

Rhyming and Folk Tales

Resources to Mathematical Thinking



Philip Clarkson

encourages teachers to make mathematical use of rhymes and folk tales that also provide a rich cultural/historical context.

Rhymes are often useful teaching devices for small children. Simple short rhymes such as “One two buckle my shoe” have been used for counting over many years. Counting backwards can be practised using rhymes “Ten green bottles”, and others emphasise one-to-one correspondence “Three red plums on the old plum tree, One for you and one for me, And one for the boy who picks them.” There are of course many other rhymes that teachers could choose.

Rhymes can also become another creative resource for teaching mathematics. The students and their teachers can change many of them to better fit their environment and/or extend the rhyme so that higher numbers are involved. But care needs to be taken. When changes are made, it is the pattern (in some cases the words, but for others the rhythm or beat) that needs to be preserved.

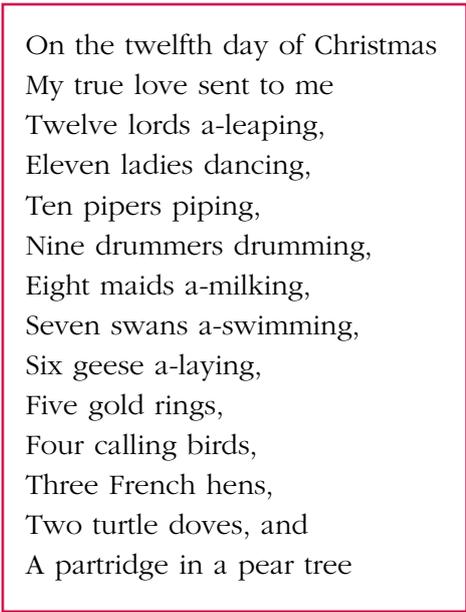
A number of rhymes and folk tales lend themselves to more detailed analysis by students to uncover other mathematical ideas. Below, a number of examples are given for finding patterns, mapping and measurement, and estimating - all critical aspects of mathematics.

Finding and using the patterns

Singing “The Twelve Days of Christmas” was always good fun. By the time we got to the twelfth day and raced up to “the five gold rings” for a short pause, and then rushed to the poor “partridge in a pear tree” for the final time, the students were in a high state of excitement; something to be channelled before chaos broke out. I have orchestrated this scene a number of times, both with primary school students and undergraduate pre-service teachers. One way to channel the excitement is to start thinking about how this rhyme is structured, as well as what it says. This was done in

groups, continuing to some extent the dynamics heightened by singing together.

If you have forgotten this rhyme you can read the final verse in Figure 1. You begin the rhyme by singing: “On the first day of Christmas, My true love sent to me, A partridge in a pear tree.” This format is repeated with two changes to give the second “verse.” In the initial line, “first” changes to “second.” As well the second last line in Figure 1, “Two turtle doves”, is inserted immediately after “My true love sent to me.” Hence, you sing four lines for the second verse. In the third verse, we find out what happened “On the third day of Christmas”, in five lines by including the “French hens” in the gift. This sequence is repeated until finally one gets to the 14 lines to find out what happens on the twelfth day.



On the twelfth day of Christmas
My true love sent to me
Twelve lords a-leaping,
Eleven ladies dancing,
Ten pipers piping,
Nine drummers drumming,
Eight maids a-milking,
Seven swans a-swimming,
Six geese a-laying,
Five gold rings,
Four calling birds,
Three French hens,
Two turtle doves, and
A partridge in a pear tree

Figure 1

So we sang it, and enjoyed it, but how can it be a resource for mathematics without distorting the situation so much that it becomes a totally contrived exercise? It is important to avoid such distortions since these only go to reinforce many students’ beliefs that mathe-

matics is purely a game composed of tricks that have to be remembered by rote.

Patterning is often the key to the structure of a rhyme and it is this that makes it enjoyable for students. Such patterning is not always that end words of particular lines have similar rhyming sound. It can take various forms such as the continuous repetition of the same lines, with something new added each time the verse is said or sung. The whole notion of “pattern” is frequently what makes particular situations “mathematical”. Identifying that pattern and articulating it is often what we mean by “doing mathematics”. However, not all situations that have at their heart a pattern are necessarily mathematics. We would not want to call a large proportion of art that uses patterning “mathematics”. However, the process of recognising pattern in other situations can often allow students to see the same form in what we call mathematical situations. One way for them to start to recognise patterns is to ask the question, “What should come next?”

