Using Native American Legends To Teach Mathematics

Legends Retold by Students Participating in the Anishinabe Teachers for Anishinabe Children Project

Edited by
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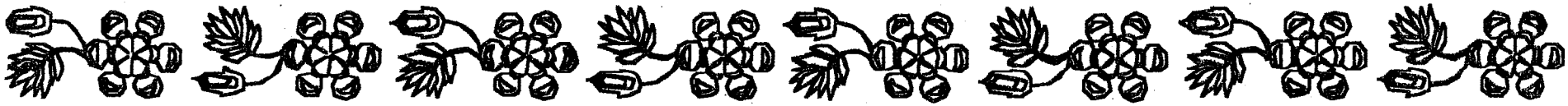
University of Wisconsin Oshkosh



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Anishinabe Teachers
for
Anishinabe Children Project

Directed by Judith E. Hankes, Ph.D. and Gerald R. Fast, Ph.D.

University of Wisconsin Oshkosh

June 19999

Twenty-one Anishinabe (Woodland Native American) high school students spent one week studying how young children learn mathematics. The students were selected to participate in this program because of their high academic aptitude and interest in teaching.

The goal of this unique mathematics experience was to prepare the students to tutor in elementary classrooms at their home reservations. Besides learning how to teach mathematics, the students also learned how to write a variety of word problems. They based their problems on Native American legends. The students also made linoleum prints to illustrate their legends. The students' legends, word problems, and illustrations make up this volume.

The mathematics content to which the students were introduced during this week-long program is based on principles of Cognitively Guided Instruction (Carpenter, et al., 1999). Cognitively Guided Instruction is described in the **Teacher's Guide** section of this volume.

Number translations of Menominee, Ojibwe, and Oneida languages are included in the section entitled **Using Native American Number Words to Develop Base Ten Understanding.**

Student Participants

Students from seven Wisconsin reservations participated in this project:

Bad River--- Aurora Conley and Valerie Connors

Ho Chunk---Angie Naquayouma and Amanda Peters

Lac du Flambeau---Heather Cardinal, Roland LaBarge, and Rebecca Maki

La Courte Orielles---Doreen Belille, Leonard Belille, Marian Belille, Nicole Miller, and Heather Gouge

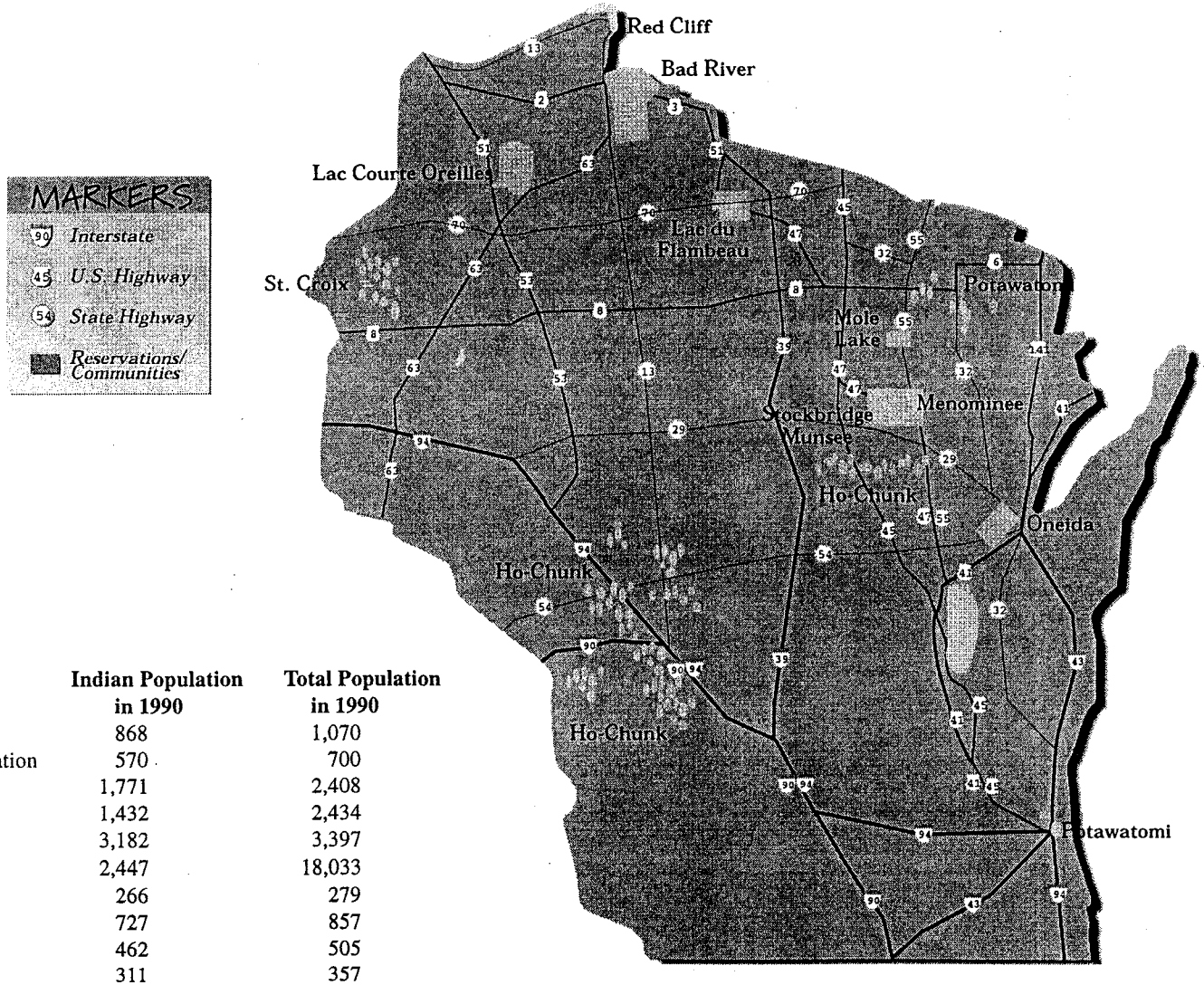
Menominee---Louise Bear, Talenna Marie Peters, Leona Tourtillott, Sara Wescott, and Terri Zhuckkahosee

Oneida---Desiree Barber, Priscilla Dessart, and Charlie Doxtator

Stockbridge Munsee---Maggie Putnam

The long range goal of the project is to attract Native American students into teacher education.

Wisconsin Reservation Map
Tribe Populations 1990 Census



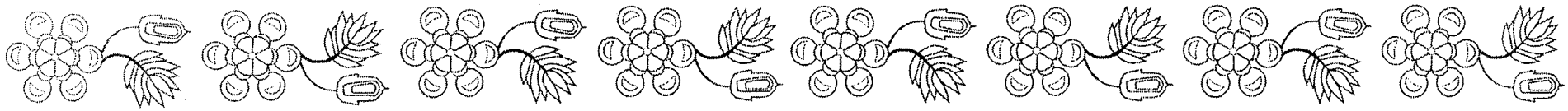
Reservation	Tribe	Indian Population in 1990	Total Population in 1990
Indian Population			
Bad River	Chippewa	868	1,070
Ho chunk Nation	Ho Chunk Nation	570	700
Lac Courte Oreilles	Chippewa	1,771	2,408
Lac du FLambeau	Chippewa	1,432	2,434
Menominee	Menominee	3,182	3,397
Oneida	Oneida	2,447	18,033
Potawatomi	Potawatomi	266	279
Red Cliff	Chippewa	727	857
St. Croix	Chippewa	462	505
Sokaogon	Chippewa	311	357
Stockbridge-Munsee	Mahican/Munsee	447	581

Native American Legends and Related Math Problems

Note for teachers: When solving the following word problems, insert one set of the given numbers into the problem. Vary number sizes to increase difficulty.

Example:
Otter went fishing. He caught 5 fish. Then he caught 4 more fish. How many fish did Otter catch?
(5, 4) (16, 23) (46, 46)

The problems have been sequenced according to mathematical difficulty. Information explaining this sequence is provided in the Teachers' Guide (pages 61-70).



How the Bear Lost His Tail

an Ojibwe legend told to Marian, Doreen, and Leonard Belille
by Jerry Smith

Long, long ago there were only creatures on the earth. There were birds, bears, deer, mice, everything but people. In this long ago time, all the animals spoke the same language. And just like some people nowadays, they played tricks on one another and made each other laugh. They also helped each other. So it was with all the animals.

One day in the winter when the lakes had frozen, but before the winter sleep, Bear was walking along the lakeshore. As he was walking, he came upon Otter sitting near a hole on the ice with a pile of fish.

"You've got a mighty big pile of fish there," Bear said. "How did you get them fish?"

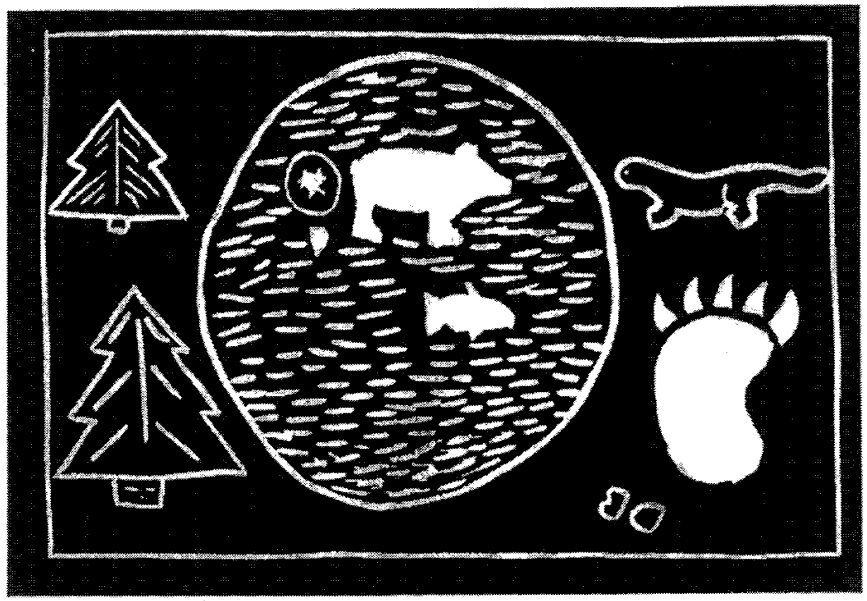
Instead of telling how he dove down into the water and caught the fish, Otter decided to trick Bear. You see, back then Bear had a very long bushy tail. He was very proud of his tail, and all the animals knew it.

"The way I catch my fish is by putting my tail in this ice hole," Otter explained. "I wiggle it around once in a while so the fish see it. When a fish bites onto my tail, I quickly pull it up and out of the water."

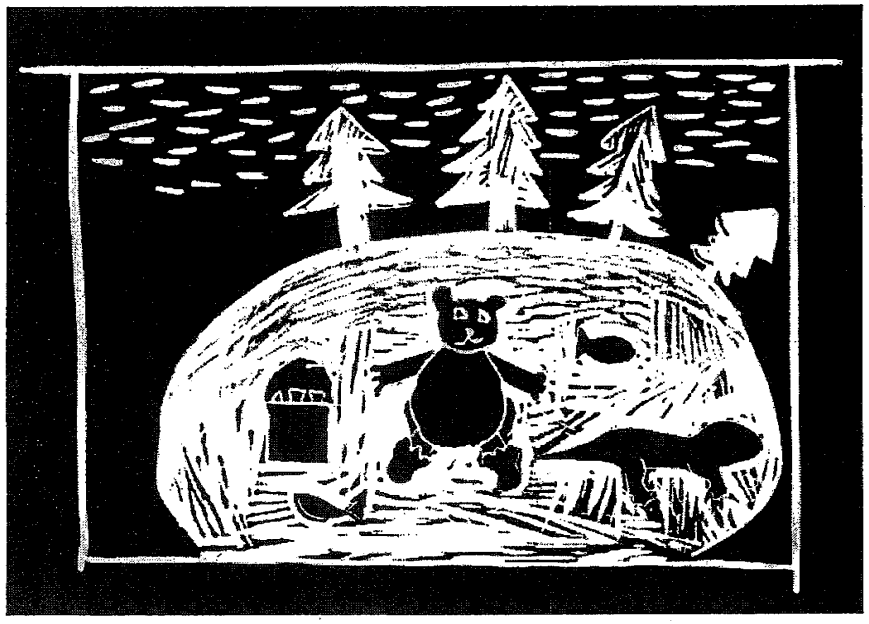
"That sure is an easy way to catch fish," Bear said. "Do you mind if I use your fishing hole?"

Otter, laughing behind the Bear's back, said, "I have enough fish. Use my fishing hole as long as you like." Then Otter picked up his fish and walked away. Bear carefully poked his tail into the ice hole and waited. He waited and waited. Once in a while he'd wiggle his tail so the fish could see it. Bear waited until the sun began to set, but not one fish even nibbled at his tail. At last, he decided to go home, but when he tried to stand up, his tail had frozen into the ice! He couldn't move! He pulled and pulled at his tail, but it was stuck tight. Finally, he pulled with all of his strength and ripped off half his tail!

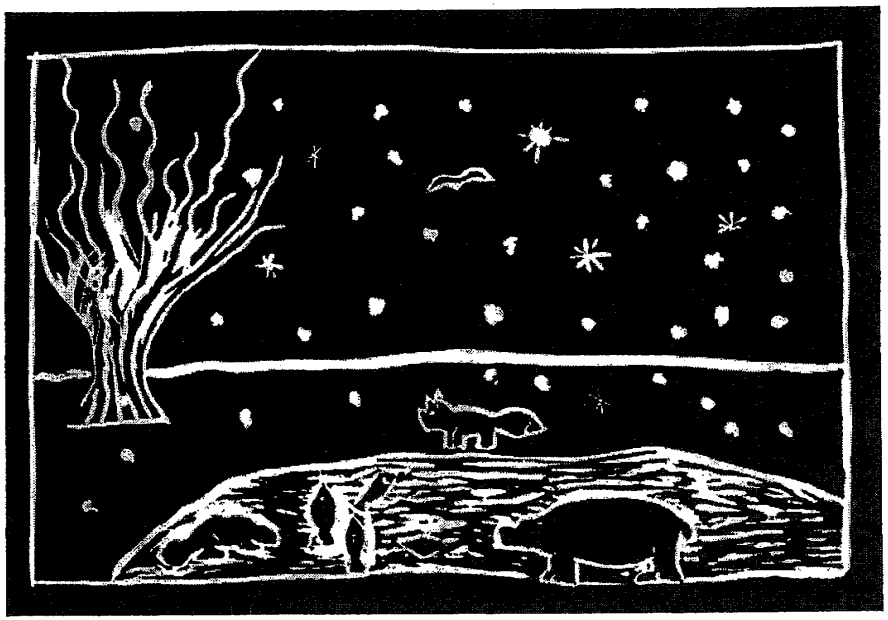
Now you know why the Bear has a short tail, and remember . . . *don't always believe what people tell you.*



Doreen Belille



Marian Belille



Leonard Belille

How the Bear Lost His Tail
Word Problems

Join: Result Unknown
Otter went fishing. He caught ___ fish and then he caught ___ more. How many fish did Otter catch?
(5, 4) (16, 23) (46, 46)

Separate: Result Unknown
Otter caught ___ fish.
He gave ___ fish to a friend.
Now how many fish does Otter have?
(7, 4) (18, 6) (33, 27)

Part Part Whole: Whole Unknown
There were ___ bass and ___ northern pike swimming near Otter's fishing hole.
How many fish were swimming altogether?
(4, 6) (22, 15) (37, 29)

Compare: Difference Unknown
Otter has ___ fish.
Bear has ___ fish.
How many more fish does Otter have than Bear?
(10, 7) (18, 12) (42, 34)

Multiplication
Otter had ___ fishing holes.
He caught ___ fish from each hole.
How many fish did Otter catch?
(3, 4) (4, 10) (7, 20)

Measurement Division
Bear gave ___ of fish to some friends.
He gave ___ to each friend.
How many friends got fish?
(8, 2) (25, 5) (48, 12)

Partitive Division
Otter shared ___ fish with his ___ friends. Otter and each friend got the same number of fish. How many fish did each friend get?
(8, 2) (15, 5) (48, 6)

Join: Change Unknown
In the morning Otter caught ___ fish. By the end of the day, he had caught ___ fish. How many fish did Otter catch in the afternoon? He did not fish in the evening.
(6, 10) (12, 23) (66, 85)

Separate: Change Unknown
___ fish were swimming in a pond. Some swam away. Then there were ___ fish swimming. How many fish swam away?
(9, 4) (17, 6) (35, 27)

