Houston, We Have a Wor(l)d Problem!

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INTRODUCTION

As an elementary school teacher I have seen how our students struggle many times when trying to solve word problems, despite the fact that they very much like mathematics. This issue has always caught my attention, and I want to do something about it.

Math skills are fundamental for students' success, which is why I decided to take the seminar entitled *Real Wor(l)d Problems.* I intend to provide teachers and students with a formal procedure to successfully approach word problem solving. Students will learn the four-step method and the strategies to solve problems.

I have been a bilingual teacher for six years. I have the opportunity to work with students in a 3rd grade bilingual setting at Jefferson Elementary School, an inner-city school located in the North Region of the Houston ISD. Our student population of about 700 students in K-5 is approximately 95% Hispanic, 4% African-American, 1% White, and <1% Asian. About 82% of the students receive free or reduced lunch, and 48% are Limited English Proficient (LEP).

OBJECTIVES

Ten Texas Essential Knowledge and Skills (TEKS) that relate to this curriculum unit have been identified in Appendix A. Two particular TEKS show what this curriculum unit is about:

Math.3.14A – *Identify the mathematics in everyday situations.* This objective is self explanatory and reminds us of the importance of making the classroom learning process meaningful for students, so they can perform to meet the expectations of this complex world. I want students to realize that math works beyond the classroom and can be applied in real life.

Math.3.14C – *Select or develop an appropriate problem-solving plan or strategy including drawing a picture, looking for a pattern, systematic guessing and checking, acting it out, making a table, working a simpler problem, or working backwards to solve a problem.* This objective is pertinent to the different learning styles that may be found in the classroom and to the fact that problems can be solved in different ways. Students should realize that in order to find a solution, they need to use both the formal academic tools and their creativity to take advantage of these tools.

The unit is designed for the third grade, but it can be modified for other grade levels. It is aligned with the Houston Independent School District curriculum, and it contains five lesson plans.

RATIONALE

A federal panel found that American students' math achievement is mediocre compared with that of their peers worldwide. Eighth graders are having difficulties with fractions. The report also found that in order to prepare students for algebra in middle school, the curriculum must develop the understanding of problem solving skills (Lewin).

It is clear then that we have to do everything in our power to assist our students early in the primary grades with word problem solving strategies that will boost their reading comprehension skills and will allow them to meet the curriculum standards and be competitive with students from other countries.

This unit has been developed so that students think as "detectives" looking for clues and understand that a problem means difficulty but can be solved in a smart efficient way following the four-step word problem solving method.

Students will be able to identify the relevant details and the unnecessary details. Once they know what is important and what is not, they can decide how to manipulate the information with numbers, symbols, operations, etc., to obtain the right answer and finally explain the outcome in plain English.

Students are better served if we can relate whatever we teach in the classroom to their daily experiences. If students can relate to the topic being taught, they get a sense of ownership that builds their confidence and can work hard toward getting a good outcome with a greater chance of success. For instance, few people know that origami has real life applications:

> The problem of rigid origami, treating the folds as hinges joining two flat, rigid surfaces such as sheet metal, has great practical importance. For example, the Miura map fold is a rigid fold that has been used to deploy large solar panel arrays for space satellites. ("Mathematics of Paper Folding")

Students should be given the opportunity to work with engaging, hands-on activities exposing them to different media and manipulatives to ensure that all learning styles will be served.

UNIT BACKGROUND

In my experience, third graders may find word problems challenging due to a combination of several factors: poor reading skills, limited vocabulary, and lack of mastery of computational procedures. But there is also a chance that the teacher wrongly assumes that students are ready or have enough knowledge to correctly solve a problem.

Sometimes the students do not even know the meaning of basic symbols like =, <, >, or expressions like *less than*, *greater than*, and *twice as much*. If students do not master such concepts as place value, the number line, addition, subtraction, time telling, or measurement, their chances of solving a word problem are minimal.

When working with students in word problem solving make sure the students have already mastered the mathematical concepts at grade level.

The fundamental problem with learning math is that some things are hardwired – for instance, our number sense. However, calculation requires cultural tools like symbols and algorithms that the built-in brain circuits can't naturally handle. The cultural differences in how we handle numbers are present in the classroom. Think about Arabic numerals that are widely used around the world, while the words with which we name these numbers differ from language to language (Holt).

