

## **The Three D's of Environmental Data: Deciphering, Dissecting, and Displaying Data**

### **Brief Overview:**

*Students will know how to collect, display, and analyze data by experimenting with “growing animals,” measuring the distance of origami creatures, predicting a census flower count of a meadow, and observing and recording the growth of planted seeds. The students will understand the value of graphs and will be able to draw conclusion and make generalizations in the form of BCR's and ECR's. The content focus is Environmental Science. While learning to analyze and display data, the students will learn about habitats, plants, and animals.*

### **NCTM Content Standard/National Science Education Standard**

*Collect data using observations and experiments  
Represent data using graphs such as bar graphs, line plots and line graphs.  
Determine the mean, medium, mode and range.  
Predict and justify conclusions and predictions based on data and design studies  
and to complete further investigations for further conclusions and predictions.*

**Grade/Level:** 3 - 6

### **Duration/Length:**

*3- 5 days for 60 minutes daily; Assessments will be woven throughout the lessons.  
A Cumulative assessment will be administered on day four or five.*

### **Student Outcomes:**

Students will:

- *Know how to record data on charts and construct a line graph by collecting data related to the size of sea creatures.*
- *Construct a pictograph by plotting the distance of origami sea creatures after measuring their flight.*
- *Construct line graphs to compare and contrast data collected over a period of time.*
- *Predict, and estimate the census of a field of flowers by using paper manipulative of a flower meadow.*

- *Predict, measure, and display the number of seeds in a package on a chart*
- *Plant seeds, observe, record, and display data of the growth patterns on charts and on a line graph.*
- *Draw conclusions and write BCR's and ECR's upon completion of deciphering and analyzing the data.*

***Materials and Resources:***

***Lesson 1***

- *(Student Resource Sheet # 1) Endangered Whale Survey.doc)*
- *(Student Resource Sheet # 2) Endangered Whale Survey Paragraph.doc)*
- *(Teacher Resource Sheet # 1) Endangered Whale Survey Questions.doc)*  
*(There are two documents/ sheets for Teacher Resource Sheet # 1)*
- *(Teacher Resource Sheet # 2) Description of Stem and Leaf and double bar graph)*
- *(Student Resource Sheet # 3 Endangered Whales and Ships - paper manipulative)*

***Lesson 2***

- *Colored pencils*
- *Graph paper*
- *Masking tape*  
*Yardstick with inches and centimeters*
- *Origami paper*
- *Origami instruction for making Whales (Student Resource Sheet # 4 - Wally the Whale” Origami Creatures.doc)*
- *Chart the Whale Distance – Paper manipulative (Student Resource Sheet # 5- “A Whale’s Journey”)*
- *Tin pans for growing creatures (1 per 4 students)*
- *Growing Creatures (1 per 4 students. Purchase them at a dollar store or Teacher Resource Sheet # stores.)*
- *Growing creatures data chart (Student Resource Sheet # 6- “ Growing Creatures’)*
- *(Student Resource Sheet # 7 - Class Data Growing Creatures)*

***Lesson 3***

- *Packages of Marigold seeds*
- *A picture of a Marigold (Student Resource Sheet # 8 - “ A Beautiful Marigold”)*
- *(Student Resource Sheet # 9 - How to grow a Marigold.doc)*
- *Student charts (Student Resource Sheet # 10 -“The Marigolds Of the Meadow”) Guesses and Predictions*
- *Class chart for Guesses and predictions (Student Resource Sheet # 11 - The Sum of our Marigold Predictions)*
- *Paper cups*

- Potting soil
- Graph paper for multi-line graphs.doc
- (Student Resource Sheet # 12- BCR/ ECR – Observing and Measuring Marigolds

## Development/Procedures:

### **Lesson 1**            **Wally the Endangered Whale** **Part 1**

*Introduction: Habitats! A habitat is a place where plants and animals live and grow. There are many different kinds of habitats. If the habitat is disturbed the plants and animals can become endangered. Use the given website to give students more information about habitats and endangered species.*

*[http://www.fws.gov/endangered/Kids/resources/how\\_help.htm](http://www.fws.gov/endangered/Kids/resources/how_help.htm) l#Data and the National Wildlife Federation website <http://nwf.org>*

*The students will learn that a graph or chart can often give a complete snapshot view of detailed information. It is often clearer than a paragraph or story. The students will also get practice constructing picture graphs.*

#### **Preassessment –**

- *Distribute (Student Resource Sheet # 1 –Endangered Whale Survey) to one half of the students and (Student Resource Sheet # 2 to the other one – half of the class. (See Teacher Resource Sheet # 1. There are two sheets.) Ask the students to answer several questions in 10 seconds (The students will discover that the students with the chart or graph are able to quickly answer the questions because of the format or display of information)*
- *Ask: What conclusion can you make about showing information in a graphing format? Which form was easier for you to read and to use to answer the questions quickly?  
Does format help one understand more quickly? Which form was easier for you?  
To read and to use to answer the questions?*

#### **Launch**

- *The students will exchange papers with their partners and more questions are asked.*
- *Ask: (Teacher Resource Sheet # 1- Endangered Whale Survey Questions) “How many ships saw the Humpback Whale? What was the only ship that saw the Blue Whale? Name the ship or ships that*

saw the Right Whale. Which ship saw more whales than any other ship?

