heard, or volume is uncomfortably loud. At times, the listener strains to hear what is being said.	Volume is consistently loud enough to be heard easily by the listener.	20	
<b>Pacing</b>	Often, pace of speaking may be rushed, too slow, or both. Speaking may include frequent awkward pauses. Often, pace of speaking is inconsistent, distracting, and/or ineffective.	Occasionally, pace of speaking is rushed, too slow, or both. Speaking may include some awkward pauses and/or some effective pauses. Occasionally, pace of speaking may be inconsistent, distracting, or ineffective.	Pace of speaking is slightly slower than used in normal conversation. Occasional pauses are used effectively.	20	

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<b>Posture and Gestures</b>	Body movements and/or gestures detract from the presentation. Stance may include slouching, swaying, leaning, or fidgeting. Shoulders may be directed away from audience. Gestures are awkward or absent.	Body movements and/or gestures are inconsistent in support of the presentation. Stance may include occasional slouching, swaying, leaning, or fidgeting. Gestures used are mostly appropriate and effective, but occasionally may be awkward.	Body movements and/or gestures support and/or enhance the presentation. Stance includes steady, straight posture with shoulders directed toward the audience. Gestures are appropriate and effective.	20	
<b>TOTAL</b>				100	

Comments:

# Critter Counters

## **Background:**

One way that scientists estimate the population of a species is through direct observation. Today cameras connected to robotic sensors are often used to record observations without the need for a person to be present.

The City of Colonial Heights has marketed the 63 acre brownfield that was formerly part of the closed landfill for commercial development without success. Meanwhile, seagulls attracted to the open Tri-City Landfill across the Appomattox River fly all around the Southpark Mall area, frustrating citizens by making messes on their cars.

Some citizens are pressuring the City to develop a natural habitat on the brownfield for native plants and animals that will attract birds of prey, such as hawks, owls, and falcons to discourage the seagulls.

City officials are not sure that the number of seagulls is actually greater than the number attracted to other area malls and shopping centers that are not near a landfill. They are reluctant to spend money developing a natural habitat on the brownfield if the problem isn't really that bad.

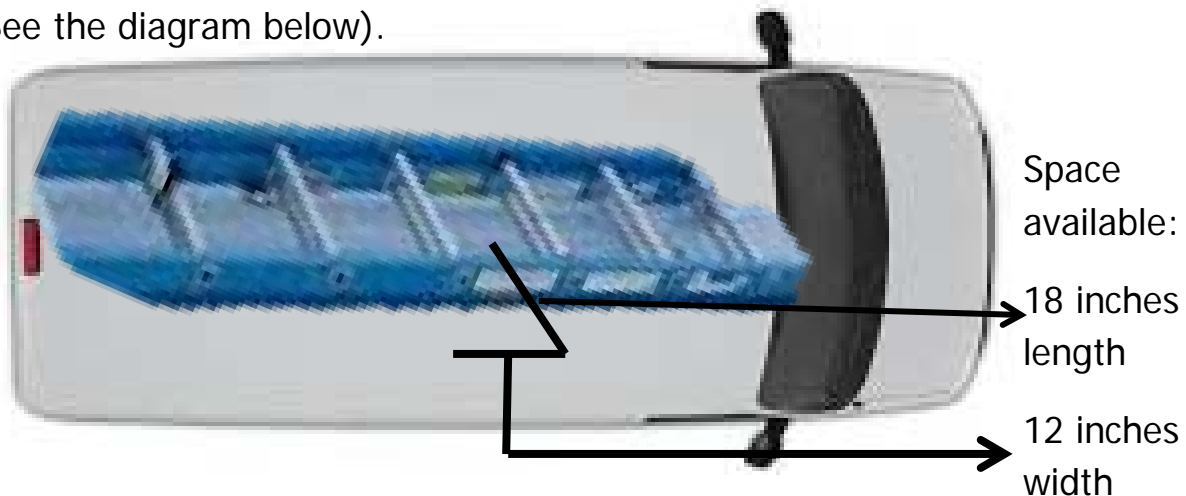
City officials have decided to estimate the seagull population at Southpark Mall and several other shopping sites in the Richmond Metropolitan Area. Some of the sites will be near landfills and some will not.

## **The Design Task:**

Your company is going to respond to a request for bids from the City of Colonial Heights to provide a robot controlled counting device that will count, photograph, and record size measurements for birds. A computer program will be able to compare the size measurements and photographs to those of seagulls and identify the number of seagulls flying over the device in given time periods.

Specifications:

The device will be camouflaged to look like a toolbox (to avoid public curiosity) and will be mounted on top of a white work van. It will sit inside of the space available between the rungs of a ladder on top of the van. (See the diagram below).



**The “toolbox” does not need to take up the entire space available. The team can choose any size between the minimum needed to house the robotic device and the space available.**

The robotic counting device will be housed inside the “toolbox”. Its sensor for detecting birds flying overhead will be installed on the top of the “toolbox”. 3 LED lights will be visible through a “window” on one side of the “toolbox”. A yellow LED light will flash when no birds are detected. When a bird is detected a green LED light will flash to indicate a photograph has been taken and a red LED light will flash to indicate that measurements have been taken. When someone is not monitoring the device, the “window” should have a cover.

## **Team Member Responsibilities:**

One team member will be the technician who will assemble and test the robotic components.

Two team members will be the “toolbox” designers and builders.

All team members will participate in calculating the surface area and volume of their “toolbox”. All team members will participate in presenting and demonstrating their counting device to the City officials (class and teachers).

Your presentation should include the following:

1. The surface area of your “toolbox”.
2. The volume of your “toolbox”.
3. Why you think your “toolbox” looks realistic so that it will not attract the attention of the public.
4. A demonstration of your counting device at work which includes what a yellow, green, and red LED means.

## **Materials:**

The technician will have a hummingbird robotics circuit board, distance sensor, and yellow, green, and red LED lights. All technicians will attend training with Mrs. Dortch to assemble their robotic devices and test them with the computer program developed by Mrs. Dortch.

To make the fake toolbox the designers and builders will get:

1 inch grid paper for making a net pattern for your toolbox

Tape

Scissors

Ruler

1 piece of black poster board **after** an accurate pattern is made

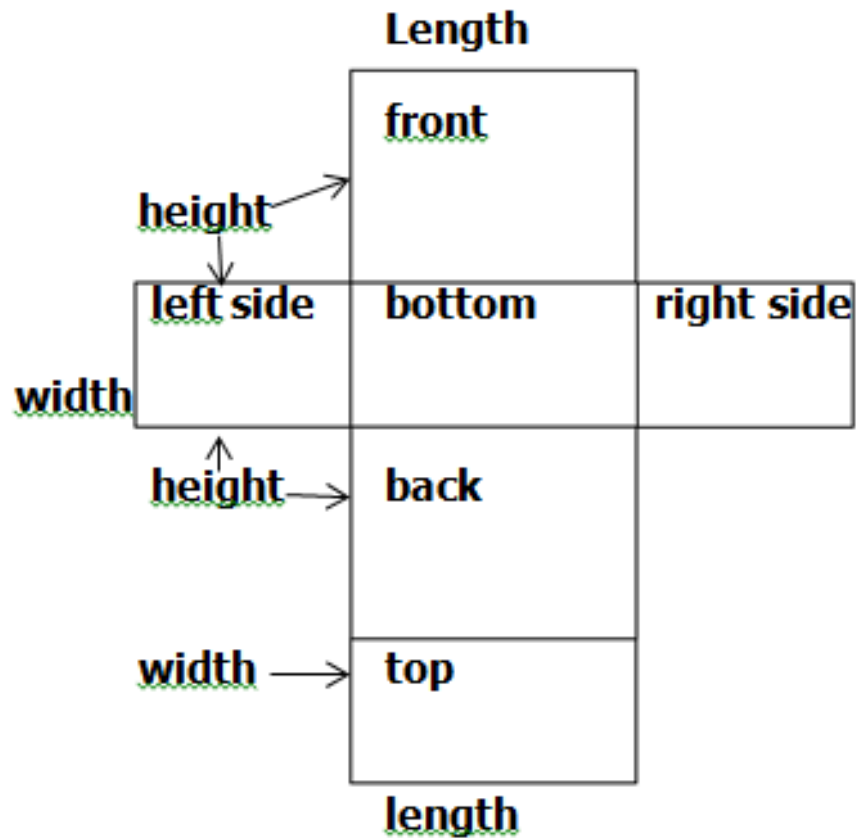
### **Time Constraints:**

You will have Tuesday 12/16 and all of Wednesday 12/17 in class to complete the device. You will have 30 minutes on Thursday 12/18 to plan your presentation. Presentations will be given during the remainder of Thursday's class. They should last no more than 5 minutes each.

### **Steps for designing and building the "toolbox".**

1. Decide on the length, height, and width in inches.
2. Make a net "pattern" of your design using one inch grid paper. You will need to cut and paste sections together.
3. Tape the completed pattern on the poster board and cut out the net.
4. Fold, tape as needed to make your "toolbox". **Do not tape the top closed.**
5. Cut a small "window" on one side of the "toolbox" so it can open and close like a door. This will allow someone to see the LED lights inside.
6. Cut a hole in the top for the distance sensor. The technician will tell you the length and width needed.



