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## Pepe's Party

This problem gives you the chance to:

- use numbers and prices in a real situation
- 

Pepe is having a party.

There will be 20 people at the party.

Here is the price list for things Pepe needs.

<b>Party supplies!</b>	
Plastic knife, fork, and spoon set	30¢
Package of 10 paper plates	\$2.75
Package of 5 paper cups	\$1.50

1. Complete the table to show the prices for 20 plastic knives, 20 forks, and 20 spoons, 20 paper plates and 20 paper cups.

	<b>Number of packages</b>	<b>Price</b>
Plastic knife, fork, and spoon set		\$
Paper plates		\$
Paper cups		\$

Show your calculations.

2. Pepe also wants to buy 20 party hats.

A package of 8 hats costs \$1.50. The shop will not split a package.

The price of 1 hat is 30¢.

What is the cheapest price for 20 hats?                      \$ \_\_\_\_\_

Explain how you figured it out.

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**10**

Pepe's Party	Rubric	
<p>The core elements of performance required by this task are:</p> <ul style="list-style-type: none"> <li>• use numbers and prices in a real situation</li> </ul> <p>Based on these, credit for specific aspects of performance should be assigned as follows</p>	points	section points
<p>1. Gives correct answer for knives, forks and spoons: <b>\$6</b> Shows work such as: <math>20 \times 30</math></p> <p>Gives correct answer for plates: <b>\$5.50</b> Shows work such as: <math>2 \times 2.75</math></p> <p>Gives correct answer for cups: <b>\$6</b> Shows work such as: <math>4 \times 1.50</math></p>	<p>1 1  1 1  1 1</p>	<p>6</p>
<p>2. Gives correct answer: <b>\$4.20</b></p> <p>Gives correct explanation such as: Price of 20 x 1 hats is <math>20 \times 30\text{¢} = \\$6</math> Price of 3 packs of 8 hats is <math>3 \times \\$1.50 = \\$4.50</math> Cheapest price is <math>(2 \times 8 + 4)</math> hats. Price of <math>(2 \times 8 + 4)</math> hats is <math>2 \times \\$1.50 + 4 \times 30\text{¢} = \\$4.20</math></p>	<p>1  1 1  1</p>	<p>4</p>
<b>Total Points</b>		<b>10</b>

### Fifth Grade – Task 4: Pepe’s Party

Work the task and examine the rubric.

What does the student have to understand about equal groups and multiplication to work this problem?

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Look at student work on part one for silver ware. How many of your students put:

\$6.00	30 cents	90 cents	\$18	\$30	Other

In each case, what did the student not understand about groups?

Look at student work on part 2:

- How many students put \$2.75?
- How many students put \$55.00?

What were they thinking about?

What evidence did you see that students were confused about decimal place value?

Students had difficulty with the idea of making a comparison in part two of the task. In order to make a comparison, there must be other values to compare against. In part two, how many of your students thought the best buy was:

\$4.20	\$6.00	\$4.50	\$2.40	\$1.50	\$30	Other

- How many students only thought about one value – this is the best?
- How many tried two possible ways of buying the hats?
- How many could not calculate even one way of buying 20 hats correctly?

How does this data make you think about the different types of experiences that the students need?

## Looking at Student Work on Pepe's Party

Student A can think about sets and packages and uses multiplication to find the cost of the different picnic items in part one. The student is also able to think about the different ways of buying party hats and uses that to compare between the options to find the best buy.

### Student A

1. Complete the table to show the prices for 20 plastic knives, 20 forks, and 20 spoons, 20 paper plates and 20 paper cups.

	Number of packages	Price
Plastic knife, fork, and spoon set	20	\$ 6.00 ✓✓
Paper plates	2	\$ 5.50 ✓✓
Paper cups	4	\$ 6.00 ✓✓

Show your calculations.

$$\begin{array}{r} 1.50 \\ \times 4 \\ \hline 6.00 \end{array} \checkmark$$

$$\begin{array}{r} 2.75 \\ + 2 \\ \hline 5.50 \end{array} \checkmark$$

$$\begin{array}{r} 30 \\ + 20 \\ \hline 6.00 \end{array} \checkmark$$

2. Pepe also wants to buy 20 party hats.

A package of 8 hats costs \$1.50. The shop will not split a package.

The price of 1 hat is 30¢.

What is the cheapest price for 20 hats?

\$ 4.20 ✓✓✓

Explain how you figured it out.

$$\begin{array}{l} 8 \times 2 = 16 \\ 8 \times 3 = 24 \end{array}$$

$$\begin{array}{r} 1.50 \\ + 1.20 \\ \hline 2.70 \\ + 1.50 \\ \hline 4.20 \end{array} \checkmark$$

$$\begin{array}{r} 30 \\ + 1.20 \\ \hline 4.50 \end{array} \checkmark$$

$$\begin{array}{r} 30 \\ + 2.00 \\ \hline 6.00 \end{array} \checkmark$$

Student B does a nice piece of logic by finding the cost of 2 packages and then only looking at the individual and package rate for the addition 4 hats. The student doesn't consider the cost of buying all the hats at the individual rate.