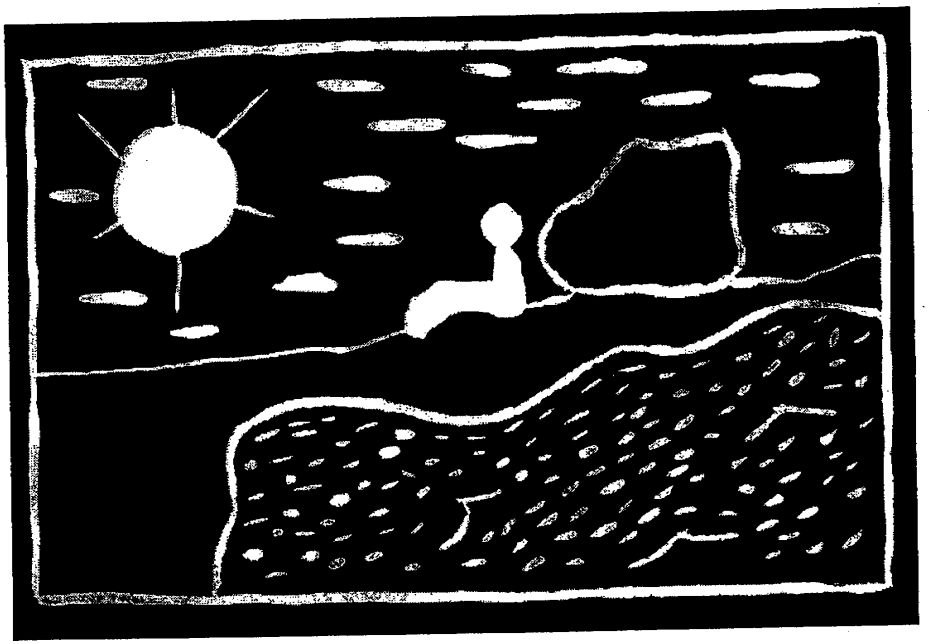
Part Part Whole: Part Unknown
Otter caught ___ fish. ___ were northern pike. The rest were small mouth bass. How many small mouth bass did Otter catch? (7, 2) (26, 7) (33, 22)

Wild Rice

an Ojibwe legend retold by
Heather Cardinal and Becky Maki

Waynaboozhoo was worried about what his people would eat during the long winter months. For several winters there had been very little food and the people had suffered. Waynaboozhoo wanted to put a stop to the suffering, so he went into the woods and fasted for four days in a wigwam. On the fourth day he started on a long walk, and as he walked, he thought about how to keep his people from starving. He continued walking until he came to the edge of a river. By that time, he was very tired, so he lay down to rest and fell asleep. Waynaboozhoo awoke late in the night when the moon was high in the sky. He walked along the edge of the river and saw what looked like dancers in the water. Waynaboozhoo thought he saw the feathers of the headdresses worn by Ojibwa men. He walked a little closer and asked if he could dance along. He danced and danced until he grew tired. He lay down and fell asleep again. The next morning when he awoke everything was calm. Waynaboozhoo remembered the dancers but thought it all had been a dream. Then he looked out at the tassels waving above the water. He waded out and found long seeds that hung from these tassels. He gathered some of these seeds in the palm of his hand and carried them with him back to his wigwam. There he continued fasting. Once again he grew tired and fell asleep, and as he slept, he had a vision. In the vision he learned that he had gathered wild rice and that it was to be eaten. He tasted the rice and found that it was good. Waynaboozhoo returned to the village and told his people about the rice. Together, they harvested enough to provide food for the long winter.

Wild Rice
Word Problems



Rebecca Maki

Join: Result Unknown
The people harvested ___ pounds of rice the first night and ___ pounds the second night.
How many pounds of rice did they harvest altogether?
(9, 4) (18, 6) (24, 18)

Separate: Result Unknown
Grandmother made ___ pieces of frybread.
She gave Waynaboozhoo ___ pieces.
How much frybread did Grandmother have left?
(9, 4) (18, 6) (24, 18)

Part Part Whole: Whole Unknown
Grandfather has ___ pieces of frybread and ___ pieces of venison.
How many pieces of food does he have altogether?
(6, 7) (22, 34) (37, 47)

Compare: Difference Unknown
Grandmother has ___ beads sewn onto her medicine pouch. Grandfather has ___ beads sewn onto his medicine pouch.
How many more beads does Grandmother have than Grandfather?
(10, 8) (28, 12) (34, 26)

Multiplication
Grandmother has ___ baskets.
There are ___ rice cakes in each basket.
How many rice cakes are there altogether?
(3, 3) (5, 12) (10, 12)

Measurement Division
A gatherer had ___ baskets of wild rice.
He gave ___ baskets to each of his friends.
How many friends got wild rice?
(6, 2) (15, 3) (36, 12)

Partitive Division
Grandmother made ___ pieces of frybread.
She gave the frybread to ___ friends.
If each friend got the same amount, how much frybread did each friend get?
(6, 2) (12, 4) (55, 11)

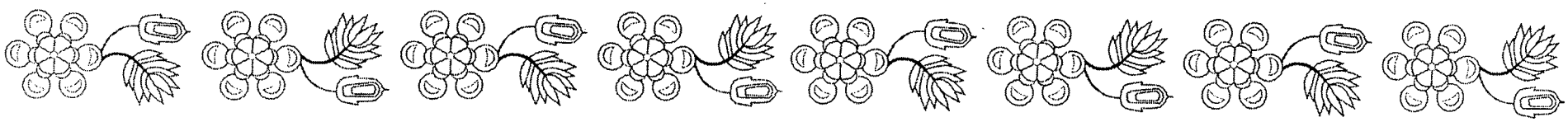
Join: Change Unknown
___ pounds of wild rice were gathered in the morning.
More was gathered in the afternoon.
By late afternoon, ___ pounds of wild rice had been gathered.
How much wild rice was gathered in the afternoon?
(7, 13) (17, 27) (24, 36)

Separate: Change Unknown
Grandmother made ___ pieces of frybread.
She gave some to Waynaboozhoo.
Then she had ___ pieces left.
How much frybread did she give to Waynaboozhoo?
(8, 5) (20, 9) (34, 26)

Part Part Whole: Part Unknown
At the feast there were ___ people.
There were ___ adults.
The rest were children.
How many children were at the feast?
(12, 8) (26, 16) (45, 28)

Compare: Referent Unknown
Grandfather had ___pieces of frybread. He had ___more pieces than Waynaboozhoo. How many pieces did Waynaboozhoo have?
(12, 7) (23, 12) (43, 14)

Two-Step Problem
Each family gave ___ pounds of wild rice for the feast. ___ families gave rice. After the feast, ___ pounds of rice were left over. How many pounds of rice were eaten at the feast?
(3, 4, 6) (5, 6, 15) (6, 7, 26)

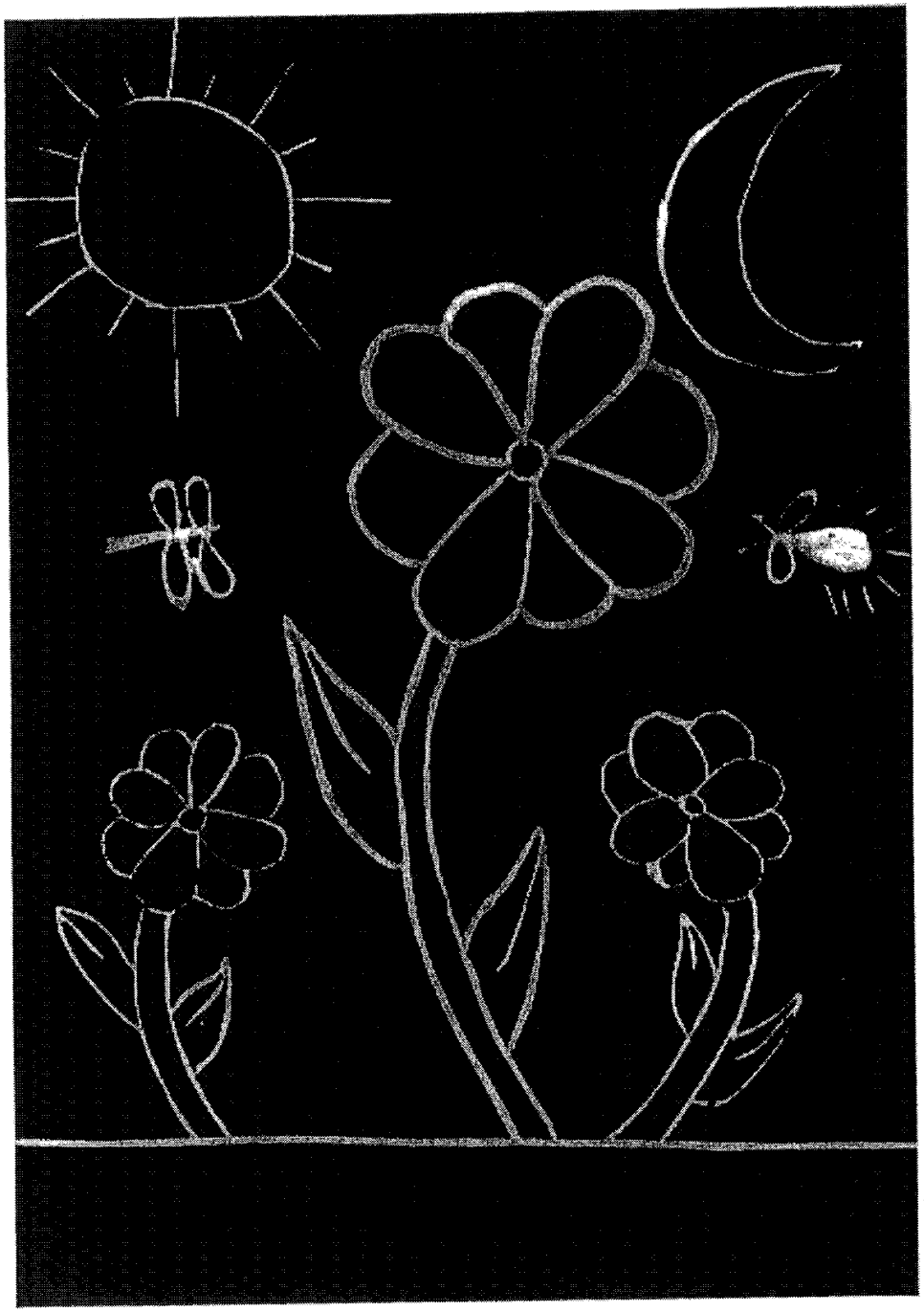


How the Flower Came to Be

a Menominee legend retold by
Sara Wescott

Long ago when the Creator was making life, He was feeling real happy. He truly enjoyed creating! He looked around at all the wonderful things He had made and thought to Himself, "I am so happy that I want to make something special to spread my happiness." He thought long and hard, and then said, "This thing must be so pleasing that it will get a second look. It must fill the air with sweet smells that create happiness." He thought some more, and then he added, "But I also want it to serve a purpose. It must be able to be eaten and used as medicine."

So, after thinking long and happily, the Creator took bits of this and bits of that and bits of things that had never been and created the flower. He made tall ones and short ones, skinny ones and fat ones. He made them every color imaginable. He was so satisfied with His new creation that He spread them all over the world for everyone to enjoy.



Sara Wescott

How the Flower Came to Be Word Problems

Join: Result Unknown
___ butterflies were fluttering in the garden.
___ more butterflies fluttered into the garden.
How many butterflies are in the garden now?
(6, 3) (24, 13) (47, 55)

Separate: Result Unknown
A field had ___ clover blossoms.
Rabbits ate ___ of the blossoms.
How many clover blossoms were not eaten?
(7, 3) (29, 7) (62, 56)

Part Part Whole: Whole Unknown
There are ___ pink flowers and ___ purple flowers.
How many flowers are there altogether?
(5, 4) (14, 23) (37, 44)

Compare: Difference Unknown
One hill has ___ flowers.
A field nearby has ___ flowers.
How many more flowers does the field have than the hill?
(6, 9) (23, 35) (72, 96)

Multiplication
There are ___ flowers, and each flower has ___ leaves.
How many leaves are there altogether?
(3, 4) (7, 10) (12, 8)

Measurement Division
In a garden there are ___ roses on each rose bush. Altogether there are ___ roses. How many rose bushes are in the garden?
(2, 12) (5, 25) (6, 42)

Partitive Division
In a garden there are ___ rose bushes. There are the same number of roses on each bush. Altogether there are ___ roses. How many roses are on each bush?
(3, 9) (4, 24) (6, 48)

Compare: Difference Unknown
The Creator planted ____ red flowers and ___ yellow flowers. How many more red flowers than yellow flowers did the Creator plant?
(9, 4) (22, 11) (56, 28)

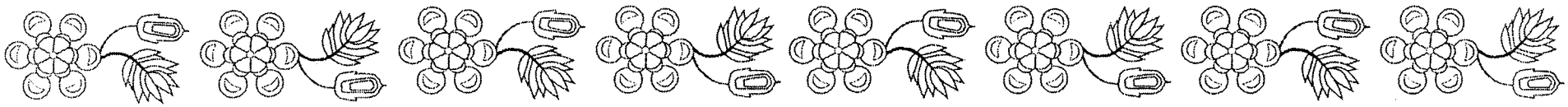
Join: Change Unknown
There were ___ clover blossoms in a meadow.
A rabbit ate some of them. Then there were ___clover blossoms. How many blossoms did the rabbit eat?
(7, 4) (26, 14) (32, 24)

Separate: Change Unknown
___ butterflies were fluttering among the flowers.
Some flew away. Then there were ___ butterflies left.
How many butterflies flew away?
(6, 4) (17, 5) (44, 33)

Part Part Whole: Part Unknown
There were ___ flowers on a hill.
___ of them were yellow.
The rest were red.
How many red flowers were on the hill?
(9, 3) (26, 18) (56, 48)

Compare: Referent Unknown
There were ___ roses in a field. There were ___ more roses than daisies. How many daisies were in the field?
(8, 4) (28, 14) (32, 23)

Two-Step Problem
___ butterflies fluttered into a flower filled garden.
___ more butterflies fluttered into the garden.
Then a gentle breeze blew___of the butterflies into the woods.
How many butterflies stayed in the garden?
(4, 5, 3) (11, 23, 14) (24, 37, 22)



Brother Bear

a true Menominee story retold by
Louise Bear,
and Terri Zhuckkahosee

A long time ago on the Menominee Indian Reservation there lived a very old couple. The husband loved hunting and fishing. One winter night he decided to go on a hunting trip. So the next day his wife packed some warm clothes and lots of dried meat and berries for him and he set off on his trip.

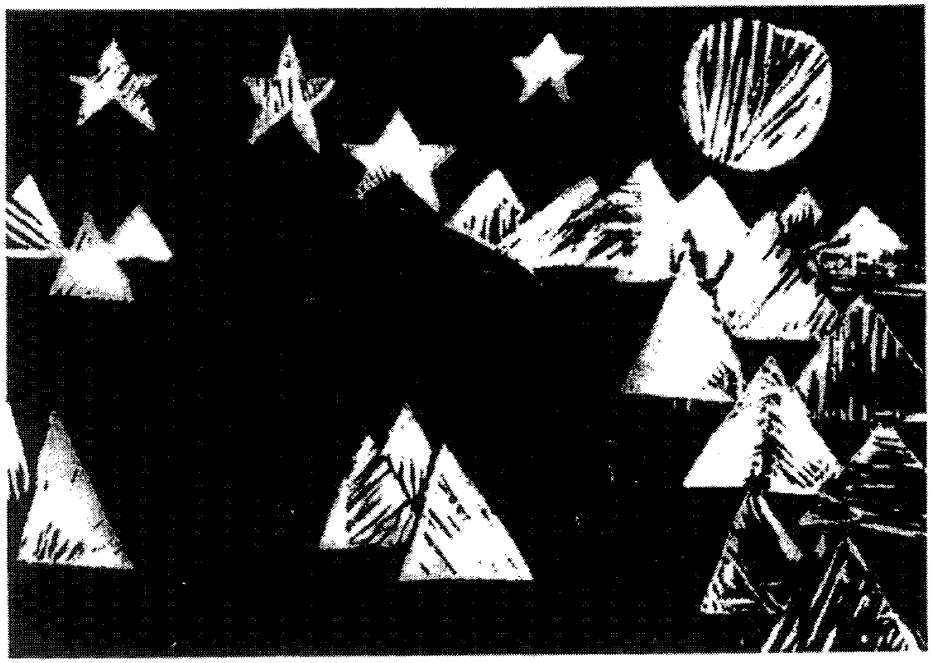
He followed deer trails through the woods for a long time without seeing a deer. Then, at the edge of a meadow, he spotted one. Carefully, he aimed the arrow in his bow and let it fly. The arrow struck the deer but only wounded it. The deer leaped into a thicket of trees, and the old man quickly followed. He tracked the deer for many miles but eventually lost its trail. When he finally decided to return home, he realized that he was lost. The old man panicked and started to run, but he could not find a familiar trail. The old man remained lost for many days.

Late one afternoon, while trying to save time, he decided to walk across a lake. He had not gone far, when suddenly he broke through a weak spot in the ice! He carefully pulled himself from the water and crawled to shore. There, he took off his snowshoes and other heavy clothing and started walking. He became very cold and tired. Fortunately, he noticed a small cave and went inside. A bear was hibernating in the cave, but that didn't bother him. The old man cuddled close to the bear to keep warm, and while lying next to the bear, he ate the dried meat and berries his wife had sent with him. He stayed with the bear until his clothing dried and he regained his strength.

When he finally returned home, his wife asked, "Where have you been?"

The old man answered, "I was staying with my brother bear."

