

Fractions and Spatial Problems Assignment 2 Scenarios

Scenario 1:

Haro is a 3rd grader at Manchester Elementary School. He has strong braille skills and uses Nemeth Code within UEB contexts. He is learning about fractions in his math class. Next week, Haro will participate in an Orientation & Mobility (O&M) lesson at his local convenience store. He will be purchasing up to \$2.00 worth of products. These will be shared with others in order to reinforce the concept of fractional parts. He will be walking from his home to the store 3 blocks away, accompanied by his O&M specialist, Mr. York. You have had successful collaborative lessons with Mr. York in the past.

1. What information can you share with Mr. York about the math concepts, including about fractions and money that could be embedded in this lesson?

- Meet with Mr. York to share what Haro has been learning and to brainstorm with him about opportunities for him to utilize the skills he is learning in the O&M sessions. I would explain concepts Haro has been learning in math and discuss possible ways he could practice relating fractions to his route to the store. Mr. York could use some of the manipulatives from the [APH Math Builders Kit Unit 7](#) to represent the route in parts and could also use a [Wheatley Board](#) to build the map of the route using 3 equal parts to represent the blocks Haro will travel on his way to the store – $1/3$, $2/3$, $3/3$. He could also talk about time, which can be explained in fractions – $1/2$ hour to the store, $3/4$ of an hour to shop.
- The item at the store to purchase, such as a muffin or cookie, can be split into a fraction- like I will eat $1/2$ and you can eat $1/2$.
- Money can be split into parts ($1/4$ = quarter, $1/10$ = dime, dollar is a whole, etc.). They could practice preparing his money for the trip, as it is important to organize and plan ahead of time (how to fold bills, differentiate coins, etc.).
- Mr. York could point out that his folding cane is separated into parts which can be represented by a fraction (an open cane is 3 parts joined together to make a whole $1/3+1/3+1/3 = 3/3 = 1$ whole).
- Provide reference pages to Mr. York with Nemeth numbers, signs of operation, and symbols for dollar sign and decimal. He could reference this as Haro reads information that he and I worked on during pre-teaching sessions to assist with decision making during the lesson. Haro would have a list of items to purchase and the estimated cost of

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each. He would have a list of student preferences using fractions (i.e., $\frac{1}{2}$ the class likes chocolate, $\frac{1}{4}$ of the class likes peppermint, etc.).

2. What math related materials or tools would you recommend Haro bring with him?

- Mr. York may find it helpful to give Haro a list of things that might be useful and see if Haro thinks he should bring said items. A brailled out shopping list and an abacus so he could calculate items he might purchase (with only \$2 he may not need to do this because he may be able to use his mental math skills). If an iPad or iPhone are part of his tools, he could use the [Seeing AI](#) app for multiple uses during the trip: money ID, product ID, color identification, and price identification of products).
- Mr. York may suggest that Haro bring an [APH Score Card](#) to keep track of the blocks they travel to the store and back. They would need two rows of 3, one row for the way there and one for the way back. They could punch the card for each block they traveled. They could do the same with the scorecard to represent the amount of quarters he will have to spend at the store or the amount of items they will have to buy to share with friends back at school.
- Since there is not a lot of room at convenience stores to bring a lot of materials, I would only recommend bringing items that the student will actually use independently at a store. I would save other tools for pre-teaching and follow up. I would recommend bringing: coin purse/wallet that can hold a lot of change and an iPad with [Desmos Scientific Calculator on the App Store](#) and [Supersense - AI for Blind on the App Store](#) to identify money, read barcodes and prices, and add/subtract dollars and cents.

3. What would your pre-teaching prior to the lesson look like? What would you do for a follow-up? Keep the following in mind: math concepts, using Nemeth within UEB, and math tools to assist.

- As the TVI, I could reinforce and relate all of the math skills we have learned to what Mr. York will be teaching prior to the lesson. That way, as Mr. York teaches his lesson and works in the concepts, Haro is already familiar with how to relate his math to the O&M concepts. Use the APH Math Builders Unit 7 and [APH Number Line](#) with fractions to discuss the route, the money, and the items Haro will purchase to share with friends.
- Sort his coins by touch and fold/organize his money for when he is ready to use it at the store.