The children of single parents or broken families do worse at school and in their career (Zuckerman). A stable family seems to be the ideal environment for molding character, for nurturing, for inculcating values, and for planning a child's future.

Given the diverse demographics of the HISD student population, it really becomes fundamental to take into account cultural differences in order to better serve the students in the classroom when teaching math. Particularly at Jefferson, with a population 95% Hispanic and

48% LEP, lessons should be planned taking into account any "cultural factor" that could prevent students from learning.

This unit is student-centered. Students will work both individually and in small groups. The activities are hands-on, going from the concrete to the abstract. I use real world situations that are of significance to the students; thus, they will feel the motivation to go the extra mile because they have identified themselves with the problem they have to work on.

There are five lesson plans included in this work. They are designed for 90 minute blocks, but can be modified to suit different needs. The first one covers the four fundamental steps of word problem solving. I recommend using it at the very beginning of the school year. The rest of the lessons you may use at your leisure through the year.

Keep in mind that third graders have a very short attention span, so the use of games, jokes, riddles, and proverbs will help in keeping students engaged and using higher order thinking skills. Thus, learning should be taking place continuously.

There are many educational websites with plenty of age/level appropriate activities that will keep your students entertained while learning. Take advantage of this powerful and helpful resource.

Having said this, let's help our students realize that solving a problem may not be an easy task at first, but that by following the strategies it is always possible to build from past experiences to find patterns or similarities and get a solution. They will realize this process is challenging and rewarding and that it is only to their own benefit to commit to work hard and master the thought process to tackle the problems.

Four-step Method

The four-step method (summarized by Peter Alfeld from a book by G. Polya) was created in the '50s to solve word problems. The first step is called *Understanding the Problem* where you should identify the question and relevant information. Teach students to circle the question and underline the helpful data. Third grade students tend to rush while reading the statement the first time, which makes them miss relevant information needed to find the right answer. One thing teachers can do to check if students understand the problem is have them retell the story in their own words.

The second step is known as *Devising a Plan* or finding the right strategy. Students must understand that there may be more than one strategy to solve the problem. They have to choose the one they feel can help better to solve the problem. This step is all about teaching students to think carefully before doing any calculation. Sometimes because they just want to please you and find an answer quickly, they skip this planning phase and jump to doing the numbers. Show them that being patient and taking the time to come up with a good strategy saves a lot of time and allows them to find a solution.

Carrying out the Plan is the next step. This is where you actually work the strategy until you get the answer to the problem. Sometimes you may consider going back to the previous step and choosing another strategy that works better. Once the student gets a convenient strategy, it is a matter of making sure that the problem solver executes well the arithmetic procedures.

Finally you have the last step, which is *Looking Back*. Students should understand that they are being asked a question that requires not only an answer but also a correct answer. This solution is the outcome of an organized plan that they must be able to carry out and explain to others. This step is very important because you check that the solution answers the question and meets all the criteria.

Strategies

Students should learn that there is more than one way to find a solution. Also, that there may be more than one answer to a problem (for instance, find an even number greater than 148). Because students learn in different ways, encourage them to choose the strategy that works best for them.

Planning the strategy will probably take most of the time during the word problem solving process, but it provides the foundation to do the computations. Students need to be aware that once they get a possible solution, they have to check whether it is or is not a reasonable answer. If not, then look for computational mistakes or review the chosen strategy to check if it needs to be changed.

Even though there are some strategies available already, always encourage students to come up with their own. The following strategies can be used to teach students to solve problems:

Drawing a picture: Students provide a visual image of the problem. The drawing does not have to be a masterpiece. It is to help students to understand the story of the problem.

Looking for a pattern: a pattern is a repetition. If the problem solver identifies a pattern, then he or she can predict what comes next.

Systematic guessing and checking: This strategy may be used to get started and then find another one. Students may also try this technique to get answers and test them to gradually get closer to the right solution.

Acting it out: This is a good approach for some students because they get to manipulate objects and act out the story, which helps them to remember what they did to visualize the solution.

Making a table: A table helps students to keep track of data, spot missing data, and identify patterns.

Working backwards: Students have to do some computations starting with data presented at the end of the problem and ending with data presented at the beginning of the problem.

Problems

I have chosen the following four categories of problems: age, money, numbers, and time. They are very common in third grade and give the teacher a chance to practice most of the strategies. Also, they can be very easily connected to fractions.

