How to Make Sense of Percentages

"I try to save 10 percent of the money I make."

"About 70% of Earth is covered in water."

"I scored 91 percent on the math test last week."

"The scientists saw that only 20% of the ants reacted to the stimulus."

Have you heard phrases like these before? The symbol % stands for "percent." The word *percent* means "out of 100." So 10 percent reads "10 out of 100."

A diagram can help make it easier to understand percentages. Suppose the person in the first statement makes 100 dollars a week. The grid in figure 1 represents the 100 dollars, with 1 square for each 1 dollar.

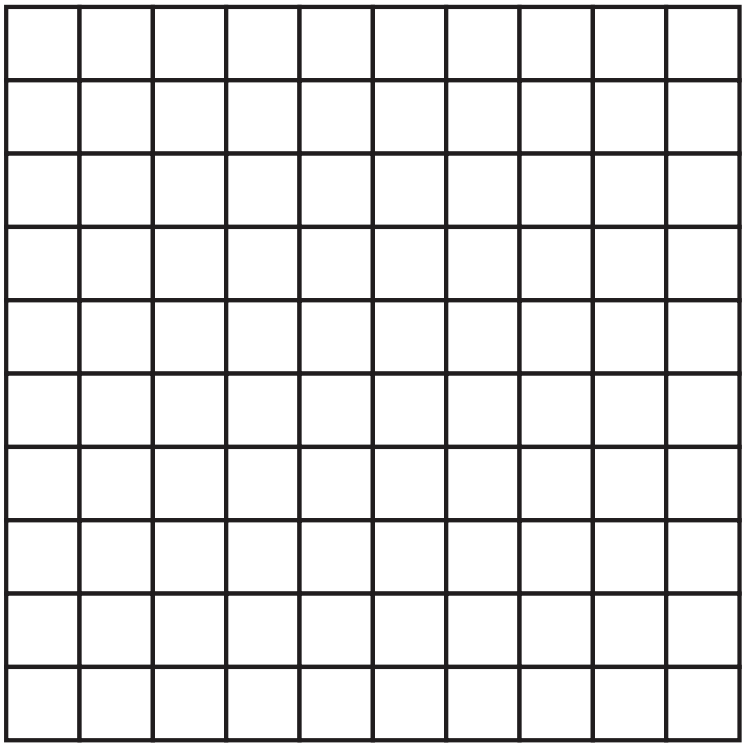

Figure 1: This grid has 100 squares. Imagine a person who makes 100 dollars a week. Each 1 dollar is represented by 1 square.

The person said that she saves 10 percent of what she makes. That means she saves 10 dollars out of every 100 dollars. There are 10 shaded squares in figure 2. That means that 10 percent—10 out of 100—of the squares are shaded.

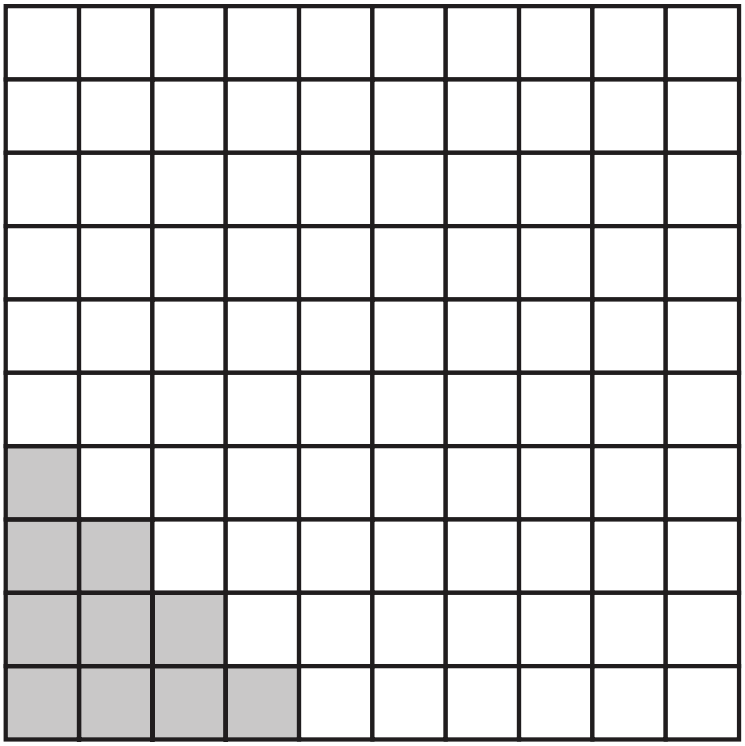

Figure 2: Ten percent (10%). Ten out of the 100 squares in this grid have been shaded. This represents the 10 percent of the 100 dollars that the person saves.