Terri Zhuckkahosee



Louise Bear

Brother Bear
Word Problems

Join: Result Unknown
The old man lay next to the bear eating berries.
First he ate ___ berries.
Then he ate ___ more.
How many berries did the old man eat?
(5, 3) (13, 24) (35, 47)

Separate: Result Unknown
The old man had ___ berries.
He ate ___ of them.
How many berries didn't he eat?
(8, 3) (18, 12) (34, 26)

Part Part Whole: Whole Unknown
The old man has ___ blueberries
and ___ strawberries.
How many berries does the old man have?
(3, 6) (12, 13) (38, 27)

Compare: Difference Unknown
The old man saw ___ crows and ___ blue jays.
How many more blue jays than crows did the old man see?
(4, 9) (12, 18) (16, 23)

Multiplication
There were ___ oak trees. In each oak tree there were ___ blue jays. How many blue jays were there altogether?
(3, 4) (4, 6) (5, 8)

Measurement Division
The old man gave ___ berries to some animals. He gave ___ berries to each animal.
How many animals got berries?
(9, 3) (18, 6) (36, 4)

Partitive Division
The old man fed berries to ___ birds. Each bird got the same number of berries. Altogether, the old man gave the birds ___ berries. How many berries did each bird get?
(2, 8) (4, 16) (4, 32)

Join: Change Unknown
The old man stayed with the bear for two days.
On the first day he ate ___ pieces of venison.
On the second day he ate some more pieces of venison.
Altogether he ate ___ pieces of venison.
How much venison did the old man eat on the second day?
(4, 10) (14, 26) (18, 32)

Separate: Change Unknown
The old lady packed ___ pieces of venison for the old man. When he returned home, he still had ___ pieces of venison. How many pieces did he eat on his hunting trip?
(10, 2) (30, 8) (45, 17)

Part Part Whole: Part Unknown
The old man saw ___ birds. ___ of the birds were blue jays. The rest were crows.
How many crows did the old man see?
(7, 2) (22, 18) (31, 24)

Compare: Referent Unknown
The old man ate ___berries. He ate ___more berries than pieces of venison. How many pieces of venison did he eat?
(13, 9) (26, 25) (54, 37)

Two-Step Problem
To celebrate the old man's safe return, the old lady held a feast. ___ friends came to the feast.
Each friend ate___pieces of frybread.
There were___ pieces of frybread leftover.
How many pieces of frybread had the old woman fried?
(3, 5, 5) (6, 4, 25) (11, 6, 29)

Waynaboozhoo and the Great Flood

an Ojibwe legend
retold by Valerie Connors

Long ago the world was filled with evil. Men and women lost respect for each other. The Creator was unhappy about this and decided to cause a great flood to purify the earth.

A man named Waynaboozhoo survived. He turned some floating sticks and a log into a raft for the animals and himself. They floated around for a full moon waiting for the water to go down. It didn't, so Waynaboozhoo decided to do something about it.

"Maang!" he called to the loon. "You are an excellent swimmer. See if you can dive down to the old world and bring back a lump of mud in your bill. With mud, I will create a new world."

Maang dove into the water and was gone a long time. When he finally did return, he said, "I could not reach the old world. It was too far down."

"Amik!" called Waynaboozhoo to the beaver. "You are an excellent swimmer. Will you try next?"

Amik dove off and was gone even longer than Maang, but he too returned empty-handed.

"Is there anyone else who'll try?" asked Waynaboozhoo.

Just then a small coot, Aajigade, came swimming along and asked, "What's going on?"

"Get away Aajigade," called one of the birds. "We do not have time for your nonsense."

Now the animals began arguing loudly. Everyone had a different plan about how to get the mud, but no one could agree on whose plan they would use. For hours and hours they argued. By and by, someone noticed that the sun was beginning to go down. They would have to put off the planning until the next day. Everyone began to find their sleeping spot on the raft to rest for the night. Maang asked, "Whatever happened to that silly little Aajigade?"

Suddenly, there was shouting on the other end of the raft. Someone had noticed a small body floating in the water. Water birds paddled hurriedly to investigate and found that it was Aajigade. They brought his body to the raft.

Waynaboozhoo and the Great Flood (continued)

Waynaboozhoo lifted him up, and looking in his small beak, he found a particle of mud. Little Aajigade had reached the old world and got the mud! He had given his life to do this. The other animals were ashamed of themselves for having made fun of little Aajigade. They hung their heads. They felt very sad.

Waynaboozhoo took Aajigade's little body and softly blew life back into him. Waynaboozhoo held him closely to warm him and announced that from that day forward, Aajigade would always retain a place of honor among the animals. Waynaboozhoo set Aajigade down on the water and he swam off as though nothing had happened.

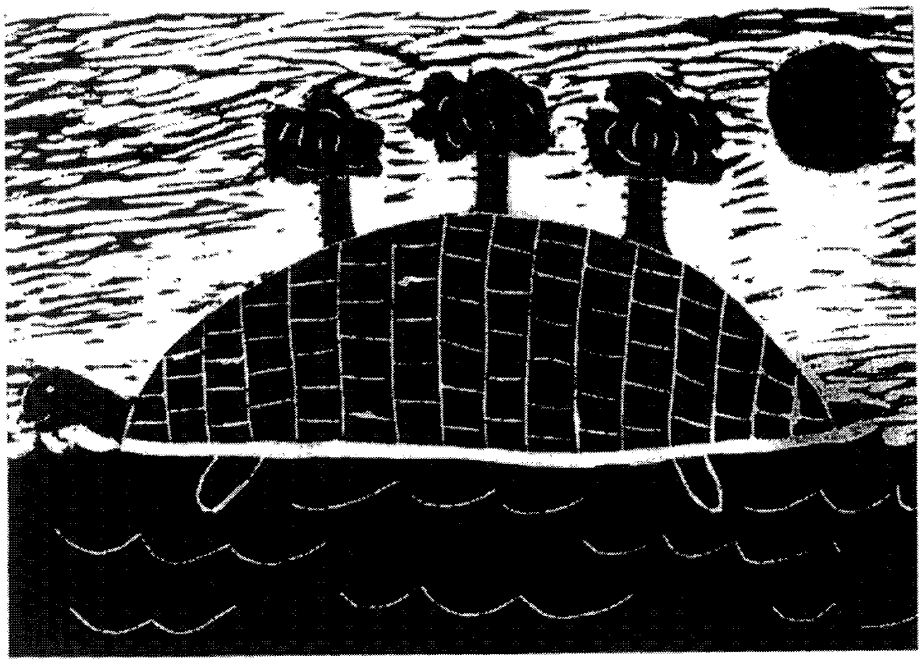
Then Waynaboozhoo took Aajigade's mud in his hands and began to shape it. Next he commanded it to grow. As it grew, he needed a place to put it. Mikinaak (the snapping turtle) came forward and said, "I have a broad back. Place it here."

Waynaboozhoo put it on Mikinaak's back so that it could grow larger.

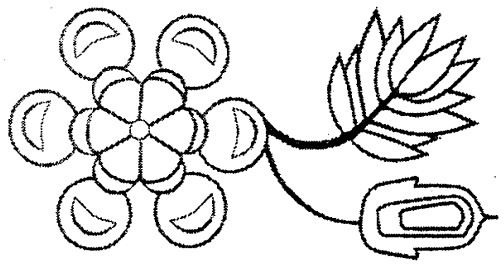
"Miigwetch, Mikinaak," said Waynaboozhoo. "From this day on, you shall have the ability to live in all the worlds, under the mud, in the water, and on land."

The mud began to take the shape of land. Waynaboozhoo placed some tiny enigoonsags (ants) on it. This made it start to spin and grow more. It grew and grew, and more animals stepped onto it until finally it was large enough for moose to walk about. Now Waynaboozhoo sent benishiyag (the birds) to fly around to survey how large the land was. He said to them, "Return to me now and again to let me know how the land is doing. Send back your messages with songs. To this day, that is what the birds continue to do. That is also why they are called the singers.

At last, Waynaboozhoo stepped onto the new world. It had become a home, a place for all the animals, insects and birds, a place for all living things to live in harmony.



Valerie Connors



Waynaboozhoo and the Great Flood Word Problems

Join: Result Unknown
Waynaboozhoo made a raft from sticks that were floating in the water. He picked ___ sticks from the water. Then he picked out ___ more sticks. How many sticks did Waynaboozhoo pick out of the water?
(3, 6) (25, 12) (36, 36)

Separate: Result Unknown
___ animals were floating on the raft. ___ jumped into the water. How many stayed on the raft?
(7, 4) (17, 6) (35, 18)

Part Part Whole: Whole Unknown
There were___ maple leaves floating in the water and ___ willow leaves. How many leaves were in the water?
(5, 4) (16, 14) (27, 27)

Compare: Difference Unknown
Swimming near the raft were___ bass and ___ walleye. How many more walleye then bass were swimming near the raft?
(6, 12) (12, 24) (25, 33)

Multiplication
There were ___ sticks floating in the water.
Each stick had ___ enigoonsags (ants) on it.
How many enigoonsags were there altogether?
(3, 4) (4, 7) (5, 13)

Measurement Division
Waynaboozhoo gave ___ berries to some friends.
He gave ___ berries to each friend.
How many friends got berries?
(8, 2) (15, 5) (32, 8)

Partitive Division
Waynaboozhoo gave ___ fish to ___ friends.
Each friend got the same number of fish.
How many fish did each friend get?
(9, 3) (24, 6) (48, 6)

Join: Change Unknown
___ frogs were swimming near the raft.
Some more frogs jumped into the water to join them.
Then there were ___ frogs swimming.
How many frogs jumped into the water?
(3, 9) (16, 28) (47, 64)

Separate: Change Unknown
___ birds were sitting on a log. Some flew away.
Then there were ___ birds on the log. How many birds flew away?
(8, 3) (18, 7) (32, 26)

Part Part Whole: Part Unknown
___ turtles were swimming. ___ were snapping turtles and the rest were sea turtles. How many were sea turtles?
(10, 4) (26, 14) (72, 38)

Two-Step Problem
Maang (the loon) dove___ times to find the old world.
Amik (the beaver) dove___ more times than Maang.
Aajigade dove twice as many times as Amik. How many times did Aajidad dive?
(12, 9) (24, 14) (33, 28)

Encourage students to write and solve their own word problems and to share their problems with classmates.

How the Birch Tree Got It's Burns

an Ojibwe legend retold
by Aurora Conley

The Ojibwe people always had stories to tell that had a moral. A main character who was always used was Waynaboozhoo. But it is told that you cannot tell a Waynaboozhoo story in the spring, summer, or fall, only when there is snow on the ground or it is said that a frog will be in your bed. You can put down cedar and ask to tell the story and nothing will happen to you or your bed. This is what I am told. Now this is the story about how the birch bark got its burns. Often stories have different morals or different explanations so this one may be somewhat different from others that you have heard.

It was wintertime and Waynaboozhoo's grandmother called him to her. "Waynaboozhoo, omaa bi izhaan!" she called. "Come here. It is cold and we have no fire for warmth or to cook and prepare our food. I ask of you to go to find the fire, ishkodence, that Thunderbird has in the west."

"Grandmother," Waynaboozhoo replied. "I will go and look for the great ishkodence for you." He disguised himself as a waboos, a little rabbit, and headed off to the west looking for the fire.

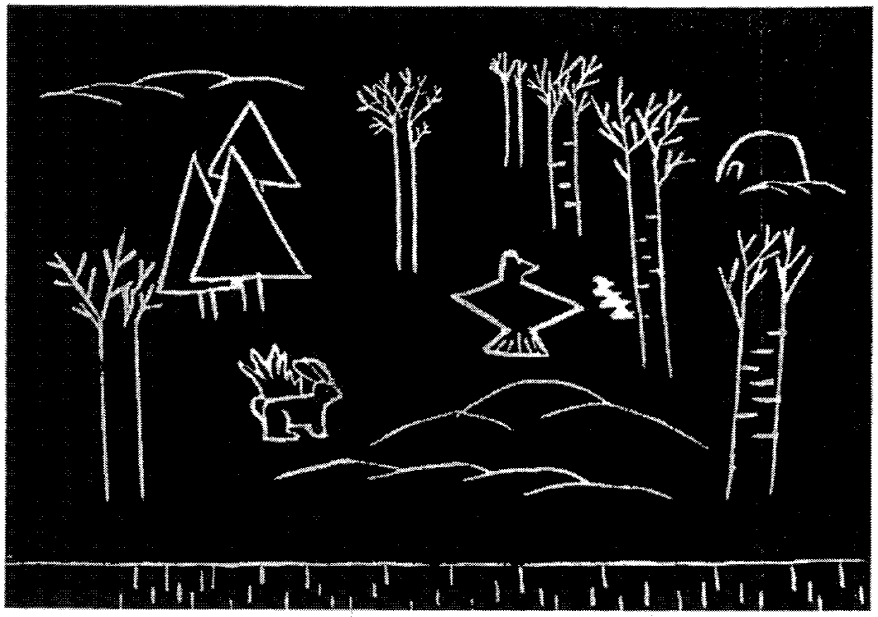
When Waynaboozhoo finally reached Thunderbird's home, he asked, "Please share the warmth inside your home. I am cold and lost. I will only stay a little while, for I must be on my way."

The Thunderbird agreed and allowed Waynaboozhoo to enter his home. Inside, Waynaboozhoo saw the fire and waited until Thunderbird looked away. Then, Waynaboozhoo quickly rolled in the fire and took off running toward his home with the fire on his back!

Thunderbird flew behind Waynaboozhoo throwing lightning flashes at him! Waynaboozhoo grew tired and yelled for someone to help him. "Widoka! Widoka washin! Help me!" he cried.

Then omaaî mitig, the birch tree, spoke. "Come, hide beside me my brother. I will protect you." The little waboos hid beneath the tree while Thunderbird flashed and thundered, angry that Waynaboozhoo had stolen the fire. The lightning bolts missed Waynaboozhoo every time but they hit omaaî mitig. Dark burn marks scarred the white bark of the tree. That is why the birch tree now has burn marks on its bark.

How the Birch Tree Got It's Burns
Word Problems



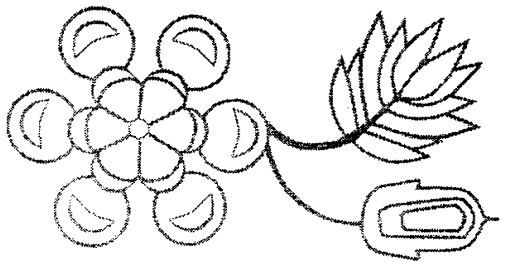
AURORA CONLEY

Join: Result Unknown
When Waynaboozhoo returned home with the fire, his grandmother made ___ pieces of frybread.
Then she made ___ more pieces.
How much frybread did Grandmother make?
(5, 4) (13, 15) (24, 37)

Separate: Result Unknown
Grandmother made ___ pieces of frybread and Waynaboozhoo ate ___ pieces.
How many pieces of frybread were left?
(10, 6) (19, 7) (35, 16)

Part Part Whole: Whole Unknown
There are ___ birch trees and ___ maple trees.
How many trees are there altogether?
(4, 5) (23, 24) (32, 29)

Compare: Difference Unknown
There are ___ maple trees and ___ birch trees.
How many more maple trees than birch trees are there?
(9, 6) (17, 12) (33, 26)



Multiplication
Grandmother put frybread into ___ baskets.
She put ___ pieces in each basket.
How many pieces of frybread did Grandmother put in the baskets altogether?
(3, 5) (4, 6) (12, 7)

Measurement Division
Waynaboozhoo gave berries to ___ little waboos (rabbits). Each rabbit got the same number of berries. Altogether he gave ___ berries to the rabbits. How many berries did each rabbit get?
(4, 8) (6, 18) (4, 36)

Partitive Division
Grandmother put frybread into ___ baskets.
She put the same number of pieces in each basket.
How many pieces of frybread did she putin each basket?
(9, 3) (25, 5) (96, 12)

Join: Change Unknown
In the morning Waynaboozhoo gathered ___ twigs for Grandmother's cooking fire. In the afternoon he gathered more twigs. By late afternoon he had gathered ___ twigs. How many twigs did Waynaboozho gather in the afternoon?
(6, 13) (14, 28) (34, 62)

Separate: Change Unknown
Thunderbird had ___ pieces of wood.
He burned some in his fire.
Then he had ___ pieces of wood left.
How many pieces of wood did Thunderbird burn in his fire?
(7, 4) (17, 5) (22, 14)

Part Part Whole: Part Unknown
There were ___ birds sitting in a birch tree. ___ were chickadees and the rest were pine finches.
How many pine finches were in the birch tree?
(12, 7) (29, 17) (22, 18)

Compare: Referent Unknown
Waynaboozhoo and Grandmother gathered twigs for the fire. Waynaboozhoo gathered ___twigs. He gathered ___more than Grandmother. How many twigs did Grandmother gather?
(12, 7) (24, 12) (36, 19)

Two-Step Problem
A young birch tree had ___ branches. By autumn it had ___ more branches. Each branch had ___ twigs sprouting. How many twigs were on the birch tree?
(4, 4, 3) (5, 5, 10) (12, 14, 20)

The Legend of Spirit Rock

a Menominee legend retold by
Leona M. Tourtillott and Talenna M. Peters

Long ago an elder told three warriors that if they walked a great distance to a sacred place along the Wolf River and offered tobacco, the Great Spirit would grant them their most wanted wish. So the three set out on their journey. They walked for many days and overcame many obstacles before reaching the sacred place.

