

# Projects and Writing Assignments

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## Topic 1

### Organizing Information Pictorially Using Charts and Graphs

- » Find information on a flu pandemic, and present at least two graphs or charts that show important ideas about the pandemic. Explain what your graphs or charts show. A useful website might be [www.pandemicflu.gov](http://www.pandemicflu.gov).
- » Find a particular environmental issue, and present at least two graphs or charts that show important ideas about this issue. Explain what your graphs or charts show and how they help clarify some aspect of the issue.

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## Topic 2

### Bivariate Data

- » Find information that explores the relationship between income levels in a region (a neighborhood, a city, a county, a state, or a country) and some other social indicator, such as incidence of disease, educational

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level, mortality levels, or another factor. (The website [www.prb.org](http://www.prb.org) has population data and information on many social issues.) Illustrate your findings using at least two graphs.

- » Build on Example 2.2c and find data on active-duty military personnel by gender and race and show changes over time. Create at least two graphs, and explain what your graphs show about the relationships depicted in them.

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### Topic 3

#### Graphs of Functions

- » The U.S. Census Bureau [www.census.gov](http://www.census.gov) keeps U.S. poverty statistics over time. Find information about the poverty threshold, including what it means and how it is used. Find data on the annual poverty threshold for two different sizes of family for at least twelve years. Create one or more graphs of these data, and explain what your graphs show.

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### Topic 4

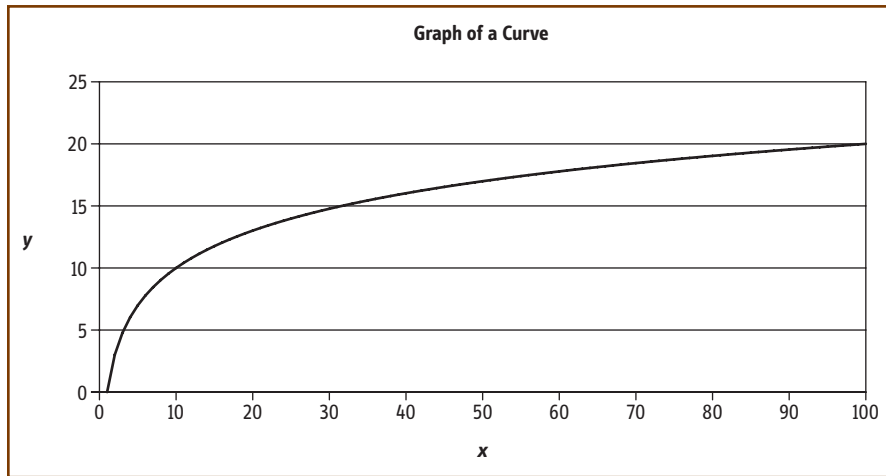
#### Multiple Variable Functions

- » Weight Watchers International, Inc. promotes a diet program based on a “points” system. With this system, the number of points in food is calculated and dieters are limited to a certain total number of points each day, depending on their weight and age. The number of points ( $p$ ) in a serving of a particular type of food is a function of the number of calories, the number of fat grams, and the number of grams of dietary fiber in the food. Find the formula for  $p$ , and create several graphs showing the relationship between  $p$  and one of the explanatory variables for fixed values of the other explanatory variables. Explain what your graphs show and how the formula works. (You can find information on the web or in print journals.)

**Topic 5**

**Proportional, Linear, and Piecewise Linear Functions**

- » Explain why you might want to use a piecewise linear function to approximate a “curved” function, like the one pictured in the next graph. Create a piecewise linear function that could be used to approximate this curve.



**Topic 6**

**Modeling with Linear and Exponential Functions**

- » Pick two countries in different parts of the world, and find the population of these countries in 1990 and 2000. Predict the population for each of the countries in 2006 and in 2020, assuming population growth is linear. Repeat the exercise assuming population growth is exponential. Explain how you obtained all of your predictions. Then find population estimates for your countries for 2006 and discuss your predicted results for 2006 and for 2020.

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### Topic 7

#### Logarithms and Scientific Notation

- » Logarithms are used to give the stellar magnitude for the brightness of stars and in music when working with frequency ratios and tuning. Pick one of these applications, and explain how and why logarithms are used in this application.
- » Explain what the United Nations' Human Development Index is designed to measure. (A useful website might be <http://hdr.undp.org/>.) Also explain how and why logarithms are used in this index.

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### Topic 8

#### Indexes and Ratings

- » Find what elements go into the *U.S. News and World Reports* rating system for colleges and universities. Discuss how important you think each of these elements is in rating a college or university and how the index might be improved.
- » If you want to create an index that measures gender equity across states of the U.S., what measures would you want to include? How would you get the needed data? Investigate an existing measure of gender equity and discuss it.

