

## **1997 Released Items**

# Forecasting Population Trends

## 1. Muskrat Population Table

Wildlife biologists are introducing 100 muskrats into a restored wetland area.

Predict the population size for the 2nd and 3rd generations using the following formula:

$$\text{Population Size} = 2.7P - \frac{P^2}{500}$$

where  $P$  is the population size of the previous generation.

Show your work and complete the table in your answer booklet.

## 2. Opossums

The table below shows the predicted population size of the first 8 generations of opossums as calculated using the following formula:

$$\text{Population Size} = 2.3P - \frac{P^2}{500}$$

where  $P$  is the population size of the previous generation.

Generation	1	2	3	4	5	6	7	8
Population Size	50	110	229	422	614	658	647	651

Show the relationship of the population of opossums and each generation. Predict the size of the population for generation 10. Explain how you arrived at your answer.

## Forecasting Population Trends (continued)

### 3. The Population Stabilizes

Biologists found that the population of another wetlands animal could be predicted using the formula:

$$\text{Population Size} = 1.5P - \frac{P^2}{500}$$

where  $P$  is the population size of the previous generation.

One hundred of these animals have been introduced into a restored wetlands. If a population stabilizes when it maintains its size over time, how many generations will it take for the population of this wetlands animal to stabilize? Explain your reasoning. You may use the grid in your answer booklet or any other method you choose.

# The Case for Recycling

## 1. Meeting the Contract

Tylerville has three routes for garbage pickup. The average tonnage per week collected on these routes is shown in the table below.

AVERAGE TONS OF GARBAGE  
COLLECTED PER WEEK

Route 1	4.2 tons
Route 2	6.8 tons
Route 3	7.5 tons

Tylerville has a contract with the Trash to Energy Company that states the town must deliver 800 tons of garbage per year. Based on the table above, will Tylerville be able to deliver their contracted amount? Explain how you arrived at your answer.

## 2. Lyndon's Commitment

The neighboring town of Lyndon collects an average of 14.3 tons of garbage weekly. Their commitment to the Trash to Energy Company is 600 tons annually. The residents of Lyndon have just decided to begin recycling about  $\frac{1}{4}$  of their garbage. If they meet their goal of recycling  $\frac{1}{4}$  of their garbage, will they meet their annual commitment to the Trash to Energy Company of 600 tons of garbage? Show the mathematics you used and explain your answer.

## 3. Less Garbage

A recycling program in a neighboring town was so successful that the town set recycling goals. The year before the recycling program went into effect, the town generated 120 tons of garbage. Their recycling program resulted in a reduction of 10% from the previous year in each of the next 3 years. Fill in the table and construct a graph that shows the reduction from 1990 to 1993.

## The Case for Recycling (continued)

### 4. What Is Wasted?

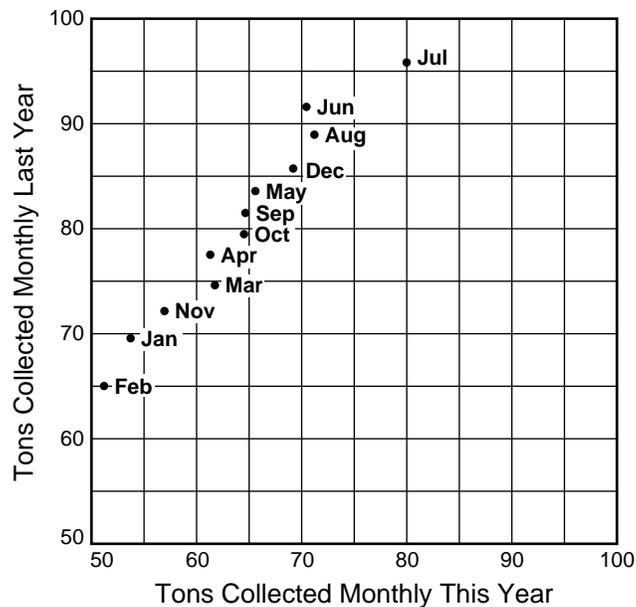
To build support for recycling, the students in one community are trying to show how much of the community's waste is paper. Their research shows that the average waste per person per day in the United States is:

- 0.25 pounds of glass
- 1.75 pounds of paper
- 0.40 pounds of plastic
- 1.00 pound of other waste materials

Use the circle to construct a circle graph that represents the proportion of glass, paper, plastic, and other waste generated by the average American each day.

### 5. Who Is Right?

To see how much progress their recycling program was making, town officials created a scatterplot of tons of garbage collected this year versus tons of garbage collected last year for each of the 12 months of the year.



The mayor looked at the graph and stated that it showed that this year's monthly tons were about 1.25 times last year's monthly tonnage. The town manager looked at the graph and stated that it showed that this year's monthly tons were about 0.8 times last year's monthly tonnage.

Who do you think has accurately interpreted the data in the graph? Explain how you arrived at your answer.