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- Practice addition and subtraction on the abacus - I have \$2 and I spend \$1.39. How much money should I get back? Estimating money to prepare for taxes spent.
- What \$2.00 can actually buy and get a wallet ready with the money. The teacher can also work out price comparisons in supermarkets. Also the idea can be discussed about scales in stores, that most likely don't talk, but fractions are all over a store like in buying $\frac{1}{2}$ pound of apples or 1 whole pound of potatoes.
- Practice fractions with manipulatives such as playdough.
- Practice his UEB and Nemeth skills by writing a list of items he might want to purchase and estimating the cost of those items (using the iPad for research on product).
- Once he is back from the store, reflect on how many of the skills he was able to use on the trip. He could write or explain how he was able to apply the use of fractions in the real world and he could use manipulatives mentioned to show his thinking.
- Follow up – if store has the potatoes at $\frac{1}{2}$ off, what does that mean? And practice the actual problem with Haro. When families/friends go to a restaurant and split the bill, what does that look like? If it is split in half or in thirds??
- Practice the purchase using a \$2-bill and/or using coins prior to Mr. York and Haro's trip to their local convenience store. To model the transaction, Mr. York could pretend to be the cashier and Haro would have to find an object and go through the physical and verbal process of bringing his item to the register to buy it with real money. Mr. York could practice giving Haro the correct and incorrect change to model the importance of good money management skills.
- Follow-up after lesson: Have him bring the receipt and retell his experience. How did he choose? What were the prices? Did he calculate in his head or use the calculator? Have him write a story problem about his experience using the Perkins (Nemeth within UEB). Have him write a spatial money equation to solve his story problem using the Perkins. Use the items he bought to reinforce fractional parts. How will he split the items up with his classmates?
- The point of the lesson is to practice using fractions to share the items purchased, you need to ensure that the items purchased are easily shared. Therefore, before the shopping trip, help the student develop an understanding of items which can be divided into equal size pieces, or come in pieces to be distributed into groups. Compare products - M&M's, chips vs doughnuts or soda. Look at serving size and how many servings per bag. If there are 25 students in his class is it reasonable to cut a doughnut into 25 pieces? How would he split the soda equally?

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- Prior to the trip, pre-teach skills and/or review skills of dollar sign, decimal, and opening and closing fraction indicators as well as the horizontal fraction line in Nemeth code. Provide guided practice for writing addition and subtraction problems using decimals on his [Perkins braillewriter](#) and include opportunities to read spatial addition and subtraction problems with monetary amounts including dollar sign and decimal points. Practice these on the abacus as well. Tools for pre-teaching:
 - [Unit 7 Mathbuilders Kit](#)
 - [Hundreds Board with Manipulatives](#) to demonstrate fractions
 - [Ten Frame](#)
 - EZeeCOUNT Abacus – discontinued from APH, but still in our inventory
 - [Number Line Device](#)
 - Perkins Braillewriter

Scenario 2:

It's parent-teacher conferences time! You are the TVI for Izzy, a 4th grader who is a dual-media learner at Hawthorne Prep Academy. She has cerebral palsy and limited fine motor skills on her left side. She does a great job with one-handed braille but needs extra time to complete her work. She is slightly below grade level in math and continues to work on memorizing math facts. Izzy uses Nemeth Code within UEB for most of her math educational materials as well as a CCTV to reinforce visual concepts. You will be attending the parent-teacher conference as well. During the 20-minute conference a few items will be discussed.

1. The class has been working on long division. You noticed that Izzy is understanding the concepts but having difficulty rolling the braille paper up and down to align the columns and braille the quotient. Her parents commented that it's taking her over an hour to complete the math homework on most nights. What accommodations or alternatives would you suggest for completing long division and the homework time commitment?

