cycle, and the environmental impact of land development are central to the story without being preachy.

Emma's Christmas (Trivas 1988) is a delightful retelling of the song "The Twelve Days of Christmas." On each day a young prince gives his love the gifts of the day as well as a repeat of the items given on previous days. As a result, on the last day his love has 12 partridges in pear trees, 24 turtledoves, and so on. The big numbers in this book add to its humor and invite the reader to imagine what it would be like to feed and care for so many animals and people.

The unique format of *The Farm* (Aubinais 1996) is intriguing for children and adults alike. This cumulative story introduces farm animals, from small to large, on pages

that fold out. The surprise quality of the format provides a wonderfully natural presentation of size comparisons. There is no better way to introduce nonstandard and standard measurement than through *How Big Is a Foot?* (Myller 1990). The humorous errors made in constructing a bed by measuring with various sizes of feet leave readers with a real problem to solve.

In all of these books, mathematical ways of thinking are emphasized; they are not facts presented in an authoritarian tone. As such, children have opportunities to question and pursue solutions. This places them at the center of their learning and fosters a sense of wonder that fuels the desire to learn (Katz & Chard 2000).

Choosing Books for Math Class

1. Would I read this book to the children even if I weren't choosing it for a math lesson?
2. Does the book stimulate curiosity and a sense of wonder? Are children inspired to do their own investigations?
3. Is the book meaningful to the children? Can they make personal connections?
4. Are the math connections natural?
5. Is the information accurate?

5. Is the information accurate?

Many books unwittingly perpetuate misconceptions due to inaccuracy of information. *What Neat Feet!* (Machotka 1991) is a masterful collection of photographs that invites the reader to consider why animals' feet have such different shapes, but the author inaccurately labels a sea lion as a seal. This is an error that has permeated media for decades (from *Sammy the Seal,* written by Hoff in 1959; to *Edward the Emu,* a 1988 book by Knowles; and *Sea Squares*, a 1991 book by Hulme, seals have been inaccurately pictured as the zoo animals that sit up and balance balls on their noses). Such inaccuracies, however, are not reason enough to discredit otherwise acceptable books. If a book promotes curiosity and motivation, the teacher can use the inaccuracies to engage children in investigations that dispel myths or misinformation.

Posing questions to initiate literature-based investigations

There are many available resources of varying quality on the use children's literature in the classroom. But rather than relying on these, teachers and children can draw upon their own interests and experiences and design projects to answer questions they generate themselves. The use of personally generated questions versus those posed by someone else in a book is more closely aligned to the ways in which mathematicians think (Parker 1993) and is more satisfying for learners (Helm & Katz 2001). Here are three guidelines to help teachers stimulate children's questions.

The children's results may be presented in drawings, stories, charts or graphs, drama, or manipulation of objects, all with an accompanying explanation of the math involved.

1. Select a good book and pose natural mathematical questions.

Consider how mathematical ways of thinking enhance children's understanding of the content of the book being read. Questions should grow naturally from the story; avoid contrived questions such as the typical math "word" problems. Here are some examples of questions that teachers and children have posed:

• *Goldilocks and the Three Bears* (Brett 1987): Why would the temperature of a large bowl of porridge

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be hot, a medium bowl cold, and a small bowl "just right" (Weaver 1999)?

- *The Three Little Pigs* (Galdone 1970): Could a wolf really blow hard enough to knock over the pigs' houses?
- *Shapes, Shapes, Shapes* (Hoban 1986): Why are some things always circular? Why do bridges have triangles?
- *Biggest, Strongest, Fastest* (Jenkins 1995): Can I run as fast as a____?
- *How Much Is a Million?* (Schwartz 1993): Would it really take 95 years to count to a billion?

2. Use both fiction and nonfiction books.

Mathematical questions raised in a fiction book can lead to the reading of nonfiction books. For example, reading *Tacky the Penguin* (Lester 1988) for mathematical connections may elicit such questions as

- How high was Tacky when he dived into the water?
- How cold is it where Tacky lives?
- How much does Tacky eat?
- What size shirt does Tacky wear?

The reading of *Tacky the Penguin* also may cause some children to wonder and read about real penguins. Further investigations can be based on such questions as

- How fast can real penguins move on land? In the water?
- How much cold can a real penguin tolerate?
- How big are real penguins?
- Why are penguins' bodies, beaks, and wings shaped the way they are?
- How long can penguins stay underwater?

When children pose questions based on their reading of both fiction and expository texts, they never suggest the traditional math textbook word problem such as, "If Tacky ate 2 sandwiches for breakfast, 1 for lunch, and 3 for dinner, how many sandwiches did he eat all together?" Such a question serves only to force children to simply *practice* skills, whereas children naturally desire to *apply* their skills to answer real questions of interest.

In general, it is preferable that children investigate math topics that allow them to have direct, hands-on experiences (Helm & Katz 2001). We know from young children's fascination with dinosaurs and spaceships, for example, that their interests go beyond direct experiences and into the realm of possibilities and dreams. The pleasures of literature include "the ways in which [pictures and text] allow us to visualize people and places we've never actually seen or think about ideas we haven't considered before" (Nodelman 1996, 20). The challenge for the teacher is to make topics as concrete as possible. For example, when investigating how much a penguin weighs, children can pile books onto a scale until they reach the indicated weight. They also can represent their findings in a concrete way, using photographs or drawings. Comparisons to familiar items in their lives make the information meaningful.

3. Ask "what if" questions.

Another technique for posing mathematical questions based on the reading of children's books is to ask, "What if____?" This is a very powerful method of involving children in the pursuit of personal areas of interest, a technique modeled on

Three Ways to Stimulate Children's Questions

1. Select a good book and pose natural mathematical questions.
2. Use both fiction and nonfiction books.
3. Ask "what if" questions.