Age Problem

This type of problem presents a perfect opportunity to review number concepts and basic operations. Students like age problems because they are something the students can easily relate to. Labeling is very important because most likely an algebraic equation is the way to go here.

Remind your students that once they have identified each variable, they have to modify them to reflect changes such as the passage of time. "Five years later Peter's age would be equal to twice Henry's" can be represented as "P+5 = 2H." Age problems may be also solved using tables to focus the students on the search for patterns.

Money Problem

Students get excited just hearing the word "money." Here you can review place value, subtraction, addition, multiplication, or fractions. I highly recommend using problems with money because the students are likely to pay attention. Before working on the problems, make sure students know the fundamentals like the difference between five dollars (5.00), fifty cents (0.50), and five cents (0.05). Also, touch base with the class about conversion; for instance, there

are 100 pennies to the dollar, 20 nickels to the dollar, and so on. Remind the class that before doing any computation, they have to make sure all the variables are converted to the same magnitude. For instance, don't mix dollars with pennies or quarters. Check previous knowledge because some students may not know the denominations of the different coins and bills. Some students call all coins "quarter," and all bills "a dollar," regardless of denomination. Teach your students to use mnemonic names when labeling variables, like "d" for dollar.

Algebraic equations, tables, and drawings are good strategies for problems involving money.

Number Problem

These problems may represent a challenge for the students. Let's say, "The sum of two consecutive numbers is 7. Find the numbers." At first the problem may seem fairly easy, but it could be very hard for third grade students. The key word on this example is "consecutive" because either they do not know what it means or they forget to keep in mind this condition. Show students that 6 and 1 are not answers to this problem simply because the sum is 7 – they are not consecutive.

Write on the board the following master list of consecutive numbers:

$$(1,2)\ (2,3)\ (3,4)\ (4,5)\ (5,6)\ (6,7)$$

Tell students that only 3 and 4 meet the two conditions. The sum is equal to 7 and they are consecutive.

The difficulty with this type of exercise is that it is very abstract. It is extremely hard for the students to find the relationship to real life. The challenge for the teacher is to explain that such problems require a lot of practice until they get used to them. Students have to read carefully, translate the plain language into mathematics, label carefully, and proceed with the calculations.

These problems are hard for the students. Practice them a lot, following the steps one at a time, until they get used to them.

Time Problem

"The clock is ticking" and "Time flies" are just a couple of the thousands of sayings related to time. This is an essential skill that all students must master. A very difficult concept for students in 3rd grade is elapsed time. It is hard for them to grasp whether we are talking about the past or the future. Have students assist you with keeping the time. Set up managers to help you monitor routines, such as switching subjects, restroom/lunch breaks, etc.

Keep asking them, what time is it? How much longer until we go to recess? Remind them that time is also a pattern: days, nights, weeks, months. Make sure they master the vocabulary: 1:15 p.m. can be read as "one fifteen" or "quarter past one."

Reviewing time will give you a very good opportunity to work multiplication tables and fractions. Also take the opportunity to work backwards, particularly when doing elapsed time problems. Because time may be a difficult topic for the students, rely on pictures and use both digital and analog clocks.

Conclusion

I suggest that before you teach any lesson on word problem solving, you first show your students what the word "problem" means. They probably would appreciate finding out that it is something involving doubt, uncertainty, or difficulty. Take the opportunity and tell them that it is okay to fail at first because the problem may not be easy and they need to try again to build the knowledge. Show them real life situations and how even adults struggle to find a solution.

Regardless of the type of problem, students should always carefully read the statement. First, understand the question and identify relevant data. Then proceed to plan how to manipulate the information (strategy). Once they have chosen the strategy, they can proceed with computational procedures. Finally they will check the reasonableness of the answer.

Checking the answer is a key component of word problem solving. This is the time when students would check their own work. Guide them in understanding that they need to know or have an idea of the magnitude of the answer even before doing the calculation.

Teach students to clearly label the variables. They should know what each variable represents and what to do with each variable. Answers should also be labeled. Tell your students that every answer in numeric form should represent something (units, dollars, books, candies, days, yards, etc.). Do not accept an answer that is not properly labeled, and ask students to state the answer using meaningful, complete sentences.