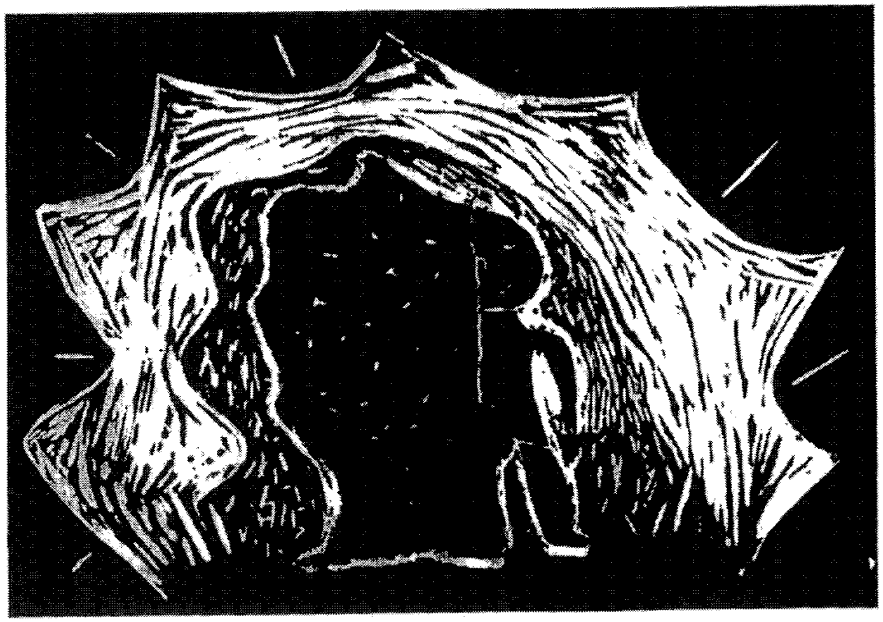
The first warrior offered his tobacco and thought about his wish for a while. Finally, he said, "Oh Great Spirit, could you please give me the skills to hunt better, for I have a big family and am not able to feed them?" The Great Spirit gladly granted his wish and sent him on his journey back home.

The second warrior also offered his tobacco and then thought about his wish. A moment later he said, "Oh Great Spirit, could you please help me find a wife, for I have everything and no one to give it to?" The Great Spirit granted his wish and sent him on his way home.

The third warrior then stepped forward and offered his tobacco. He stood at the sacred spot looking at the ground. When he looked up, he said, "Oh Great Spirit, would you grant me eternal life, for I want to live forever?" Such selfish pride angered the Great Spirit. In return, the Great Spirit granted his wish by turning him into an everlasting rock, Spirit Rock.

To this day Spirit Rock still exists. It is said that if the rock ever crumbles away, the Menominee people will have lost their culture. Some also say that if the rock crumbles, there will no longer be any full-blooded Menominee. Gifts of tobacco are offered on the rock because it is a symbol to be cherished forever by the Menominee people.

Leona Tourtillott



Talenna Marie Peters

The Legend of Spirit Rock
Word Problems

Join: Result Unknown
In the morning, the warriors
sang ___ sacred songs.
In the afternoon they sang ___ more songs.
How many songs did they sing altogether?
(4, 5) (14, 12) (23, 17)

Separate: Result Unknown
The second warrior had ___ deer horn dice.
He gave ___ of them to the other warriors.
How many dice does he have left?
(7, 4) (18, 6) (26, 18)

Part Part Whole: Whole Unknown
The warriors picked ___ blueberries
and ___ strawberries.
How many berries did they pick?
(3, 5) (22, 14) (48, 39)

Compare: Difference Unknown
The third warrior picked ___ chokecherries.
The second warrior picked ___ chokecherries.
How many more chokecherries did the
second warrior pick than the third warrior?
(3, 8) (15, 27) (25, 39)

Multiplication
At a feast there were ___ baskets of frybread.
In each basket, there were ___ pieces of frybread.
How many pieces of frybread were there altogether?
(3, 4) (5, 7) (8, 12)

Measurement Division
The warriors gave ___ berries to some children.
Each child got ___ berries.
How many children were given berries?
(8, 4) (24, 4) (48, 12)

Partitive Division
The warriors saw ___ crows sitting in ___ trees. Each tree had the same number of crows.
How many crows were in each tree?
(6, 2) (16, 4) (39, 3)

Join: Change Unknown
The first and second warriors gave an old man some dried venison.The first warrior gave ___ pieces. After the second warrior gave his venison, the old man had ___ pieces. How many pieces of venison did the second warrior give to the old man?
(4, 9) (15, 28) (24, 43)

Separate: Change Unknown
___ blue jays were sitting in an oak tree.
Some flew away.
Then there were ___ blue jays in the tree.
How many blue jays flew away?
(9, 5) (17, 12) (25, 16)

Part Part Whole: Part Unknown
The three warriors saw ___ birds. ___ of the birds were crows. The rest were blue jays.
How many blue jays did the warriors see?
(10, 4) (24, 11) (37, 18)

Compare: Referent Unknown
In June ___ families visited spirit rock. ___ more families visited in June than in May. How many families visited in May?
(12, 7) (26, 15) (42, 25)

Two-Step Problem
In June ___ Menominee families visited Spirit Rock. In July ___ families visited. In August, the same number of families visited as in both June and July. Altogether, how many families visited Spirit Rock in June, July, and August?
(6, 7) (18, 22) (37, 37)

How the Beaver Got His Tail

an Ojibwe legend retold by
Roland LaBarge

Once upon a time there was a beaver who loved to brag about his tail. One day while taking a walk, the beaver stopped to talk to a bird. The beaver said to the bird, "Don't you love my fluffy tail?"

"Why, yes I do little beaver," replied the bird.

"Don't you wish your feathers were as fluffy as my tail? Don't you wish your feathers were as strong as my tail? Don't you wish your feathers were just as beautiful as my tail?" the beaver asked.

"Why do you think so much of your tail, little beaver?" asked the bird. This insulted the beaver and he walked away.

After walking for a while, he stopped for a drink by the river and saw a muskrat. He walked to the muskrat and said, "Hello little muskrat. What do you think about my tail?"

"Well, it is very beautiful and big and fluffy," answered the muskrat. "Is it also a strong tail?"

"Why, yes it is," the beaver answered. "Do you wish you had a tail like mine?"

"I didn't say I wanted a tail like yours. I just asked if it was strong," the muskrat replied with a disgusted voice.

The beaver quickly turned and began walking back to his dam. He was angry because he felt that the animals were being rude to him. He was very upset and decided to take out his frustration by cutting down trees. After cutting down a couple of trees, he came to a very large one. He knew that it would be a great challenge for him. So he went to it. But as he was cutting, he kept thinking about his tail and didn't notice that he was cutting at a bad angle. Before he knew what was happening, the tree began to fall toward him. He jumped to get out of the way, but he didn't jump fast enough, and the huge tree fell on his beautiful tail! He tugged and pulled and finally dug away the earth to free himself. When he finally pulled his tail from under the tree, he was horrified to see that it was flat. The beaver was very sad and started to cry. As he was crying he heard a voice. It was the Creator.

"Why are you crying?" asked the Creator

"A tree has crushed my beautiful tail," the beaver cried. "Now no one will like me."

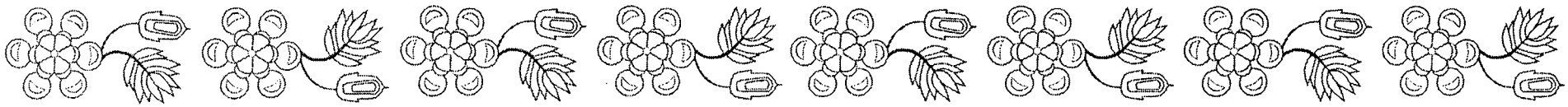
How the Beaver Got His Tail (continued)

The Creator told him that a beaver is not liked for his tail but for his kindness and wisdom. He also told him how to use his flat tail. "Now your tail will help you swim rapidly," the Creator said. "And when you want to signal a message to a friend, all you have to do is slap your tail on the water."

Hearing this made the beaver happy again. When the animals saw his flattened tail they were shocked! But the beaver said, "It's better this way."

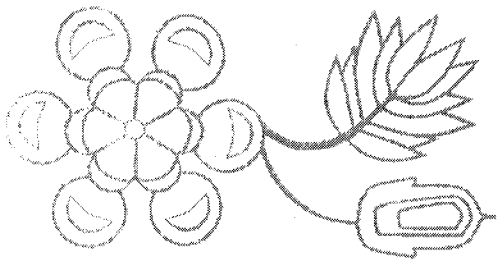
From that day on, the beaver never bragged about his tail, and all the animals liked him.

That's how the beaver got his flat tail.



Roland La Barge, Jr.

Join: Result Unknown
The beaver ate ___ leaves. Then he ate ___ more leaves. Altogether, how many leaves did the beaver eat?
(5, 4) (12, 14) (25, 29)



How the Beaver Got His Tail
Word Problems

Separate: Result Unknown
There were ___ animals listening to the beaver brag about his tail. ___ got tired of his bragging and walked away. How many stayed and listened to the bragging?
(8, 6) (19, 15) (46, 39)

Part Part Whole: Whole Unknown
The beaver bragged to ___ gold finches and ___ chickadees.
How many birds heard the beaver brag?
(6, 3) (14, 14) (27, 33)

Compare: Difference Unknown
On the hill near the beaver's pond there are ___ poplar trees and ___ maple trees.
How many more maple trees than poplar trees are near the pond?
(4, 7) (25, 34) (48, 57)

Multiplication
The beaver bragged to ___ animals.
He bragged ___ times to each animal.
How many times did he brag altogether?
(3, 3) (11, 5) (12, 7)

Measurement Division
After his tail was flattened, the beaver apologized ___ times to each of his friends. Altogether, he apologized ___ times. How many friends heard the beaver's apologies?
(2, 8) (6, 18) (4, 32)

Partitive Division
The beaver tucked ___ chips of wood into holes in his dam. He tucked the same number of wood chips in each hole. There were ___ holes in the dam. How many wood chips did the beaver tuck in each hole?
(12, 2) (24, 6) (30, 6)

Join: Change Unknown
The beaver sent a message by slapping his tail on the water. First he slapped it ___ times softly. Then he slapped it loudly.
Altogether, he slapped his tail ___ times.
How many times did he slap his tail loudly?
(5, 11) (22, 35) (43, 61)

Separate: Change Unknown
The beaver had ___ berries to give to his friends. While walking to the forest, he ate some of them. When he got to the forest, he had ___ berries left.
How many berries did the beaver eat?
(9, 4) (28, 6) (33, 16)

Part Part Whole: Part Unknown
In the forest the beaver met ___ little furry creatures. ___ were field mice, and the rest were rabbits.
How many rabbits did the beaver meet?
(6, 4) (32, 23) (34, 26)

Compare: Referent Unknown
The muskrat caught ___ fish. He caught ___ more fish than the beaver. How many fish did the beaver catch?
(8, 3) (18, 7) (32, 15)

Two Step Problem
The beaver softly slapped his tail against the water ___ times. Then he slapped it ___ times loudly. He repeated this tail slapping pattern ___ times. Altogether, how many times did the beaver slap his tail?
(2, 4, 2) (4, 5, 3) (5, 6, 10)

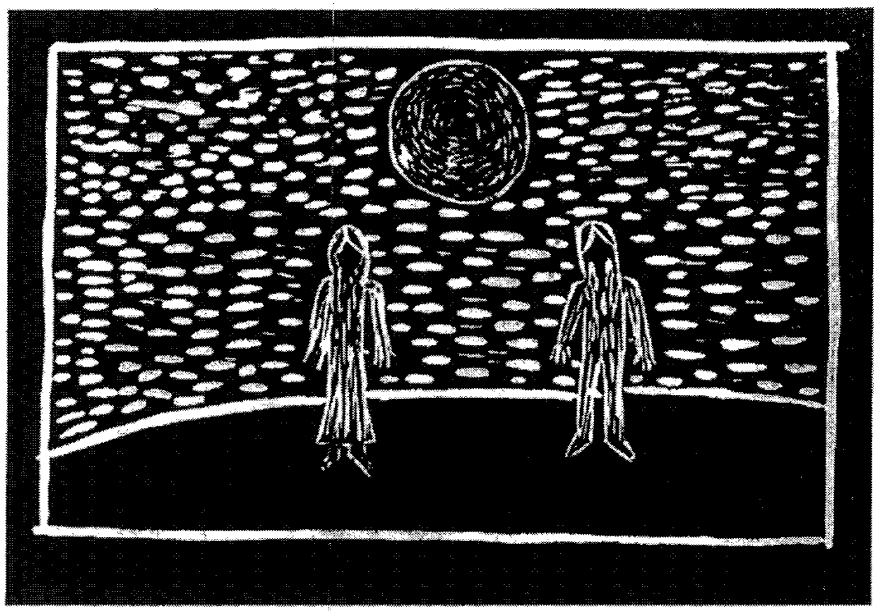
Encourage students to write and solve their own word problems and to share their problems with classmates.

The Creation Story

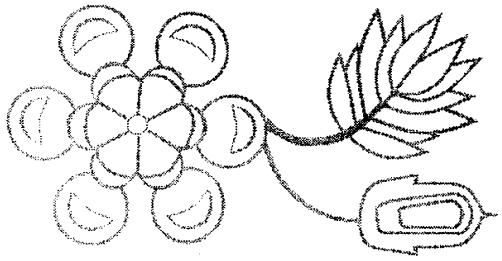
an Ojibwe legend retold by
Heather Gouge and Nicole Miller

Long ago before Mother Earth existed, the Creator sat alone in darkness thinking, and with His thoughts He formed Mother Earth. He covered the Earth with plants and trees, birds and animals, and many crawling insects, but He became lonely. So, from the soil of the Earth he formed two companions, a man and a woman. Beside the man he placed a bow and arrow. This was to show that the man was to be the protector and provider of food. Beside the woman he placed a birch bark basket filled with seeds. The basket and seeds represented the natural resources given to the Ojibwe people. The Creator also placed a book next to the woman. Then the Creator blew life into the woman and the man. First he blew life into the woman, and when she arose, she picked up the birch bark basket full of seeds, but she did not pick up the book. Her choice doesn't mean that Ojibwe people are not educated, they just have a different way of learning. When the Creator blew life into the man, the man picked up the bow and arrow and accepted his responsibility to protect and provide food. Then the Creator said, "Take care of Mother earth, and she will take care of you. Don't get greedy. Take only what you need, and remember to put down tobacco before you take from Mother Earth."

This is how the Ojibwe people came to be.



Nicole Miller



The Creation Story Word Problems

Join: Result Unknown
___ butterflies fluttered into a meadow.
Then ___ more butterflies fluttered into the meadow.
How many butterflies fluttered into the meadow?
(5, 4) (13, 14) (32, 27)

Separate: Result Unknown
There were ___ birds on a tree. ___ of the birds flew away. How many birds stayed on the tree?
(9, 3) (27, 8) (32, 27)

Part Part Whole: Whole Unknown
There were ___ mud turtles and ___ paint turtles sitting on the log?
How many turtles were sitting on the log?
(8, 4) (14, 13) (29, 31)

Compare: Difference Unknown
The man had ___ arrows with red feathers and ___ arrows with yellow feathers.
How many more arrows had red feathers than yellow feathers?
(8, 4) (19, 14) (31, 22)

Multiplication
The woman had ___ birch bark baskets.
In each basket she stored ___ pieces of dried meat.
How many pieces of dried meat did she store?
(4, 5) (11, 10) (5, 25)

Measurement Division
The woman gave ___ berries to her children.
Each child got ___ berries.
How many children does the woman have?
(10, 2) (18, 3) (32, 8)

Partitive Division
The man prepared ___ pieces of dried venison to give to his ___ relatives.
Each relative got the same amount.
How many pieces of venison did each relative get?
(9, 3) (15, 3) (28, 7)

Join: Change Unknown
The woman made ___ pieces of frybread for a family feast.
After the feast, there were ___ uneaten pieces of frybread.
How many pieces of frybread were eaten during the feast?
(10, 21) (26, 52) (49, 77)

Separate: Change Unknown
The woman sewed ___ beads onto her husband's moccasin.
In the night, a pack rat chewed off some of the beads so that there were only ___ beads left on the moccasin.
How many beads did the pack rat carry away to its nest?
(10, 6) (26, 14) (32, 19)

Part Part Whole: Part Unknown
The man sang ___ songs to his wife. ___ of the songs were serious. The rest were silly.
How many silly songs did he sing?
(12, 8) (24, 6) (35, 26)

Compare: Quantity Unknown
Red and yellow beads are in a basket. There are ___ red beads. There are ___ more yellow beads than red beads. How many yellow beads are in the basket?
(3, 8) (12, 22) (24, 28)

Two-Step Problem
The woman gave ___ pieces of frybread to each of her ___ children and ___ pieces of frybread to her mother.
How many pieces of frybread did the woman give away?
(2, 2, 4) (3, 5, 6) (4, 7, 10)

How the Turtle Flew South for the Winter

an Oneida legend
retold by Priscilla Dessart

One day while Turtle was walking, he noticed some birds flying overhead. He yelled to them, "Where are you going?"

Two birds flew down and answered, "We're flying south for the winter."

"What is in the south?" Turtle asked.

"Don't you know anything?" the birds said. "In the south there is a lot of food and it is nice and warm."

"That sounds wonderful," Turtle said. "May I go with you?"

"No way. You can't fly," replied the birds.

Turtle kept pestering them until they finally agreed.

"But, if you come with us," they told Turtle, "you must hang on to a stick and not let go until we get there."