**Student B**

2. Pepe also wants to buy 20 party hats.

A package of 8 hats costs \$1.50. The shop will not split a package.

The price of 1 hat is 30¢.

What is the cheapest price for 20 hats?

\$ 4.20 ✓

Explain how you figured it out.

1.50 times 2 = 3.00 another package  
 cost 1.50 but four 1's = 1.20 so 3.00 + 1.20 = 4.20 ✓  
 #4.20 ✓

Student C may have difficulty with the idea of a group or package. The student's totals are correct on part one, but the table does not make sense. Student C also ignores the cost of buying all the hats individually.

**Student C**

1. Complete the table to show the prices for 20 plastic knives, 20 forks, and 20 spoons, 20 paper plates and 20 paper cups.

	Number of packages	Price
Plastic knife, fork, and spoon set	20	\$ 6.00 ✓✓
Paper plates	20	\$ 5.50 ✓✓
Paper cups	20	\$ 6.00 ✓✓

Show your calculations.

10 paper plates \$2.75  
 \$2.75  
 x 2  
 \$5.50 ✓✓

5 paper cups = \$1.50  
 \$1.50  
 x 4  
 \$6.00 ✓

Plastic knife, fork, spoon set  
 30¢  
 x 20  
 6.00 ✓

**Student C, part 2**

2. Pepe also wants to buy 20 party hats.

A package of 8 hats costs \$1.50. The shop will not split a package.

The price of 1 hat is 30¢.

What is the cheapest price for 20 hats?

\$ 4.20 ✓✓✓

Explain how you figured it out.

I multiplied  $\$1.50 \times 3 = 4.50$ . The shop will not split a package so you will have 4 extra. I then  $\$1.50 \times 2 = 3.00$ . I did  $\$3.00 + (4 \times 30¢) = 4.20$  ✓

While Student D is able to get the best price for buying the hats, the student has failed to see if there are better options.

**Student D**

$$\begin{array}{r} \cancel{1.50} \\ \times 3 \\ \hline 4.50 \end{array}$$

$$\begin{array}{r} \$3.00 = 16 \\ 4.20 \end{array}$$

2. Pepe also wants to buy 20 party hats.

A package of 8 hats costs \$1.50. The shop will not split a package.

The price of 1 hat is 30¢.

What is the cheapest price for 20 hats?

\$ 4.20 ✓✓

Explain how you figured it out.

I took two packages of 8, so I did  $\$1.50 \times 2 = \$3$ . Then I only needed 4 hats left, so I did  $30¢ \times 4 = \$1.20$ . Then I did  $\$3 + \$1.20 = \$4.20$  ✓

Student E considers the option of all packages or all individual hats, but doesn't consider using a combination of the two options. *How do we help students try to optimize the possibilities? How often do we ask students to provide other alternatives?*

**Student E**

2. Pepe also wants to buy 20 party hats.

A package of 8 hats costs \$1.50. The shop will not split a package.

The price of 1 hat is 30¢.

What is the cheapest price for 20 hats?

\$ 4.50 X

Explain how you figured it out.

Well my work is shown below but in words it's like this. First I got \$1.50 and multiplied it by 3 because if I do it by 2 you get only 16 hats ✓ so as I was saying it equaled \$4.50 Then I did  $30 \times 20$  which equaled \$6.00. ~~\$4.50~~ was cheaper so the 8 hats thing was better and cheaper

$$\begin{array}{r} 1 \\ 24 \Rightarrow 1.50 \\ \times 3 \\ \hline 4.50 \end{array}$$

$$\begin{array}{r} X \\ 20 \Rightarrow 30 \\ \times 20 \\ \hline 00 \\ 600 \\ \hline 6.00 \end{array}$$

(8)

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When learning a new idea or concept, students often slip back and forth with old ideas. Student G is able to think about how many packages of plates or cups are needed and use addition or multiplication to find the cost. However, the student adds money and things together for silverware.

**Student G**

	Number of packages	Price
Plastic knife, fork, and spoon set	1	\$ 9.00 ✓
Paper plates	2	\$ 5.50 ✓
Paper cups	4	\$ 6.00 ✓

Show your calculations.

$$\begin{array}{r} 30 \text{¢} \\ + 20 \text{ things} \\ \hline 50 \\ + 20 \\ \hline 70 \\ + 20 \\ \hline 90 \end{array}$$

$$\begin{array}{r} 2.75 \\ + 2.75 \\ \hline 5.50 \\ \times 2 \\ \hline 11.00 \\ \times 9 \\ \hline 99.00 \end{array}$$

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Student H misinterprets the idea of set for the silverware and buys 60 sets instead of 30 sets.

**Student H**

1. Complete the table to show the prices for 20 plastic knives, 20 forks, and 20 spoons, 20 paper plates and 20 paper cups.

