Meaningful Math

FOR PRE-SCHOOLERS

WAYNE RESA
Leading... Learning for All

National Head Start Program

Robert A. Ficano
County Executive

Marble graphic courtesy of www.dragonartz.net

Wayne County Health & Family Services Head Start and three of its delegates, Starfish Family Services Head Start, The Guidance Center Head Start, and Wayne Westland Head Start , collaborated with Wayne RESA and the HighScope Educational Research Foundation to produce ***Meaningful Math***.

Meaningful Math is a parent education resource and tool to inspire parents to interact with their young children and support early mathematics learning in playful ways using:

- a supportive home environment
- home-early education and care connections
- interactive parent-child strategies
- community resources
- internet resources

Wayne County Head Start extends its appreciation to Wayne RESA for making this early mathematics education resource available to parents of preschool-age children.

National Head Start Program

THE GUIDANCE CENTER

HIGH/SCOPE Educational Research Foundation

STARFISH FAMILY SERVICES

WAYNE RESA Leading... Learning for All

Wayne-Westland COMMUNITY SCHOOLS

Introduction

Young children are natural explorers of their environment. As they explore, young children begin to notice patterns, quantities, and relationships that are the foundations for mathematics, or math. Their natural curiosity helps them learn how things work.

Preschool-aged children often become interested in exploring shapes and patterns, comparing sizes, and counting items. It's through those experiences that they build a foundation for math concepts in the areas of number, geometry, measurement, algebra or patterns, and data analysis or meaningful use of numerical information.

When parents encourage their children to ask questions and help children explore the world around them, they help to build an interest in math. In fact, many experts say that children who have such experiences when they are very young learn to enjoy math and feel confident they can learn it. This confidence can pay off as they get older.

Play is important to young children's development, so it isn't surprising that children experience math first through play. Play is a vehicle that allows a child to access and explore his or her world. Through play children pursue their own goals. They tackle problems that challenge them enough to keep them interested without causing too much frustration. **Children learn better when it is fun combined with a high rate of success and a little bit of challenge.** The activities in this booklet will help your child experience what they need to begin their journey as lifelong mathematical learners.

Simple math activities engage children in problem solving, predicting, and analyzing situations. Children will use all these skills as they grow and develop as teens and young adults. Parents can help to build this foundation for learning. And since mathematics becomes increasingly important in a technology-rich world, it is even more important for our children to learn math at home, as well as in school.

Section 1: Creating a Mathematics-Friendly Home

Your home provides many opportunities for your child to use and learn math. You and your child use math everyday—and you might not even know it! Everyday items and events can provide valuable math learning opportunities for your child.

Hands-on experiences and activities are the best ways for your child to learn math. Math learning is the most meaningful for your child when she is allowed to explore, solve problems, and explain her thinking. The home and neighborhood offer materials and experiences related to number, measurement, shapes, positions, patterns, relationships, and organizing math information. Children will develop symbolic thinking skills only after they have experienced enough learning with real objects in the physical world.

IN THE KITCHEN

- Provide your child with empty plastic food containers with lids and encourage the child to stack them on top or inside each other. See if your child matches the lids with the containers. It's fun to explore shapes and sizes this way.

- Ask your child to use a tablespoon to take the cereal out of its container and into his the bowl. Count the number of tablespoons it takes to fill his bowl for breakfast. Try this activity with a teaspoon or a measuring cup. Talk about the number of scoops needed for each serving.

- Follow a simple recipe. This is a great way to learn about measurement, sequencing (doing things in order), and duration of time.

- When preparing rice for a meal, allow your child to take an amount of dry rice and pour it into a variety of containers of different sizes. Ask: "Does the amount of rice change when it goes from one container to the next?" After cooking, ask: "Will the rice fit in the same containers?"

- When eating finger foods like raisins or crackers, encourage your child to count the total pieces he has, how many he eats, and how many are left as pieces are eaten.

- Ask your child to divide a favorite dessert into equal parts for each member of the family. Compare the number and size of the servings.

- After a grocery shopping trip, ask your child to sort the products by type of container—box, bottle, bag, can, etc. Next have your child help you put the groceries away. Pick up two items and decide which item is heavier and which item is lighter.

- Ask your child to guess how many spoonfuls, or bites, it will take to eat his breakfast. This will help your child learn the math skills of counting and estimation.