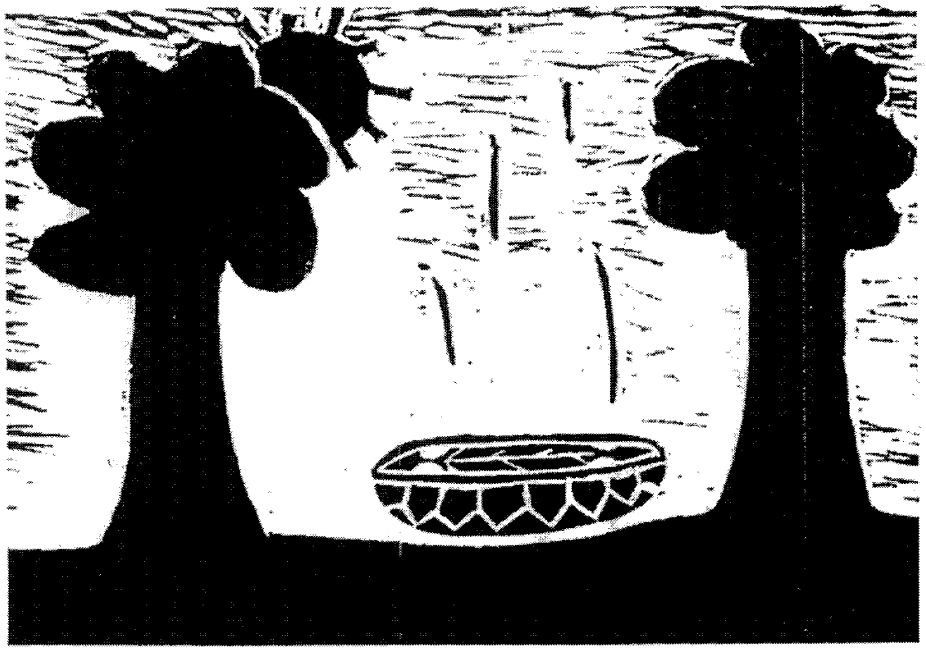
"That won't be a problem," Turtle said. "Once I bite something, I won't let go until I want to."

So the two birds grasped each end of a stick with their feet. Turtle bit tightly onto the middle of the stick and hung on.

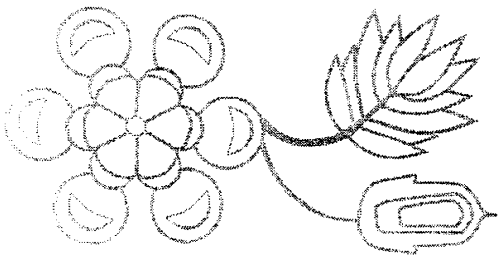
At first Turtle enjoyed his ride, but then he began to feel anxious. He wanted to know how far they had traveled, so he tried to get the birds attention by mumbling, but the birds pretended not to hear Turtle. Soon they were really high and Turtle was getting worried. He worried about whether the birds knew where they were going and when they would get there. He wiggled his legs to get the birds' attention, but they ignored him.

Unfortunately, Turtle's curiosity got the best of him, and he opened his mouth to ask, "Are we there yet?" But the birds didn't hear his question for he was falling quickly to the earth. As he fell, he tucked himself into his shell. When Turtle hit the ground, he got up unhurt and buried himself in the mud.

That is why Turtle goes underground during the cold winter months.



Priscilla Dessart



How the Turtle Flew South for the Winter Word Problems

Join: Result Unknown
To get the birds' attention, Turtle wiggled his tail ___ times. Then he wiggled it ___ more times.
How many times did Turtle wiggle his tail?
(4, 5) (12, 22) (36, 47)

Separate: Result Unknown
There were ___ bugs on a log.
Turtle ate ___ of them.
How many bugs didn't he eat?
(8, 5) (24, 12) (53, 27)

Part Part Whole: Whole Unknown
Turtle has ___ long sticks and ___ short sticks.
How many sticks does Turtle have altogether?
(3, 7) (14, 25) (39, 48)

Compare: Differences Unknown
Turtle has ___ berries.
The bird has ___ berries.
How many more berries does the bird have than Turtle?
(4, 9) (23, 35) (49, 67)

Multiplication
Turtle saw ___ flocks of birds.
There were ___ birds in each flock.
How many birds did Turtle see altogether?
(3, 4) (7, 5) (4, 12)

Measurement Division
Turtle gave ___ fish to some friends.
Each friend got ___ fish.
How many friends got fish?
(9, 3) (24, 6) (66, 11)

Partitive Division
Turtle gaveberries to ___ of his friends.
Each friend got the same number of berries.
Altogether, he gave away ___ berries. How many berries did each friend get?
(3, 6) (3, 18) (3, 33)

Join: Change Unknown
Turtle counted ___ autumn leaves floating on the water.
Some more leaves settled onto the water.
Then there were ___floating leaves.
How many new leaves fell onto the water?
(5, 9) (14, 26) (53, 72)

Separate: Change Unknown
There were ___ turtles on a log.
Some slipped into the water and swam away.
Then there were ___ turtles on the log.
How many turtles swam away?
(7, 3) (19, 14) (25, 16)

Part Part Whole: Part Unknown
Turtle saw ___ birds. ___ of them were blue and the rest were yellow.
How many yellow birds did Turtle see?
(8, 3) (17, 6) (32, 18)

Compare: Quantity Unknown
Maple and birch leaves were floating on the water. There were ___ maple leaves. There were ___ fewer birch leaves than maple. How many birch leaves were floating on the water?
(11, 6) (25, 13) (52, 28)

Two Step Problem
___ bullfrogs, ___ leopard frogs, ___ snapping turtles, ___ paint turtles, and ___ leather back turtles burrowed into the river mud to sleep during the long winter. How many more frogs than turtles burrowed into the river mud?
(4, 6, 3, 2, 3) (15, 16, 11, 8, 10) (26, 38, 24, 14, 22)

Right in Front of You

an original story by
Amanda Peters, HoChunk

One night a stranger walked into a village. The stranger needed a place to stay for the night, but the villagers did not invite him into their homes. Finally, at the edge of the village, he came to the house of an old man and an old woman. They welcomed the stranger because they didn't get many visitors. The man was also young and reminded them of their grandson who lived far away.

The young man said that he was only going to stay for a few days, but a few days turn into a few weeks and then into a few months. The stranger and the old couple became good friends. Many nights were spent telling stories. The young man listened respectfully to the stories of the old couple.

One day the old couple went berry picking and when they returned home, the young man was gone. The old couple asked the villagers if they had seen their friend. One villager said she saw him leave in the same direction from where he first came.

The old couple was very sad. They went into the room where the young man slept and searched for a clue to let them know where he had gone. While searching, they found a box, and inside the box was the most beautiful stone they had ever seen. They couldn't keep their eyes off it! There was also a note in the box. In the note, the young man explained that the stone would give them the power to get whatever possession they wanted. The old couple began to cry and hug each other because they had always been poor.

That very day they wished for a new house and got one. All they had to do was think of what they wanted and it appeared, but they noticed that there was a problem. Always after making a wish and having the object appear, the old man would get a terrible stomach ache. It didn't take long for the village people to notice all of the old couple's new stuff.

"Where did you get these things?" they asked. But the old couple did not answer truthfully, and every time they lied, the old man's stomach would start aching. After awhile he started to get headaches along with the stomach aches. So the couple decided to tell the truth. That's when everything went out of control.

When they told the villagers the truth, everyone forced the old couple to make their wishes come true.

Right in Front of You (continued)

Soon the old man became so ill that he had to stay in bed. Fearing for the health of her husband, the old lady hid the stone and told the villagers that it was lost. Of course, everyone thought she was lying.

"We cannot believe her. She lied before. She's lying now!" the villagers shouted. They rushed to the old couple's home, forced open their door, and demanded to be given the stone. But the old couple said nothing. So the villagers beat them. Since the old man was already very sick, he nearly died when they beat him.

When the people finally left, the old woman took the stone from its hiding spot. She knew that if they didn't get away from the selfish villagers her husband would die. She thought that if he was going to die he might as well die trying to get away. So, that evening, the old woman made a wish for a horse with a travois, and it appeared. Next the old woman carefully helped her husband to the travois. There she made a bed and covered him with a blanket. Then she got on the horse and guided it quietly down the road.

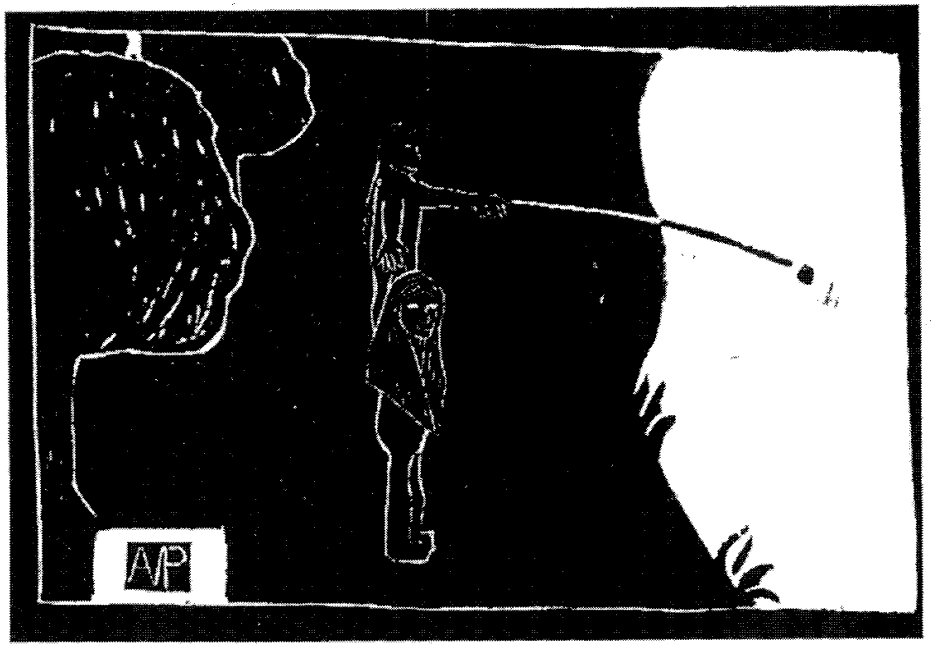
They traveled through the night, and just as the sun was setting, they came to a pond. The old woman stopped by the pond to give her husband a drink. She was very tired and wanted so badly to rest.

"I must get rid of this stone," she thought. Suddenly she had an idea. She helped her husband stand up, gave him the stone and said, "Throw it in."

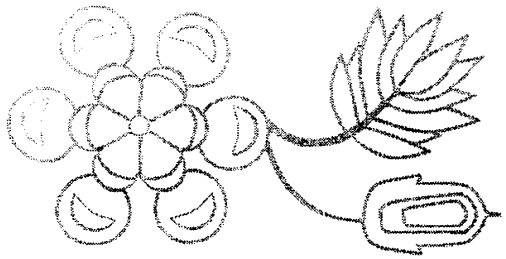
"Yes," the old man agreed, and he feebly tossed the stone into the still surface of the water. Ripples spread throughout the whole pond.

The force of the toss caused the old man to lose his balance, and he fell partly into the water. There he lay, too weak to move. As he lay in the cold pond, ripples from the tossed pebble slowly made their way to him, and with the touch of the first ripple, the old man started to regain his strength. Gradually, he became as strong as he had been before.

The old man could see that his wife was tired. So, he went into the woods and made a bed of grass and cedar boughs for her. When he was finished, he gently picked her up and carried her to the soft bed. After gently placing her on the bed, he sat next to her and thought about how much he loved his wife and how much she loved him. Though they had never had many possessions, they had always had the most important thing. They had each other.



Amanda Peters



Right in Front of You
Word Problems

Join: Result Unknown
The old lady made ___ pieces of fry bread for her husband.
Then she made ___ more pieces of fry bread.
How much fry bread did she make altogether?
(5, 4) (13, 24) (45, 46)

Separate: Result Unknown
The young man took ___ apples on his journey.
He ate ___ of them.
How many apples did he have left?
(9, 3) (18, 7) (35, 27)

Part Part Whole: Whole Unknown
The young man had ___ evil stones and ___ good stones.
How many stones did he have altogether?
(4, 6) (15, 14) (46, 46)

Compare: Difference Unknown
The old lady had ___ new things and the old man had ___ new things.
How many more new things did the old lady have than the old man?
(10, 6) (28, 12) (32, 23)

Multiplication
The old lady had ___ baskets. She put ___ apples in each basket. Altogether, how many apples did she put into the baskets?
(3, 4) (5, 10) (6, 12)

Measurement Division
The old lady granted ___ wishes for the people.
Each person got ___ wishes.
How many people got their wishes granted?
(6, 2) (15, 3) (24, 6)

Partitive Division
The old man had ___ arrows.
He put them in ___ bundles.
How many arrows did he put in each bundle?
(9, 3) (18, 3) (33, 11)

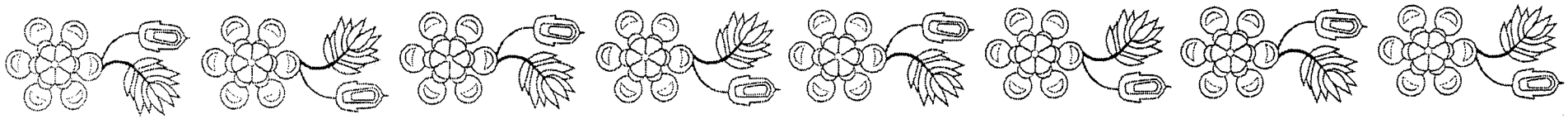
Join: Change Unknown
The old man had ___ arrows. The young man gave him some more arrows. Then the old man had ___ arrows.
How many arrows did the young man give to the old man?
(5, 11) (12, 26) (28, 53)

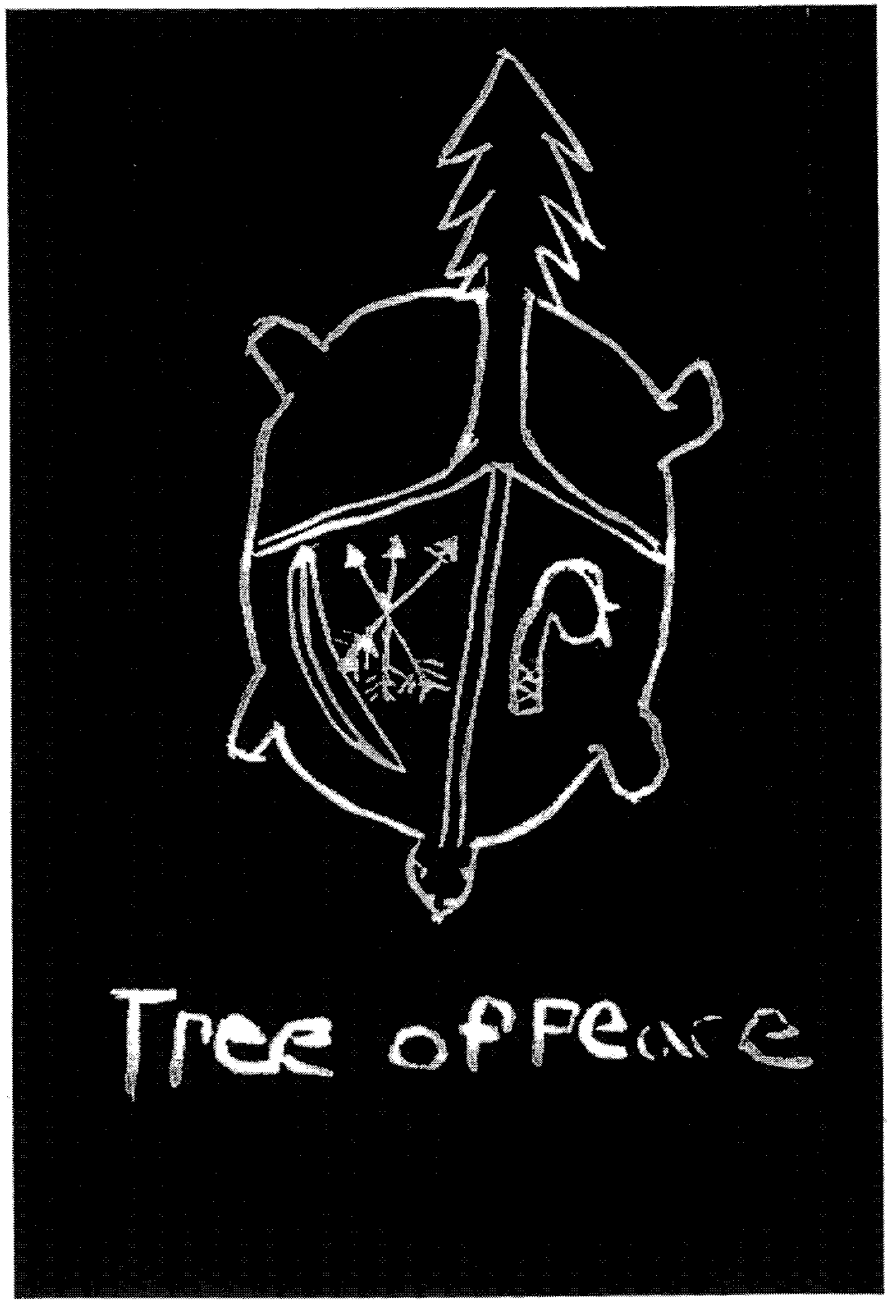
Separate: Change Unknown
The young man had ___ magic stones in his pouch. As he walked, some fell out through a small hole in the pouch. Then he only had ___ magic stones.
How many stones fell from his pouch?
(9, 3) (17, 9) (27, 18)

Part Part Whole: Part Unknown
The old lady made ___ wishes, ___ were for herself and the rest were for other people.
How many wishes did she make for other people?
(7, 3) (27, 8) (34, 16)

Two-Step Problem
The old lady sewed___porcupine quills and___beads onto the old man's new moccasins.
Then she sewed on ___more quills. How many more quills than beads did she sew onto the moccasins?
(4, 12, 10) (12, 26, 20) (35, 68, 35)

Encourage students to write and solve their own word problems and to share their problems with classmates.