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### Topic 9

#### Personal Finances

- » Find information from your local newspaper about home prices in your region, mortgage rates, typical closing costs, points, taxes, and down payment required. Use this information to develop a scenario for buying a home in your area. Calculate your costs at settlement and your monthly payments. Explain your calculations and where you obtained each piece of information used in your calculation.

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## Topic 10

### Introduction to Problem Solving

- » Obtain a credit card offer and read the fine print to determine the card's policies, including interest rate on purchases, interest rate on cash advances, the policy on late fees, and how interest is calculated. Create a "typical" credit card use scenario for a three-month period of time (for example, you might charge gas, groceries, gifts, and so on) and use the information on your credit card offer to calculate interest paid on charges over that period. Assume you make a minimum payment each month, but you don't pay off any additional debt owed on the card during the three-month period.

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## Topic 11

### Decision Making

- » You and three friends want to take a one-month-long trip this summer and need to determine the destination. Pick at least five potential destinations, and develop criteria on which you will rate your travel destinations. Rank the destinations on the criteria, giving your reasons for each choice. Use two decision-making methods to find the best destination. Explain how you used the decision-making methods and how you incorporated each friend's individual ratings to arrive at the final choice.

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## Topic 12

### Inductive Reasoning

- » Find follow-up studies that detail cell phone use while driving and report on changes in cell phone use while driving over time. Find out which states prohibit cell phone use while driving and how that has affected use and accident rates; also report on differences among age groups. Write a report with appropriate graphs summarizing your findings.

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- » Refer to Example 12.2a. Identify trends over time in home-schooling. Include information on education level and income of parents who choose to home-school their children and follow-up information on what students who were home-schooled chose to do after high school. Write a report with appropriate graphs summarizing your findings.

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### Topic 13

#### Deductive Reasoning

- » Interview a reference librarian at your school, and write a paper on how the different types of logical statements involving “and,” “or,” and “not” are used to search for references on a particular topic.
- » Find a speech given by a public official that contains a variety of types of logical statements. Identify uses of each of the types of logical statements given in the speech.

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### Topic 14

#### Apportionment

- » Determine how the decennial census is conducted, and what kinds of demographic information are collected. Include a discussion of what groups of people may be missed in the census, and if any groups are over- or under-counted. What implications might this have for cities, counties, and states? What implications might it have for American society?
- » Find a situation on your campus or in your community in which representation to a governing body is based on population. Discuss how the members of each subgroup are counted. Use several of the methods discussed in this topic to determine how representatives for each of the groups should be apportioned.

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## Topic 15

### More on Problem Solving

- » Pick a serious environmental problem facing the world today. For each of the problem-solving techniques given in Topic 15, explain how that technique can be used to help understand and begin to solve your environmental problem.

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## Topic 16

### Averages and Five-Number Summary

- » Pick a professional sports team and discuss at least two averages that are tracked for the players on this team. Explain what the averages measure and how they are used. Illustrate your explanations with graphs or charts.

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## Topic 17

### Standard Deviation, z-Score, and Normal Distributions

- » Ask a professor at your school to share some basic information about test scores from tests given to classes with at least 30 students, for at least three different exams. For each set of test scores, find the mean and standard deviation. Then, for each set, find how many of the test scores fall within one standard deviation of the mean, how many fall within two standard deviations of the mean, and how many fall within three standard deviations of the mean. Compare these values with the empirical rule. Also, find the highest and lowest z-scores for each class. Explain what your computations show.

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### Topic 18

#### Basics of Probability

- » Playing cards are shuffled to create randomly mixed decks of cards, which are then distributed to the players. In fact, there has been some interesting mathematical research on card shuffling. Collect information on this subject, and write a summary paper on the mathematics of card shuffling.

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### Topic 19

#### Conditional Probability and Tables

- » Investigate two recent measures voted on by members of the U.S. House of Representatives. Create a two-way table showing how the members voted. (You can create a table that shows party affiliation or gender of the member or another appropriate characteristic.) Explain what your tables show about the measures under consideration.

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### Topic 20

#### Sampling and Surveys

- » Identify an online survey. Discuss specifically how the results from this particular survey might be biased. Then develop a method for obtaining responses to the question(s) posed in the survey that would avoid these possible biases of the online survey. Explain your answers.

## **Topic 21**

### **More on Decision Making**

- » Find details about two different lottery games in one or two state lottery systems. For each, explain how the game works and find your chances of winning and your expected winnings, assuming you buy a certain number of lottery tickets. What conclusions can you draw from your analysis?
- » Create an interesting game involving a “wager,” and analyze your game.