### **Teacher Facilitation**

- Ask, “What makes it easier to read the graph with this information? What kind of graph is this? Who can recall the name of other kinds of graphs?”
- “Yes, there are **line plots, line graphs, picture graphs and bar graphs, double bar graphs, Double line graphs and stem and leaf graphs.** What are the characteristics of these graphs?” (**Teacher Resource Sheet # 2 - Description of Graphs – Stem and Leaf**)
- What other kind of graph can we use to portray this information? Yes, I agree I think a pictograph would work well. What pictures would you place on the **x-axis**? Do we need a key for a pictograph? (Yes, we can use pictures of each ship and pictures of the different kind of whales.

### **Student Application**

- The students will be given materials to construct individual picture graphs. They must decide what pictures to put on the **x-axis** and the number and kind of ships to put above the kinds of whales. See (Student Resource Sheet # 3 Endangered Whales and Ships)

### **Embedded Assessments**

- The students will share the information orally and write sentence to **make generalizations** about the data. These generalizations will be placed in their Math Journal. What did you learn today about sharing information? Name the kinds of graphs we used. Describe them.

## **Lesson 2**

### **Preassessment/ Motivation:**

- Can you think of other ways to collect data about endangered species? What are some other kinds of animals that you like? Do you know of another animal that is endangered? Distribute (Student Resource Sheet # 4 - Wally the Whale Origami)

### **Launch:**

- “Let’s have some fun making Wally the Whale.”
- The students will follow the directions and cut and fold to make their own Wally.

### **Teacher Facilitator:**

- The teacher will assist students having trouble following directions.
- After completing their origami whales, the students will take turns blowing their whale to see who constructed the best sailing whale.

***Student Application:***

- *The students will line up and take turns blowing their whale on a journey.*
- *Student place their whales on the starting line. They will take one breath and blow their whale as far as they can.*
- *Students will measured the distance of their whales traveled. Data should be recorded on a chart.*
- *Students should work in teams of no more than four and roles should rotate.*
- *They should take turns being the timekeeper, the taskmaster, the recorder and the reporter.*
- *Students will construct a line plot of the class data. (Student Resource Sheet # 5- “A Whale’s Journey”)*

***Extension***

***Introduction:***

*This part of the lesson is experimenting with growing creatures. The students will measure a variety of sea creatures in centimeters and monitor their growth over a period of 1 – 3 hours or 1-4 days according to the directions on the package. These are commercial materials that expand when soaked in water.*

*(Students open the packages and measure their creatures in centimeters. Have the students predict how large their creatures will grow.*

*Depending on the maximum amount of time it takes for the creatures to grow, have the students take measurements at equal interval (See Student Resource Sheet # 6 – Growing Creatures)*

***Teacher Facilitator:***

*“Children use your centimeter ruler or tape and measure your creature to the nearest centimeter.” Lunchtime, “It’s time now to measure and record our new data.” At dismissal time, the students remind the teacher that they have to measure and record their creatures for the third time.*

***Student Application:***

*The students get practice recording and measuring their creatures. At the end of the third or fourth day according to the kind of creatures used the students will compile (Student Resource Sheet # 7 – Class Data Growing Creatures) and make multi colored line plots to show the growth of individual creatures. The students must use the acronym T.A.I.L.S. They need a T. Title, A and Axis, equal intervals, L labels for the x and y-axis,*

and a scale. (Student Resource Sheet # 7 –B - T.A.I.L.S - Growing Creatures Chart)

**Embedded Assessment:** The accuracy of the line graph and all the necessary parts will be graded. Using the data gathered individually about your creature and the creatures of your classmates draw conclusions and make comparisons about the rate of their growth.

## Development/Procedures:

### Lesson 3 Growing Data

#### Day One

##### *Introduction:*

In this lesson the students will estimate the number of seeds in a package of seeds, and check their estimations to see who was the closest. They will also guess the number of seeds that will actually germinate from the package. After germination the students will chart and graph the growth of the flowers two times a week or every three days. A class graph will be constructed and displayed to show the rate of growth of each plant. This will be a multi line graph, which will be color-coded.

##### *Preassessment –*

- Ask how many students have ever seen a marigold seed?
- The class will get into a discussion about marigold seeds and what the plant looks like. The teacher will tell the class that they are going to grow their own marigold flowers, but first they are going to play some guessing games.
- Show students a package of marigold seeds.
- Ask: How many seeds do you think are in this package?

##### *Launch*

- The teacher will display a picture of a marigold (Student Resource Sheet # 8 A Beautiful Marigold”) and distribute the Student Resource Sheet # paper about Marigolds. (Student Resource Sheet # 9 - “How to Grow Marigold’s”)
- After reading the given materials the students will share the new information learned. Each team of four students will be given a package of flowers seeds.
- First each child will **guess** how many seeds are in the package without looking.
- Next each child will look at the seeds and **estimate** how many seeds are in the package.