LESSON PLANS

Lesson 1

Objectives

The purpose of the lesson is to formally introduce the steps of word problem solving. At the end of the lesson students should be able to solve a story problem following the four steps procedure. TEKS MATH.3.14A, MATH.3.14B, MATH.3.14C, MATH.3.16B.

Vocabulary

Problem, solution, plan, strategy, detective, math, computation.

Materials

Computer, LCD projector, white board, Internet access, notebook, pencil, detective badge.

Website

http://www.unitedstreaming.com/ (Before teaching the lesson you need to watch the video *Word Problems? No Problem!* It lasts 17:39)

Starter

Ask your students if they know what a detective is; pause for answers. Explain that a detective is a person that obtains information and evidence. Detective comes from detecting. Tell your students that you are teaching them how to become a detective to solve word problems.

Let your class know that you are playing a game. Challenge the students with the activity Hidden Colors found on Appendix B. This activity is intended to get students focused and engaged.

Warm up

Write on the board, "It is 7:30 a.m., time to go to school; you are ready to get in the car when your dad notices that the keys are locked inside the car. It takes 10 minutes to get from home to the school. School starts at 7:50 a.m. How much time does your dad have to get the keys and get you on time to the school?"

Procedure

Review the vocabulary and make sure students get the meaning. Explain that word problems are stories that hide a mystery to be solved. Like good detectives they will look for evidence and find a solution. They will learn a method to find the evidence, translate the words into numeric sentences, do the computations, and finally check the answer. Show the video *Word Problems? No Problem!* from <http://www.unitedstreaming.com>.

While playing the video, pause and check for understanding every time you think it appropriate or necessary. The video is very good; it keeps the students engaged. At the end of the presentation, students should know the four steps of the procedure:

1. Understand the problem
2. Plan the strategy
3. Do the math
4. Check the answer

Guided practice

Choose a simple word problem and proceed to work on it on the board following the steps. Remind students that strategy means to come up with ideas to approach the problem and solve it.

Independent practice

Give students a word story to practice and walk around monitoring that they are actually following the steps. Make sure that they are reading carefully the statement and are not rushing. Remind them to first circle the question and underline the relevant data. Have them double check the answer. Praise them and reward all of them with their detective badge.

Assessment

I highly recommend observation and checking for comprehension. Try to get students to explain what and why they solved the problem the way they did instead of focusing on the answer.

Lesson 2

Objectives

The purpose of the lesson is to teach students to translate the wording into numeric expressions while figuring out how old people are. TEKS MATH.3.14A, MATH.3.14B, MATH.3.14C, MATH.3.15B**.**

Vocabulary

Variable, label, solution, algebra, strategy, equal, computation.

Materials

Computer, LCD projector, white board, Internet access, notebook, pencil.

Website

http://www.internet4classrooms.com/word_problems_quest.htm (Aldebaran)

Starter

Challenge the class with the activity "Test for Your Eyes" found on Appendix B. Have the students work in groups of two. You can either use your projector or run copies for the students. Monitor them closely and wait until they are done.

Warm up

Ask students to write their birthdate down on their notebook. Tell them to calculate how old they are by subtracting the birthdate from the current date. Have them find out who is older, younger, or the same age.

Procedure

Review the vocabulary and make sure students get the meaning. Remind the class that word problems are stories that hide a mystery to be solved. Like good detectives, they will look for

evidence and find a solution. When looking for a solution, we are to find an unknown number that we can label. The known information can also be labeled and used in mathematical expressions to get the answer.

Group students in pairs have them calculate their age difference. Wait until they are done. Choose any of the two students groups; write on the board their total age and one of the students' age. Ask the class who's older. Check the answers.

Guided practice

Write the following on the board "Rachel and Jose are siblings. Rachel is 7 years older and the sum of their ages is 39. How old are they?"

Make sure to follow the procedure: read, plan, computation, check answer. The problem is asking for both Rachel's and Jose's age. Label them as "r" and "j". We know that $r = j + 7$ and $r + j = 39$. The clue here is that Rachel is older so show the class that the 39 years are not evenly divided between the two students. Let's take 7 years aside for Rachel $39 - 7 = 32$. Now we are left with 32 years to be divided by two. This takes us to $32 / 2 = 16$ which means that Jose is 16 years old then Rachel is $16 + 7$ years old. Answer $r = 23$ $j = 16$. Remind the students we are looking for two numbers r and j. The sum has to be equal to 36 and $r > j$ because Rachel is older.