■ During breakfast, talk with your child about the day's schedule. For example: "First, we wake up, second we eat breakfast, third we get dressed, fourth…". By doing this regularly, your child will start to build the math skill of recognizing patterns.

■ Allow your child to explore measuring cups. Have her fit them together, talk about which ones are bigger or smaller, and arrange them in order by size. Discuss the numbers on the cup, too.

■ Allow your child to set the table. Be sure to count the plates, cups and silverware. Point out how each set is the same with a plate, napkin, fork, knife, spoon, and cup. Next have them change the layout of the place setting to make it fun (e.g., put the fork at the top of the plate and the cup on the plate). Ask him to make each place setting look the same.

■ Create a counting snack by giving children small pretzel rods, cream cheese or peanut butter, and goldfish crackers. Encourage your child to dip a pretzel rod in the cream cheese, and then see how many fish she can catch on her stick.

■ Make pancakes with your child. Make some pancakes big, some medium size and some small. Have your child describe the ones she chooses to eat.

IN THE LIVING ROOM

■ Help your child list the items in the living room. Help him write the amounts of each item. For example: one couch, three pillows, two plants, one television, etc.

■ Have your child hunt for shapes. Give your child a paper rectangle and ask her to look for items that contain that shape. Do the same thing with a square, circle, triangle and oval.

■ Have your child compare the sizes of items in the living room. Discuss which items are large and which are small. Help your child arrange the items by size, from smallest to biggest or biggest to smallest.

■ Play a game of "I Spy," naming items in the room. Use math concept words, such as, "I spy with my little eye something that looks like a rectangle; it is small and it has 25 buttons." (Answer—the television remote control.)

■ Play a "Where Is the Toy?" game with your child. Use words that describe the location or position of a favorite toy, such as under, next to, over, above, in front of and behind.

■ Use the television and the television remote to explore numbers by flipping through channels as you count. When your child can recognize numbers, ask her to name the number that is displayed on the screen as you change channels.

■ Spread out a handful of pennies or buttons across a table. Use the pennies to make lines of different lengths. How many pennies are used to make the longest line? How long a line can be made with all the pennies? Make circles with the lines of pennies. Are the number of pennies more, less, or the same as when they were placed in a line?

IN THE BEDROOM

- Label toy bins or boxes with a picture or drawing of the type of toy that will belong in it. Encourage your child to sort his toys into the bins by looking at the pictures.

- When putting clean laundry away, encourage your child to sort the clothes into two groups: clothes that will go in the closet and clothes that will go in a drawer.

- When your child is undressing for bed, play a game of "beat the clock" with a timer set for three minutes. Ask your child to take off his clothes before the timer goes off. Play a similar game when getting dressed in the morning.

- Invite your child to notice the patterns on items of clothing.

- While cleaning the bedroom, ask your child to match up pairs of things like shoes, socks, gloves, or toys. With your child, count the pairs of items, explaining that pairs are two of each item.

- Play a clean-up game of "Clean the Colors." Have your child choose a color, then put away items that are that color. Continue with other colors until the room is clean.

- For a bedtime story, gather three items of different sizes. Tap your creativity and make up a story to tell your child based on the items, using size words such as, small, medium, large, bigger, tinier, etc. (Ex: Once upon a time, there was a family of three buttons. Papa button was large and blue, mama button was medium and yellow and little baby button was small and green. One day…")

- Ask your child to find and match pairs of shoes, then line up the pairs by length.

- About two weeks before a special holiday, vacation or special event help your child create a paper chain with construction or scrap paper—one for each day left. Hang the chain next to your child's bed and each night have her remove one link before going to bed. Count together by touching each link to see how many more night-nights until the special occasion.

IN THE BATHROOM

- Use the bathroom scale to explore the weight of different items or people.

- While giving a bath, ask your child how many toys he wants in the bathtub with him. Help him count the number of toys he requests.

- The American Dental Association recommends that children spend two minutes brushing their teeth, each time they brush. Use a timer or a watch to measure the time, as you bring your child's attention to the two minutes passing.

- Allow your child to sort plastic bottles by size, color, or shape.

- Give your child assorted containers in the bathtub. Talk about which containers hold more, or less, water.

- Invite your child to help you fold, hang, or stack bath towels. Notice together the different sizes and shapes of wash cloths, hand towels, and bath towels. Ask your child to help you hang or stack towels by size.