- Izzy's teacher and parents consider allowing her to complete less problems than what is normally assigned. She could complete only the odd or even numbered problems or as a team they could decide on a set number of problems Izzy must complete for homework. Only show work for selected problems.
- Allow someone to assist Izzy in manipulating the braillewriter under her direction.
- Introduce the alternative long division method (referred to as the "t-method" or "hangman method" by general education teachers) if her teacher needs her to show her work for her math homework. This method allows Izzy to show her work and understanding of the concepts the same way as other students are, but she does not have to constantly roll the braille paper up and down to align the columns.
- Using manipulatives, such as an APH 100s Board, a sorting tray with base 10 blocks, or a Cranmer Abacus. She can also use a Braillewriter to braille full cells in groups with the value of the divisor in each row until the dividend is reached.
- Use the CCTV to help visually reinforce the long division concepts she is learning, while using Speech-To-Text or a similar app to help Izzy fill in and keep track of the steps and alignment of a long division problem. If Izzy's classroom teacher has a digital worksheet of the problems that need to be completed, this process can be further simplified.

2. The classroom teacher recommended a list of educational apps for tablets and computers that can reinforce math facts. Izzy's parents were interested

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in how Izzy can access some of the educational math games on the family's iPad. What suggestions do you have for the family? Are there any apps that you can recommend for Izzy that are accessible?

- Teach Izzy prerequisite iPad accessibility features and gestures such as drag and split tap gestures, VoiceOver, Sonification, and Earcons. Izzy will learn critical skills through experience, such as spatial concepts and mental mapping (top/bottom, quadrants, rows/columns, grids).
- The TSBVI website has an iPad accessibility booklet based on iOS6 from 2013, it is dated but many of the features in there can still be used.
- Suggested apps:
 - [Blindfold Games](#)
 - Melodies by EveryWare Technologies
 - Math Melodies by Retina Italia Onlus
 - My Math Flash Cards App by Power Math Apps
 - FlashToPass Free Math Flash Cards by Scybot Technologies, LLC
 - Flashcards+ by Connor Zwick (choose from premade decks or customize own decks)
 - SAS Flash Cards by SAS Institute Inc. (choose from premade decks or customize own decks)
 - Math Cards!!/Ace Math Flash Cards by Horizon Business, Inc.
 - Planet Kranos- grid concepts
 - ViA - By Braille Institute app is one app that helps users search through all apps that are compatible with VoiceOver, and could be used by Izzy or Izzy's parents to find even more educational apps, specifically those that focus on math facts and practice.
 - Ballyland Magic Plus app by Charlotte Cushman can help Izzy learn and practice touch gestures with VoiceOver if Izzy is unfamiliar with the skills and could benefit from an app that exclusively practices these skills.
 - [Math Robot](#) App which provides fun math fact drills
 - Slapstick Math App- Free app from APH
 - [Thinking Cap Math](#)
 - [Code Quest](#)
 - Animal Watch Suite which incorporates common core standards for grades 5-7 would be good for Izzy.
 - Objective Ed to teach basic iPad gestures
 - Quick Math Jr- School Edition
 - Marble Math
 - 4 Dice: Fraction Game
 - 5 Dice: Order of Operations
 - Dimension U

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- Education Galaxy
- Fiete Math Climber
- Fun Brain
- There are websites that also have a comprehensive list, just be aware that accessibility will depend upon Izzy's ability to manipulate the environment. Some websites for math game listings are:
 - [Tech Learning](#)
 - [Teacher with Apps](#)
 - [EduPad](#).
 - [Math Matters](#)
 - [Mobile Guardian](#)
- I would suggest trying the three-finger double tap zoom magnification feature on math games that are not accessible with a screen reader. While some games are too visually busy or have action that gets pushed off the screen in zoom, others may be visually simple and big enough to see using zoom. It might also be fun to try some visually simple math games, like Rummikub <http://amzn.to/2ENImwH> or [Moby Math Whale](#) with a partner using the CCTV. The game [Think Fun Math Dice Jr.](#) has tactile colored dice, a simple game board that could be adapted with tactile lines, and a 12-sided die that could be replaced with this [larger](#) one for larger print numbers and a wider surface to put Nemeth stickers on.

3. What other tools, games, or suggestions would you provide to reinforce math concepts for Izzy either in the classroom or at home?