- The final time the students will take all the seeds out, place them on a colored piece of construction paper, spread the seeds, and make an **educated estimate**. Students will record their data on (Student Resource Sheet # 10 – (“Marigolds of Our Meadow”))

### ***Teacher Facilitation***

- Say: Today we are going to learn the difference in **guessing** and **making estimates** or **educated** guesses. We are also going to select the best kind of graph to display our data from the marigold seeds and the plants that we are going to grow in our own classroom.
- “We will also find the **mean, mode, median, and range** of the data we collect. “
- “What does it mean to make a guess? When you first stated the number of seeds you thought might be in the package you took a wild guess. In other words you had no idea. After looking in the package, you had some information about the size of each seed and how much of the package was actually filled.”

### ***Student Application***

The students will find the mean, median, mode, and range of the class data. See (Student Resource Sheet # 11 – Sum of our Marigold Predictions)

### ***Embedded Assessments***

- Observe the number of students responding correctly to questions throughout the lesson and make a point of directing some questions to the students who are not as verbal, with total class responses.
- The completion of their individual guesses and prediction is an assessment.
- The teams with the perfect answers to the mode mean etc. will receive certificates for Jobs Well Done, Excellent Work, or Super Team.

### ***Extension/ Assessment***

- Answer the BCR/ECR (Student Resource Sheet # 12 “Observing and Measuring Marigolds”). Use what you know about mean, mode, median, and range to explain why your answers are correct Use words, numbers, symbols and or pictures.
- The students will construct bar graphs, and line plots to display their guesses, predictions and the actual number of seeds in each package.

## **Day 2 Extension & Reteaching**

### ***Introduction:***

In this part of lesson three, the students will learn some science concepts about plants while learning more about data. They will find out what is needed to grow marigolds, and they will make guesses about the number of plants they can grow from a package of marigold seeds. Students will chart and graph the number of plants that grow and the rate of growth after the seed germinates.

***Preassessment*** –

What are the necessary ingredients for growing marigolds?

***Launch*** –

Says: Do most plants need the same things in order to grow? Read the directions on your package. What does the package tell you about planting marigolds? Where should we place the container for optimal growth?

***Teacher Facilitation*** –

Say: Let's plant our seeds. Each table is to take turns getting the necessary materials. How much dirt will you put in the container? How many seeds will you put in each container? How deep should the seeds be planted? (Teacher Information: This part of the lesson will take several days before the seeds germinate and several weeks before they develop.

***Student Application*** –

The students work as a team and individually to get all the materials, soil, container, seeds, and water. The teacher moves around the room and questions the students to help them think and rethink the process. She should ask how many seeds you think should be placed in each container. What do the seeds need to grow? Is place a consideration? Should the seed be on top of one another?

***Embedded Assessments*** –

*The teacher assessment takes many forms again. This is a performance assessment. Each child is given a container, a cup of water, soil and marigold seeds. Students will observe (Student Resource Sheet # 8 - "A Beautiful Marigold"). The students will note the day they plant the seeds and the first day a sprout emerges from the soil. They will measure and graph the growth of the seedling over a period, using Student chart and graph paper. Students will have two graphs one for their individual plant and another representing the sum growth of seedlings in the class. Again they will be required to use their T.A.I.L.S. strategy for remembering the parts to a line graph. As a summative assessment the students will complete (Student Resource Sheet # 13 -BCR or Student Resource Sheet # -13 ECR Measuring Marigolds) The BCR's are for grades 3 and 4. The ECR's are for grades 5 & 6.*