The “building up” patterning, which is the essential structure of “The Twelve Days of Christmas”, is used in a number of branches of mathematics. Adding at the end or beginning, as well as in the middle to “tighten the logic” can elaborate a simple proof in geometry. Algorithms in algebra, as well as in simpler arithmetic, use this form as well. Sadly not all students recognise the structure, thinking there is none, and what is required of them is memorisation only.

At a simple level, there is a fair amount of numeracy to be found in this rhyme. The counting is obvious, as is the use of the ordinal names of numbers. The students can change the types of gifts, which can be fun, and continue the rhyme to bigger numbers, as long as the structure of the pattern is preserved. However, the real interest comes by asking students a very simple (and hence good) question: “Just how many presents did my true love send in total?” Clearly, the answer is not 12, but just what is it? Apart from arriving at an answer, this is a situation that often produces a variety of solution strategies. Hence it is an opportunity to discuss the differences between strategies

and the reasoning that led to them, and perhaps emphasize that in this case the use of the pattern inherent in the rhyme gives a very elegant solution strategy.

Delving into spatial and measurement ideas

Students will be able to bring together notions of spatial ability and measurement after they read a poem such as the one by C. J. Dennis in Figure 2. Perhaps the first exercise based on this poem is to devise a map of the ant's exploration, including a key for distances. Although some distances are given, which students will need to change to metric units, some careful and realistic estimation of others will need to be made. For example, how long was the fern frond? How big does bracken grow? Hence what is a reasonable estimate for the "bracken bridge"? Again, if

students do not live in relevant parts of Australia, they may need to find out about "sugar ants" and "bracken fern". This would add another interesting cross subject aspect. Another line of questioning can focus on time and speed. How big is a sugar ant? What is a reasonable average speed for a sugar ant to travel? Having already made an estimate of the length of the journey from their map, students can calculate how much time our explorer was away from home?

Estimation and measuring

The same skills of estimating measurements from the content of the story can be applied to some folk tales where journeys are involved. The story of Little Red Riding Hood lends itself to this. In one version of the story a young girl of about 12 years old visits her grandma. She leaves after breakfast to carry some food for lunch to grandma's house. Her journey takes her through some woods, bush or scrub, depending

THE ANT EXPLORER

*Once a little sugar ant made up his mind to roam
To fare away far away, far away from home.
He had eaten all his breakfast, and he had his Ma's consent
To see what he should chance to see and here's the way he went
– Up and down a fern frond, round and round a stone,
Down a gloomy gully where he loathed to be alone,
Up a mighty mountain range, seven inches high,
Through the fearful forest grass that nearly hid the sky,
Out along a bracken bridge, bending in the moss,
Till he reached a dreadful desert that was feet and feet across.
'Twas a dry, deserted desert, and a trackless land to tread,
He wished that he was home again and tucked-up tight in bed.
His little legs were wobbly, his strength was nearly spent,
And so he turned around again and here's the way he went –
Back away from the desert lands feet and feet across,
Back along the bracken bridge bending in the moss,
Through the fearful forest grass, shutting out the sky,
Up a mighty mountain range seven inches high,
Down a gloomy gully, where he loathed to be alone,
Up and down a fern frond and round and round a stone.
A dreary ant, a weary ant, resolved no more to roam,
He staggered up the garden path and popped back home.*

Figure 2

on where you live. She stops on the journey to talk to a wolf and also to pick some flowers. An interesting question to ask is “What would be the maximum number of kilometres Little Red Riding Hood would have to walk?”

From the story, some guesses as to elapsed time limits can be made. It really does not matter what these limits are, and they will vary depending on what students are used to. What time would we say breakfast was finished? How long after that did the little girl set out? Did she have any household chores to complete before she could leave? Did mother have to get the lunch basket ready or was it prepared the night before? As well, what would be a reasonable time of the day for grandma to eat lunch? The students may wish to add other ideas. The key notion is that reasonable time estimates are made. There is no need to fix on very specific times or time spans. But students should be able to argue why their suggestions and estimates are reasonable. Knowing when Little Red Riding Hood could reasonably be expected to leave and by when she should arrive, we are on the way to making an estimate of how much time she could walk for.