Charles Doxtater

Tree of Peace

an Oneida story
retold by Charlie Doxtater

The story of the Tree of Peace is true and happened in the early 1800's. The Tree of Peace helped unite one of the most powerful leagues ever, The Iroquois League of Nations. The Iroquois League was made up of six tribes: the Cayuga, the Mohawk, the Oneida, the Onondaga, the Seneca, and the Tuscarora.

The tribes of the Iroquois League at one time were fighting with one another. There were fierce battles, but the people grew tired of the fighting. So they agreed to bury their weapons under a giant white pine tree. They believed that the weapons would be carried away by the under ground waters. So they sent the weapons off through the path of the roots. The weapons went in all four directions. After that, the tribes no longer fought. Instead, they formed the Iroquois League.

Today the Iroquois people have peace with one another and together the tribes form a powerful nation.

Tree of Peace
Word Problems

Join: Result Unknown
One little boy picked up ___ pine cones.
A little girl gave him ___ more pine cones. How many pine cones does the little boy have?
(3, 4) (12, 17) (14, 27)

Separate: Result Unknown
There were ___ pine cones on a white pine.
___ of the pine cones fell to the ground.
How many pine cones didn't fall?
(7, 3) (18, 6) (33, 14)

Part Part Whole: Whole Unknown
There were ___ pine trees and ___ cedar trees.
How many trees were there altogether?
(6, 3) (11, 8) (25, 37)

Compare: Difference Unknown
There were ___ sparrows and ____ blackbirds on sitting in the same tree.
How many more sparrows were there than blackbirds?
(8, 3) (14, 6) (22, 18)

Multiplication
___ children each gathered ___ pine cones from the ground. How many pine cones did the children gather?
(2, 3) (6, 4) (5, 12)

Measurement Division
A little boy gave ___ pinecones to each of his friends. Altogether, he gave away ___ pine cones.
How many friends does the little boy have?
(2, 8) (3, 12) (5, 25)

Partitive Division
There were ___ birds sitting in ___ trees.
Each tree had the same number of birds.
How many birds were in each tree?
(8, 2) (18, 3) (48, 12)

Join: Change Unknown
A little girl had ___ pine cones. A firend gave her some more pine cones. Then she had ___ pine cones. How many pine cones did her friend give her?
(8, 12) (23, 45) (125, 210)

Separate: Change Unknown
There were ___ blackbirds in a tree.
Some flew away. Then there were ___ in the tree.
How many blackbirds flew away?
(17, 9) (26, 14) (37, 28)

Part Part Whole: Part Unknown
There were ___ birds in a tree. ___ were sparrows.
The rest were blackbirds.
How many blackbirds were there?
(13, 6) (22, 10) (37, 18)

Rabbit Dance

an Oneida legend
retold by Desiree Barber

Long ago, two hunters went hunting deer for their village. They hunted for a very long time without seeing any signs of deer, but they didn't return to the village for they knew they had to provide food for the winter.

Suddenly, they heard a very loud thump! They stopped and listened to see if there would be another thump, and sure enough, they heard it again! This time the thump was louder, "THUMP!"

One hunter said to the other, "What is that?"

The other hunter said, "I don't know, but IT sounds very close!"

So, both hunters got on their bellies and crawled to a nearby clearing surrounded by bushes. In the center of the clearing they saw the biggest rabbit they had ever seen!

The first hunter started to aim his bow and arrow at the huge rabbit, but the second hunter stopped him and said, "Let's wait to see what he is going to do."

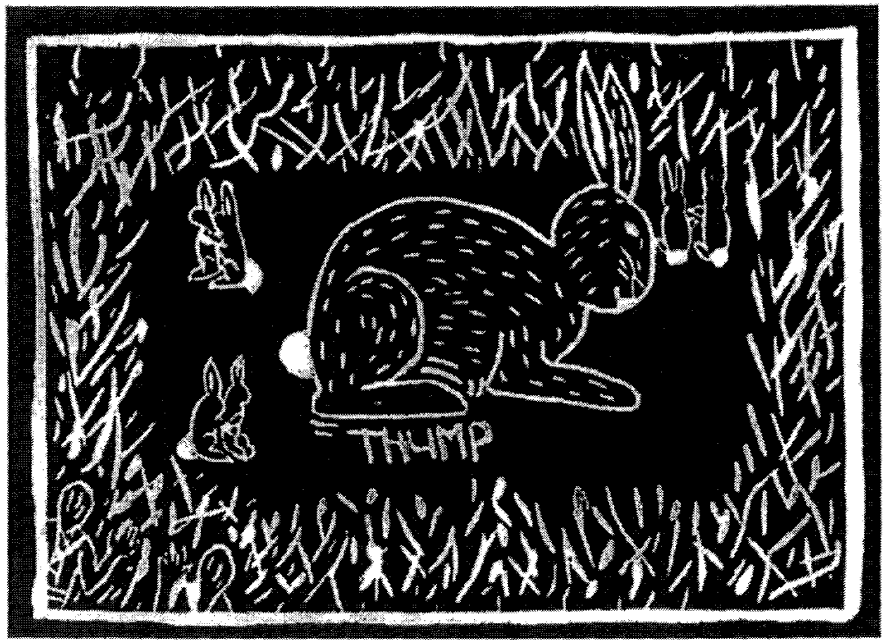
Both hunters waited and watched the huge rabbit as he lifted one of his big back legs and thumped it three times on the ground. Then, out from every direction hopped regular sized rabbits. The hunters watched very closely not wanting to miss anything.

The little rabbits gathered around the big rabbit, and the big rabbit began to thump his back leg in a pattern as the little rabbits danced. The hunters watched in awe as the rabbits danced. Then the big rabbit thumped his leg in the directions in which the hunters lay. The huge rabbit looked in that direction and leaped into the sky. Then all the rabbits quickly hopped away.

The hunters watched still in awe. They realized they had to go back to the village and tell the people what they had seen and heard. They ran all the way to the village and asked if they could speak to the elders. After they told their story, one of the elders said, "Show us how the beat and the dance went." The hunters showed them exactly what the rabbits did.

Another elder said, "The rabbits gave this dance to tell us to show them respect and appreciation for what they give to us. We will name the dance after them, and we will dance it at our socials to show them our gratitude."

So this is the way it was then and and is now. That is how the *rabbit dance* came to be.



Desiree Barber

Rabbit Dance
Word Problems

Join: Result Unknown
Big rabbit thumped his leg ___ times.
Then he thumped it ___ more times.
How many times did big rabbit thump his leg?
(5, 6) (12, 16) (24, 18)

Separate: Result Unknown
The hunters saw ___ rabbits in the clearing.
___ of the rabbits hopped away.
How many rabbits stayed in the clearing?
(5, 3) (23,13) (25, 16)

Part Part Whole: Whole Unknown
There were ___ big rabbits and ___ little rabbits.
How many rabbits were in the clearing altogether?
(4, 3) (9, 13) (24, 47)

Compare: Difference Unknown
There were ___ rabbits and ___ hunters.
How many more rabbits were there than hunters?
(6, 4) (13, 7) (23, 9)

Multiplication
There were ___ groups of rabbits.
Each group had ___ rabbits.
How many rabbits were there?
(2, 3) (10, 7) (11, 9)

Measurement Division
Each rabbit thumped ___ times.
Altogether there were ___ thumping sounds.
How many rabbits thumped?
(2, 6) (4, 12) (5, 35)

Partitive Division
There were ___ hunters and ___ arrows.
Each hunter had the same number of arrows.
How many arrows did each hunter have?
(3, 6) (4, 16) (7, 77)

Join: Change Unknown
Big rabbit was thumping his leg.
He thumped it ___ times.
How many more times would he have to thump his leg to have thumped it ___ times?
(5, 8) (9, 14) (23, 31)

Separate: Change Unknown
___ rabbits were in the clearing.
Some hopped away.
There were ___ rabbits left.
How many rabbits hopped away?
(9, 5) (19, 7) (26, 18)

Part Part Whole: Part Unknown
The hunters saw ___ rabbits. ___ of the rabbits were brown and the rest were white.
How many white rabbits did the hunters see?
(8, 3) (28, 7) (44, 35)

Compare: Quantity Unknown
There were ___rabbits. There were ___fewer field mice than rabbits. How many field mice were there?
(9, 3) (18, 6) (33, 19)

Two-Step Problem
___ hunters each had ___ arrows.
While hunting, ___ arrows were lost.
How many arrows did the hunters have when they returned home?
(3, 4, 4) (5, 11, 13) (12, 12, 14)

How Beaver and the Dog Helped Each Other

an original story by
Angelia Naquayouma, HoChunk

One day as a beaver was gnawing down trees in the forest he heard a strange rustling sound. At first he was scared, but he was also curious. So, the beaver hid behind a tree to see what animal was making the noise. As he watched, he saw a dog with a strange object wrapped around its head. It was a leather thing that went around the dog's mouth and fastened behind its ears. It was also attached to a strap that went around the dog's neck and then dragged on the earth. The dog was struggling to pull the thing from his head. The beaver was afraid, but he cautiously went up to the dog.

"Please help me get this thing off," the dog pleaded in a muffled voice.

"Of course I will help you," the beaver quickly replied.

He took two chomps with this strong teeth, and the strange strap was off! The dog was very grateful!

"You helped me. How can I help you?" the dog asked.

"Well, will you help me drag this log to my pond? " the beaver replied.

"Of course," the dog answered. He grabbed a limb with his teeth and started to tug, but the log did not budge.

"I guess I'm just going to have to gnaw it into smaller lengths," Beaver said. "It's just too big."

"Wait! I have an idea," the dog said. He took the end of the strap and fastened it to a strong tree branch. He gave Beaver the other end."Pull!" he shouted. The dog also pulled on the strap, and the log slid easily along the ground.

Soon they found themselves on a little hill above the pond. Carefully, they dragged the log to the edge of the hill and then quickly released the stap as the log started to roll. It rolled right to the edge of the water!

"Wow, that worked great!" the beaver said. "Thanks for helping."

"And, again, thank you for helping me," the dog replied.

So the dog and Beaver thanked each other and went their separate ways.

Angie Naquayouma

How Beaver and the Dog Helped Each Other Word Problems

Join: Result Unknown
The beaver gnawed ___ twigs from the log.
Then he gnawed ___ more twigs.
How many twigs did he gnaw from the log?
(5, 4) (12, 21) (26, 17)

Separate: Result Unknown
There were ___ logs on the hill. The beaver rolled ___ logs down to the pond.
How many logs are still on the hill?
(7, 3) (27, 16) (32, 14)

Part Part Whole: Whole Unknown
There are ___ birch trees and ___ poplar trees.
How many trees are there altogether?
(2, 6) (8, 9) (36, 27)

Compare: Difference Unknown
There are ___ poplar trees and ___ birch trees.
How many more poplar trees are there than birch trees?
(8, 5) (17, 9) (43, 26)

Multiplication
The beaver gnawed ___ twigs from each log.
There were ___ logs.
How many twigs did the beaver gnaw?
(2, 3) (4, 6) (6, 12)

Measurement Division
The beaver had ___ apples.
He gave ___ apples to each of his friends.
How many friends got apples?
(6, 2) (18, 6) (44, 11)

Partitive Division
The beaver had ___ apples.
He gave them to ___ of his friends.He gave each friend the same number of apples.
How many apples did each friend get?
(8, 2) (24, 6) (56, 4)

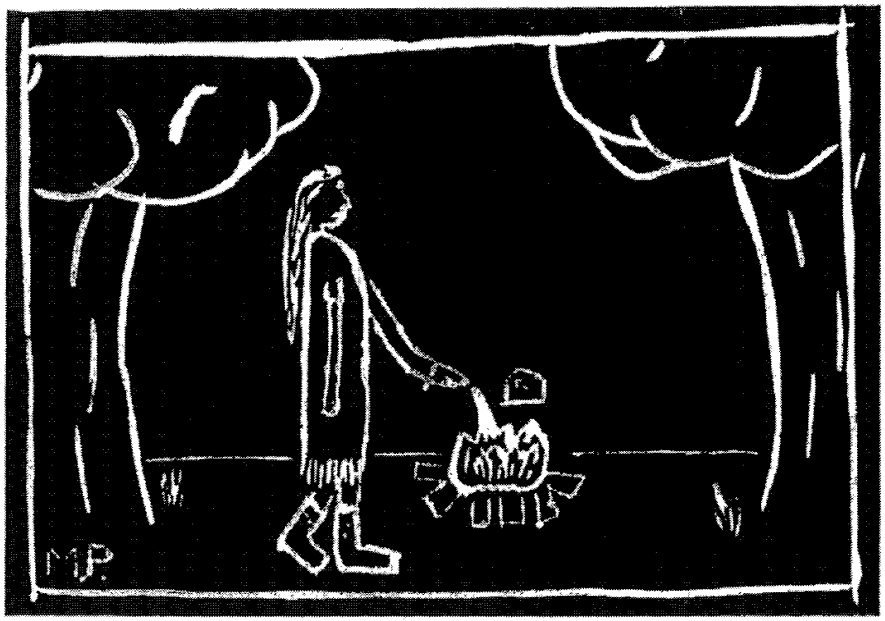
Join: Change Unknown
In the morning the beaver rolled ___ logs down the hill to the pond. By late aftenoon, he had rolled ___ logs to the pond. How many logs did he roll down the hill in the afternoon?
(3, 7) (9, 23) (76, 84)

Separate: Change Unknown
The beaver had ___ fish. He gave some to the dog. Then he had ___ fish left. How many fish did he give to the dog?
(8, 3) (13, 24) (35, 27)

Part Part Whole: Part Unknown
There were ___ trees. ___ of them were maple trees. The rest were birch trees.
How many birch trees were there?
(8, 5) (26, 24) (48, 29)

Join: Start Unknown
The beaver had some fish. A friend gave him ___ more fish. Then he had ___ fish. How many fish did the beaver have before his friend gave him any?
(8, 12) (12, 23) (36, 52)

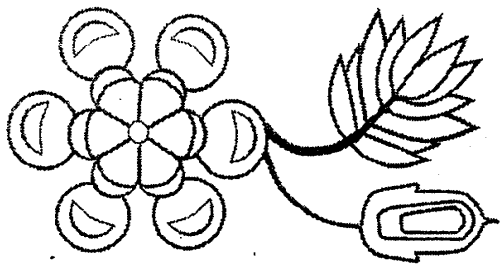
Two Step Problem
Beaver gnawed down ___ trees.
Each tree had ___ branches.
Beaver used ___ branches to plug a hole in his dam. How many branches didn't he use?
(4, 4, 12) (6, 6, 14) (7, 11, 38)

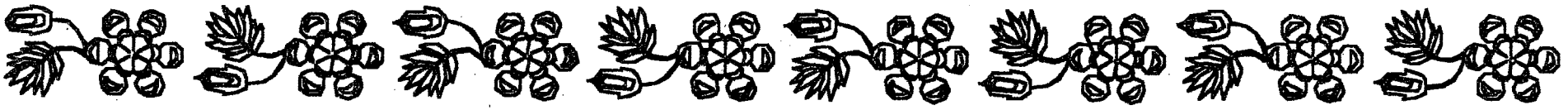


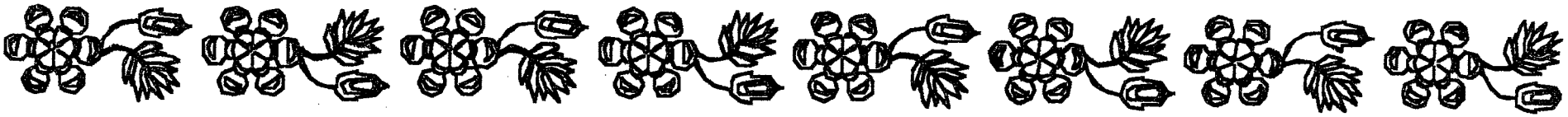
Maggie Putnam, Stockbridge Munsee

Story Starter

Write a story telling about this picture. Give your story a title. Also write five math word problems to go along with your story.







Using Native American Number Words to Develop Base Ten Understanding

Language Consultants

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USING NATIVE AMERICAN NUMBER WORDS TO DEVELOP BASE TEN UNDERSTANDING

Number words in many Native American languages are base ten specific.
Refer to the following examples:

Number 15

Ojibwe	Oneida	Menominee
midaaswi ashi nanan	wisk yaw^. le	metatah nianan eneh
(10 + 5)	(5 + 10)	(10 + 5)

When presenting the word problems that accompany the legends in this volume the teacher may replace English number words with Menominee, Ojibwe,or Oneida number words presented in this section. This substitution will provide language practice and also promote the development of base ten understanding.