**Student Resource Sheet # 12**

**BCR/ ECR      “Observing & Measuring Marigolds**

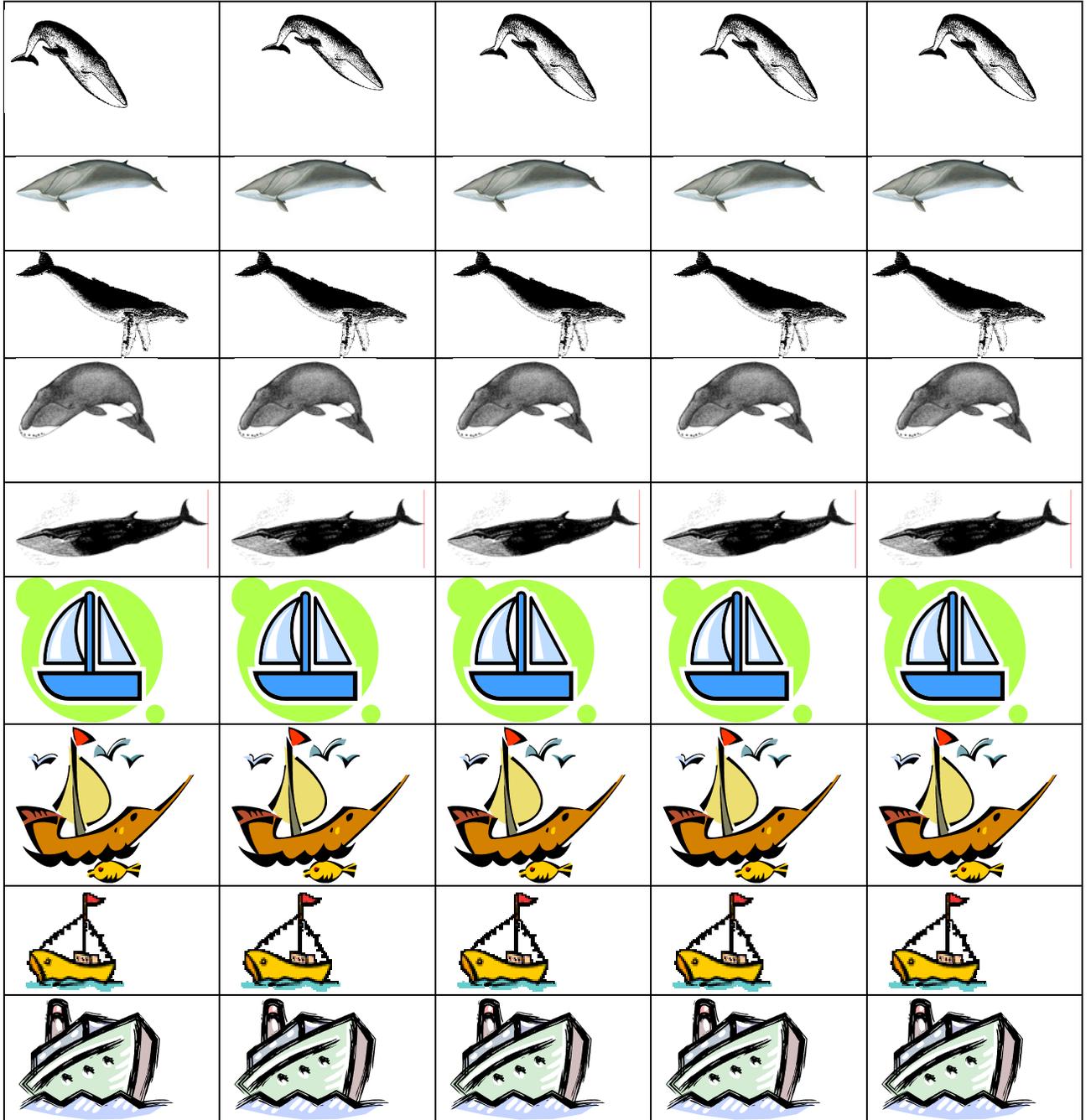
**Authors:**

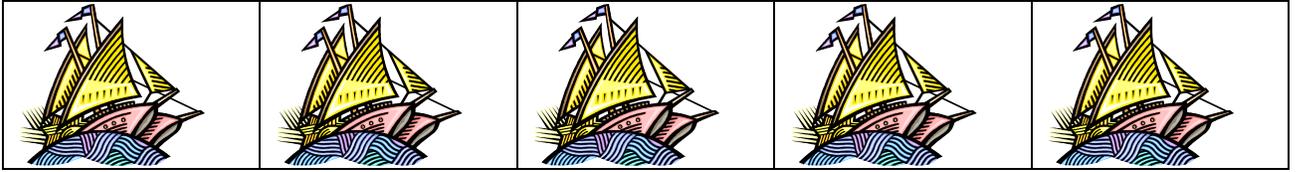
Sandra E. Braxton-Riley  
Rosemont Elementary/ Middle School  
Baltimore City Public School

Evelyn Campbell  
Rosemont Elementary/Middle School  
Baltimore City Public School



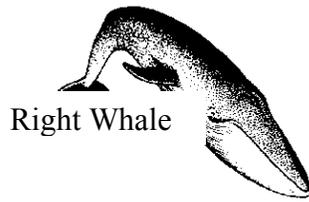
**Paper manipulative - Whales and Ships**  
Cut to make Pictographs of Whales or Sails





## Wally The Endangered Whale

Blue Whale



Right Whale

Sei Whale

Finback Whale

Bowhead Whale

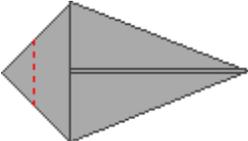
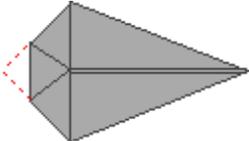
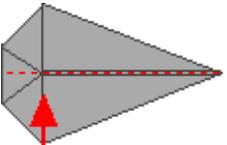
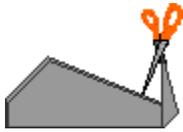
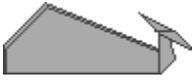
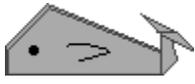
Humpback Whale

