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The Folktale: Linking Story to Mathematical Principles

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"Mathematics and Literature" has recently come into its own as a topic on the mathematics education scene. Sessions with this name are scheduled at National Council of Teachers of Mathematics and other organizational conferences. A department called "Links to Literature" now appears regularly in Teaching Children Mathematics, the NCTM publication dealing with the lower grades. Most of the articles included in "Links to Literature" tell how to plan classroom activities based on stories read by or read to students.

For instance, "Mathematics and Mother Goose" uses the familiar rhymes as a springboard to illustrating prenumeration concepts such as patterning, ordering, recognizing attributes, and classifying into sets [1]. "Popping Up Number Sense" relates how popping popcorn was used as a device to bring the concepts involved in *If You Made a Million* alive [2, 3]. "Mathematics Is Something Good!" tells how a teacher used *Moira's Birthday* as a stimulus for a discussion of rate as her second-graders tried to figure out how fast all the children Moira invites to her party would take to eat the cakes she has ordered for her birthday party [4, 5]. Other titles such as *Ten for Dinner* and *The Story of Z* produce related activities in graphing [6, 7]. And, as implied by the title, *How Big is A Foot?* can be used to inspire learning about linear measurement, nonstandard units, and use of a ruler [8].

Counting books are also referenced, and books depicting quilt patterns and the history surrounding them are also used as inspiration for mathematical investigation.

"Fictional Literature", an article in *Mathematics Teaching in the Middle School*, makes note that it is difficult to find middle-level fictional books which mention mathematics in a positive way [9]. Another article in the same journal examines heritages from other cultures, such as calendars and names [10], and a recent article in *Humanistic Mathematics Network Journal* tells of a newly-developed Middle School Mathematics Minor Certification Program course at St. Norbert College in Wisconsin which extends the search for mathematics into an examination of pottery, beadwork, textile, art and basketry patterns; archeoastronomy; comparisons and contrasts in mathematical philosophy; and the mathematical bases for games of chance - all serving as an avenue for "exploration of human endeavors within their cultural context" [11]. In addition, "Mathematics and Poetry" also finds its way into discussions of the use of literature as well. (N.B. Many such poems have been published in the *Humanistic Mathematics Network Journal*.)

As the reader may observe, the stories noted above for use in the classroom were all published within the past twenty-five years. Moreover, it is important to recognize that for the most part, it required the ingeniousness of a teacher to relate mathematics to the story.

But there is yet another way to link mathematics and story, mathematics and human endeavors, mathematics and culture — and I suggest that it is as significant and perhaps more fundamental than any of the examples noted above.

While searching for folktales to use in my present work as a storyteller, I have discovered stories which I believe actually illustrate mathematical principles. The stories in the articles noted above provide a jumping-off place for exploration of mathematical notions, but the folktales I have been collecting are themselves built on mathematical concepts. And therein lies the difference.

For instance, there is a story involving six young lads who go off fishing. Just before they are to return home, Brother Number One decides to count to see if all his siblings are present. He counts to five (forgetting himself) and begins to cry. Brother Number Two asks what's wrong, and upon hearing the problem, proceeds to count. He too finds only five brothers...and so it goes, until a boy comes along and asks if he can help. He quickly sizes up the situation, and asks each

brother to count aloud as he squeezes hard a hand from each brother. They soon find that they really are six in number, and joyously reward the stranger with their entire catch. Everyone goes home happy! What better example of one-to-one correspondence, so simple that it can easily be appreciated by a six-year-old [12].

The version recounted above is retold from a tale that was collected in eighteenth-century England. I have also found two American, one Middle Eastern and one African version of this tale, each setting the story within the context of its own culture. "How the mathematical concepts became a part of the folk culture?" is a challenging question in itself. Did people adapt the principles and then apply them to events in their daily lives? Did someone hear the story in a far-off land and then change it to a more appropriate setting before recounting the story to family and neighbors? Or did people in different areas instinctively invent their own versions? Whatever the sequence, there are often multiple versions of many folktales, including those based on mathematical principles, illustrating again the unversality of mathematics throughout different cultures.

A wonderful introduction to fractions is found in *Two Greedy Bears*, a current-day retelling of an old Hungarian folktale wherein a fox helps two bears who are trying to equally divide a cheese into two parts [13]. The fox cleverly keeps dividing the cheese into unequal parts, each time nipping off a piece of the larger part, ostensibly to make the piece even, but always managing to make one part larger. The fox ends up leaving only two crumbs for the bears. But the pieces were equal! A Middle Eastern version, "The Ape and the Two Cats", describes how two cats steal a cheese, and then ask an ape to divide it equally, since neither cat trusts the other to divide the cheese equally. The ape carries on in a similar fashion to the fox noted above. He finishes off the cheese, and the cats conclude that there is "no wrongdoer who is not afflicted by a greater wrongdoer" [14].