What percentage of the squares is not shaded? If you said 90 percent, you are right. Ninety out of the 100 squares are not shaded.

People often use percentages to represent **probability.** Remember that probability can tell you how likely something is to happen, but it cannot tell you that something will happen for sure. Think about a raffle drawing. What if the people running the raffle said that you had a 20 percent chance of winning a prize? What would that mean?

Think of the tickets in the raffle as plastic pieces, like the ones in figure 3. The 20 red pieces show your 20 percent chance of winning a prize. The 80 white pieces represent the chances of not winning a prize.

Figure 3: Twenty percent (20%) of the pieces are red. Twenty out of the 100 pieces are red to represent your chances of winning. The other 80 pieces are white, showing your chances of not winning.

Imagine putting these 100 plastic pieces into a bag and then, without looking in the bag, drawing out one plastic piece. Do you think the piece is likely to be white or red? Because more of the pieces are white, it is more likely that you would draw out a white piece. But you *could* draw out a red piece. It is just not as likely that you would draw out a red piece because there are so few of them. This shows that your chances of winning the raffle are not very good.

Suppose you had a 60 percent chance of winning the raffle. Look at the difference in the way the pile of pieces look when 60 percent are red (see figure 4). How do you think your chances of winning would be in this case?

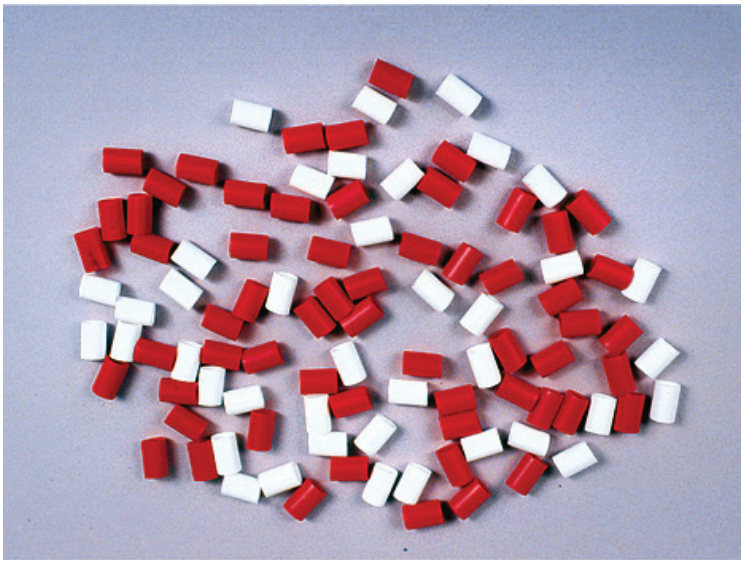

Figure 4: Sixty percent (60%) of the pieces are red. Remember, red pieces show your chances of winning the raffle. Do you think you would have a good chance of winning a prize in this situation?

Percentages are usually not too difficult to understand when you have exactly 100 of something. But suppose you have 50 plastic pieces and 20 percent of them are red. How many of the 50 pieces would be red? Look back at figure 3, where 20 percent of the 100 pieces were red. Imagine that someone divided the 100 pieces into two equal piles. To be exactly equal, each pile would have exactly the same number of white pieces and red pieces as the other pile. This is shown in figure 5.

Figure 5: What happens if you have 50 plastic pieces and 20 percent are red? Here, the 100 plastic pieces are divided into two equal piles.

Now you have 50 plastic pieces in each pile. Count the number of red pieces in one pile. You should count 10 red pieces. This means that 10 red pieces out of 50 total pieces is the same as 20 red pieces out of 100 pieces. The portion of pieces that are red, compared to the total number of pieces, is the same. You can represent this in terms of fractions:

$$\frac{\text{20 red pieces}}{\text{100 total pieces}} = \frac{\text{10 red pieces}}{\text{50 total pieces}}$$

Percentages can also be represented using decimal numbers. For example, 20 percent can be represented by 0.20. Fifty percent (50%) is the same as 0.50. Knowing this can help you calculate percentages. Think back to the original problem of 100 plastic pieces with 20 percent of them being red. To calculate the number of pieces that are red, you would use the following equation:

$$\text{100 total pieces} \times 0.20 \text{ red pieces} = \text{20 red pieces}$$

See if you can calculate the number of red pieces for the following situations:

a. 10 total pieces and 30 percent are red

b. 70 total pieces and 50 percent are red

c. 300 total pieces and 65 percent are red

Percentages can be used in many different situations. Imagine that you took a test with 25 questions on it and you got 84 percent of the questions correct. How many questions did you get correct?

Can you think of any other ways you can use percentages?