Independent practice

Walk around monitoring that they are actually following the steps. Make sure that they are reading carefully the statement and are not rushing. Remind them to first circle the question and underline the relevant data. Have them to double check the answer. Write the following on the board "Carlos is twice as old as Eric, and the sum of their ages is 84. How old are they?"

Make sure to follow the procedure: read, plan, computation, check answer. The problem is asking for both Carlos' and Eric's age. Label them as "c" and "e". We know that $c + e = 84$; and $c = 2e$. Solving the equation we have $c = 84 - e$; therefore, $84 - e = 2e$ which takes us to $84 = 3e$ and finally $e = 28$. The answer is Eric is 28 years old ($e = 28$) and Carlos is 56 years old ($c = 56$).

Assessment

Write on the board "Humberto's dad is 48 years old. He is 18 years older than three times Humberto's age. How old is Humberto?" Try to get students to explain what and how they solved the problem instead of focusing on the answer.

Solution: let's have "d" for daddy and "h" for Humberto. We know that $d = 48$. We also know that $48 = 18 + 3h$. Solve the equations and you get $h = 10$.

Enrichment

Go to the link below called "Taming Word Problems" written by Merak Aldebaran. It is good for assigning a project to your class about working with word problems and also gives students some tools/activities to create their own problems: http://www.internet4classrooms.com/word_problems_quest.htm.

Lesson 3

Objectives

The purpose of the lesson is to teach students handle money and apply the concept to real life situations. TEKS MATH.3.14A, MATH.3.14B, MATH.3.14C, MATH.3.15B, MATH.3.16A, MATH.3.16B.

Vocabulary

Change, coin, currency, bill, label, solution, algebra, less than.

Materials

Computer, LCD projector, white board, Internet access, notebook, pencil.

Website

http://nlvm.usu.edu/en/nav/vlibrary.html (Utah State University)

Starter

Tell students that the school just got a great opportunity to raise some money. The Dynamo Academy team will face the school soccer team. For every goal that the school scores Dynamo Academy will donate $250 to the school. How much money will the school get if its team scores 5 goals? Wait for answers and check for comprehension.

Warm up

Tell your class that the Dynamo Academy is going to pay the $1,250 using hundred dollar bills and fifty dollar bills. The total number of bills will be 15. How many of each bill denomination will they use to pay the debt? Wait for answers. Use the board and show your students that "f" stands for the fifty dollar bills and "h" for the hundred bills. We know that f + h = 15 and 50f + 100h = 1,250. Solve the equations and get h = 10 f = 5. Ask students if this is the only way to pay with $100 and $50 bills? It is not.

Procedure

Review the vocabulary and make sure students get the meaning. Remind class that like good detectives they will look for evidence and find a solution. Tell the class that it is very important to understand how to handle money because this is a skill they need to survive in the real world. Remind students to read the word problem carefully and plan accordingly.

Guided practice

Write the following on the board: "We just got more good news. For the Dynamo Academy game, we will sell tickets. Adult tickets will sell at $3.00, and child tickets will go at $1.50. If 600 tickets for $1,200 were sold, how many child tickets and adult tickets would be sold?" Make sure to follow the procedure: read, plan, computation, check answer. The problem is asking for two numbers – adult tickets sold and child tickets sold. Label them as "a" and "c" respectively. We know that 600 = a + c and 3.00a + 1.50c = 1,200. Make 600 – c = a plug into the other equation; it will look like 3.00(600 – c) + 1.50c = 1,200. Solve the equation to get c = 400 and a = 200.

Independent practice

Walk around monitoring that they are actually following the steps. Make sure that they are reading carefully the statement and are not rushing. Remind them to first circle the question and underline the relevant data. Have them to double check the answer. Write the following on the board: "Laura has 21 coins; some of them are pennies, some nickels and some quarters. If you count the pennies and nickels, there are 15. If you count the nickels and quarters, there are 16. How many of the coins are pennies, how many nickels, and how many quarters?"