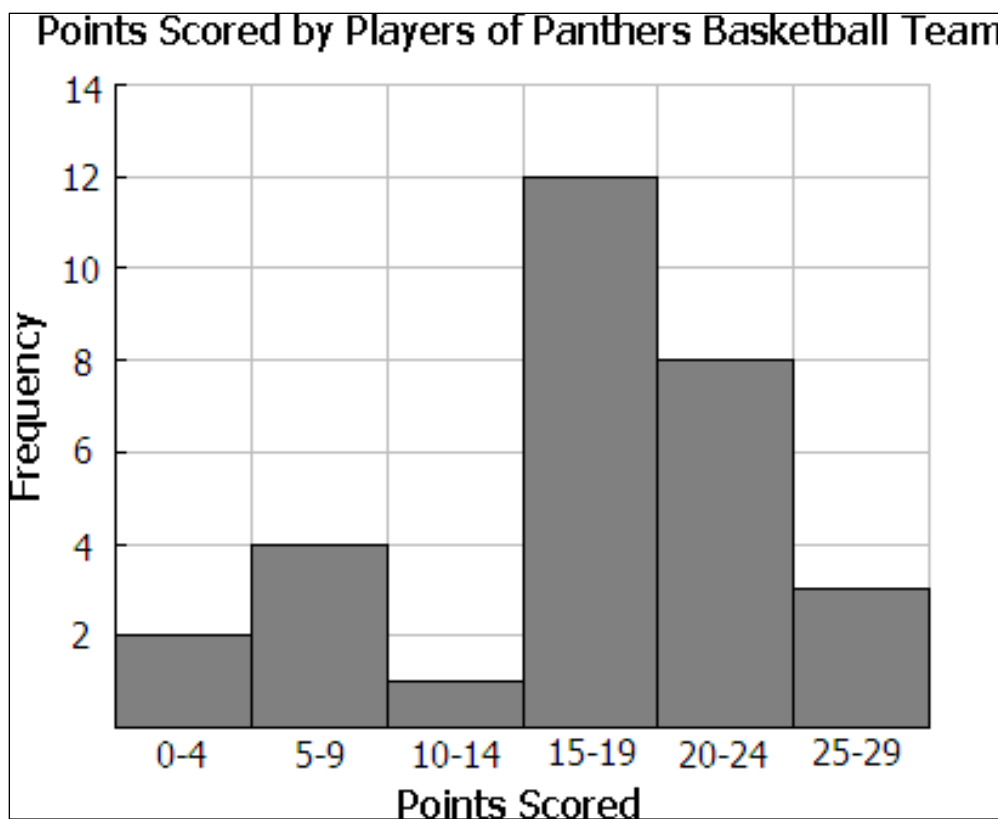


Name \_\_\_\_\_ Date: \_\_\_\_\_

All graphs tell a story and include a \_\_\_\_\_ and \_\_\_\_\_ that describe the data.

A histogram is a form of \_\_\_\_\_ graph in which the categories are \_\_\_\_\_ (\_\_\_\_\_) and \_\_\_\_\_ intervals. The length or height of each bar is determined by the number of data elements (\_\_\_\_\_) falling into a particular interval.

A histogram is **best used** for **numerical data** that can be characterized using **consecutive intervals**.



A \_\_\_\_\_ shows how often an item, a number, or range of numbers occurs. It can be used to construct a histogram.

<b>Points Scored by Players of the Panthers Basketball Team</b>			
Point Range	Tally	Frequency	Cumulative Frequency
0-4		2	2
5-9		4	6
10-14		1	7
15-19		12	19
20-24		8	27
25-29		3	30

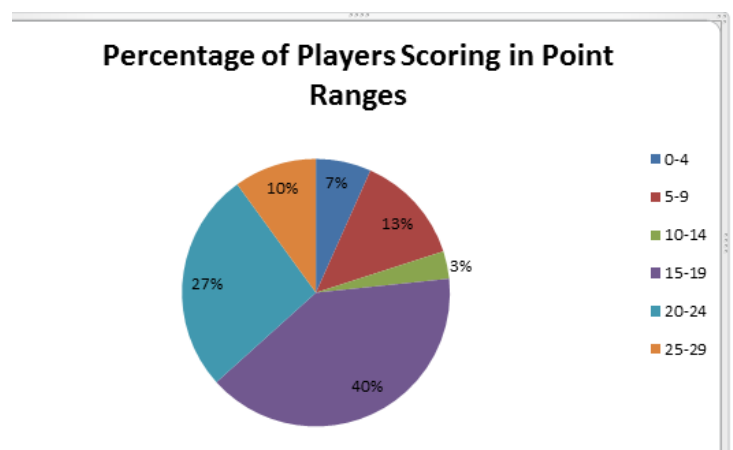
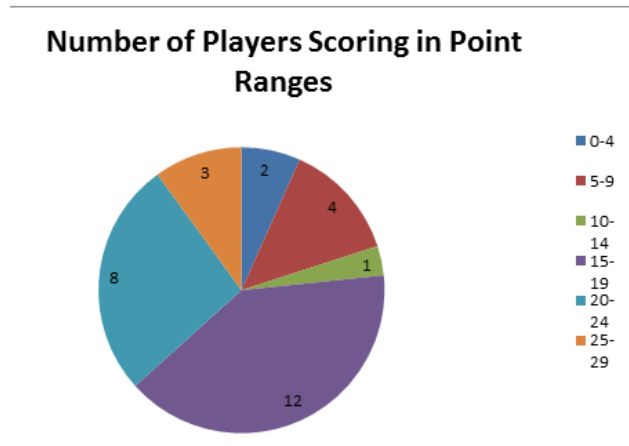
This same data could be represented by a \_\_\_\_\_ and \_\_\_\_\_ plot.

### Points Scored by Players of the Panthers Basketball Team

Stem	Leaf
0	1, 4, 5, 5, 6, 7
1	2, 5, 5, 6, 6, 6, 7, 7, 7, 8, 8, 9, 9
2	0, 0, 1, 3, 3, 4, 4, 4, 5, 6, 7

**NOTICE:** The stem and leaf plot provides actual data, not just the frequency within a range.

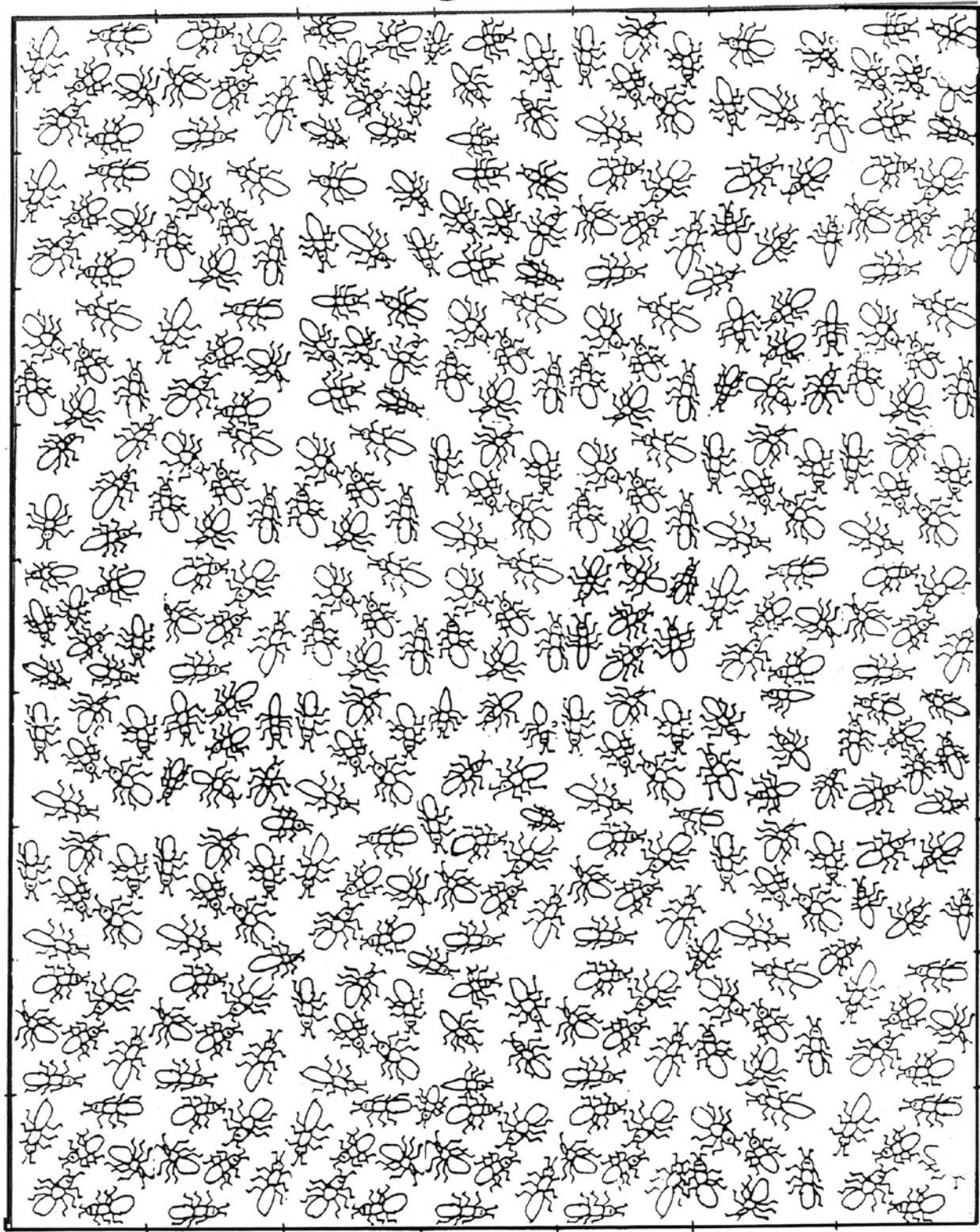
A **circle or pie graph** could also be used to represent this data.