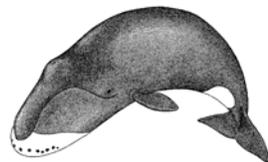
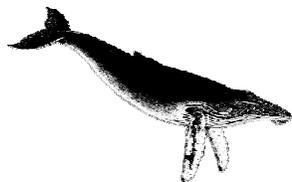


### Supplies needed:

- Paper
- Scissors
- Markers or crayons

	<p>Start by making a square piece of paper. To start making the square, fold one corner of a piece of paper over to the adjacent side.</p>	
	<p>To finish making the square, cut off the small rectangle, forming a square (which is already folded into a triangle).</p>	
<p>Fold to center fold</p>	<p>Fold two opposite side over so that they meet at the fold.</p>	

	<p>Fold the tip over to just meet the other folds.</p>	
	<p>Fold the piece in half along the central axis.</p>	
	<p>Fold the tail up.</p>	
	<p>Make a short cut through the end of the fold in the tail. Fold the edges of the tail outwards.</p>	
	<p>Draw eyes, fins, and any other patterns you like, and enjoy your whale.</p>	



“A Whales Journey”

“Go Wally Go!”

Place an X on the line at the distance you have blown Wally. Blow your Whale Three to Five times. Label each place on the graph. Then compute the averages.



Range =

Mode=

Mean =

Median =

Are there any outliers?