- Ask your child to help you hang a variety of towels by size from longest to shortest. Or make a pattern of towels—long, short, long, short.

- Draw your child's attention to the the waterline in the bathtub before and after she gets in. Any changes? Ask: "Does the amount of water in the bathtub change?"

IN THE YARD

- Give your child a large cardboard box opened on both ends. Urge her to crawl through it to learn about her body in space.

- Count out the number of steps it takes to get from the front yard to the back yard. Help your child draw a map of your yard including how many steps it takes to get from one part to another.

- Have several beanbags, balls, or rolled-up pairs of socks to play a game of catch. Ask your child to try to catch five beanbags and tell you to "Stop" when she thinks she has caught the five beanbags. (Play with other numbers, too).

- Have your child use balls of paper to throw into a target (bucket, box, etc.). Ask your child to count the balls that landed in the target and the balls that landed out of the target.

- Collect leaves or rocks with your child. Ask him to sort the leaves or rocks into different piles by size or type.

- Use a thermometer to compare the temperature inside to the temperature outside. Place the thermometer inside for ten minutes. Place a small piece of tape on the number (or record the number if it is a digital thermometer). Take the thermometer outside and place it in the sun for ten minutes. Discuss the temperature difference with your child.

- Find items in the yard and help your child sort them into piles of items that are hard and items that are soft.

- Give your child a piece of chalk or a rock to draw shapes on the sidewalk or in the dirt.

- Collect containers of three different sizes (small, medium and large). Have your child collect some toys and predict which container the toy will fit into. Use the words, "small, medium and large" as you describe the toys and the containers. Let your child test out her ideas.

- Outside, use two or three deep containers and fill them half full with water. Gather small plastic balls to toss into the water. Have your child count each ball that lands inside the containers. This game helps build your child's eye/hand coordination and gross motor skills, and it is a fun way to learn to count.

- Have your child help plant a garden or annual flowers with you. Let her help you design where to the flowers by having her put popsicle sticks in the ground for where each plant will go. Next have her help you plant the flowers in a color pattern, for example red, white, red, white, etc.

IN THE NEIGHBORHOOD

- Take a trip to the library and look for books that have numbers or number words in the title.

- While walking in the neighborhood, bring your child's attention to the numbers that are on buildings, signs, and vehicles. Ask your child for his ideas about what the numbers tell us. How else might the numbers be used?

- Encourage your child to notice the shapes of different street signs and symbols.

- During a grocery shopping trip, comment on the number of types of containers (boxes, bags, cans, bottles, etc.) being selected for purchase. Are there more cans than boxes? More bottles than bags?

- Look for numbers on houses, signs and license plates while you walk outside with your child. You can play the game of finding the numbers 1 through 10. Or find just a single number, like your child's age, to help him or her begin to be able to recognize and identify numbers.

- Look at street signs and talk about the shapes. Help your child draw the shapes in the air with his or her finger. This will help your child learn about geometry.

- Use rocks and sticks to make simple patterns, such as rock, stick, rock, stick. Encourage your child to help you find what comes next in the pattern.

- Count how many cars pass by your home in a one-minute time span. Help your child write the number on a piece of paper.

IN THE CAR

- Count telephone poles as you pass them. This will help your child learn the math skill of counting. It will also help him recognize rhythm.

- Before a car trip, create a graph for your child. Draw a line down the middle of paper. On one side, at the top, draw a picture of a red light. Draw a picture of a green light on the other side. During the trip have your child mark an "X" under the green light picture for every green light you pass through. Have him mark an X under the red light picture for every red light where you stop. At the end of your trip, count the X's on each side of the paper and help your child write the numbers. Talk about which number is more, or less.

- Have your child select a color and count together to see how many cars you can find in the color she selected. You could make it a game by challenging each other to see who can find more. After counting cars of a few different, colors talk with your child about what color you saw most, least, etc.

- While on the freeway go on a "number hunt" to see how many numbers you and your child can find on billboards or exit signs.

Section 2: Building Good Home-Early Education/Care Connections

As a parent, you are the "expert" on your child. You are the resource caregivers and teachers need to provide effective services for your child and family. Your involvement in your child's preschool education or child care program supports your child's success in school and learning.

