Math Lesson – Fundraising: Henna Designs

Outcomes or Learning Goals

The story *Henna Designs* provides an opportunity for students to learn about the problem-solving skills needed when working to accomplish a goal – fundraising in this case. The story also supports issues of project management, collaboration and planning. The related math problems address reading and interpreting money values, and making change.

Grade Level

MAT1LZ – Locally Developed Math grade 9
MAT2LZ – Locally Developed Math grade 10

Context & Rationale

In the book *Henna Designs*, we read about a group of students who are members of a group called the Water Ambassadors. The Water Ambassadors have a goal of raising money to help build a well for clean water in an African country. Mariam and her friends decide to sell henna designs as their fundraising project. Students learn about the planning involved in a fundraising project, as well as the mathematical skills and financial concepts needed to realize such a plan.

Related Topics/Units

• solve problems involving money drawn from everyday situations (Gr. 9, 10)
• communicate information about money concepts/sense (Gr. 9, 10)
• write money values, using correct units (Gr. 9)
• enter decimal numbers correctly on a numerical key pad (Gr. 9)
• demonstrate the effective use of a calculator in operations with decimals (Gr. 9, 10)
• estimate the change for a transaction (Gr. 9)
• represent a given coin or bill as a combination of other coins or bills (Gr. 9)
• identify different combinations of coins and bills that would result in a given amount of money (Gr. 9)
• make the correct change for an offered amount with and without concrete materials (Gr. 9)
• solve problems involving the accomplishment of a particular goal, including investigating, planning, gathering, and organizing data and making relevant calculations (Gr. 10)
• verbalize their observations and reflections regarding money sense and ask questions to clarify their understanding (Gr. 9, 10)
• communicate, orally and in writing, the solutions to money problems and the results of investigations, using appropriate terminology, symbols and form (Gr. 9, 10)
• explain their reasoning used in problem solving and in judging reasonableness (Gr. 9, 10)
• develop, select, and apply problem-solving strategies while posing and solving problems (Gr. 9)

Number Sense and Numeration Skills from the Ontario Mathematics Curriculum, Grades 1-8 (2005), that link well to this lesson and would support the needs of limited prior formal learning students are:

• estimate, count, and represent (using the $ symbol) the value of a collection of coins and bills with a maximum value of $100 (Gr. 4)
• solve problems that arise from real-life situations and that relate to the magnitude of whole numbers up to 10 000 (Gr. 4)
• add and subtract three-digit numbers, using concrete materials, student-generated algorithms, and standard algorithms
• add and subtract money amounts up to $100 (Gr. 4)
• add and subtract decimal numbers to hundredths, including money amounts, using concrete materials, estimation, and algorithms (Gr. 5)

Lesson Sequence

Part 1 Minds On/Prior Learning (15 minutes estimated for this section)	What to prepare

Activity
Remind students of the book they have read, *Henna Designs*.
 	
Page through the book and identify as many things as possible the group needed to think about to do to prepare for their fundraising event.
 	
One thing that Mariam and her friends would need on the day of their fundraising project is to have a "float" – a tray of money available to them so that they can make change.
 	
Let's think about making change …
 	
Record $10, $5, $2, $1, 25¢, 10¢, 5¢, on the whiteboard. Typically, there would be a quantity of these bills and coins in a float.
 	
Underneath, write two numbers on the board. The first number represents how much an item costs, and the second number represents how much money was used to pay for the item.
The students can think of the first number as their starting number, and the second number as their target number. The goal is to find the difference between these two numbers. The challenge is that they can only use the numbers in the list (bill and coin amounts) when finding the difference.
 	
Try one or two together, recording on the whiteboard, for example:
$3.50 - $20 ($3.50 is the starting point, so need to add 25¢, 25¢, $1, $5,
        $10 to get to $20, therefore the difference, or change,
         would be $16.50).
	Copies of the book
	
	Blank/scrap paper or Math Logs
	
	OPTIONAL (If needed to support meaning of text):
	• photos of: henna, henna dyes, henna designs
	
	NOTE: Dyes are made from the henna plant (from crushed leaves, turmeric and oil), and used to create temporary designs on the skin. Henna tattoos last for a few weeks. They are popular during weddings and festivals in India, and are usually done on the palms and feet.