# 6 SRS - Growing Creatures

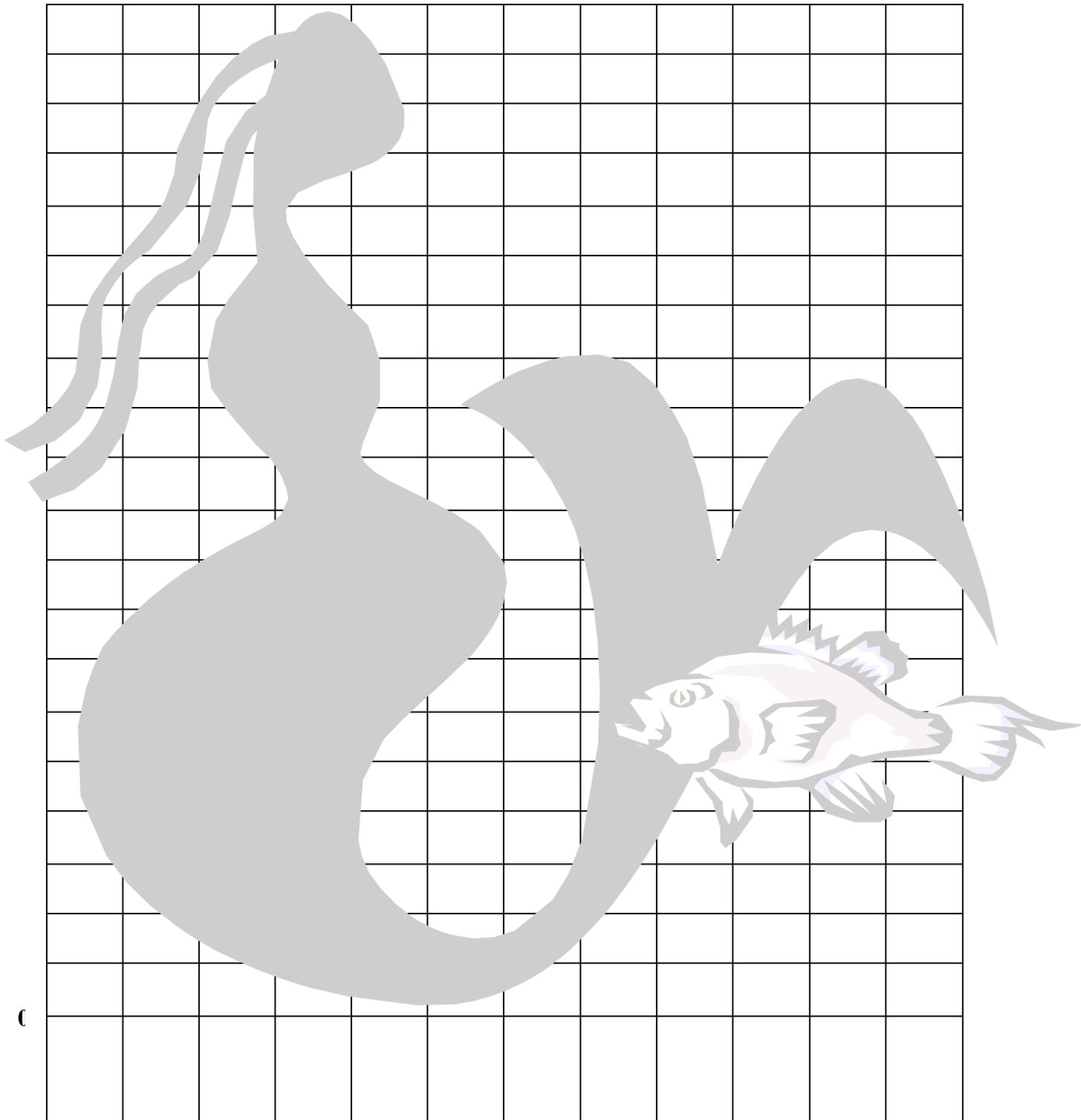


1. *Select a Creature That*Select a creature that your team of likes.
2. *Take a bowl and fill it with water.*  
*The creature must be covered with the water.*
3. *Measure the length and width of the creature in inches and centimeters.*  
*Record on your data sheet. Starting size length\_\_\_\_\_in. \_\_\_cent. Width \_\_\_\_\_inches \_\_\_\_\_cen*
4. *Now place the creature in the water.*
5. *Remember we have decided to measure its growth three times a day.*
6. *Noon time, take your second measurement for the day. Also record it on your chart in inches and centimeters*
7. *Repeat this process of measuring the length and the width three times for the next four days.*
8. *Ending Length Inches \_\_\_\_\_centimeters\_\_\_\_\_*  
*Width\_\_\_\_\_ Inches \_\_\_\_\_ centimeters*  
*Width \_\_\_\_\_inches \_\_\_\_\_centimeters*

Remember  
**T.A.I.L.S.**

Student Resource Sheet # 7 B

Growing Creatures Graph



# *Growing Creatures Data Chart*

*Student :* \_\_\_\_\_

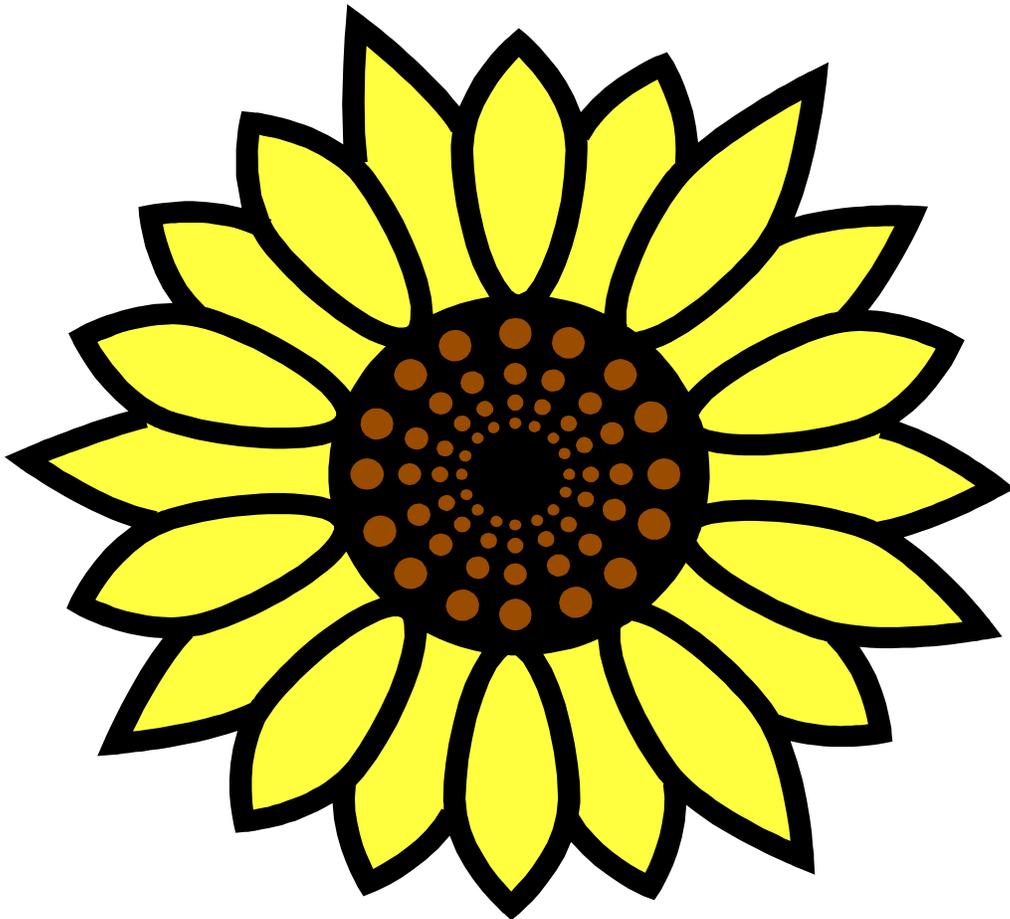
*The Name of our Creature:*

\_\_\_\_\_

Days	Morning Time Length/width	Lunchtime Length/width	<i>The End of the Day</i> Length/width
1			
2			
3			
4			



## A Beautiful Marigold



## “How to Grow Marigolds”

Marigolds are among the easiest of flowers to grow. They provide bright, cheerful color to your gardens. Marigolds are extremely easy to start from seeds. They are annuals, which mean they grow for just one year and need to be replanted every year. The greatest thing about the marigold is once you have bought the seeds you will never have to buy another Marigold plant. The new seeds come from the blossoms. Once the bloom dies it can be immediately planted to grow more plants or you can save the seeds for the next year. You will have marigold seeds for the rest of your life. Marigolds are bright, beautiful, hardy flowers.