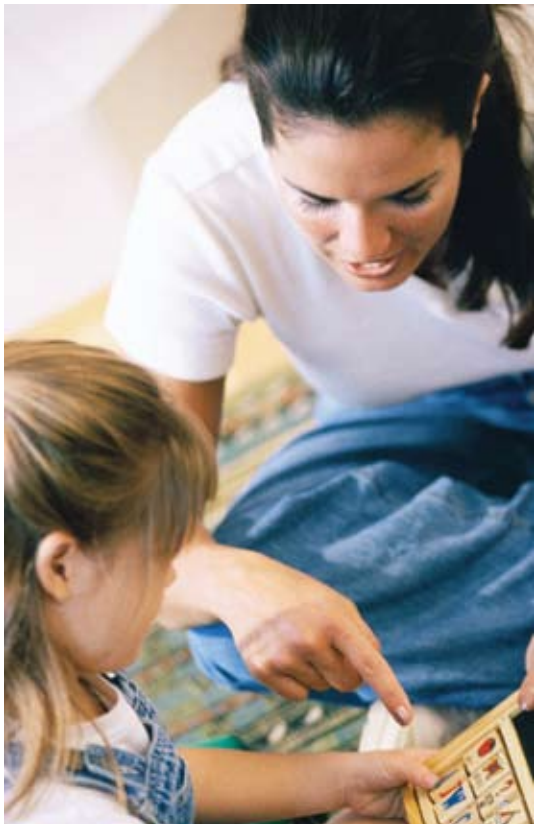
All early childhood education and child care programs benefit from parents being involved. Parent involvement includes:

- Welcoming teaching and family service staff into your home, if the program offers home visits
- Attending parent–teacher conferences or open houses
- Sharing information about your child's life and home experience with program staff
- Sharing materials and resources that allow your family culture or home language to be part of the classroom or child care site
- Keeping program staff informed about changes in your child's and family's life and home experiences through phone calls, notes, and on-site visits with the staff
- Attending family activities at your child's preschool or child care site
- Attending and participating in parent meetings and committees or program governing groups
- Volunteering in your child's preschool classroom or child care site

"Anyone who does anything to help a child in his life is a hero to me."

—Fred Rogers, television host and producer

Section 3: Learning and Doing Math Together



You might not have had a positive experience with math during your school years. You might even have said that you are "not good at math." It is very important that your child does not hear you express a negative attitude about math.

Instead, try paying attention to the many positive ways you and your child use math every day. That's right! When you set the timer on the microwave oven or move quickly through a crowd to exit a store, you are using math. These everyday experiences can be shared with your child to help her recognize and use math in meaningful ways.

It is important for you to share with your child how you use math through the day. Point out what you are doing and invite her to participate with you, if possible. Measure the amount of juice poured in a glass or sort nails from screws. These are math experiences that you could share with your child.

You can help your child explore and learn math if you keep several things in mind:

- Join your child at her level; sit on the floor or at a table.
- Explore along with your child. Use materials in the same way your child does.
- Comment on your child's ideas. Be specific and describe your child's actions and thinking.
- Listen to your child. This can be as important as talking to him. Be an active listener.
- Accept your child's ideas.
- Encourage your child to solve her own problems, and accept her answers, even if they seem wrong to you. Your child's mistakes can help you understand how she is thinking and offer her opportunities for further learning.

TALK ABOUT MATH

Your child will need many opportunities to think aloud about the math ideas, problems, and discoveries that she encounters. Thinking aloud and talking with you about her experiences with math will help your child solve problems, make discoveries, and organize information.

Encourage your child to discuss her math experiences with you. You can support the "back and forth" sharing of ideas by asking a few open-ended questions that encourage your child to talk more.

Open-ended questions require more of an answer than a simple "yes" or "no" or a one-word response. Open-ended questions invite your child to answer with more words and thought. In this way, open-ended questions support the development of higher levels of thinking.

EXAMPLES OF OPEN-ENDED QUESTIONS

Use a comment or an open-ended question to suggest a new idea that is directly related to your child's experience. A new idea can challenge your child and lead to math-related thinking such as estimation and prediction.

- I wonder how many you will have if…?
- What will it look like if…?
- I wonder how many steps it will take you to get from one place to another? (For example, from the couch to the TV.) How can you use your feet to find out the answer? Try it.