Make sure to follow the procedure: read, plan, computation, check answer. The problem is asking for three numbers – the number of pennies "p," number of nickels "n" and number of quarters "q". We know that p + n + q = 21. We also know that p + n = 15 and n + q = 16. Here we have three equations to solve. Make p = 15 – n and q = 16 – n. Substitute this into the first equation and get 15 – n + n + 16 – n = 21. You will get then –n + 31 = 21; therefore. –n = -10 and finally n = 10. Once you get the value for n you can solve p = 15 – 10 = 5. And q = 16 – 10 = 6. You have to make sure that 5 + 10 + 6 = 21.

Assessment

Ask the class if Laura has enough money to go to the Dynamo Academy game. If she has enough, how much money will she have left after paying for the ticket? If she does not have enough to pay for the ticket, how much money does she need to get the ticket? The problem is asking whether Laura has the $1.50 or not. Remember she is a child so she does not have to pay $3.00 but $1.50. Students should find out how much money she has $0.01(5) + 0.05(10) + 0.25(6) = 0.05 + 0.50 + 1.50 = 2.05$ then subtract $2.05 – 1.50$. The answer is yes, she has enough money to pay and she will have 0.55 left.

Observation and checking for comprehension – Try to get students to explain what and why they did what they did to solve the problem instead of focusing on the answer.

Enrichment

Go to National Library of Virtual Manipulatives website. Choose your grade level. Go to Number & Operations and pick "Money." There are three activities to practice with counting and change.

Lesson 4

Objectives

The purpose of the lesson is to teach students to translate English into mathematical expressions. TEKS MATH.3.4C, MATH.3.7B, MATH.3.14A, MATH.3.14B, MATH.3.14C, MATH.3.14D, MATH.3.15A.

Vocabulary

Greater than, order, clues, plan, number, total, consecutive.

Materials

Computer, LCD projector, white board, Internet access, notebook, pencil.

Website

http://nlvm.usu.edu/en/nav/vlibrary.html.com

Starter

Write on the board the following: "Mariana is one year older than Alexis. The sum of their age is 91. How old are they?" Remind the students that they have to find two numbers, Mariana's age and Alexis' age. Approach the problem like this: $m + a = 91$; $m = a + 1$. Then you get $a + 1 + a = 91$ which means $2a = 90$ then $a = 45$. If Mariana is one year older, then $m = 45 + 1 = 46$. You can also create a table of consecutive numbers and start guessing with 20, 21 for instance. Add the two numbers up to check if they add up 91. If they do not, then try another pair of consecutive number until the total is equal to 91.

Warm up

Write on the board: "There are 56 cars, 17 cats, and 26 trucks in the school parking lot. How many vehicles are there in the parking lot?" Wait for answers. Check that students are not including the cats in their calculations. If some students do, point it out and make sure they understand the question. The problem is asking for vehicles only.

Procedure

Review the vocabulary and make sure students get the meaning. Remind class to focus and follow the procedure to solve word problem. They are to look for evidence and find a solution. Explain that math goes beyond the textbook and can be applied to the outside world. Remind students to read the word problem carefully and plan accordingly.

Guided practice

Show class the following statement: "A shop repaired 80 vehicles (cars and motorcycles) in a week. The total number of wheels was 200. How many cars and motorcycles were repaired?"

As usual first understand what is being requested. We need to find two numbers "c" for cars repaired and "m" for motorcycles repaired at the shop. We know that c + m = 80. We also know that 4c + 2m = 200. You could multiply the first equation by 4 and then subtract the second equation. You will get 2m = 120 so m = 60. If m = 60, then c = 20.

You can also try c = 80 – m and plug it into the other equation. You will end up with 4(80 – m) + 2m = 200 which takes you to 320 - 2m = 200. Same result m = 60, c = 20.

Another way to solve it will be to make a table of pairs of numbers to check which pair meets both restraints: c + m = 80 and 4c + 2m = 200. Start with c = m = 40 which makes the first restraint true but not the second one. Show the students to make c less than m because a car has more wheels than a motorcycle. Try next c = 30 and m = 50 which also does not meet the second restraint. Go for c = 20 and m = 60 which meets both restraints.

Encourage the students to do drawings and look for similarities with other problems.

Independent practice

Walk around monitoring that they are actually following the steps. Make sure that they are reading carefully the statement and are not rushing. Remind them to first circle the question and underline the relevant data. Have them double check the answer. Write the following on the board: "In the community where the school is located, there are 24 streets. Half of this number has 15 houses on each street. In the other half there are 10 houses on each street. How many houses are there in the community?"