Start your marigold garden indoors next spring, six to eight weeks before our last frost date. Or, if you don't mind later blooms, start after the frost date. Sow, (toss) the seeds directly in the ground, covering them with about  $\frac{1}{4}$  inch of potting soil.

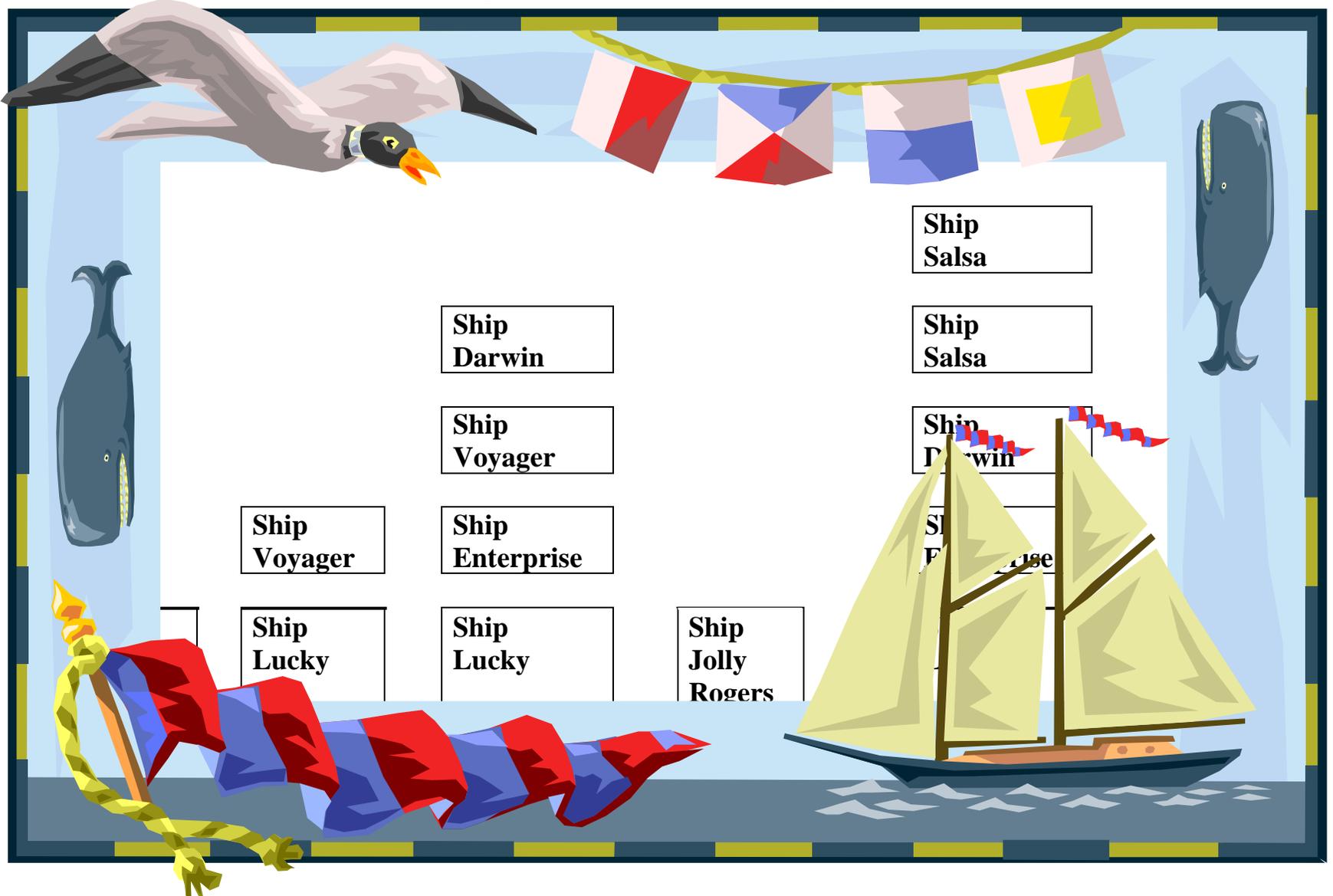
Steps:



(This is not a Marigold. All marigolds are yellow.)

1. Get a container, soil, seeds, and a cup of water.
1. Fill the container or planter almost to the edge with the potting soil.
2. Place the seeds  $\frac{1}{4}$  inch below the top of the soil.
3. Place the planter in a bright sunny spot
4. Water the seed often. Don't let the soil get dry or soggy.