Encourage your child to describe what she is observing, creating, and using.

- What are you doing now?
- How far can it …?

Ask a few questions that are related directly to what your child is doing or seeing.

- Why do you think…?
- How did you…?
- Why are you…?
- Can you find another way to…?

PLAY WITH MATH

To help your child understand **numbers** and how they represent quantity, you can:

- Cut out footprints, and space them out onf the ground or floor. Have your child count each step as he follows the paper footprints.
- Provide a variety of small objects to count (pennies, buttons, etc.). Encourage your child to take a handful of pennies and estimate how many he picked up. Then have him count them out to see how many he actually has.
- Encourage your child to divide and combine groups of objects.
- Sing counting songs and read books about counting.
- Point out numbers as you see them in your world or use them in your day-to-day activities (for example writing out an address or phone number, the clock, etc.).
- Use beanbags, balls, or rolled-up pairs of socks to throw into a target (bucket, box, etc.). Have your child throw all of them into or as close to the target as possible. Count how many balls went in the target and how many balls missed the target.
- Ask your child to sort a bag of M&Ms® by color. Next ask her to count two of each color and put them in your hand. Then have her count how many she has given to you altogether.

To help your child recognize different **shapes and spatial relations**, you can:

- Point out and label different shapes and sizes.
- Encourage your child to find shapes in the world around you.
- Encourage your child to move in a variety of ways—in, out, around, under, over, etc.
- Offer your child a variety of materials to arrange, stack, and build.
- Routinely use words that describe position as you talk to your child [such as "I'll put the cheese between the two crackers" or "You and I will find the towels under the sink."

To help your child understand **measurement** and relations of height, length, width, area, volume, frequency, money values, and time, you can:

- Use non-standard units of measure like foot steps, building block lengths, or crayons before trying standard units of inches, feet, or yards.
- Invite your child to sort and compare things by length, weight, or value.
- Encourage your child to estimate—to take a good guess about—amounts, measurements, or money value.
- Talk about the passing of time while you go through your day. Describe time intervals meaningful to them. For example, "after lunch" and "first we have to drive mother to work, then we will go to the library."

To help your child understand **patterns**, the first skill in using algebra, you can:

- Encourage your child to identify and recognize patterns in songs and storybooks.
- Invite your child to make patterns with body movements by clapping or jumping in repeated patterns.
- Encourage your child to find patterns in the world around them—in clothing, wallcoverings, tiles, etc.
- Describe to your child patterns that you see, hear, or use.

To help your child understand and show relationships of **number and numerical values** (data), you can:

- Provide a large number of pennies and have your child take a handful in each hand. Ask them which hand he thinks has more pennies. Next count the number of pennies in each handful. Discuss which hand had more or less.
- Encourage your child to collect and sort things by size, color, shape, texture, or function.
- Talk about things that go together and why they do.
- Invite your child to help you make simple charts and graphs that organize and show information about quantities.

Section 4: Community Resources

Children can have hands-on experiences with math concepts in places that families visit often, such as stores and markets. While you are there, children to may see and experience:

- Printed numbers
- Counting
- Comparing of quantities
- Weighing amounts
- Grouping
- Money values

Some places in the community where families can visit, explore, and learn together are:

Arts and Scraps
16135 Harper Ave.
Detroit, MI 48224
(313) 640-4411
www.artsandscraps.org

Eastern Market
2934 Russell St.
Detroit, MI 48207
(313) 833-9300
www.detroiteasternmarket.com

Local museums, science centers, and other attractions can also offer children hands-on experiences with math.

Ann Arbor Hands-On Museum
220 E. Ann St.
Ann Arbor, MI
(734) 995-KIDZ (5439)
www.aahom.org

Children's Museum
6134 Second Ave.
Detroit, MI 48202
(313) 873-8100
www.detroitchildrensmuseum.org

Cranbrook Institute of Science
39221 Woodward Ave.
Bloomfield Hills, MI
(877) 462-7262
http://science.cranbrook.edu

Detroit Science Center
5020 John R St.
Detroit, MI 48202
(313) 577-8400
www.detroitsciencecenter.org

Detroit Zoo
8450 W. 10 Mile Rd.
Roya Oak, MI 48067
(248) 398-0900
www.detroitzoo.org