**Seagull Counts for Various Shopping Areas**  
**48 hour period of data collection for each**

<b>Shopping Facility and Location</b>	<b>Distance from Nearest Active Landfill</b>	<b>Number of Seagulls Counted during 48 hour period</b>
<b>Chesterfield Town Center 11500 Midlothian Turnpike Richmond, VA 23235 Chesterfield County</b>	<b>12 miles (Northern Chesterfield Landfill)</b>	<b>210</b>
<b>Short Pump Town Center 11800 West Broad Street Richmond, VA 23233 Henrico County</b>	<b>Over 25 miles (Only Henrico Landfill is closed)</b>	<b>3</b>
<b>Stoney Point Fashion Park 9200 Stoney Park Parkway Richmond, VA 23235</b>	<b>15 miles (Richmond Southside Transfer Station)</b>	<b>32</b>
<b>Virginia Center Commons 10101 Brook Road Glen Allen, VA 23059 Hanover County</b>	<b>5 miles (Elmont Convenience Center)</b>	<b>187</b>
<b>Colonial Heights Walmart Supercenter 671 Southpark Boulevard Colonial Heights, VA 23834</b>	<b>2.7 miles (Tri-City Regional Landfill)</b>	<b>298</b>
<b>Chester Walmart Supercenter 12000 Ironbridge Road Chester, VA 23831</b>	<b>3 miles (Southern Chesterfield Landfill and Shoosmith Landfill)</b>	<b>279</b>
<b>Willow Lawn Shopping Center 1601 Willow Lawn Drive Richmond, VA 23230</b>	<b>14 miles (Southside Richmond Transfer Station)</b>	<b>5</b>

# CENSUS TAKERS



CRITTERS

# CENSUS TAKERS

Name \_\_\_\_\_

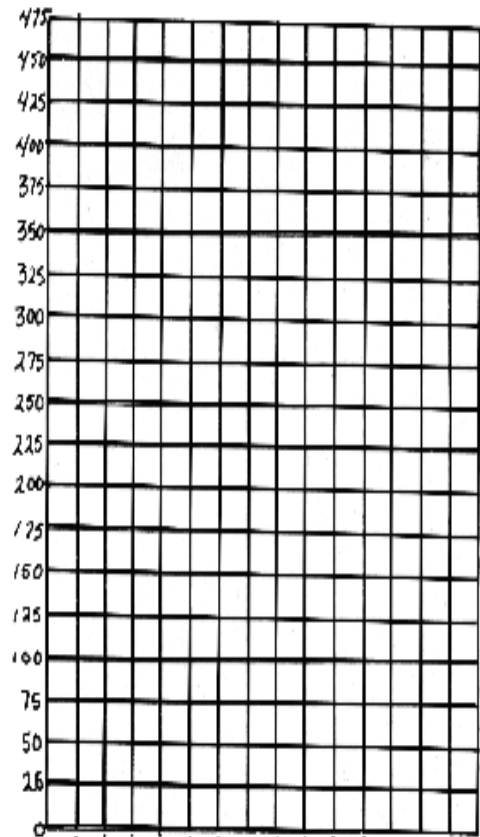
- 1) Prediction \_\_\_\_\_
- 2) Population Samples

A \_\_\_\_\_  
B \_\_\_\_\_  
C \_\_\_\_\_  
D \_\_\_\_\_  
E \_\_\_\_\_

- 3) Sample Total \_\_\_\_\_
- 4) Average ( $\div 5$ ) \_\_\_\_\_
- 5) X Number of Square Units \_\_\_\_\_
- 6) Population Estimate \_\_\_\_\_
- 7) Actual Population \_\_\_\_\_
- 8) Difference \_\_\_\_\_

POPULATION

Population Estimates



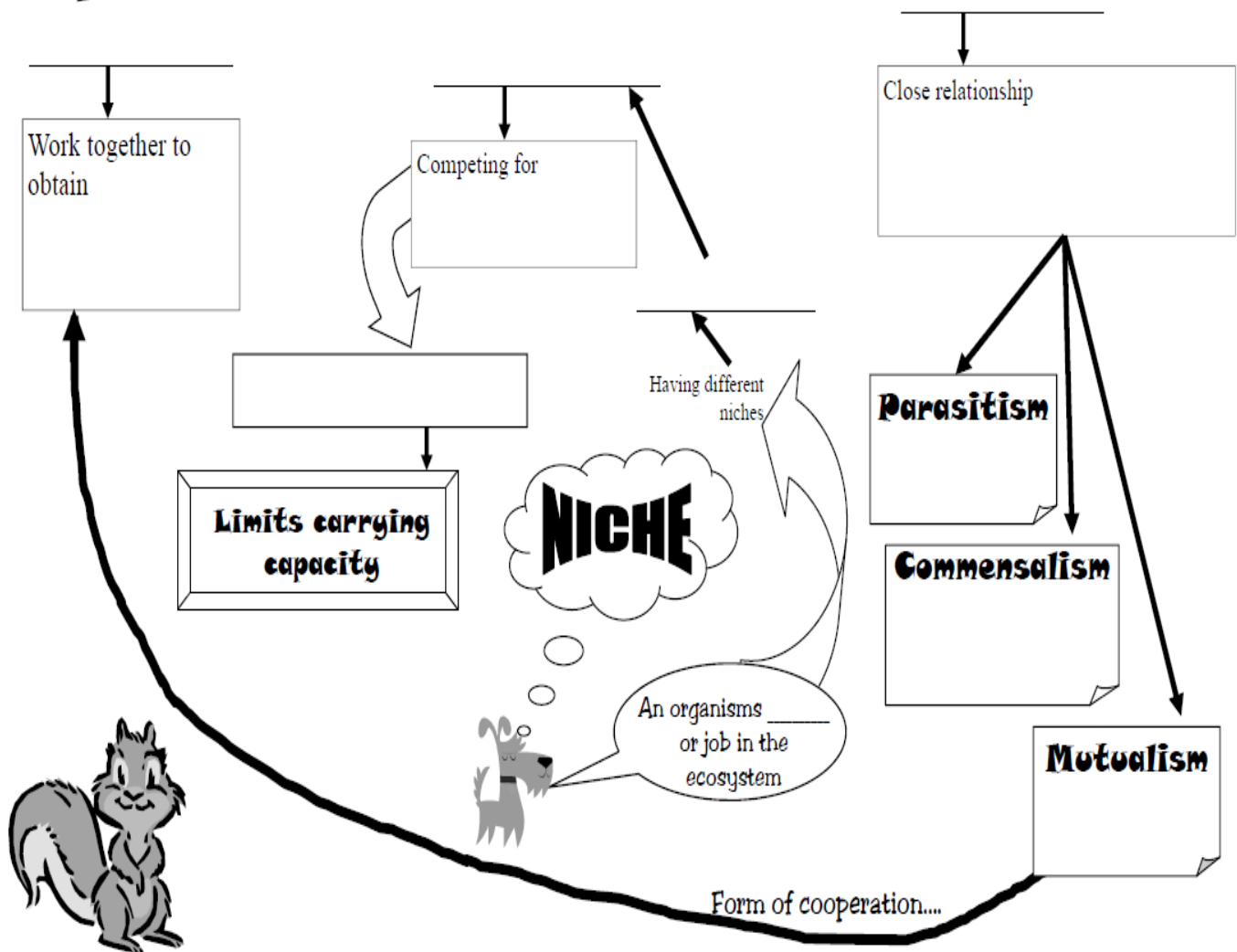
Census Takers

Cut Out



Name: \_\_\_\_\_ pd/sec: \_\_\_\_\_ Date: \_\_\_\_\_

# Interactions Between Organisms





# Owl Pellet Lab

Name: \_\_\_\_\_ Pd/Sec: \_\_\_\_\_

- \_\_\_\_\_ 1. (20 pts) Read Background on owl pellets – complete questions
- \_\_\_\_\_ 2. (25 pts) Nocturnal Hunter Lab Data Sheet – complete the following
  - \_\_\_\_\_ (5) Length
  - \_\_\_\_\_ (5) Width
  - \_\_\_\_\_ (5) Coloration
  - \_\_\_\_\_ (5) Visible contents
  - \_\_\_\_\_ (5) Scale Drawing
- \_\_\_\_\_ 3. (30 pts) Record your findings
  - \_\_\_\_\_ (25) 5 pts for each of 5 bones
  - \_\_\_\_\_ (5) # of consumed animals and class average
- \_\_\_\_\_ 4. (25 pts) Bones reconstructed into one skeleton with missing bones drawn where they belong – this should include your name, the scientific name of the organism (Genus and species) and the common name of the organism (vole, mole, rat, type of bird, shrew, etc...)



## Background Reading: Owl Pellets

Both hawks and owls consume quantities of bone, feathers, and hair when eating prey. After the bird has digested its meal, this indigestible material is rolled and compacted in part of the bird's digestive tract to form what is called a **pellet** or **casting**. This is regurgitated several hours after feeding or before the next meal. Because of differences in feeding habits and physiology, hawks and owls produce pellets that differ in their ability to be examined. Owls tend to swallow small prey whole and larger prey in several pieces. They don't take the time to pluck their prey. Also, their digestive tract does little or no damage to the bones consumed. Since the stomach muscles of owls are weak, even the most delicate bones are not crushed. Thus, a pellet contains the intact skeletons of the animals the owl had eaten the night before the pellet was formed. Hawks, on the other hand, pluck their prey before eating and then tear it into small pieces before swallowing, consuming varying amounts of fur or feathers. They also digest bone more completely than owls so that their pellets often contain little bony remains.

You can find the pellets of owls beneath their roosts. The pellets of barn owls can be found in open barns, or on the ground beneath trees in which they roost. Pellets of other kind of owls, hawks, and eagles are usually more difficult to find.