A little more thinking about time is necessary. How long would she have talked with the wolf? And how long did she spend picking flowers, remembering it was a lovely sunshine day in spring (well I always think of it that way)? From these estimates we can make a calculation for the time that the young girl spent on her walk.

How fast do fit young girls of 12 walk? I think we can assume Little Red Riding Hood was quite fit because presumably this was not the first time she would have walked to grandma’s house, although it might have been the first time she had gone alone. The students might need to do some experimenting to find out what a reasonable estimate of this speed would be. Once we have an estimate of the walking speed we can

calculate the distance, and then find out that she could have been walking quite a long way. Well a long way, if we live in a city and are not used to lots of long walks through the bush or woods.

Other folk tales can also be examined from a mathematical point of view. “The Three Little Bears” for example can be a focus for measurement ideas. What would the temperature of the porridge have been if it was “too hot”, or “too cold”, or “just right”? How do you measure the “softness” and “hardness” of a bed? With these two groups of questions the whole notion of measuring to an accepted standard, compared with a subjective measurement is raised. We do both in real life; measure a length, compared with measuring the quality of performance of a dive at the swimming pool. Of course at a much simpler level there are in this story the notions of one-to-one correspondence: three bears, three bowls; three chairs, three beds. One could rewrite the story emphasising this by having Goldilocks asking herself before she goes upstairs for instance; “I wonder how many beds there will be?”

“Jack and the Bean Stalk” also lends itself to some mathematical questioning. How tall was the bean stalk if it reached to the clouds? How can you measure the height of clouds? How tall would the giant have to be before Jack would call him “a giant”? How long would it have taken Jack to climb up the bean stalk, and how long to climb down? How heavy could the bag of gold be if Jack was able to carry it? How heavy could the bag be if Jack was able to out run the giant? What then was the monetary value of the gold based only on its weight? How far in front of the giant would Jack have to be if he had time to climb down, fetch an axe, and chop through the stalk while the giant was only part way down? (Remember the giant had to be high enough up the bean stalk to still fall to his death! Gruesome isn’t it? But many folk stories were before Disney got hold of them, and sanitised them).

Historical and cultural analyses

Mathematics is not just the study of number, space, measurement, etc. Often overlooked in mathematics sessions are the historical and cultural settings in which the mathematics appears. Clearly in the above examples such cross subject issues could be pursued.

To go back to “The Twelve Days of Christmas” there is quite an historical angle that could be taken. This was one of many counting songs that originated in the Middle Ages essentially to test the memory of the singer. The earliest known written record of it is in a 13th Century manuscript in Trinity College Library, Cambridge. The first day of the song refers to the 26th of December, the day after Christmas Day that was known as “The first day of Christmas”. On this day, St Stephen’s day, the village Church was open as were the alms boxes in the church, the contents of which was distributed to the poor. Hence the 26th is called Boxing Day in some countries now. The days of Christmas progressed to the final twelfth day, January

6th, which is the Feast of the Epiphany. Epiphany commemorated the visit of the Magi or wise men to the baby Jesus and the giving of their gifts. Hence it was at Epiphany that gifts were given in this tradition. Shakespeare later also celebrated the joy and giving at Epiphany in his play “Twelfth Night”.

Other old rhymes shown in Figure 3 may well be worth investigating not only for their mathematics, but the cultural and historical settings. In the first the cardinal points of the compass are used to note the direction of the wind, which in turn is related to a local understanding of fishing. Finding out when this was written and where may well be a useful exercise.* But the students could also change the rhyme to fit into their own situation, and to do that they may well have to ask some in their own community about fishing in the locale in which they live. On the other hand the direction of the wind and the weather it brings may well be related to outside sporting events. In the second rhyme calendar time is a link to mathematics, and may form a basis for rhymes or tales of animal behaviour in the students’ environ, rather than a setting in England as depicted here. Finally, money is featured in an old rhyme that students could first