Students work either on their own, or with a partner. They can record on paper or in Math Logs if they have them.
As they add up the numbers, they should record the numbers used (i.e., from the list).

$1.75 - $5.00
$7.30 - $20.00
$25.05 - $40.00

Circulate to assess learning.

Select a small number of students share their work. If students do not use minimum number of coins and bills, ask if anyone can find the difference using fewer.

To Differentiate:
Use prices that students would need to round off, as pennies are no longer used as currency. For example:
56¢ - 75¢
78¢ - $2.00
$1.62 - $5.00

Assessment

For each student, assess ability to find the difference (change) using dollar and coin amounts. Note addition strategies used as well as computational fluency.

Part 2 – Work On It
(30 minutes estimated for this section)

Work in small groups - 2 per group.
The following set of parallel tasks, based on the same context, offers an opportunity to differentiate learning.
Look at the page showing images of henna designs and costs. Encourage students to estimate the answer before finding a solution.

Problem A
Marian and her friends raised $89 in four days.
What combination of small and large designs could they have made?

Problem B
Small henna designs are two for $3.75. Four friends each get a small henna design and offer a $20 bill as payment. Is it enough?
What collection of bills and coins could they get as change?
OR How much more money would they need?

Chart paper for students to record thinking and solution.

	Recording sheet needed for Problem C (see Appendix)
Problem C (see graphic in appendix) Three friends want henna designs. The cost for large henna designs is $3.00 each, or two or more for $2.75. They dig into their pockets and find this change. Is this enough money for each of them to get a large henna design? How much money would they have left over? OR How much more money would they need? ## Activities During Work Period • Students work with partners and record question, work/thinking, and answer on chart paper. • Grid chart paper works well when working with decimals and money. • Teacher visits partners to clarify the question they are answering and to see if they have a strategy to start/continue working on the problem. • Challenge students who solve their problem quickly to answer one of the other problems or to create their own problem based on the henna designs fundraising project. • Teacher thinks about which solutions to share in the third part of the lesson, and the order in which they will be shared.	
## Assessment For each student, observe and document: - problem solving and strategies, - computational strategies and fluency - fluency with money and making change	
## Part 3 – Conclude & Share Solutions (20 minutes estimated for this section)	
## Activity The 2 – 4 solutions selected are shared, from simplest solution/problem to most complex. As students share their work, encourage them to discuss: - how they figured out what they question was asking (problem solving strategies) - how they solved the problem (computational strategies) - what part of the problem they found challenging and how they handled that challenge Invite other students to ask questions of the presenters. An interesting way to share solutions is to post student work, one at a time, and then have students turn and talk to a partner about what they think the students did to solve the problem. Students then share their	

hypothesis/thinking with the whole group, and the creators of the solution can explain their thinking at the end.	
Follow up Problem A Choose any amount of money between $50 and $100. What combination of small and large designs could Mariam and her team have made? Problem B Write a reflection in your Math Log: What did you learn today about adding money and/or making change? Problem C Create your own henna design problem: What are other prices might the group charge for henna designs? Choose a number of friends who want to buy henna designs. Choose an amount of money that they have to buy the designs (either a bill or bills or a collection of coins). Is this enough money for each of them to get a henna design? What combination of bills and coins would they get for change? OR How much money would they have left over?	
Assessment For each student, continue to observe and document: - problem solving and strategies, - computational strategies and fluency - fluency with money and making change Based on your assessment for learning data, do students need additional opportunities to: - count collections of bills and coins - determine difference between cost and money for payment - make change - develop problem solving skills - communicate thinking and reasoning - develop computational fluency (both mental computational skills as well as student-generated and formal algorithms) Select problems for future exploration based on student learning needs.	

Problem C
Three friends want henna designs.
The cost for large henna designs is $3.00 each, or two or more for $2.75.
They dig into their pockets and find this change.
Is this enough money for each of them to get a large henna design?
How much money would they have left over?