- Game Ideas: Qwirkle, Yahtzee, games with dice, or have students be creative and make up their own math games and then have students teach their peers how to play their game.
- Multiplication War with a set of Braille playing cards on her own or with a family member or family members. Each person playing the game will flip the two topmost cards of their deck face up, then multiply the two numbers on the cards together. Whoever has the highest product from their two cards wins all of the cards for that round. The player with the most cards at the end of the game, or the player who has all of the cards at the end of the game, wins.
- Multiplication War can be adapted to work with practicing division facts in Division War by creating a deck of Braille cards of divisors from 0-10 or 0-20, and a deck of dividends consisting of 1-digit, 2-digit, 3-digit, or so on, numbers. Each player would pick one card from their divisor deck and one card from their dividend deck, then divide their dividend by the divisor. Whoever ends up with the highest quotient (including remainders) wins the set of cards for the round. Division War requires much more set up from Izzy's parents or from a teacher, and leads

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towards some long division problems that end with remainders, but can be adapted to practice specific types of problems (e.g. 4-digit numbers divided by 2-digit numbers) Izzy is seeing in class.

- Bingo! to encourage multiplication or division facts. The boxes on the Bingo card (with a grid of size 3x3, 4x4, 5x5, etc.) will be filled with numbers of common products (or quotients), such as 18, 24, 42, 81, etc. Each person playing the game can make their own Bingo card filling in their own products (or quotients) before the game begins for even more individuality, though this requires advance preparation and extended time since Izzy's cards are likely to use raised lines or Braille. A multiplication (or division) problem (3 x 6, 4 x 6, 6 x 7, 9 x 9, etc.) is called out or drawn from a pile, then each person solves for the product (or quotient). If the product (or quotient) is on the person's card, then they can mark off that Bingo space on their card. Any Bingo type of "win" can be used based on preference of the teacher or Izzy's family. The game can be modified to use two or more dice for the multiplication (or division) problem over drawing a card from a pile or calling out the problem, and may also be played as a single-player game in this way.
- Use Legos (bricks, beams, minifigs, etc.) or other objects (beans, coins, clay, etc.) as a tool in helping her lay out and "see" the multiplication or division problem as an array of rows and columns or grouping into sets.
- Tools/ Suggestions:
 - Sing math songs about math facts
 - Math Facts flashcards from APH or homemade
 - Manipulatives: counters, ones, rods, and flats, hundreds board, tens frame
 - Making arrays with the Connect 4 game, using candy like M&Ms or Skittles to make arrays, stickers or a hole punch make great arrays.
 - Using coins to practice skip counting or adding
 - Take turns skip counting by random numbers
- APH's Math Drill Cards for Multiplication & Division; APH's Quick Pick Math: Division; APH's Math Flash Software with digital flash card drills, APH's game board and use math facts cards to move spaces, APH hundreds chart with removable shapes.
- Base ten blocks and the APH divider to practice place value and comparing decimals.
- Perkins School for the Blind eLearning website that provides wonderful game suggestions for kids of all ages and is a great resource for parents.

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- Card games or other games that can be played with siblings and/or other family members are a fun way to practice math skills. For example, use the numeric cards from a brailled deck of playing cards or Uno cards. Draw two cards from the deck to multiply. Players take turns reading the two cards aloud (multiplicand, multiplier) and saying the result (product). A talking calculator can be used to check results. In addition to games, hands-on activities are great. If Izzy likes to cook, she could practice doubling or tripling a recipe; dividing it; or even calculating how much of each ingredient she would need for the whole class. Since multiplying fractions may be too advanced at this point, one way to talk about the measurements is “how many scoops do we need if the original recipe calls for 2 scoops [whether $\frac{1}{2}$ cup, $\frac{1}{3}$ cup, or other] and we are making 3 times as much” [= 6 scoops regardless of the size of the scoop]. Vegetable soup would be a quick and easy recipe to adjust: instead of measuring by scoop, actual vegetables could be used e.g. count out a few baby carrots, baby potatoes, pieces of celery, beans, etc. and then figure out how to make a larger amount such as 6x or 7x as much. If she has a chore chart for things like cleaning her room, doing dishes, etc. then tie points to those activities and calculate the point accumulation per week, month, year. The same could be done with allowance amounts to calculate accumulation of money over various lengths of time and also division of that same money (a box for savings, a box for spending, and a box for donations that she divides her allowance amongst). Whether points or money, kids can see their assets grow and base calculations around both savings and spending.