Word Problem Example

Grandmother picked midaaswi strawberries.
Then she picked naanan more strawberries
How many strawberries did Grandmother pick?

Answer

Grandmother picked midaaswi ashi naanan strawberries.

Number Sentence

Encourage children to also write a number sentence for this problem:

10 + 5 = 15

ONEIDA LANGUAGE
RULES FOR PRONUNCIATION

Vowels

Oneida has 6 vowel sounds. Unlike English, each letter stands for one and only one sound.

Vowel	as in
a	like the a in father
e	like the e in egg
i	like the i in ski
o	like the o in hope

The following two vowels are nasalized. That means they are pronounced more through the nose than the usual English sounds.

u	like the u in tune
^	like the u in up

Consonants

Most of the consonants have the same sounds as they usually do in English. This is true for:

h, l, n, w, and y

The letters 't', 'k', and 's' each have two pronunciations depending on the other sounds near them.

- t - as in 'water' (normally sounds more like a 'd')
  or as in 'top' (if a 'k', 'h', or 's' follows)
- k - as in 'skill' (normally a g-like sound)
  or as in 'kill' (if a 't', 's', or 'h' follows)
- s - as in 'was' (a z-like sound when it comes between two vowels)
  or as in 'sea' (before or after an 'h')

Other Symbols Used in Oneida

- ? - glottal stop (quickly stopping)
- / - above a vowel to show a stressed syllable
- . - used after a vowel to show that the vowel is dragged out

ONEIDA NUMBER WORDS

Numbers 1 - 10

1 - úskah
2 - téken
3 - áhs^
4 - kayé
5 - wisk
6 - yá. yahk
7 - tsya . ták
8 - téklu?
9 - wá tlu?
10 - oye . li

Numbers 11 - 19

Within these numbers, the li ending of the word oye .
li (10) changes to le . The word 'yaw .' is used as plus (+).

11 - úska yaw^ . le (1 + 10)
12 - tékni yaw^ . le (2 + 10)
13 - áhs^ yaw^ . le (3 + 10)
14 - kayé yaw^ . le (4 + 10)
15 - wisk yaw^ . le (5 + 10)
16 - yá . yahk yaw^ . le (6 + 10)
17 - tsya . ták yaw^ . le (7 + 10)
18 - téklu? yaw^ . le (8 + 10)
19 - wá . tlu? yaw^ . le (9 + 10)

Numbers 20 - 99

'Wash^' (^ pronounced uh) is used to represent 10 in all number words between 20 - 99.
The word 'ni' is used to indicate multiplications of tens.

20 - te wásh^
30 - áhs^ niwásh^
40 - kaye niwásh^
50 - wisk niwásh^
60 - yá . yahk niwásh^
70 - tsya . ták niwásh^
80 - téklu? niwash^
90 - wá . tlu? niwash^
45 - kayé niwash^ wisk
52 - wisk niwash^ téken

OJIBWE LANGUAGE
RULES FOR PRONUNCIATION

Ojibwe Alphabet

a, aa, b, ch, d, e, g, h, i, ii, j, k , m, n, o, oo, p, s, sh, t, w, y, z, zh and the glottal stop.

Vowels

The English vowels are a, e, i, o and u.
The Ojibwe vowels are a, aa, e, i, ii, o, oo.
Four are long: aa, e, ii and oo
Three are short: a, i, and o.
The long and short refer to the amount of time you hold the sound when you say it.
aa=ah, e=ay, ii=ee, a=uh, i=ih, o=shorter oh, oo and oo=longer oh, oo.

Nasal Vowels

These vowels are said through the nose, but you don't have to hold your nose to make this sound.
Vowels can be nasalized and this shown by underlining them or with hooks underneath.
fish (giigoo) or (giigoo).
Some write the nasalization with a -nh in the singular and a -ny in the plural.
(giigoonh, giigoonyag)

Consonants

The letters that aren't vowels are the consonants.
b, ch, d, g, h, j, k, m, n, p, s, sh, t, w, y, z, zh, and ' (the glottal stop)

The Glottal Stop

This sound cuts off your flow, like in the middle of the English expression (oh oh).
It is written with an apostrophe.
ma'iingan (wolf)

OJIBWE NUMBER WORDS

1 - bezhig
2 - niizh
3 - niswi
4 - niiwin
5 - naanan
6 - (n)ingodwaaswi
7 - niizhwaaswi
9 - zhaangaswi
10 - midaaswi
11 - ashi bezhig
20 - niizhtana
21 - niizhtana ashi bezhig
30 - nisimidana
40 - niimidana
50 - naanimidana
60 - (n)ingodwaasimidana
70 - niizhwaasimidana
80 - (n)ishwaasimidana
90 - zhaangasimidana
100 - (n)ingodwaak
101 - (n)ingodwaak bezhig
110 - (n)ingodwaak midaaswi
111 - (n)ingodwaak ashi bezhig
200 - niizhwaak
300 - niswaak
400 - niiwaak
500 - naanwaak
600 - (n)ingodwaaswaak
700 - niizhwaaswaak
800 - (n)ishwaaswaak
900 - zhaangaswaak
1000 - midaaswaak or (n)ingodosagoons

MENOMINEE LANGUAGE

Rules for Pronunciation

Menominee Alphabet

The Menominee language has only 16 letters, they are: **a c e h i k m n o p q s t u w y.**

Vowels

Vowels are long or short, long vowels being held longer and accented.

Long vowel	as in	short vowel	as in
a	like the a in father	a	like the u in but
o	like the o in wrote	o	like the u in put
e	like the ai in wait	e	like the i in bit
i	like the ee in see	i	like the I in bit (but shorter)
ae	like the a in cat	ae	like the a in cat (but shorter)
u	like the oo in soon	u	like the 00 in soon (but shorter)

Consonants

The consonants are basically the same as English with the exception of the "q" called a glottal stop (the catch in your throat).

consonant	as in
c	like the ch in *ch*urch or the "ts" in ca*ts*
q	A slight catch in your throat like you were bumped while talking
p	like the p in pit
t	likr the t in table
k	like the k in kite
m	like the m in my
n	like the n on not
w	like the w in we
y	like the y in you
h	like the h in he
s	like the sh in she

MENOMINEE NUMBER WORDS

Number 1 - 10

1 - nekot
2 - nīs
3 - naeqniw
4 - nīw
5 - nianan
6 - nekūtuasetah
7 - nōhekan
8 - suasek
9 - sākāēw
10 - metātah

Numbers 11 - 19

11 - metātah nekot enēh (10 + 1)
12 - metātah nīs enēh (10 + 2)
13 - metātah naqniw enēh (10+ 3)
14 - metātah nīw enēh (10 + 4)
15 - metātah nianan enēh (10 + 5)
16 - metātah nekūtuasetah eneh (10 + 6)
17 - metātah nōhekan enēh (10 + 7)
18 - metātah suasek enēh (10 + 8)
19 - metātah sākāēw enēh (10 + 9)

Numbers 20 - 31

20 - nīs enoh metātah
21 - nīs enoh metātah nekot enēh (2 x 10) + 1
22 - nīs enoh metātah nis enēh (2 x 10) + 2
23 - nīs enoh metātah naeqniw enēh (2 x 10) + 3
24 - nīs enoh metātah nīw enēh (2 x 10) + 4
25 - nīs enoh metātah nianan enēh (2 x 10) + 5
26 - nīs enoh metātah nekūtuasetah eneh (2 x 10) + 6
27 - nīs enoh metātah nōhekan enēh (2 x 10) + 7
28 - nīs enoh metātah suasek enēh (2 x 10) + 8
29 - nīs enoh metātah sākāēw enēh (2 x 10) + 9
30 - naeqniw metātah
31 - naeqniw metātah nekot enēh (3 x 10) + 1

TEACHER'S GUIDE

Cognitively Guided Instruction

Cognitively Guided Instruction is an inquiry-based approach to teaching mathematics that was developed at the Wisconsin Center for Education Research (Carpenter et al, 1999). This extensively researched approach provides teachers with knowledge about the developmental stages of children's mathematical reasoning. This knowledge enables teachers to plan mathematics instruction based on their students' understanding and guide them toward greater mathematical reasoning and concept mastery.

Developing Mathematical Reasoning Using Word Problems

The word problems at the end of each legend in the preceding section are based on detailed analyses of various problem situations involving number. These problems are organized within a framework that makes it possible to distinguish among problems in terms of reasoning difficulty. An important aspect of applying this knowledge when teaching is sequencing word problems from easiest to most difficult. Such sequencing allows children to develop mathematical reasoning. The following chart provides examples of 14 different types of word problems. The problems are coded for reasoning difficulty: easiest ♣, slightly more difficult ♣♦, more difficult ♦, and most difficult ♥.

PROBLEM-SOLVING SITUATIONS

JOINING PROBLEMS		
Join: Result Unknown (JRU)	**Join: Change Unknown (JCU)**	**Join: Start Unknown (JSU)**
♣ Grandmother had 5 strawberries. Grandfather gave her 8 more strawberries. How many strawberries does Grandmother have now? 5 + 8 = □	♦ Grandmother had 5 strawberries. Grandfather gave her some more. Then Grandmother had 13 strawberries. How many strawberries did Grandfather give Grandmother? 5 + □ = 13	♥ Grandmother had some strawberries, Grandfather gave her 8 more. Then she had 13 strawberries. How many strawberries did Grandmother have before Grandfather gave her any? □ + 8 = 13
SEPARATING PROBLEMS		
Separate: Result Unknown (SRU)	**Separate: Change Unknown (SCU)**	**Separate: Start Unknown (SSU)**
♣ Grandfather had 13 strawberries. He gave 5 strawberries to Grandmother. How many strawberries does Grandfather have left? 13 - 5 = □	♦ Grandfather had 13 strawberries. He gave some to Grandmother. Now he has 5 strawberries left. How many strawberries did Grandfather give Grandmother? 13 - □ = 5	♥ Grandfather had some strawberries. He gave 5 to Grandmother. Now he has 8 strawberries left. How many strawberries did Grandfather have before he gave any to Grandmother □ - 5 = 8
PART -PART -WHOLE PROBLEMS		
Part-Part-Whole: Whole Unknown (PPW:WU)	**Part-Part-Whole: Part Unknow (PPW:PU)**	
♣ Grandmother has 5 big strawberries and 8 small strawberries. How many strawberries does Grandmother have altogether? 5 + 8 = □	♦ Grandmother has 13 strawberries. Five are big and the rest are small. How many small strawberries does Grandmother have? 13 - 5 = □ or 5 + □ = 13	
COMPARE PROBLEMS		
Comp. Difference Unknown	**Comp. Quantity Unknown**	**Comp. Referent Unknown**
♣ ♦ Grandfather has 8 strawberries. Grandmother has 5 strawberries. How many more berries does Grandfather have than Grandmother? 8 - 5 = □ or 5 + □ = 8	♥ Grandmother has 5 strawberries. Grandfather has 3 more strawberries than Grandmother. How many strawberries does Grandfather have? 5 + 3 = □	♥ Grandfather has 8 strawberries. He has 3 more strawberries than Grandmother. How many strawberries does Grandmother have? 8- 3 = □ or □ + 3 = 8
MULTIPLICATION & DIVISION PROBLEMS		
Multiplication	**Measurement Division**	**Partitive Division**
♣ Grandmother has 4 piles of strawberries. There are 3 strawberries in each pile. How many strawberries does Grandmother have? 4 x 3 = □	♣ Grandmother had 12 strawberries. She gave them to some children. She gave each child 3 strawberries. How many children were given strawberries? 12 ÷3 = □	♣ ♦ Grandfather has 12 strawberries. He wants to give them to 3 children. If he gives the same number of strawberries to each child, how many strawberries will each child get? 12 ÷ 3 = □

Problem chart based on Cognitively Guided Instruction Problem Types (Carpenter et al., 1996)

UNDERSTANDING THE STRUCTURE OF WORD PROBLEM
What makes a problem easy or difficult?

A goal of Cognitively Guided Instruction is that young children become independent problem solvers who are able to approach and solve word problems without having to rely on having a teacher tell them how to do it. However, a number of factors influence whether a problem is appropriate for a child to solve independently. Understanding these factors helps the teacher decide which word problems to use during instruction. These factors include the following:

If the Problem Involves a Situation That the Child Can Act Out

A problem that can be acted out is easier for a child to solve than one that cannot be acted out. For example, the first of the following two problems is easier. Here the child can actually pretend that s/he is giving strawberries away. The second problem is more difficult because it requires more thought to make sense of the question being asked.

SRU (Action Direct):
Grandfather had 8 strawberries. He gave 3 of them to Grandmother.
How many strawberries does Grandfather have now?

SRU (Action Indirect):
Grandfather gave 3 strawberries to Grandmother. He had 8 strawberries.
How many strawberries does Grandfather have now?

If the Child is Able to Model the Problem with Counters or Drawing

When the quantities given in a problem refer to a complete set of physical objects or amounts, the problem can be modeled directly. When a word problem can be directly modeled, that is, represented in some concrete way on fingers, with tally marks, drawings, or by manipulating counters, the problem is easier. The first of the following two problems is easier because the wording guides the child's modeling. When modeling this problem with counters, a young child might choose to set out the two quantities, lining them up side by side, and then match them to determine the difference. Solving the second problem relies on the child's ability to mentally determine the relationship between quantities within the problem.

CDU direct modeling situation:
Grandfather has 8 strawberries. Grandmother has 5 strawberries.
How many more strawberries does Grandfather have?

CRU situation that requires ability to analyze:
Grandmother has 5 strawberries. She has 3 fewer strawberries
than Grandfather. How many strawberries does Grandfather have?

Multiplication and division problems can be modeled. Therefore, young children can multiply and divide intuitively

Very young children can solve low number multiplication and division problems because such problems can be easily modeled. However, it is important that children first solve many problems involving joining and separating situations. These experiences will allow them to develop the ability to think about numerical quantities within the context of words and to make sense of the question being asked.

Multiplication problem:

Grandmother has 4 piles of strawberries. There are 3 strawberries in each pile. How many strawberries does Grandmother have?

Measurement Division problem:

Grandmother gave 12 strawberries to some children. She gave each child 3 strawberries. How many children got strawberries?

Partitive Division problem:

If Grandfather shares12 strawberries with 3 friends, how many strawberries will each friend get?

If a problem can be modeled or acted out in the order in which it is heard, it is easier.

When first learning to solve word problems, young children approach them in the order in which they hear them. They do not begin at the end of the problem and work backward. The ability to use inverse thinking develops after children have had many experiences with solving problems and have developed an understanding of the relationships among the numbers within a problem - they understand that combined parts make up the total. For this reason, the first of the following two problems is easier. The wording encourages the child to set out five counters and then add eight more. However, the second problem does not provide a beginning number. The child who has not yet developed the ability to relate a part of a quantity to the total quantity will respond to the second question with, "Some. Grandmother had some strawberries."

Joining problem that can be solved in the word order given:

Grandmother had 5 strawberries. Grandfather gave her 8 more. How many strawberries does Grandmother have now?

Joining problem that cannot be solved in the order given:

Grandmother had some strawberries. Grandfather gave her 8 more. Then she had 13 strawberries. How many strawberries did Grandmother have before Grandfather gave her any?

The Location of the Unknown Influences the Problem Difficulty

Because young children solve problems in the order that they hear them, problems that are worded in such a way so that the unknown quantity is located at the end (first example below) are easier to solve. Problems with the missing quantity in the middle (second example below) or at the beginning (third example below) are more difficult.

As the child's understanding of quantity and relationships among quantities develops, s/he becomes able to make sense of the entire question, represent the situation, and plan a solution. When a child is able to do these steps s/he will not need to use manipulatives. Rather, the child will use his or her own unique way of mentally manipulating quantities.

SRU location of unknown at end of problem: (8 - 3 = __)
Grandmother had 8 strawberries. She gave 3 to Grandfather. How many strawberries does Grandmother have now?

SCU location of unknown in middle of problem: (8 - __ = 5)
Grandfather had 8 strawberries. He gave some to Grandmother. Now he has 5 strawberries. How many strawberries did Grandfather give to Grandmother?

SSU location of unknown at start of problem: (__ - 3 = 5)
Grandfather had some strawberries. He gave 3 strawberries to Grandmother. Then he had 5 strawberries left. How many strawberries did Grandfather have before sharing with Grandmother?

Children's Intuitive Solution Strategies

Extensive research has documented the developmental thinking processes that children go through when learning to solve word problems (Carpenter et al., 1992). It is important to emphasize that these processes are **intuitive**, ones that are not taught to the student by a teacher.

To effectively promote the development of mathematical reasoning without usurping the student's intuitive thinking, a teacher must clearly understand the relationships among the different types of word problems (discussed in the previous sections) and the developmental stages of children's thinking. Detailed descriptions of how children's solutions vary depending on their developmental ability are provided in the following sections.

Relating Solution Strategies to the Developmental Stages of Mathematical Reasoning

The following word problems are used to demonstrate how children at different developmental levels will use different strategies when solving the same problems. The strategy that the child uses indicates the child's stage or level of development.

Join: Result Unknown (JRU)

Grandfather had 6 strawberries. Grandmother gave him 5 more. How many strawberries does Grandfather have now?

Separating: Result Unknown (SRU)

Grandmother had 11 strawberries. She gave 5 to Grandfather. How many strawberries does Grandmother have now?

