Chopsticks and the Future of Forests
Reading

Chopsticks are the main eating implements in much of eastern Asia, including China, Korea, Japan, and Vietnam. The other eating implement in these countries is the spoon, used for soups. The origins of chopstick use in China are not well known, but their use has been documented as far as 5,000 years ago. In Chinese, the name for chopsticks is "kuai-zi," meaning "quick little fellows." Using chopsticks was justified by Confucius around 500 BCE as being more civilized than other utensils. Using a knife for eating was related to the slaughterhouse and was considered barbaric. By 500 CE, the use of chopsticks had spread from China to Korea, Japan, and Vietnam.

The first chopsticks were like tweezers, being joined at one end. By the 10th century, however, they had become two separate pieces. Chopsticks come in a variety of styles and materials, from simple, bare, wooden chopsticks to finely painted or varnished wooden chopsticks and from resin or plastic chopsticks to metal ones. Many chopsticks are designed for single use (the first disposable ones were made in Japan in 1878), while others border on heirloom quality. Some of the heirloom chopsticks have been made of jade, gold, solver, bronze, brass, agate, coral, and ivory.

Wooden chopsticks are made from either bamboo or poplar trees, but have also been made of cedar, sandalwood, teak, pine, and bone. Bamboo chopsticks can be considered a renewable resource since the rootstock is not harvested and remains to regenerate new stalks. Poplar and other wooden chopsticks must be considered non-renewable since the tree is killed in the process of harvesting.

Many people re-use chopsticks, especially in the home, washing them after use, but in many restaurants disposable chopsticks are served with the meal. Determining how many chopsticks are used in China in a year is difficult and the answer depends on one's assumptions. But with a population of 1.4 billion, China clearly uses many chopsticks in a year. The environmental impact of this use is great and may be contributing in at least a small way to the deforestation that has plagued China for centuries.

In this exercise, we will use the volumetric measurements of a package of 40 chopsticks purchased at a local store, with dimensions of 20 cm long, 13 cm wide and 2 cm thick (unless told to do otherwise by your teacher).

CHOPSTICKS AND THE FUTURE OF FORESTS   Name_____
Mathematics

1. Measure how many chopsticks would fit across one dimension of a cubic meter. How many is it? _____

2. Measure how many chopsticks would fit across a second dimension of a cubic meter. How many is that? _____ Make sure that they are all placed in the same direction as in #1.

3. Measure how many chopsticks would fit across the third dimension of a cubic meter. How many is it?   _____

4. Multiply these 3 numbers together. _____Then multiply this answer by 40 (the total number of chopsticks in the package) to determine the number of chopsticks in a cubic meter. How many is it? _____

5. There are 1.4 billion (1,400,000,000) people in China. To get the number of cubic meters of wood used for chopsticks in 1 day, divide the number of people in China by the number of chopsticks in a cubic meter (the number you found in #4). What number did you get? _____

6. To convert this to the number of cubic meters in a year, multiply your answer in #5 by 365. What figure did you get? _____

7. Not everyone throws away his or her chopsticks each time. To find out how many cubic meters might actually be used, multiply your answer in #6 by these numbers:

        If 10% are thrown away, multiply by .10 _____
        If 5% are thrown away, multiply by .05   _____
        If 1% is thrown away, multiply by .01   _____

8. To put these numbers into perspective, the number of cubic meters of useable wood in an average 11-inch diameter ponderosa pine (the dominant tree of the Flagstaff area) is .26 cubic meters and there are an average of 741 of these trees on a hectare (2.47 acres).

9. To figure out how many cubic meters of wood are found in the trees of 1 hectare, multiply the number of trees on a hectare (741) by the cubic meters of wood in 1 tree (.26). What is your answer? _____

10. To find out how many hectares of trees would be harvested to supply China with chopsticks for 1 year, divide your 3 answers in #7 by your answer in #9.

        If 10% are thrown away, divide #7's answer by your answer in #9 _____
        If 5% are thrown away, divide #7's answer by your answer in #9 _____
        If 1% is thrown away, divide #7's answer by your answer in #9 _____

CHOPSTICKS AND THE FUTURE OF FORESTS Mathematics
ANSWER KEY

1. Measure how many chopsticks would fit across one dimension of a cubic meter. How many is it? _____*5*_____

2. Measure how many chopsticks would fit across a second dimension of a cubic meter. How many is that? _____*7.7*_____ Make sure that they are all placed in the same direction as in #1.

3. Measure how many chopsticks would fit across the third dimension of a cubic meter. How many is it? _____*50*_____

4. Multiply these 3 numbers together. _____*1925*_____Then multiply this answer by 40 (the total number of chopsticks in the package) to determine the number of chopsticks in a cubic meter. How many is it? _____*77,000*_____

5. There are 1.4 billion (1,400,000,000) people in China. To get the number of cubic meters of wood used for chopsticks in 1 day, divide the number of people in China by the number of chopsticks in a cubic meter (the number you found in #4). What number did you get?
_____*19,182*_____

6. To convert this to the number of cubic meters in a year, multiply your answer in #5 by 365. What figure did you get? _____*7,001,430*_____

7. Not everyone throws away his or her chopsticks each time. To find out how many cubic meters might actually be used, multiply your answer in #6 by these numbers:

> If 10% are thrown away, multiply by .10 _____*700,143*_____
> If 5% are thrown away, multiply by .05 _____*350,072*_____
> If 1% is thrown away, multiply by .01 _____*70,014*_____

8. To put these numbers into perspective, the number of cubic meters of useable wood in an average 11-inch diameter ponderosa pine (the dominant tree of the Flagstaff area) is .26 cubic meters and there are an average of 741 of these trees on a hectare (2.47 acres).

9. To figure out how many cubic meters of wood are found in the trees of 1 hectare, multiply the number of trees on a hectare (741) by the cubic meters of wood in 1 tree (.26). What is your answer? _____*193*_____

10. To find out how many hectares of trees would be harvested to supply China with chopsticks for 1 year, divide your 3 answers in #7 by your answer in #9.

> If 10% are thrown away, divide #7's answer by your answer in #9 *3628*
> If 5% are thrown away, divide #7's answer by your answer in #9 *1814*
> If 1% is thrown away, divide #7's answer by your answer in #9 *363*