Exhibit Museum of Natural History
University of Michigan
1109 Geddes Rd.
Ann Arbor, MI
(734) 764-0478
www.lsa.umich.edu/ExhibitMuseum

Ford Motor Factory Tours
Departs from The Henry Ford
20900 Oakwood Blvd..
Dearborn, MI 48124
(313) 271-1621
www.thehenryford.org

Heritage Park Petting Farm
12803 Pardee Rd.
Taylor, MI 48180
(734) 374-5946
www.cityoftaylor.com/pettingfarm

Saint Joseph Mercy Health Exploration Station
Saint Joseph Mercy Canton Health Center
1600 S. Canton Center Rd., Suite 10
Canton, MI
(734) 398-7518
www.healthexplorationstation.com

Section 5: Internet Resources

■ **A Place of Our Own** offers a webpage and links for parents to learn about early math development and appropriate learning experiences.
http://aplaceofourown.org/question_detail.php?id=313

■ **Child Development Tracker** is a website that describes how young children experience and learn math concepts. It offers links to interactive websites for children to use.
www.pbs.org/parents/childdevelopmenttracker/three/mathematics.html

■ **Early Childhood: Where Learning Begins Mathematics** is a website that offers links to activities that parents can enjoy with their children.
www.ed.gov/pubs/EarlyMath/index.html

■ **Early Numeracy and Pre-School Math** offers a variety of links to math activities for family math.
http://math.about.com/od/earlynumeracy/Early_Numeracy_and_Preschool_Math.htm

■ **Family Fundamentals** is a resource for parents from the State of Michigan. Online preK mathematics activities are available for parents to print and use at home.
www.michigan.gov/documents/mde/math_DK_242336_7.pdf

■ **HighScope Educational Research Foundation** offers links to information and videos about the "active participatory learning" approach to early math education.
www.highscope.org

■ **MyPyramid for Preschoolers** is a website that focuses on healthy eating, but includes activity ideas that support children's skills of counting, measuring, classifying, and sequencing.
http://mypyramid.gov/preschoolers/index.html

■ **PBS Kids' ZOOM** offers activity ideas for preschool-age children that encourage exploration of math concepts and skills through food recipes.
http://pbskids.org/zoom/activities/preschool/

■ **Wayne RESA Early Childhood Services for Parents** provides online links to a variety of free resources for early childhood activity ideas.
www.resa.net/earlychildhood/forparents/

31 Days of Activities to Nurture a Math Whiz

1	2	3	4	5	6	7
When doing laundry, compare the weight of dry clothing to wet clothing.	Find things that have a circular shape and trace circles onto paper.	On a walk, find things with wheels. Count and compare numbers of wheels.	Toss pennies towards a small bowl. Count how many get in, how many fall out, and how many there are altogether.	Find the numbers that appear on shopping coupons.	Move different body parts in a circle.	Talk about yesterday. Recall what you and your child did.
8	**9**	**10**	**11**	**12**	**13**	**14**
Collect rocks outdoors. Guess how many will fit in your hand.	Find twelve small things that fit in an egg carton.	Ask your child to find something shorter than she is.	Count all the windows of the same shape or size in the home.	Go on a triangle hunt—outdoors or indoors.	Find things that are really long/short/wide/nar-row.	Count and compare "giant steps" to "baby steps" when crossing a room.
15	**16**	**17**	**18**	**19**	**20**	**21**
Use a toilet paper roll to measure things in the home.	Order items in the cupboard from heaviest to lightest.	Find things in your home that have numbers on them.	Imitate your child's series or pattern of hand claps.	Cut sandwiches in squares and triangles.	Sort the day's mail by envelope size.	Arrange dolls or action figures by height.
22	**23**	**24**	**25**	**26**	**27**	**28**
Find patterns on the fabric of furnishings.	Look at baby pictures together. Talk about how your child has changed over time.	Use ordinal number words, "first," "second," "third," etc.	Invite your child to sort spoons and forks.	Help your child to find and practice pressing "9-1-1" on non-working phone. (Hint: cancelled cell phones will still reach 911 if they have battery power.)	Make a 5-piece puzzle from the front of an empty cereal box.	Invite your child to move along with a wind-up toy and stop when it stops.
29	**30**	**31**				
Sing songs with repeating words.	Comment on temperature changes from outdoors to indoors.	Find the numbers on a grocery store receipt.				

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