Developmental Level I
Direct Modeling

A child using a **Direct Modeling** strategy represents each number in the problem with concrete objects. In the following examples, the child solves the Join Result Unknown (JRU) and the Separate Result Unknown (SRU) problem given above by modeling with counters.

Child's Solution to JRU

"Grandfather had 6 strawberries. strawberries.
One, two, three, four, five, six."
(The child sets our 6 counters.)
"Grandmother gave him five More. One, two, four, five."
(Child sets out 5 counters and then pushes both sets together and counts all of the counters.)
"Now he has 11 strawberries."

Child's Solution to SRU

"Grandmother had 11

One, two, three, four, five, six, seven eight, nine, ten, eleven."
(*Child sets out 11 counters.)*
"She gave 5 to Grandfather. One, two, Three, four, five." *(Child counts out and removes 5 counters from the group of 11 and counts the remaining counters.)* "Now she has. . . one, two, three, four, five, six. She has six."

Developmental Level II
Counting On/Back

A child using a **Counting On/Back** strategy is able to hold a number in her/his mind and count on or back from that number while keeping track of the quantity that is added or subtracted using fingers, tally marks, or counters.

A child at this level is able to immediately recognize groups such as the amount modeled on his/her fingers without having to recount the fingers. In the following examples the child solves the Join Result Unknown (JRU) and Separate Result Unknown (SRU) problems (problems given above)) using counting strategies.

Child's Solution to JRU

"I don't have to count the six again.
I just have to add five to it.
I say, 'Seven, eight,
nine, ten, eleven'." *(Child holds up a finger with each count.)*
"I have eleven."

Child's Solution to SRU

"I know Grandmother
had eleven strawberries.
I know she gave five away.
So, I count five down.
'Eleven, ten, nine, eight,
seven.' I have six left."
(*Child folds a finger down with each count.)*

Developmental Level III
Deriving

A child possessing good number sense is able to solve problems in flexible ways, often breaking numbers down and recombining them by using known facts. This child frequently visualizes the quantities and solves the problem with mental math.

Child's Solution to JRU (Above)

"I know that five and five is ten.
I took one from the six to make five.
But I must add the one back on.
It's eleven."

Child's Solution to SRU (Above)

"I know that ten take away five is five,
but I started with eleven. The answer must
be one more. It's six."

Matching Solution Strategies to Problem Types

The problem solving decisions that a child makes when solving a problem are determined by the problem situation posed to the child. Each of the 14 different problem types requires different reasoning processes. Examples of these processes at each developmental level are provided in this section.

Level I
Direct Modeling Strategies

At the **Direct Modeling** level, the child concretely represents (using counters, fingers, tally marks, drawings) all numerical quantities within the problem. Below are examples of problems with direct modeling solutions.

JRU Problem

Grandfather had 3 strawberries. Grandmother gave him 5 more. How many strawberries does Grandfather have now?

Solution: Joins-All

The child constructs (with manipulatives or drawing) a set of three objects and a set of five objects. The child pushes the sets together and the union of the two combined sets is counted.

JCU Problem

Grandmother has 5 strawberries. Grandfather gave her some more strawberries. Now Grandmother has 8 strawberries.
How many strawberries did Grandfather give her?

Solution: Joins-To

The child constructs (with manipulatives or drawing) a set of three objects. Objects are added to this set until there is a total of eight objects. The child counts the number of objects that were added to find the answer.

SRU Problem

Grandfather had 8 strawberries. He gave 3 to Grandmother.
How many strawberries does Grandfather have now?

Solution: Separates-From

The child constructs (with manipilatives or drawings) a set of a set of eight objects. Three objects are removed. The answer is the number of remaining objects.

SCU Problem

Grandmother had 8 strawberries. She gave some to Grandfather.
Now Grandmother has 3 strawberries.
How many strawberries did she give to Grandfather?

Solution: Joins-To
A set of eight objects is counted out. Objects are removed from the set until the number of objects remaining is equal to three. The answer is the number of objects removed.

CDU Problem
Grandfather has 3 strawberries. Grandmother has 5 strawberries.
How many more strawberries does Grandmother have than Grandfather?

Solution: Matches
A set of three objects and a set of eight objects are matched one to one until one set is used up. The answer is the number of unmatched objects remaining in the larger set.

JSU Problem
Grandmother had some strawberries. Grandfather gave him 3 more.
Now he has 8 strawberries.
How many strawberries did Grandmother have to start with?

Solution: Trial-and-Error
A set of objects is constructed. A set of three objects is added to or removed, and the resulting set is counted. If the final count is eight, then the number of objects in the initial set is the answer. If it is not right, then a different initial set is tried.

Level II
Counting On/Back Strategies

At the **Counting On/Back** level, the child does not have to represent all quantities in the problem concretely. S/he has learned that a number names a quantity, that is, that a number can be stated rather than represented concretely. These strategies will develop intuitively over time. If a child is not able to make sense of counting strategies, the child is not developmentally ready to use them and needs more experience modeling solutions.

JRU Problem
Grandfather had 3 strawberries. Grandmother gave him 5 more strawberries.
How many strawberries does Grandfather have now?

Solution: Counts-On-From-First Number Heard
The child begins with 3 (the first number in the problem and continues on for 5 more counts (keeping track of counts with manipulatives, tallies, or fingers). The answer is the last number in the counting sequence.

JRU Problem
Grandfather had 3 strawberries. Grandmother gave him 5 more strawberries.
How many strawberries does Grandfather have now?

Solution: Counts-On-From-Larger
The child begins with 5 (the larger quantity and continues on for 3 more counts (keeping track of counts with manipulatives, tallies, or fingers. The answer is the last number in the counting sequence.

JCU Problem
Grandmother had 3 strawberries. Grandfather gave her some more strawberries. Now Grandmother has 8 strawberries.
How many strawberries did Grandfather give her?

Solution: Counts-On-To
The child uses a forward counting sequence starting from 3 and continues until 8 is reached (keeping track on fingers or tally marks). The answer is the number of counting words in the sequence.

SRU Problem
Grandfather had 8 strawberries. He gave 3 to Grandmother.
How many strawberries does Grandfather have now?

Solution: Counts-Down
The child uses a backward counting sequence starting from eight. The sequence continues for three counts . . . eight, seven, six . . . the answer is the next number.

SCU Problem
Grandmother had 8 strawberries. She gave some to Grandfather.
Now she has 3 strawberries. How many strawberries did she give to Grandfather?

Solution: Counts Down To
The child uses a backward counting sequence starting with 8 and continues until 3 is reached, "8, 7, 6, 5, 4 . . . " The answer is the total of number words in the counting sequence, not including the number word three.

Level III
Deriving Strategies

At this level, the child understands relationships between numbers. S/he solves problems using number facts and derived facts (combines familiar quantities when a specific fact is not at the recall level). An example of a child using a derived fact would be, "I know that nine plus four is thirteen because nine and one is ten and three more is thirteen."

Solution Strategies Summary

When children begin to solve problems intuitively, they concretely represent the relationships in the problem. Over time, concrete strategies are abstracted to counting strategies, and eventually, as number facts are learned, children apply this knowledge to solve problems. This developmental approach differs from the practice of rote drill for memorization of facts. Children in drill/skill classrooms often are able to recite facts but lack understanding that a fact represents a relationship between quantities; they lack mathematical reasoning in relation to number sense. Children who have been allowed to progress through the stages of mathematical reasoning described in this manual develop both number sense and mathematical reasoning.

SYMBOLIC PROCEDURES

Much of what has been discussed to this point has focused on children's informal or intuitive problem-solving strategies. Such strategies are often very different from the standard symbolic procedures typically taught in the elementary school. Standard procedures provide powerful problem-solving tools; however, a concern is that many children merely memorize them. They never develop an understanding of the relationships among numbers within procedures. When allowed to progress through the stages described in the preceding section, a child will develop the habit of looking for numerical relationships. When introduced to the standard procedure, this child will understand the numerical relationships and will view the procedure simply as another strategy for solving problems.

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Resource Information

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A text describing CGI, Children's Mathematics: Cognitively Guided Instruction, is available through the Heinemann web site: http://www.heinemann.com

CGI web sites:

Blog: http://mindsongmath.blogspot.com/

http://www.mindsongmath.com/

http://www.abacon.com/ie/berk/wlp452a.htm

A. Connie had 13 marbles. She gave 5 marbles to Juan. How many marbles does she have left?

G. Connie has 13 marbles. Five are red and the rest are blue. How many blue marbles does Connie have?

K. Connie had some marbles. She gave 5 to Juan. Now she has 8 marbles left. How many marbles did Connie have to start with?

H. Connie has 13 marbles. Juan has 5 marbles. How many more marbles does Connie have than Juan?

D. Connie had 13 marbles. She gave some to Juan. Now she has 5 marbles left. How many marbles did Connie give to Juan?

E. Connie has 5 marbles. Juan gave her 8 more marbles. How many marbles does Connie have altogether?

B. Connie had some marbles. Jaun gave her 5 more marbles. Now she has 13 marbles. How many marbles did Connie have to start with?

F. Connie has 13 marbles. She has 5 more marbles than Juan. How many marbles does Jaun have?

J. Juan gave Connie 5 marbles. How many more marbels does he need to give her so that she will have 13 marbles altogether?

C. Connie has 5 red marbles and 8 blue marbles. How many marbles does she have?

I. Juan has 5 marbles. Connie has 8 more than Juan. How many marbles does Connie have?

Top

Video Analysis
Section I

Child 1: boy with Iowa sweatshirt

Problem	Problem Type	Strategy
1. Josh had 6 cookies. His mom gave him 5 more. How many cookies does Josh have altogether?		
2. Nell has 4 cars. How many more cars does she need to have 12 cars altogether?		
3. Dave had 13 gumdrops. He gave 4 gumdrops to Cheryl. How many gumdrops does he have left?		
4. Megan had some markers. She gave 6 to Janice. Now she has 9 markers left. How many markers did she have to start with?		

Child 2: boy with red sweater

1. John had 6 baseballs. Jenny gave him 5 more. How many baseballs does John have altogether?		
2. Adam has 4 hats. How many more hats does he need to have 12 hats altogether?		

Child 3: girl with blue and white shirt

1. Adam has 4 hats. How many more hats does he need to have 11 hats altogether?		
2. Janice has 12 pencils. She gave 5 pencils to Tom. How many pencils does she have left?		
3. Cheryl has 14 sweaters. She gave 5 sweaters to Megan. How many sweaters does she have left?		

Video Analysis
Interview

Problem 1
Lucy has 8 fish. She wants to buy 5 more fish. How many fish would Lucy have then?

problem type developmental level strategy

Problem 2
TJ has 13 chocolate chip cookies. At lunch he ate 5 of them. How many cookies did TJ have left?

problem type developmental level strategy

Problem 3
Janelle has 7 trolls in her collection. How many more does she have to buy to have 11 trolls?

problem type developmental level strategy

Problem 4
Max had some money. He spent $9 on a video game. Now he has $11 dollars. How much money did Max have to start with?

problem type developmental level strategy

Problem 5
Willie has 12 crayons. Lucy has 7 crayons. How many more crayons does Lucy have than Willie?

problem type developmental level strategy

Problem 6
11 children were playing in the sandbox. Some children went home. There were 3 children still playing in the sandbox. How many children went home?

problem type developmental level strategy

Problem 7
Rodney is having some kids over for jelly donuts. Seven donuts will fit on one plate. How many plates will Rodney need for 28 donuts?

problem type developmental level strategy

Problem 8
Korena had 20 cupcakes , She put them into 4 boxes so there were the same number of cupcakes in each box. How many cupcakes did Korena put in each box?

problem type developmental level strategy

Relative Difficulty of Problem Types

Directions: Circle the problem that is the most difficult in each pair.

1. A. Mary had 11 gumballs. She ate 4 gumballs. How many gumballs does Mary have left?

   B. Justin had 11 cookies He gave 4 cookies to Lynn. How many cookies does Justin have left?

2. A. Diane had some kittens. She sold 5 kittens. Now she has 8 kittens left. How many kittens did Diane have to start with?

   B. Chris has 5 apples. How many more apples does Chris need to pick to have 13 apples altogether?

3. A. Mark had 12 fish. He gave 8 fish to Penny. How many fish does Mark have left?

   B. Doug has 12 snakes. Jan has 8 snakes. How many more snakes does Doug have than Jan?

4. A. Ann has 8 flowers. How many more flowers does Ann have to pick to have 12 flowers?

   B. Mr. Smith has 12 dogs. 8 are big and the rest are little. How many little dogs does he have?

5. A. Albert has 3 shells. How many more shells does Albert need to find to have 11 shells altogether?

   B. Matt has 11 flowers. Tina has 3 flowers. How many more flowers does Matt have than Tina?

6. A. There are 14 children on the bus. 6 are girls and the rest are boys. How many boys are on the bus?

   B. 14 birds were in a tree. Six flew away. How many birds were left?

7. A. Francis had 8 lollipops. His mother gave him 5 more lollipops. How many lollipops does he have now?

   B. There are 8 girls and 5 boys on a soccer team. How many children are on the soccer team?

8. A. Michelle had 12 candy bars. She gave 5 of them to John. How many candy bars does Michelle have left?

   B. Adrien had some apples. She ate 5 of them. Now she has 7 apples left. How many apples did she have to start with?

Phillip has 3 book shelves in his bedroom. On each shelf there are 9 books. How many books does Phillip have on his book shelf?

Linda bought 27 yards of material to make pillows. If each pillow uses 3 yards of material, how many pillows can she make?

Jeffrey has 20 insects. He has four boxes to put his insects into. If he puts the same number of insects into each box, how many insects will be in each box?

Elver brought home 36 flowers for his parents. If he wants to put exactly 9 flowers in each vase, how many vases does he need to hold his flowers?

Andy has 8 pages of stickers. There are 18 stickers on each page. How many stickers does Andy have altogether?

Eric has 24 jelly beans to share with his 3 friends. There are four people who are going to eat the jelly beans. If each person gets the same number of jelly beans, how many jelly beans will each person get?

There are 7 cars to take Ms. Lee's class to the zoo. Ms. Lee has 28 children in her class. How many children will ride in each car?

Tina has 14 lemons. She needs 2 lemons to make a pitcher of lemonade. How many pitchers of lemonade can she make with her 14 lemons?

Christopher is feeding pigeons. He has 24 pieces of white bread. If he allots 3 pieces of bread for each pigeon, how many pigeons can he feed?

Lila lives in a house with 13 rooms. Her art collection contains 42 paintings. She would like to hang the same number of paintings in each room of her house. How many paintings will she put in each room?

Figure 4.3
Rate, Price, and Multiplicative Comparison Problems

Problem	Multiplication	Measurement Division	Partitive Division
Grouping/ Partitioning	Gene has 4 tomato plants. There are 6 tomatoes on each plant. How many tomatoes are there altogether? 	Gene has some tomato plants. There are 6 tomatoes on each plant. Altogether there are 24 tomatoes. How many tomato plants does Gene have?	Gene has 4 tomato plants. There are the same number of tomatoes on each plant. Altogether there are 20 tomatoes. How many tomatoes are there on each tomato plant?
Rate	Ellen walks 3 miles an hour. How many miles does she walk in 5 hours?	Ellen walks 3 miles an hour. How many hours will it take her to walk 15 miles?	Ellen walked 15 miles. It took her 5 hours. If she walked the same speed the whole way, how far did she walk in one hour?
Price	Pies cost $4 each. How much do 7 pies cost? 	Pies cost $4 each. How many pies can you buy for $28?	Jan bought 7 pies. He spent a total of $28. If each pie costs the same amount, how much does one pie cost?
Multiplicative Comparison	The giraffe in the zoo is 3 times as tall as the kangaroo. The kangaroo is 6 feet tall. How tall is the giraffe?	The giraffe is 18 feet tall. The kangaroo is 6 feet tall. The giraffe is how many times taller than the kangaroo?	The giraffe is 18 feet tall. She is 3 times as tall as the kangaroo. How tall is the kangaroo?

Figure 2.6 Classification of Word Problems

PROBLEM TYPE			
Join	(Result Unknown) Connie had 5 marbles. Juan gave her 8 more marbles. How many marbles does Connie have altogether?	(Change Unknown) Juan gave Connie 5 marbles. How many more marbles does he have to give her so that she will have 13 marbles altogether?	(Start Unknown) Connie had some marbles. Juan gave her 5 more marbles. Now she has 13 marbles. How many marbles did Connie have to start with?
Separate	(Result Unknown) Connie had 13 marbles. She gave 5 marbles to Juan. How many marbles does she have left?	(Change Unknown) Connie had 13 marbles. She gave some to Juan. Now she has 5 marbles left. How many marbles did Connie give to Juan?	(Start Unknown) Connie had some marbles. She gave 5 to Juan. Now she has 8 marbles left. How many marbles did Connie have to start with?
Part-Part-Whole	(Whole Unknown) Connie has 5 red marbles and 8 blue marbles. How many marbles does she have?	(Part Unknown) Connie has 13 marbles. Five are red and the rest are blue. How many blue marbles does Connie have?	
Compare	(Difference Unknown) Connie has 13 marbles. Juan has 5 marbles. How many more marbles does Connie have than Juan?	(Compare Quantity Unknown) Juan has 5 marbles. Connie has 8 more than Juan. How many marbles does Connie have?	(Referent Unkown) Connie has 13 marbles. She has 5 more marbles than Juan. How many marbles does Juan have?

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