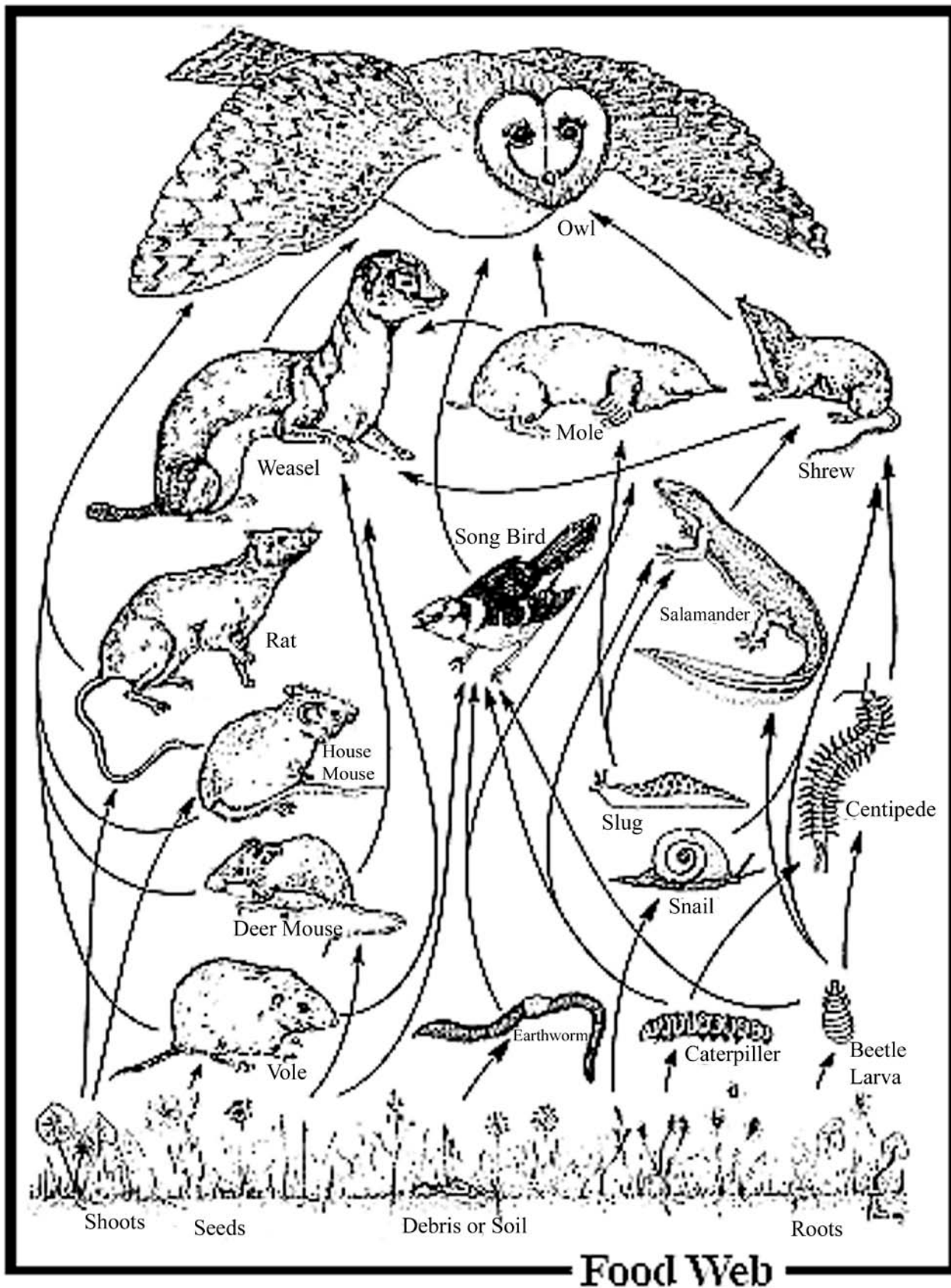
Pellets are records that tell about what owls have been eating. Most owls eat several types of rodents: mice, voles (meadow mice), and shrews. Others eat larger mammals and birds, so their pellets contain hair, beaks, claws, and feathers. The little elf owl, which lives in the desert, eats insects. Its castings contain the hard wing cases of beetles, scales from moth wings, and the tough shells of grasshoppers.

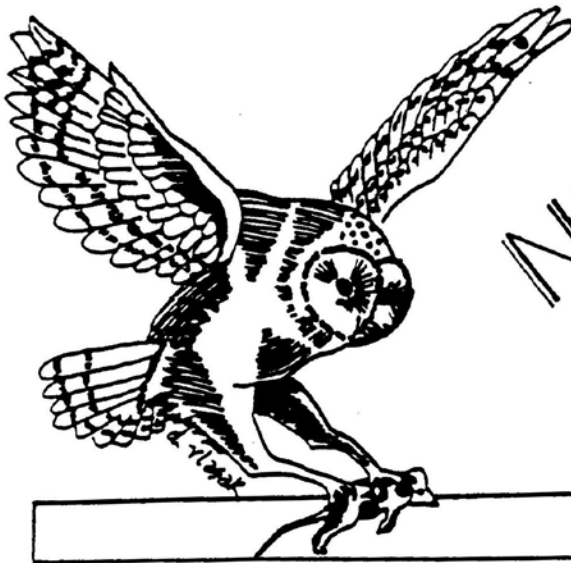
Pellets are like little surprise packages. Dissecting them is fun and easy. Most pellets are bundles of rodent fur packed tightly around tiny skulls, teeth and bones. They are lightweight and clean, and feel soft and felt-like. All of the fleshy parts of the rodents have been digested, leaving the bones smooth and clean.

## Owl Pellet Lab: Background Questions

Instructions: Use Background Reading to answer the following questions.

1. What is a pellet?
2. What is another name for a pellet?
3. Two types of birds that produce pellets are \_\_\_\_\_ and \_\_\_\_\_.
4. Explain, by giving two reasons, why there are more undamaged bones in an owl pellet than there are in a hawk pellet:
  - a. .
  - b. .
5. Where can you find owl pellets?
6. What types of rodents do owls eat?
7. Could some pellets contain feathers, claws and beaks?
8. Are owl pellets lightweight and clean?
9. How do owl pellets feel to touch?
10. Why are the bones smooth and clean?





# NOCTURNAL HUNTER

EXAMINE & RECORD	
LENGTH OF PELLET	
WIDTH (at widest point)	
COLORATION	
VISIBLE CONTENTS	

Make a scale  
drawing of pellet

							1cm

Now carefully tease away all fur and discover the contents of the pellet. Separate and clean all bones, even the tiniest ones. Sort them by type: skulls, femurs, vertebrae, etc.

# Record your findings

SKETCH OF BONE	NUMBER FOUND



Based on the number of skulls found, how many animals were consumed?

\_\_\_\_\_

What is the class average of number of skulls found?

\_\_\_\_\_

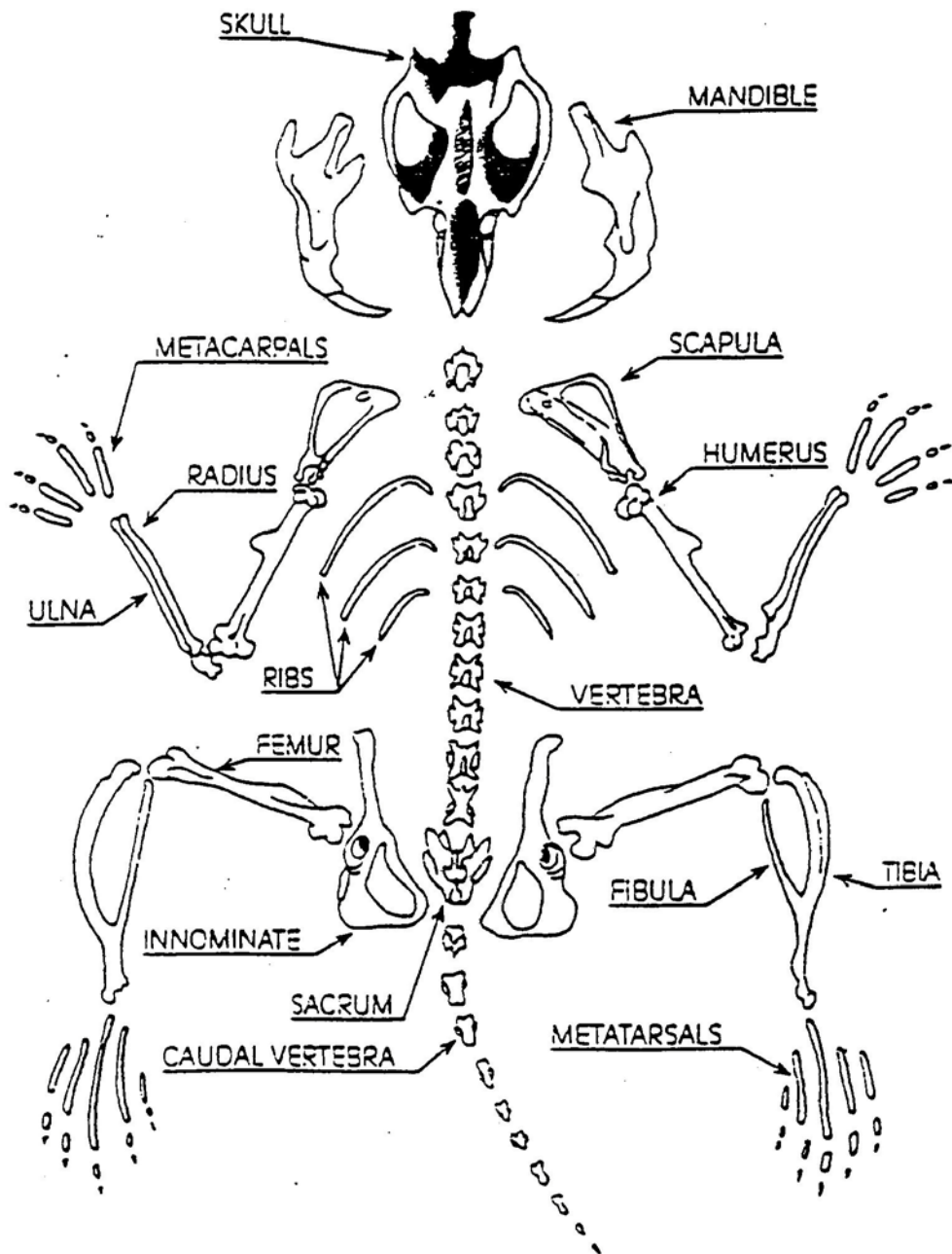
A bird often produces two pellets a day. Using your average consumption number, determine how many animals are consumed:

per day- \_\_\_\_\_

per week- \_\_\_\_\_

per month- \_\_\_\_\_

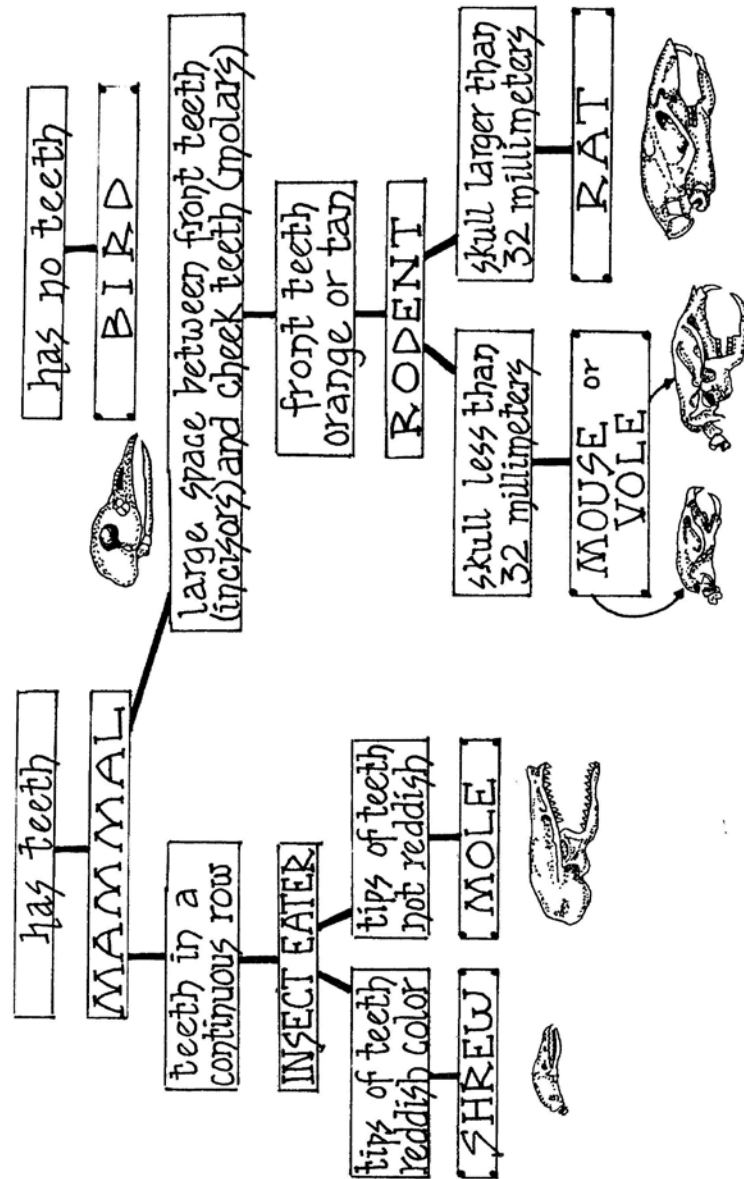
per year- \_\_\_\_\_



VOLE

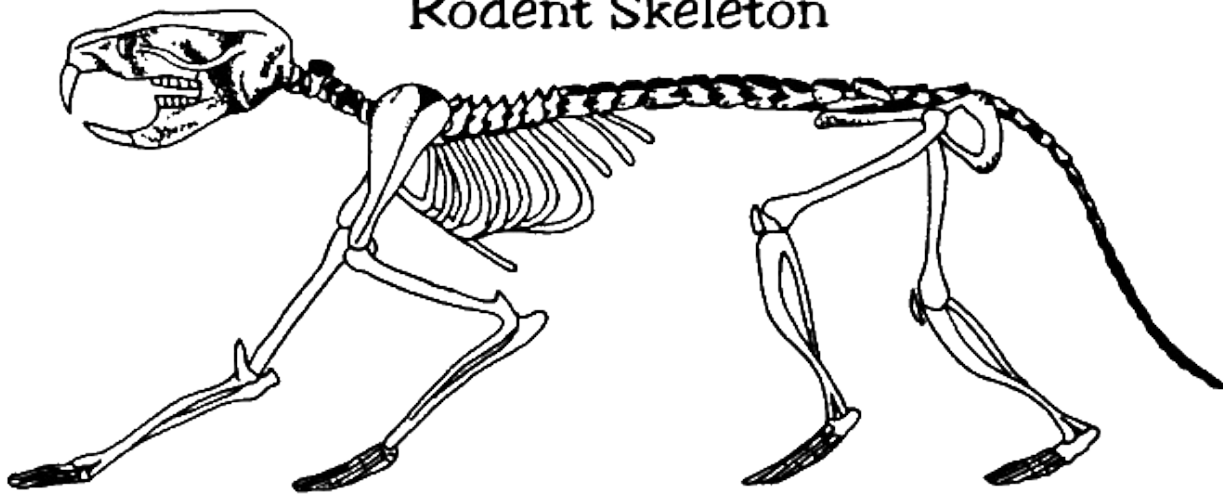


# Using skulls found, identify prey consumed





## Rodent Skeleton



## Large Bones found in Owl Pellets



Pelvis



Humerus



Femur



Shoulder Blade



Ulna & Radius

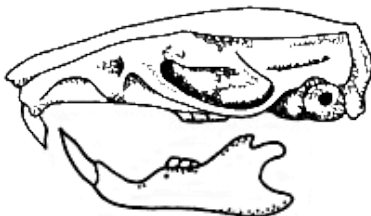


Tibia & Fibia



Ribs

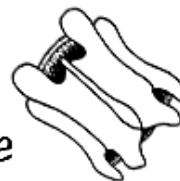
Skull



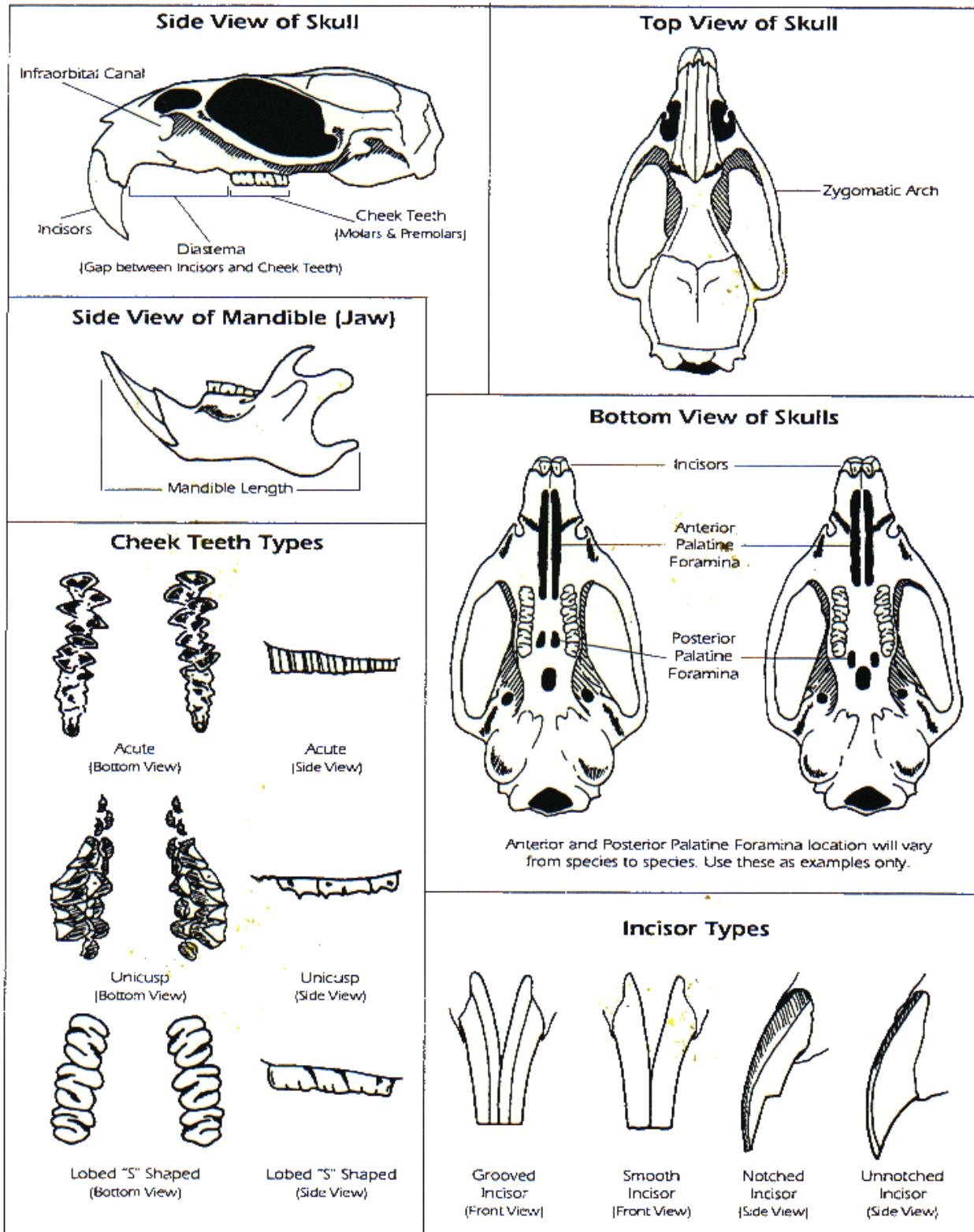
Lower Jaw



Vertebrae



Copyright 2001 KidWings.com



# Symbiosis Notes

Name: \_\_\_\_\_ Pd/Sec: \_\_\_\_\_

1. Define Symbiosis: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

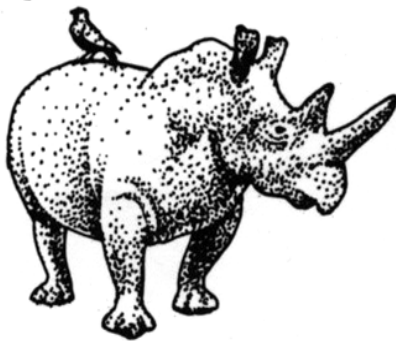
2. Define each type of symbiosis:

Mutualism: \_\_\_\_\_

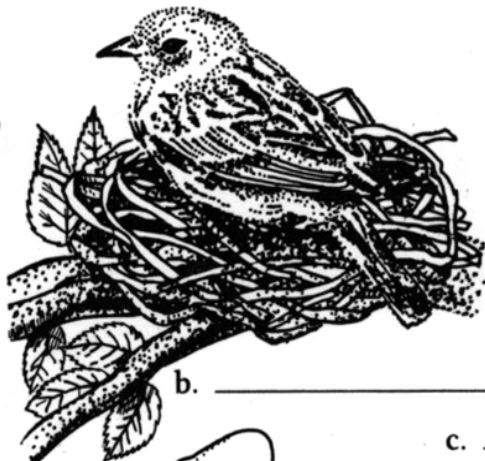
Parasitism: \_\_\_\_\_

Commensalism: \_\_\_\_\_

3. Identify each of the following relationships as mutualism, commensalism, or parasitism.



a. \_\_\_\_\_



b. \_\_\_\_\_



c. \_\_\_\_\_



d. \_\_\_\_\_



e. \_\_\_\_\_



f. \_\_\_\_\_

Name \_\_\_\_\_ Section \_\_\_\_\_

## Notes on Estimating a Population



1. What is a population?
2. Name one reason scientists study populations.
3. What are the 4 main ways scientists count populations?
  - 1)
  - 2)
  - 3)
  - 4)
4. What is a direct count?
5. What is an example of indirect evidence of a population of animals?
6. What is a quadrant?
7. (True or False) Scientists must come back and recapture animals in order to complete a mark and recapture study.

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**Hw: Study notes and vocabulary–  
read over them and KNOW them**

**Oct 19,2012**

**OBJ: Census takers, quiz, symbiosis  
handout**

**DQ: What are the 4 methods for  
determining size of populations?(696)**












# CENSUS TAKERS

Name \_\_\_\_\_

- 1) Prediction
- 2) Population Samples

- 3) Sample Total
- 4) Average ( $\div 5$ )
- 5) X Number of Square Units
- 6) Population Estimate
- 7) Actual Population
- 8) Difference

	A	B	C	D	E

Cut  
Out

- 1) Prediction
- 2) Population Samples

A  
B  
C  
D  
E

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- 3) Sample Total
- 4) Average ( $\div 5$ )
- 5) X Number of Square Units
- 6) Population Estimate
- 7) Actual Population
- 8) Difference

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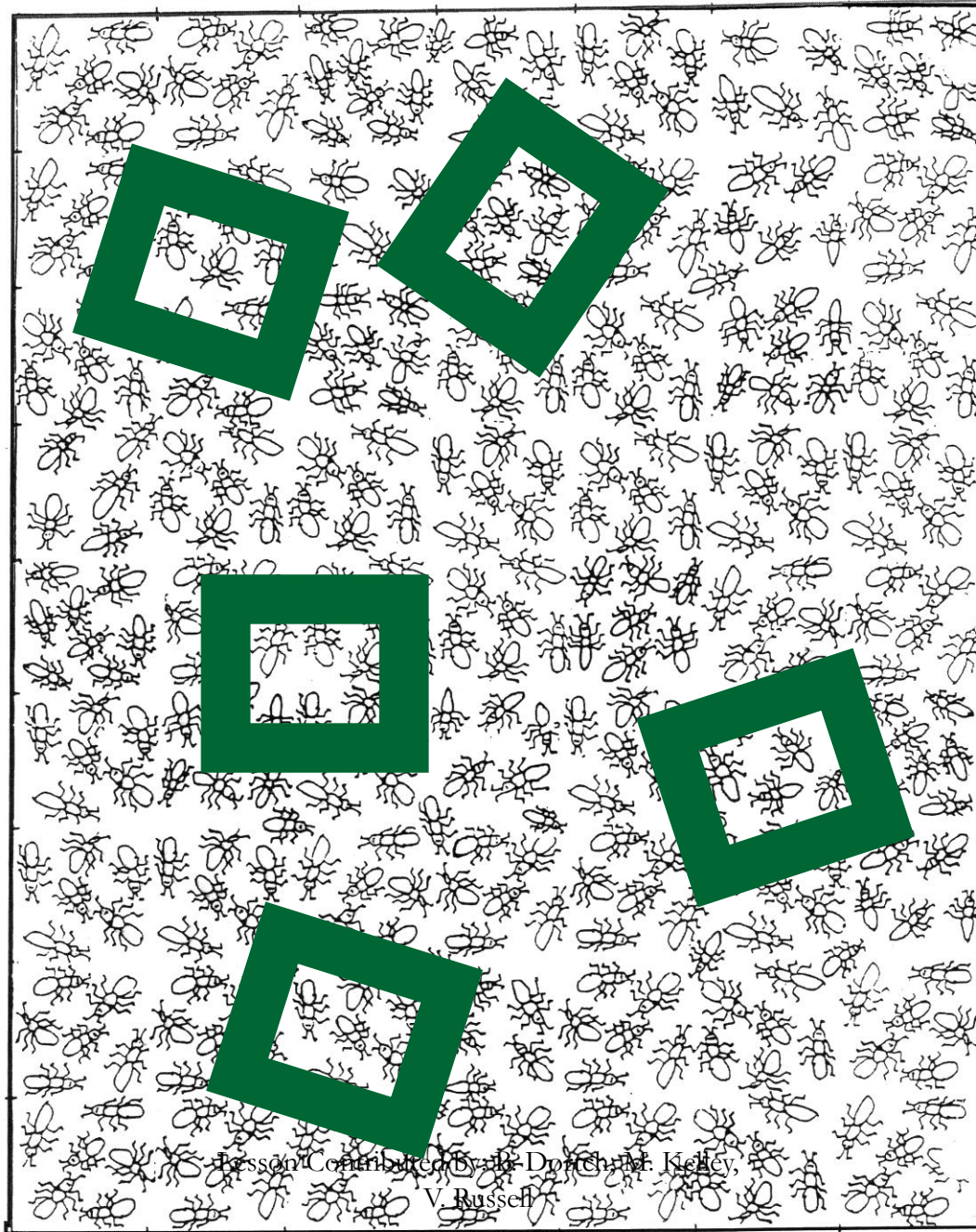
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# CENSUS TAKERS



Lesson Contributed by Dr. Don Chaffin, Kelley,  
V. Russell



- 1) Prediction
- 2) Population Samples

A  
B  
C  
D  
E

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- 3) Sample Total
- 4) Average ( $\div 5$ )
- 5) X Number of Square Units
- 6) Population Estimate
- 7) Actual Population
- 8) Difference