# Endangered Whales Survey



Ship  
Salsa

Ship  
Darwin

Ship  
Salsa

Ship  
Voyager

Ship  
Darwin

Ship  
Voyager

Ship  
Enterprise

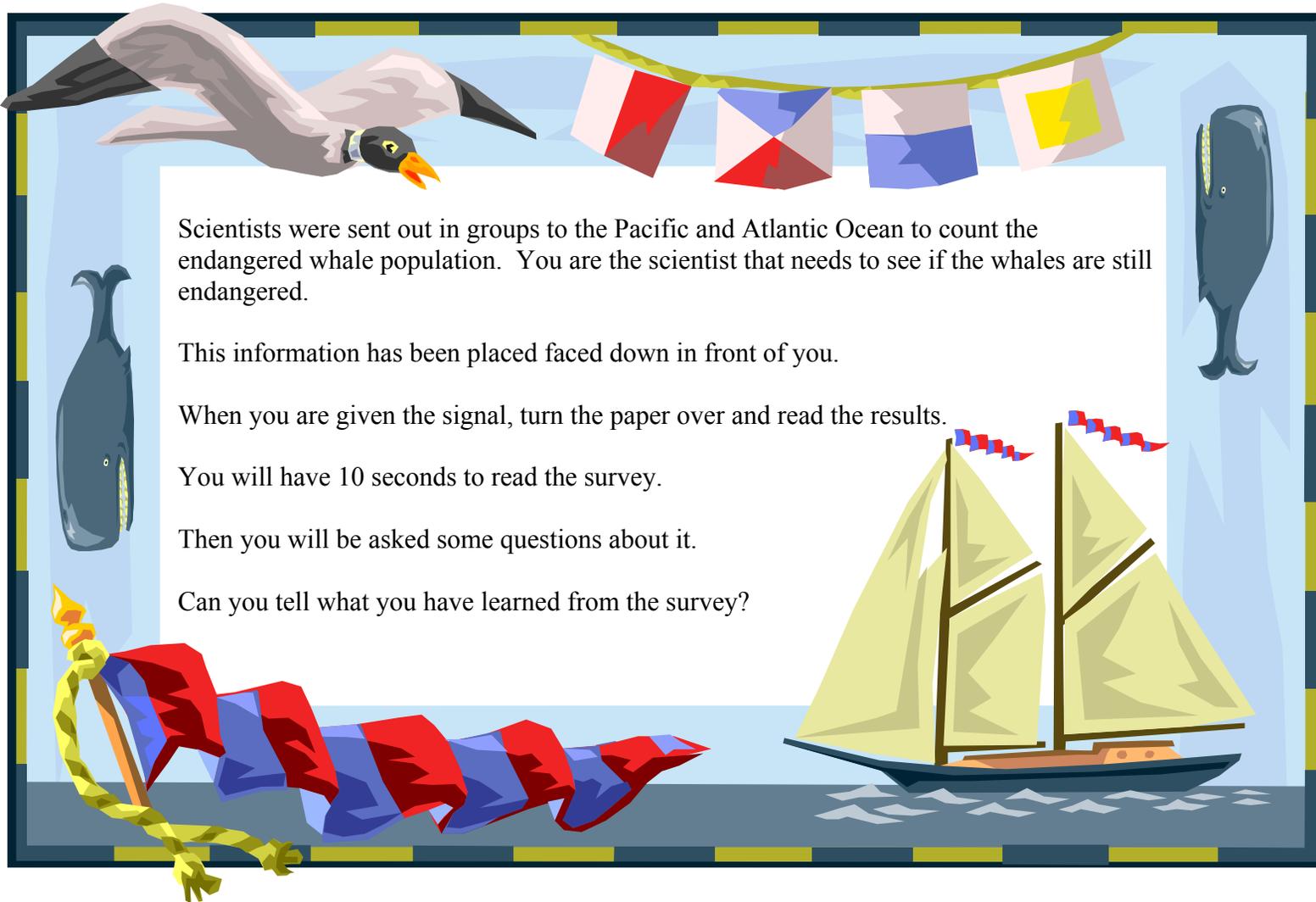
Ship  
Enterprise

Ship  
Lucky

Ship  
Lucky

Ship  
Jolly  
Rogers

TR 1 Endangered Whale Survey Questions. doc  
Can you answer questions from an Endangered Whale Survey?



# "The Marigolds of Our Meadow" Estimating Seeds

Student:

ESTIMATION METHOD	ESTIMATE
Observing the outside of the seed bag	
Looking in the seed bag	
Emptying seed bag and observing seeds	



ACTUAL COUNT: _____
---------------------

# The Sum of our Marigolds

Group name	Number of Seeds in Package

Range: \_\_\_\_\_

Median: \_\_\_\_\_

Mean: \_\_\_\_\_

Mode: \_\_\_\_\_



# Endangered Whale Survey Paragraph

## Endangered Whales Survey



## 2 TRS/SRS Description of Stem and leaf and the Double Bar Graph

### Kinds of Graphs:

#### A. Stem and leaf plot

##### Cars Sold

1		1 4 7 7 8 9	
2		4 8 8	
3		1 2 6	
4		1 2	2   4 = 24 points

#### B.

### Double Bar Graph

The low and high temperatures for four days are shown on the double bar graph below.