The problem is asking for one number "h" for total houses in the community. We know there are 24 streets. On twelve of those streets there are 15 houses on each. Let's call this half "h1". This means 12 times 15 = 180 houses, so h1 = 180. We also know that on the other twelve streets there are 10 houses on each. Let's call this half "h2". Then we have 12 times 10 = 120 houses, so h2 = 120. We know that h1 + h2 = h; therefore, 180 + 120 = 300 = h. You can encourage the students to do some drawing to see the pattern and be aware of the multiplication. The clue here is "half of the streets"; they have to realize they are looking for 24 divided by 2 and then proceed with the multiplication and finally the addition.

Assessment

Tell students that the community has agreed on painting the houses to make them look nicer. A survey was taken among the neighbors, and they chose three colors to paint their houses. Fifty percent chose to paint the house white, 25% preferred green, and 25% decided to go with yellow. How many houses will be painted in white, how many in green, and how many in red?

Students should realize they are looking for three numbers "w", "g", and "r". They should also know that the total number of houses is equal to hundred. Now they have to figure out what is half of 300 which correspond to the houses being painted in white. Then look for half of half (quarter) to get g and r. They have to check the answer probable ways 300 = w + g + r; g = r; w = 2g; w = 2r.

Enrichment

Go to National Library of Virtual Manipulatives website. Choose your grade level. Go to Number & Operations and pick "Sieve of Eratosthenes." This virtual manipulative can be used to explore patterns and relationships involving multiples.

Lesson 5

Objectives

The purpose of the lesson is to teach students to handle time, particularly to understand elapsed time. TEKS MATH.3.4C, MATH.3.7B, MATH.3.14A, MATH.3.14B, MATH.3.14C, MATH.3.14D, MATH.3.15A.

Vocabulary

Elapsed, before, later, minute, hour, day, starting, ending.

Materials

Computer, LCD projector, white board, Internet access, notebook, pencil.

Starter

Tell your class to find two consecutive numbers on the wall clock so that the sum of the numbers is an odd number greater than five. Guide comprehension and let the students try to find a solution.

Warm up

Go to <http://www.internet4classrooms.com/skills_3rd_math.htm#measurement> which has seventeen time related activities. You can pick any according to your needs. I recommend number nine "Feeding Time." I highly recommend this website, which is broken down by grade level, skill, and it is TEKS correlated. (Brooks and Byles, "Measurement").

Procedure

Review the vocabulary and make sure students get the meaning. Remind class to focus and follow the procedure to solve word problem. They are to look for evidence and find a solution. Explain that math goes beyond the textbook and can be applied to the outside world. Remind students to read the word problem carefully and plan accordingly.

Write on the board: "The school just started an afternoon soccer club. There are 45 students all together. A third of the students are girls. Boys start practice 15 minutes after dismissal. Girls start practice 5 minutes before boys. Dismissal time is 3:15 p.m. How many boys are there? What time do boys and girls start practice?" Make sure the students understand they have to find three answers: the number of boys in the club, starting time for boys, and starting time for girls. There are 45 students; of those 15 are girls because is one third. This leaves the number of boys to be 30. You can subtract 45 – 15 = 30, or you can multiply 15 by 2 because would 1/3 x 2 = 2/3. To find out the starting time of practice, point out that dismissal time is 3:15; then the boys will wait 15 minutes until 3:30 p.m. If the girls go 5 minutes earlier than the boys, then they start at 3:25 p.m.

Guided practice

Show class the following statement: "It takes Alejandra 30 minutes to walk back home from school. Her dismissal time is 3:25 p.m. Usually when she gets home, her mom is waiting for her with a yummy snack. Today when Alejandra got home, mom was not there. When mom finally showed up, Alejandra had been waiting 22 minutes. What time did mom arrive?" First tell students that the answer we are looking for is a time. If they follow the story, this time has to be later than 3:25 p.m. Start at dismissal time and count 30 minutes. Students usually will add 25 + 30 = 55 which is fine. Tell them that they can also skip count by five six times starting at 25. Either way you will get that she gets home at 3:55 p.m. Now get the second piece of information. Alejandra waited for 22 minutes. Starting at 3:55, count 22 minutes. Students will probably try to add 55 + 22 = 77, getting either 3:77 or 4:77. Point out that the minutes cannot go over 59. Try

adding five minutes to get 4:00 p.m. and then add the other 17 minutes. The answer is mom gets home at 4:17 p.m. Use the clock and show the hands moving forward while you do the counting.