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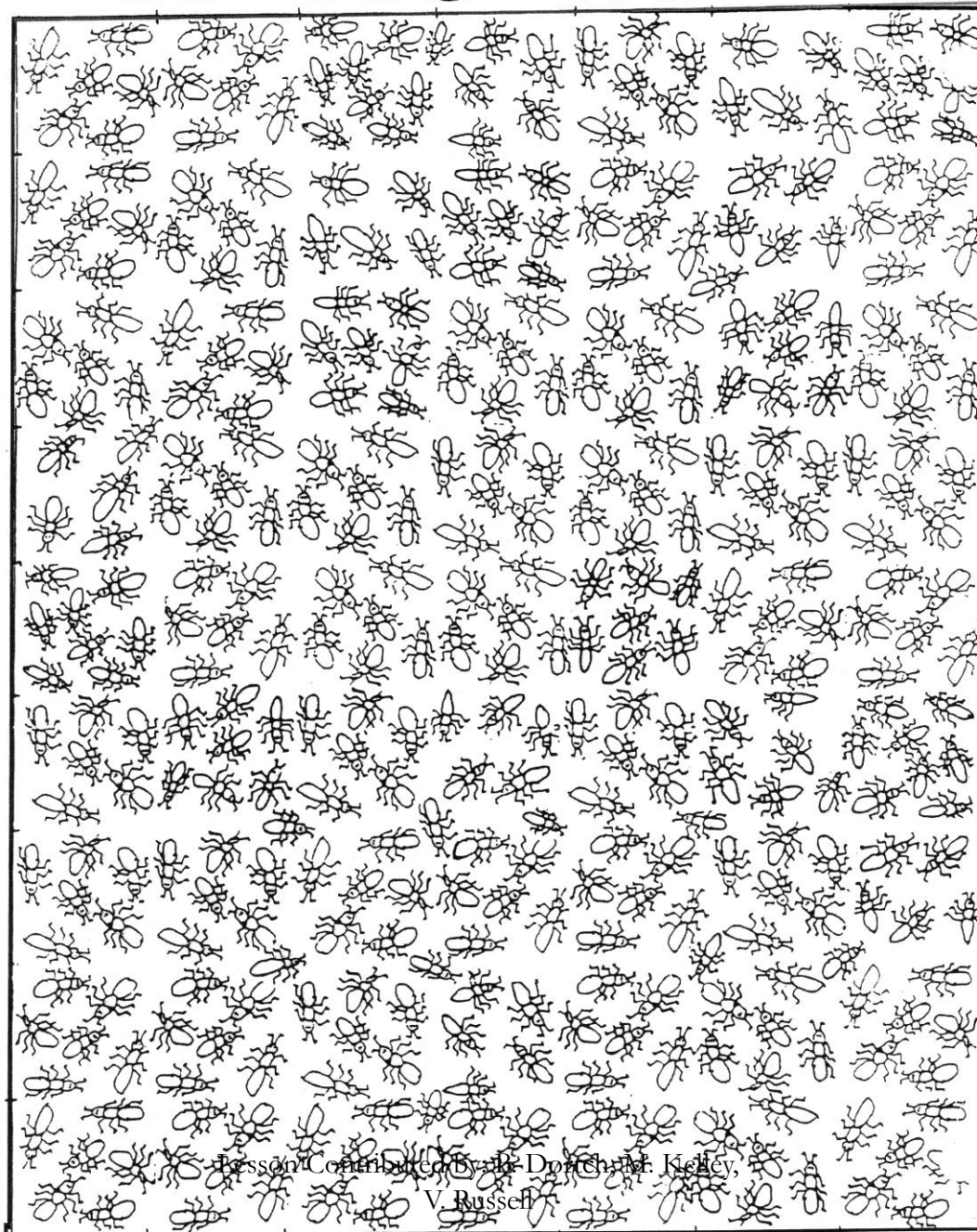
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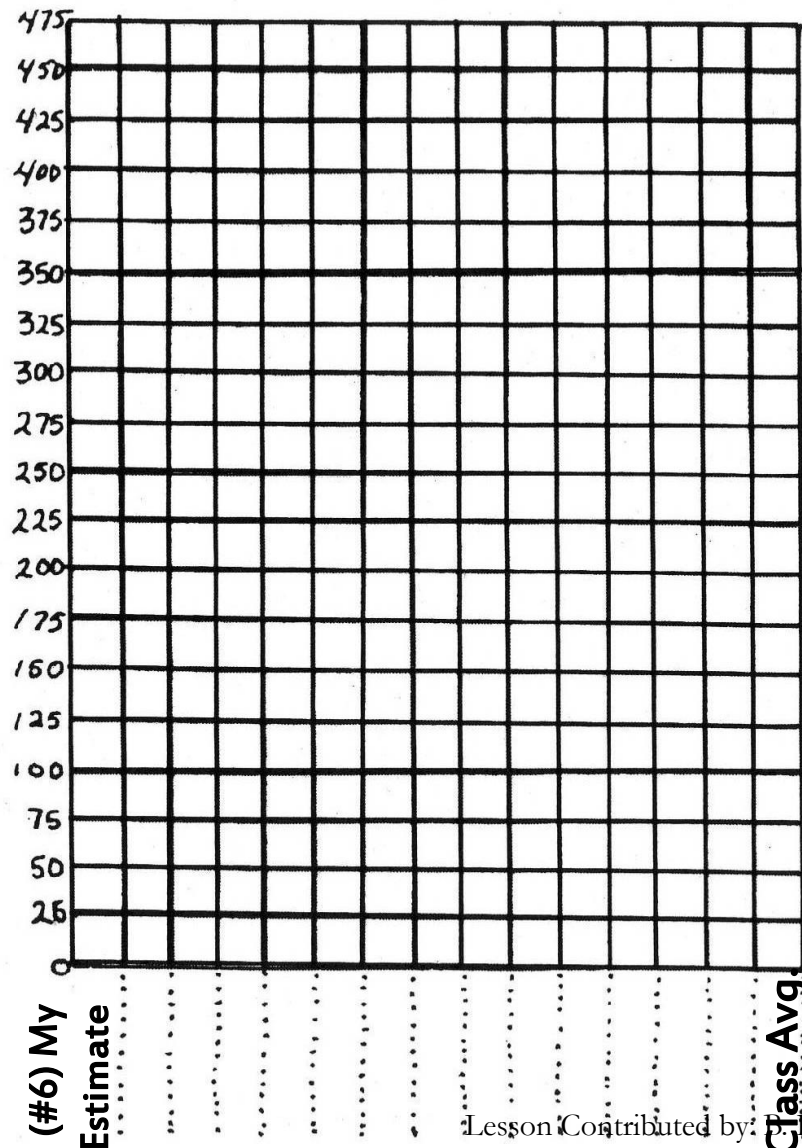
# CENSUS TAKERS



Lesson Contributor: Dorothy Kelley,  
V. Russell

# Population Estimates

POPULATION



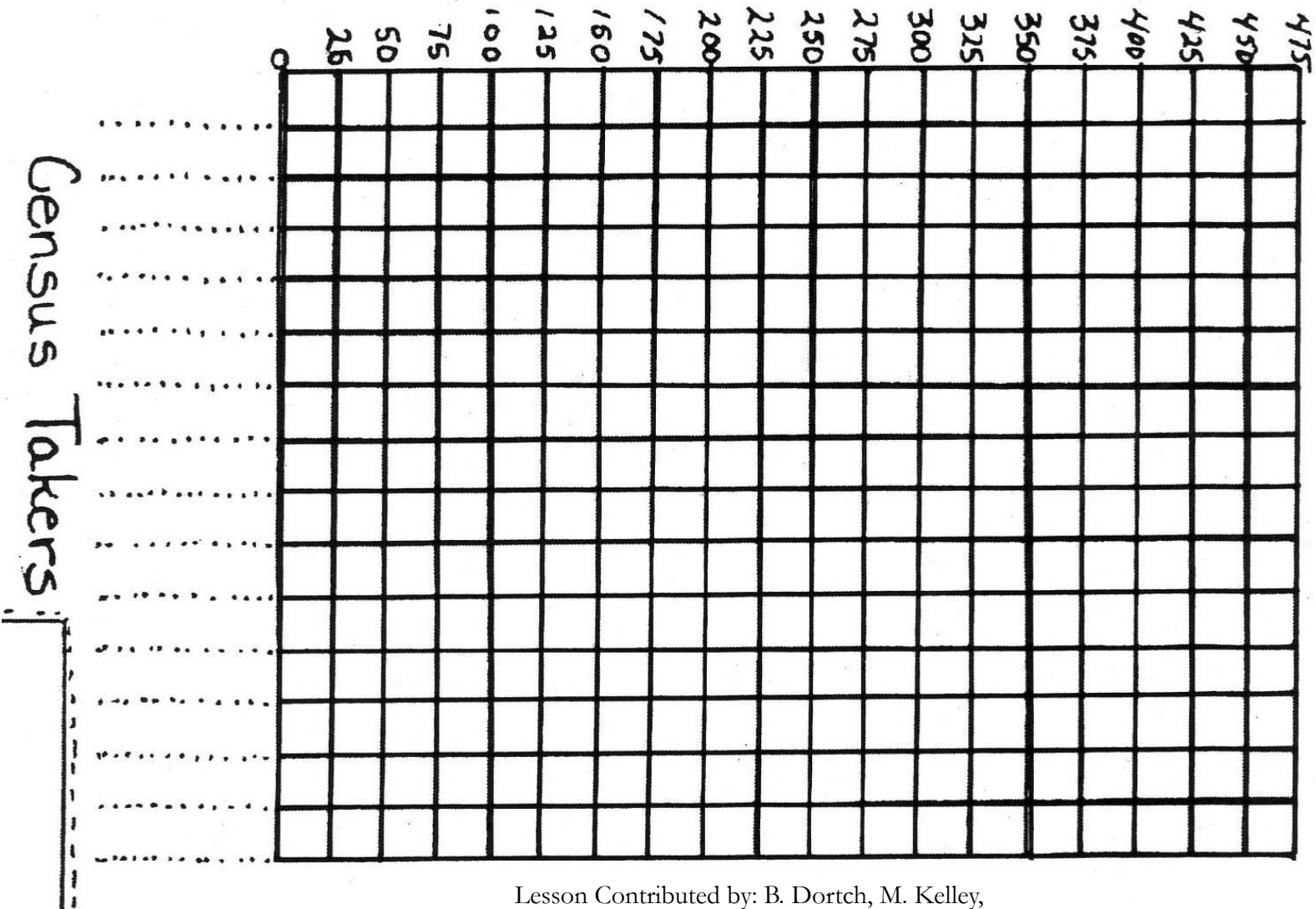
## Conclusion

1. Explain the steps for population sampling (what did you do for steps 2 – 6?)
2. Was your estimate (#6) **or** the class average closer to the actual number of ants?