## Plant Fertilizer

For a science project, Elena is testing two formulas for homemade fertilizer made from different combinations of liquid seaweed and garlic juice.

Formula 1 uses 3 times more liquid seaweed than garlic juice.

Formula 2 uses 2 times more garlic juice than liquid seaweed.

1. Elena has 6 ounces of garlic juice. To make a batch of Formula 1, how much liquid seaweed should Elena add to the garlic juice?
2. Elena has 16 ounces of liquid seaweed. She adds the proper amount of garlic juice to make a batch of Formula 2. How many ounces of fertilizer will she have

Based on her experiment, Elena wrote the following two equations to predict plant growth for each of the two fertilizers:

$$\text{Formula 1 equation: } P = H + 0.4W$$

$$\text{Formula 2 equation: } P = H + 0.2W$$

*Where  $P$  is the predicted height of the plant in centimeters,  $W$  is the number of weeks and  $H$  is the starting height of the plant in centimeters.*

3. A plant that was 4.0 centimeters tall was given Formula 2 for 3 weeks. The actual height of the plant at the end of the 3-week period was 4.8 cm. What is the difference (in centimeters) between the actual height of the plant and the height predicted by Elena's equation?

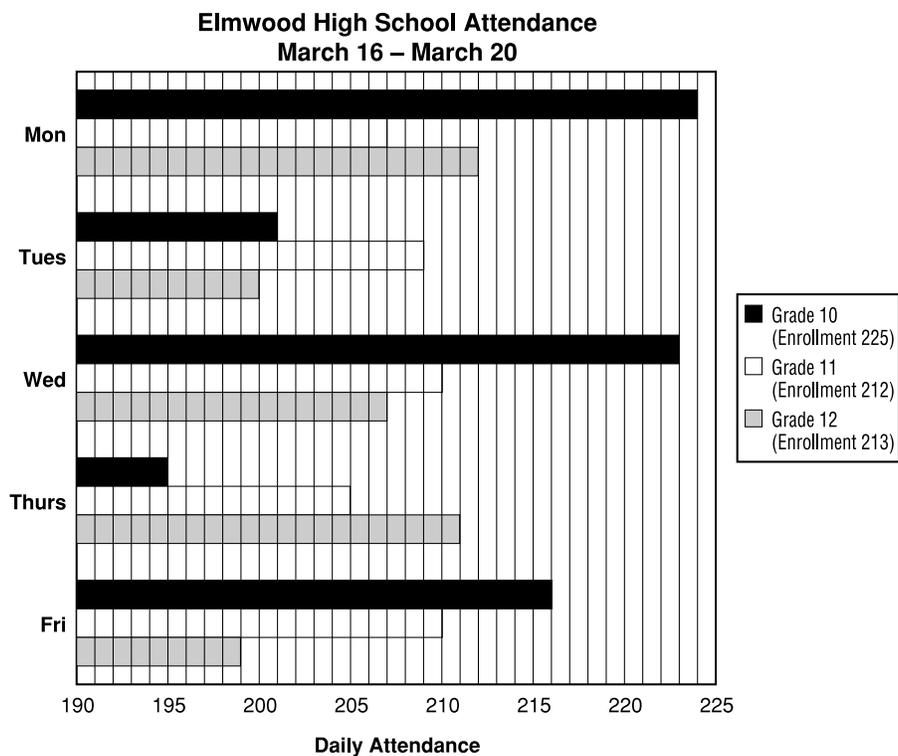
Elena recorded the data from her experiment in this table:

<u>Formula 1 Plants</u>			<u>Formula 2 Plants</u>			<u>Unfertilized Plants</u>		
<u>Plant</u>	<u>Day 1</u>	<u>Day 14</u>	<u>Plant</u>	<u>Day 1</u>	<u>Day 14</u>	<u>Plant</u>	<u>Day 1</u>	<u>Day 14</u>
1	4.0 cm	4.9 cm	4	3.8 cm	4.1 cm	7	4.1 cm	4.5 cm
2	3.7 cm	4.8 cm	5	3.9 cm	5.0 cm	8	3.8 cm	4.3 cm
3	4.2 cm	4.9 cm	6	4.1 cm	4.8 cm	9	3.6 cm	3.9 cm

4. To the nearest tenth, what was the average (mean) increase in height for the three plants that were fertilized with Formula 1?

# High School Attendance

The daily attendance for each day for each grade at Elmwood High School is shown in the graph below. Use the information in the graph and the legend to answer questions 1–5.



1. What is the total enrollment (all three grades combined) at Elmwood High School?
2. How many grade 10, 11 and 12 students were in attendance on Tuesday?
3. What percent of 12th graders were absent on Friday (to the nearest tenth of a percent)?
4. To the nearest whole number, what was the average (mean) daily attendance during the week of March 16 to March 20 for 11th graders?
5. What was the median daily attendance during this week for 11th graders?