CHAPTER 2: ARITHMETIC STRATEGIES AND AREA

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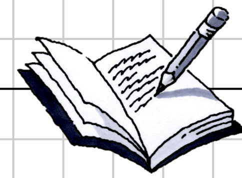

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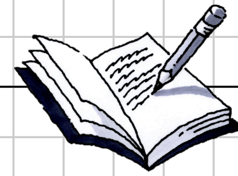

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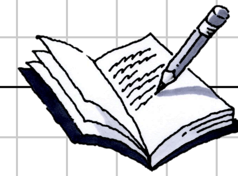

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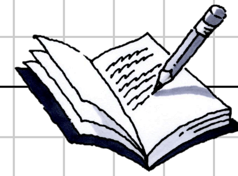

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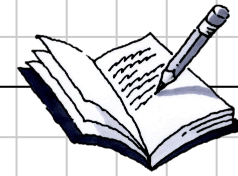


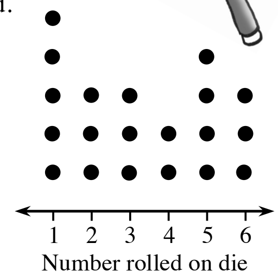
Notes:

MATH NOTES

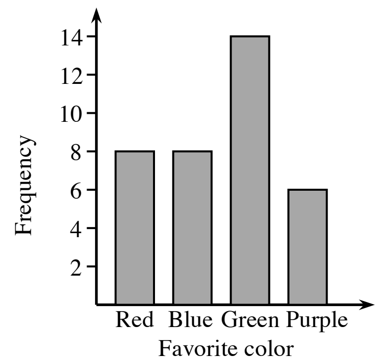
DISPLAYS OF DATA

Data can be displayed visually in different formats depending on the kind of information collected.

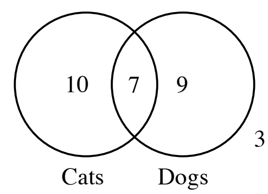
A **dot plot** is a way of displaying data that has an order and can be placed on a number line. Dot plots are generally used when the data is discrete (separate and distinct) and numerous pieces of data fall on most values. Examples: the number of siblings each student in your class has, the number of correct answers on a quiz, or the number rolled on a die (the graph at right shows 20 rolls).



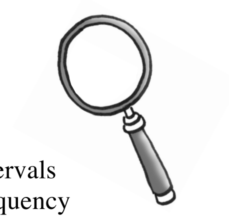
A **bar graph** is used when data falls in categories that typically have no numerical order. The graph at right shows that green is the favorite color of 14 students.



A **Venn diagram** is two or more overlapping circles used to show overlap between categories of data. The diagram at right shows that 7 students have both dogs and cats, 9 students have only dogs, 10 have only cats,3 students do not have a dog or a cat, 16 students have dogs, and 17 students have cats.

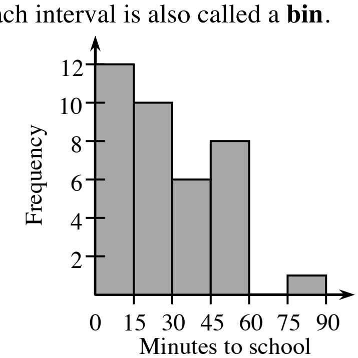


HISTOGRAMS



A **histogram** is similar to a dot plot except that each bar represents data in an interval of numbers. The intervals for the data are shown on the horizontal axis. The frequency (number of pieces of data in each interval) is represented by the height of a bar above the interval. Each interval is also called a **bin**.

The labels on the horizontal axis represent the lower end of each interval. For example, the histogram at right shows that 10 students take at least 15 minutes but less than 30 minutes to get to school.



Histograms and dot plots are for displaying numeric data with an order. Bar graphs are for data in categories where order generally does not matter.

Notes:

STEM-AND-LEAF PLOTS

A **stem-and-leaf plot** is similar to a histogram except that it shows the individual values from a set of data and how the values are distributed. The "stem" part of the graph represents all of the digits in a number except the last one. The "leaf" part of the graph represents the last digit of each of the numbers. Every stem-and-leaf plot needs a "key." The place value of the entries is determined by the key. This is important because 8|2 could mean 82 or 8.2.

Example: Students in a math class received the following scores on their tests: 49, 52, 54, 58, 61, 61, 67, 68, 72, 73, 73, 73, 78, 82, and 83. Display the test-score data on a stem-and-leaf plot.