# Population Estimates

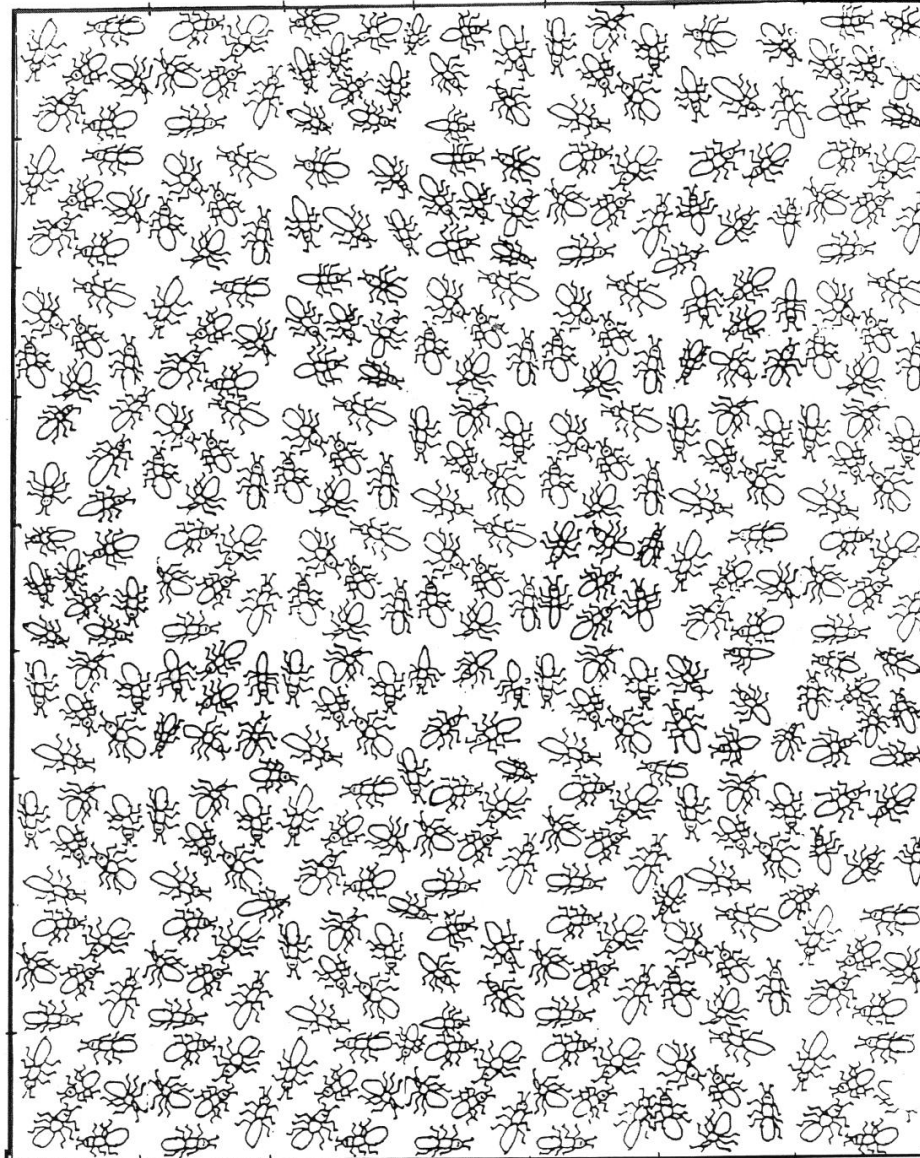
POPULATION



Lesson Contributed by: B. Dortch, M. Kelley,  
V. Russell

# Class Population Estimates (#6)

# CENSUS TAKERS



Lesson Contributed by: B. Dortch, M. Kelley,  
V. Russell

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# Conclusion

1. Explain the steps for population sampling (what did you do?)
2. Was your estimate or the class average closer to the actual number of ants?
  - ❑ Period 7 average – 370

## ESTIMATING POPULATIONS

BY M. KELLEY

Adapted from

[http://www.biotopics.co.uk/newgcse/measuring\\_population\\_sizes.html](http://www.biotopics.co.uk/newgcse/measuring_population_sizes.html)

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### What is a population?



<http://www.thewestsidestory.net/2014/06/30/13733/emperor-penguins-danger-due-climate-changes-global-warming/>

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A population is the number of individuals of a **single species** in a particular area.

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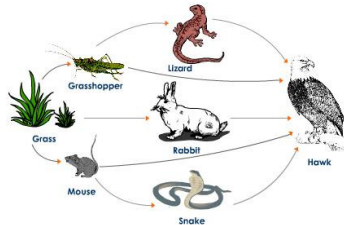
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Can you think of some reasons scientists might want to know the numbers of animals in a given area?




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One reason might be that counting the population makes it is possible to make **comparisons between different areas**, or to see **how populations change in the same area over a period of time**

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There are **4 main ways scientists count or estimate populations**.

They are

- 1) Direct Count
- 2) Indirect Count
- 3) Random Sampling
- 4) Mark and Recapture Studies




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### 1) Direct Count-count each animal



<http://www.awf.org/blog/counting-zebras-dodging-elephants>

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**2. Indirect Count** - Scientists can't see the animal. They see evidence of the animals and calculate the number of animals from this evidence. Can you name some of these?




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### Indirect Count

<http://www.gpnc.org/tracks.htm>

Animal – nests, footprints/pawprints, scat, broken branches or missing leaves, chewed wood, snagged or lost fur, claw marks on trees, feathers, disturbed dirt/holes, smell, knocked over garbages




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### Indirect Count

Try this: There are \_\_\_\_ nests. Scientist know 4 birds are usually in each nest. How many birds are in the area?



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### 3. Random Sampling

The scientist takes a sample at random. This is repeated many times. An average is taken and an estimate can be calculated.

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### Random Sampling

<http://en.wikipedia.org/wiki/Quadrat>



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An example—  
on average 12 crickets are in a meter  
square in the school yard.  
If the area is 100 square meters,  
how many crickets are there?




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#### 4. Mark and Recapture Studies

Scientists capture animals,  
mark them, release them,  
recapture them later, and  
calculate how many are  
present.

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##### Example

Capture and mark 20 frogs  
with a band.

Release them.

Come back in a month.

Recapture frogs. Count how many are marked.

Let's say 5 are marked.

This means the original number of frogs is  $\frac{5}{20}$  of the total  
number of frogs.

$\frac{5}{20} = \frac{1}{4}$  and the original number of frogs was 20. 20 is  
 $\frac{1}{4}$  the total number of frogs.

What is the total number?  $20 = \frac{1}{4} x$

$x = 80$  frogs




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1. What is a population?
2. Why would scientists want to count a population?
3. Name the 4 ways to estimate a population.
4. Which method would you use to count a population of sea urchins on the ocean floor in a given area? Why?

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# Estimating populations

BY M. kelley

Adapted from

[http://www.biotopics.co.uk/newgcse/measuring\\_population\\_sizes.html](http://www.biotopics.co.uk/newgcse/measuring_population_sizes.html)

# What is a population?



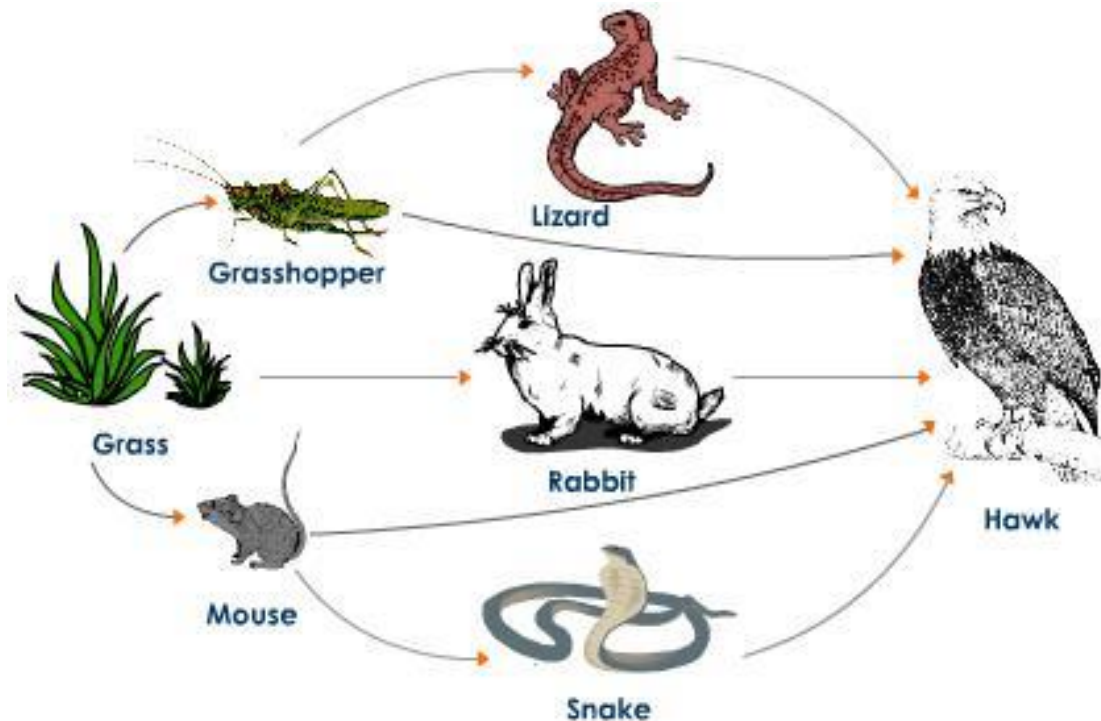
<http://www.thewestsidestory.net/2014/06/30/13733/emperor-penguins-danger-due-climate-changes-global-warming/>

Lesson Contributed by: B. Dortch, M. Kelley,  
V. Russell

A population is the number of individuals of a **single species** in a particular area.



Can you think of some reasons scientists might want to know the numbers of animals in a given area?



Lesson Contributed by: B. Dortch, M. Kelley,  
V. Russel  
**A Food Web in a Grassland Ecosystem With Five Possible Food Chains**

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- 2) Indirect Count
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# 1) Direct Count-count each animal



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Lesson Contributed by: B. Dortch, M. Kelley,  
V. Russell

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Lesson Contributed by: B. Dortch, M. Kelley,  
V. Russell

# Indirect Count

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-Animal – nests, footprints/pawprints, scat, broken branches or missing leaves, chewed wood, snagged or lost fur, claw marks on trees, feathers, disturbed dirt/holes, smell, knocked over garbages



Trail Pattern

Lesson Contributed by: B. Dortch, M. Kelley,  
V. Russell



# Indirect Count

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Lesson Contributed by: B. Dortch, M. Kelley,  
V. Russell

### 3. Random Sampling

The scientist takes a sample at random. This is repeated many times. An average is taken and an estimate can be calculated.



# Random Sampling

<http://en.wikipedia.org/wiki/Quadrat>



Lesson Contributed by: B. Dortch, M. Kelley,  
V. Russell

An example—  
on average 12 crickets are in a meter  
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If the area is 100 square meters,  
how many crickets are there?



Lesson Contributed by: B. Dortch, M. Kelley,  
V. Russell

## 4. Mark and Recapture Studies

Scientists capture animals, mark them, release them, recapture them later, and calculate how many are present.

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Release them.

Come back in a month.

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3. What are the 4 main ways scientists count populations?

1)

2)

3)

4)

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5. What is an example of indirect evidence of a population of animals?

6. What is a quadrat?

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