A more sophisticated discussion of fractions can arise readily from a story I heard as a child. It seems that there was a father who left his herd of seventeen horses to be divided among his three sons, the oldest to get one-half, the middle to get one-third, and the youngest to get one-ninth. A wise neighbor lends them his horse to make a total of eighteen. The sons receive nine, six, and two horses, respectively. The neighbor takes home his horse, and all are satisfied. Thus far I have found only Middle Eastern versions of this story [15, 16].

Nasreddin, a colorful Middle Eastern character, is working in his garden. A stranger comes along, engages Nasreddin in conversation, and then asks how much time it will take to walk to the next town. Nasreddin does not answer. The stranger politely asks again, and then shouts his question. But Nasreddin still does not say a word. Exasperated, the stranger turns toward the town and begins walking. Suddenly Nasreddin exclaims, "Fifteen minutes." The stranger, astonished, turns and asks why Nasreddin did not say as much before. "Well", replies Nasreddin, "before, I did not know how fast you were planning to walk!" [17]. Mathematical thinking at its best!

Then there is the perennial favorite, attributed to both India and China. A man solves a problem for a rajah or an emperor. In return he asks merely for grains of rice, to be granted with the aid of a chessboard: one grain the first day for the first square, two grains the next day for the next square, four grains next, then eight, and so on. The story makes a delightful introduction to the powers of 2 [18].

The folktales cited above have been written down in books, but were originally from the oral tradition. Indeed, when I recently told the Ethiopian version of "The Six Fisherman" to an audience of adults, a fellow in the audience told me how he and his family told a similar story to strangers when asked how many children were in their family. "I count eight!" was always the reply from one of the nine children. The man was from a small town in Ethiopia.

Part of the delight in finding (and telling) folktales which illustrate mathematical principles is in collecting multiple versions. Each variation invariably reflects a way of life peculiar to a particular people or country. I invite correspondence from readers who have such tales to tell:

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REFERENCES
[1] Young, Cindy and Wendy Maulding, "Mathematics and Mother Goose", *Teaching Children Mathematics*, 1:1 (September 1994), 36-38.

[2] Hopkins, Lindy, "Popping Up Number Sense", *Teaching Children Mathematics*, 2:2 (October 1995), 82-86.

[3} Schwartz, David M., *If You Make a Million*, New York: Lathrop, Lee and Shepherd Books, 1989.

[4] Oppedal, Diane Cradick, "Mathematics is Something Good!", *Teaching Children Mathmatics*, 2:1 (September 1995), 36-40.

[5] Munsch, Robert, *Moira's Birthday*, Toronto: Annick Press, 1987.

[6] Bogart, Jo Ellen, *Ten for Dinner*, New York: Scholastic Books, 1989.

[7] Modesitt, Jeanne, *The Story of Z*, Saxonville, Massachusetts:Picture Book Studios, 1990.

[8] Myller, Rolf, *How Big Is a Foot?*, New York: Dell Publishing, 1980.

[9] Sullivan, Emilie P. and William Nielsen, "Fictional Literature in Mathematics", *Mathematics Teaching in the Middle School* 1:8 (January-February 1996), 646-647.

[10] Shirley, Lawrence H., "Activities from African Calendar and Time Customs", *Mathematics Teaching in the Middle School* 1:8 (January-February 1996), 616-620.

[11] Berken, Bernadette A., "Multicultural Mathematical Ideas: a New Course", *Humanistic Mathematices Network Journal #13* (May 1996), 34-35.

[12] Elkin, Benjamin, *Six Foolish Fishermen*, Eau Claire, Wisconsin: E.M. Hale and Company.

[13] Ginsberg, Mirra, *Two Greedy Bears*, New York: Macmillan, 1976.

[14] Nahmad, H. M, "The Ape and the Two Cats", in *The Peasant and the Donkey*, London: Oxford University Press, 1967.

[15] Bulatkin, I. F., "Molla Nasreddin and his Donkey", in *Eurasian Folk and Fairy Tales*, New York: Criterion, 1965, 64-68.

[16] Ausubel, Nathan, "*Rabbinical Arithmetic*", in A Treasury of Jewish Folklore, New York: Crown Publishers, 1948, 93-94.

[17] Walker, Barbara, *Watermelons, Walnuts, and the Wisdom of Allah*, New York: Parents' Magazine Press, 1967.

[18] Curcio, Frances R. and Myra Zarnowski, "Revisiting the Powers of 2", *Teaching Children Mathmatics*, 2:5 (January 1996), 304.

Mathematical Rebuses

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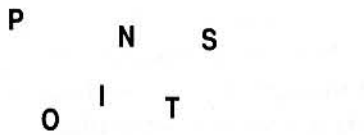

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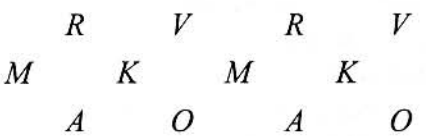

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