Independent practice

Walk around monitoring that they are actually following the steps. Make sure that they are reading carefully the statement and are not rushing. Remind them to first circle the question and underline the relevant data. Have them double check the answer. Write on the board, "After Alejandra's mom got back home, they took 15 minutes to get ready to go to the YMCA. It is a 20 minutes driving to get there from home. Her meeting lasted one hour, and then they went straight home. What time did they get home?"

Again we are looking for a time. It has to be later than 4:17 p.m. when mom got home because of the way the story has been worded. Make sure the students understand it. The answer is 6:12 p.m. They take 1:55 minutes total. One hour in the meeting, forty minutes driving and fifteen minutes getting ready at home. Assist students with a number line so they can see it more easily. Also use an actual clock or have the students draw the clock to help visualize. The tricky part is for them to understand to count the minutes forward, paying attention to changes in the hour hand.

Assessment

Ask students to write a time type word problem. Observation and checking for comprehension – Try to get students to explain what and why they did it instead of focusing on the answer.

Enrichment

Go to National Library of Virtual Manipulatives website. Choose your grade level. Go to Measurement and pick "Time." This link will take you directly to the site:

http://nlvm.usu.edu/en/nav/grade_g_2.html

APPENDIX A

Objectives

MATH.3.4C

Use models to solve division problems and use number sentences to record the solutions for contexts involving sharing equally and measuring out.

MATH.3.7B

Identify and describe patterns in a table of related number pairs based on a meaningful problem and extend the table.

MATH.3.14A

Identify the mathematics in everyday situations.

MATH.3.14B

Solve problems that incorporate understanding the problem, making a plan, carrying out the plan, and evaluating the solution for reasonableness.

MATH.3.14C

Select or develop an appropriate problem-solving plan or strategy including drawing a picture, looking for a pattern, systematic guessing and checking, acting it out, making a table, working a simpler problem, or working backwards to solve a problem.

MATH.3.14D

Use tools such as real objects, manipulative, and technology to solve problems.

MATH.3.15A

Explain and record observations using objects, words, pictures, numbers, and technology.

MATH.3.15B

Relate informal language to mathematical language and symbols.

MATH.3.16A

Make generalizations from patterns or sets of examples and non examples.

MATH.3.16B

Justify why an answer is reasonable and explain the solution process.

APPENDIX B

Hidden Colors

Directions: There is a color hidden in each of the sentences below. See if you can find the color words and circle them on this paper.

1. Would you please buy me a quart of milk at the store?
2. I wanted to yell "OW" when I stubbed my toe on the table.
3. Bob, row next to the other boat, please.
4. Our club lacks two points to win the soccer tournament.
5. The hardware store does not open until twelve o'clock.
6. I feel I am getting older every day.
7. The "southpaw" hit every ball the pitcher threw.
8. She likes to peep in kitchens to see what is cooking
9. Don't always agree, next time he might be wrong.
10. You can go to the costume party as a cowboy or angel.

Test Your Eyes!!

Can you find the B (there are 2 B's)?

RRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRR

RRRRRRRRRRBRRRRRRRRRRRRRRRRRRRRRR

RRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRR

RRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRR

RRRRRRRRRRBRRRRRRRRRRRRRRRRRRRRRRR

RRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRR

Once you've found the B's

Find the 1

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IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII

IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII

Once you found the 1..............

Find the 6

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9999999999999999999999999999999999

9999999999999999999999999999999999

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9999999999999999999999999999999999

9999999999999999999999999999999999

9999699999999999999999999999999999

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999999999999999999999999999999999

Once you've found the 6,

Find the N (it's hard!!)

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MMMMMMMMMMMMM

MMMMMMMNMMMMM

MMMMMMMMMMMMM

MMMMMMMMMMMMM

MMMMMMMMMMMMM

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MMMMMMMMMMMMM

once you've found the N...

Find the Q.

OOOOOOOOOOOOOOOOOOOOOOOOOOOO

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OOOOOOOOOOOOOOOOOOOOOOOOOOOO

OOOOOOOOOOQOOOOOOOOOOOOOOOOO

OOOOOOOOOOOOOOOOOOOOOOOOOOOO

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