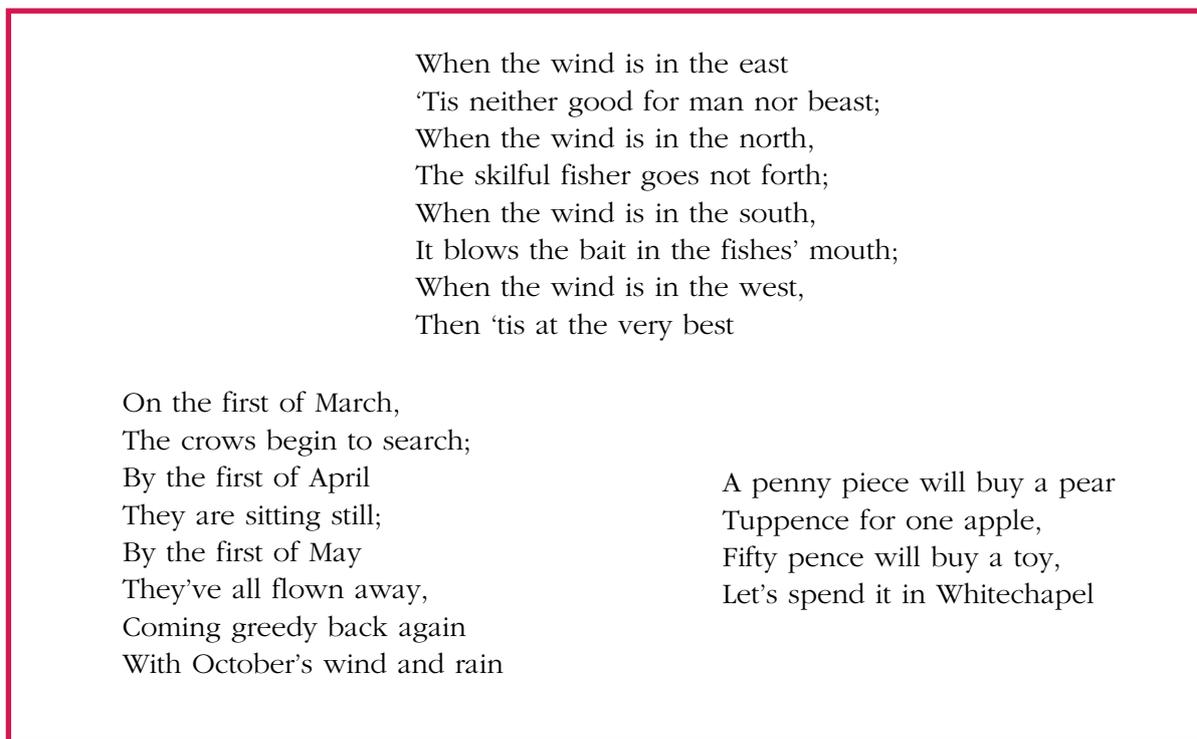


Figure: 3

investigate for its mathematical and then historical and societal content.

Summary

The role of the teacher in all of the above is to help create a situation in which the students will enjoy singing or saying the rhyme first and foremost, or listen to the folk tale, but also be led by perceptive questioning to recognise the embedded mathematics as well.

These notions can form the basis of whole class activities, but they are probably better used as project ideas for small groups. Clearly only some starter questions should be posed in discussion with the students, since the beauty of these activities is that it is easy for students to form their own questions and explore the possibilities over an extended period of time, which could well be measured in days not minutes. Their reporting back can also take various forms of written, combined with pictorial work. However, the pictorial work should be distilling the mathematics, not just the pretty pictures of the action. As well, for a number of the tales and rhymes some observations and measuring outside of the classroom will be needed.

It is obvious I have drawn on the Anglo traditions to source the tales mentioned here. All cultures have similar stories and I understand from some of my colleagues the notions outlined here could apply to them. Hence the notion of a multicultural display of mathematics is a distinct possibility in some classrooms, in the family's own language perhaps.

Finally, care needs to be taken not to destroy the folk tale or rhyme with undue analysis. Students after all enjoy these because they are fun. This must be preserved. However, if some of that fun can influence their study of mathematics, then we will all be winners.

Notes

* After completing this article I came across an interesting article that discusses a number of old rhymes dealing with the weather and their original settings:

Wilson, J. (2001). *Signs of the Weather*. Accessed on 27 April 2006 at <http://wilstar.com/skywatch.htm>

As far as the author is aware all rhymes and stories referred to in this chapter are traditional, except "The Ant Explorer".

References

Dennis, C.J. (1921). The ant explorer. In J. Rowe (Ed.). *More Poems to Read to Young Australians* (p. 9). Sydney: Ure Smith.

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