Key
8|2 means "82"

"leaves"

"stem"

4	9				
5	2	4	8		
6	1	1	7	8	
7	2	3	3	3	8
8	2	3			

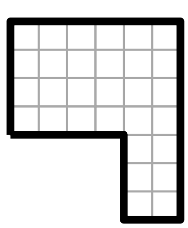
AREA

The area of a region is the number of square units of the interior of a region. In this course, you will be asked to consider the area of flat regions (known as plane figures), such as the top of a table, the floor of your classroom, other various geometric shapes, or the surface of a pond.

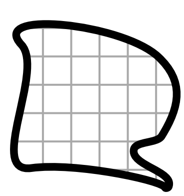
To measure the area of a region, be sure to remember these important points:

- Any square can be used as a unit of area—a square inch, a square sticky note, a square centimeter, the square face of a block—but depending on the object being measured, some units are more convenient and common than others.
- To determine the area of a region, count the number of square units that are needed to cover the region completely without gaps or overlaps.
- If the square units you have chosen do not fit exactly within the region boundaries, you will have to find a way to determine what part of the square units are needed.
- When the answer is stated, be sure to include the kind of square units that are being used.

Example: In the sample figures below, assume each small square is one square centimeter and estimate the area of each figure.



Area is 30 sq cm

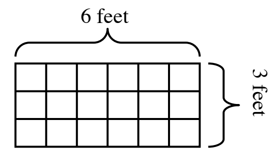


Area is between 23 and 24 sq cm

Notes:

AREA, RECTANGLES, AND SQUARE UNITS

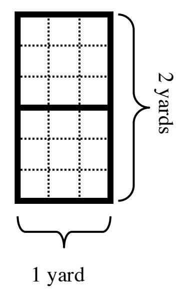
To find the **area of a rectangle**, choose a conveniently sized square unit to cover the rectangle exactly with no overlaps. Sometimes parts of square units are needed to cover the rectangle completely.



In the rectangle at right, using squares with side lengths of one foot, it takes 18 squares to cover the rectangle. Therefore, the area of the rectangle is 18 square feet.

One way to count squares in a rectangle quickly is to multiply the lengths of two sides that meet (intersect) at a corner, since multiplication is defined as repeated addition. For example, the region of the rectangle above can be seen as either six groups of three squares (viewed as columns) or three groups of six squares (viewed as rows). In either case, the area of a rectangle can be computed using:

$$A = (\text{length})(\text{width})$$



The same-sized shape may appear to have different areas if it is measured using different units of measure. Of course, the area did not change, but the number of different-sized units did. Note that the rectangle shown at right is the same size as the one above, but it is measured in yards instead of feet. The top rectangle has an area of 18 square feet. The area of the rectangle at right has an area of 2 square yards.

Units for area can be abbreviated using symbols.
The area 18 square feet is abbreviated 18 sq ft or 18 ft^2.
The area 2 square yards is abbreviated 2 sq yd or 2 yd^2.

MULTIPLICATIONS USING GENERIC RECTANGLES

To prepare for later topics in this course and future courses it is helpful to use an area model or generic rectangle to represent multiplication.

For the problem 67 • 46, think of 67 as 60 + 7 and 46 as 40 + 6. Use these numbers as the dimensions of a large rectangle as shown at right. Determine the area of each of the smaller rectangles and then find the sum of the four smaller areas. This sum is the answer to the original problem.

	60	7
40	2400	280
6	360	42

$$67 \bullet 46 = (60 + 7)(40 + 6) = 2400 + 280 + 360 + 42 = 3082$$

Notes:

GREATEST COMMON FACTOR

To find the **area of a rectangle**, choose a conveniently sized square unit to cover the rectangle exactly with no overlaps. Sometimes parts of square units are needed to completely cover the rectangle.

The **greatest common factor** of two or more integers is the greatest positive integer that is a factor of both (or all) of the integers.

For example, the factors of 18 are 1, 2, 3, 6, and 18 and the factors of 12 are 1, 2, 3, 4, 6, and 12, so the greatest common factor of 12 and 18 is 6.

DISTRIBUTIVE PROPERTY

The **Distributive Property** states that the multiplier of a sum or difference can be "distributed" to multiply each term. For example to multiply 8(24), written as 8(20 + 4), you can use the generic-rectangle model below.

The product is found by 8(20) + 8(4).
So 8(20 + 4) = 8(20) + 8(4).