	Number of packages	Price
Plastic knife, fork, and spoon set	60	\$ 18.00 ✓
Paper plates	2	\$ 5.50 ✓
Paper cups	4	\$ 6.00 ✓

Show your calculations.

$$\begin{array}{r} 1.50 \\ \times 4 \\ \hline 6.00 \end{array}$$

$$\begin{array}{r} 20 \text{ knife} \\ + 20 \text{ forks} \\ + 20 \text{ spoons} \\ \hline 60 \end{array}$$

$$\begin{array}{r} 20 \\ \times 30 \\ \hline 600 \\ \hline 600 \end{array}$$

$$\begin{array}{r} 2.75 \\ + 2.75 \\ \hline 5.50 \end{array}$$

$$\begin{array}{r} 1.50 \\ \times 4 \\ \hline 6.00 \end{array}$$

$$\begin{array}{r} 2.75 \\ + 2.75 \\ \hline 5.50 \end{array}$$

$$\begin{array}{r} 5.50 \\ + 5.50 \\ \hline 11.00 \end{array}$$

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Student K also makes place value errors. *What is Student K's misconception? How is it different from Student J?*

**Student K**

- Complete the table to show the prices for 20 plastic knives, 20 forks, and 20 spoons, 20 paper plates and 20 paper cups.

	Number of packages	Price
Plastic knife, fork, and spoon set	20	\$6.00 ✓
Paper plates	2	\$65.00 ✗
Paper cups	4	\$30.00 ✗

Student L is struggling with the idea of making equal groups. For plates and cups, the process for finding the number of groups needed is to divide the number of parts per package into 20. *Why didn't this process work for silverware?*

**Student L**

- Complete the table to show the prices for 20 plastic knives, 20 forks, and 20 spoons, 20 paper plates and 20 paper cups.

	Number of packages	Price
Plastic knife, fork, and spoon set	7	\$2.10 ✗
Paper plates	2	\$5.50 ✓
Paper cups	4	\$6.00 ✓

Show your calculations. \$13.60

Student M is just reading information off the advertisement to fill in the table. The student does not use the idea of groups or repeated addition. The student cannot think about operation in context. In part 2, the student is still in matching mode. 8 hats and 1 hat = \$1.50 + \$.30 = \$1.80. There is no attempt at finding the 20 hats.

**Student M**

Party supplies!	
Plastic knife, fork, and spoon set	30¢
Package of 10 paper plates	\$2.75
Package of 5 paper cups	\$1.50

1. Complete the table to show the prices for 20 plastic knives, 20 forks, and 20 spoons, 20 paper plates and 20 paper cups.

	Number of packages	Price
Plastic knife, fork, and spoon set	20	\$ 30¢ <del>x</del> 0
Paper plates	20	\$ 2.75 <del>x</del> 0
Paper cups	20	\$ 1.50 <del>x</del> 0

Show your calculations

2. Pepe also wants to buy 20 party hats.

A package of 8 hats costs \$1.50. The shop will not split a package.

The price of 1 hat is 30¢.

What is the cheapest price for 20 hats? \$ 1.80 ~~x~~ 0

Explain how you figured it out.

Pepe want to buy 20 party hats.  
 There are 8 hats that cost \$1.50.  
 There are hats that is 30¢.  
 $1.50 + 30¢ = 1.80$  ~~x~~ 0

Student N is also struggling with the meaning of operations in context,. In part one the student adds number of plates to cost of plates. *What kind of label would make sense for that answer? How do we help students to see that adding does not change the label?* In part two the student takes the 8 hats times the cost of 1 hat to find the cost of 8 hats. The student is not thinking about what is being found from the calculation, not attaching meaning to the calculations.

**Student N**

1. Complete the table to show the prices for 20 plastic knives, 20 forks, and 20 spoons, 20 paper plates and 20 paper cups.

	Number of packages	Price
Plastic knife, fork, and spoon set	20	\$ 50 <sup>¢</sup>
Paper plates	20	\$ 2.95
Paper cups	20	\$ 1.70

Show your calculations.

Plates

$$\begin{array}{r} 20 \\ + 2.75 \\ \hline 2.95 \end{array}$$

Plastics

$$\begin{array}{r} 20 \\ + 30 \\ \hline 50 \end{array}$$

Cups

$$\begin{array}{r} 20 \\ + 1.50 \\ \hline 1.70 \end{array}$$

## Fifth Grade

### 5<sup>th</sup> Grade

### Task 4

### Pepe's Party

<b>Student Task</b>	Use a variety of operations to find the cost of items for a party, including reasoning about remainders in a familiar setting, and making comparisons of different options to find the best price.
<b>Core Idea 2 Number Operations</b>	<b>Understand the meanings of operations and how they relate to each other, make reasonable estimates, and compute fluently.</b> <ul style="list-style-type: none"><li>• Develop fluency with dividing whole numbers</li><li>• Understand the meaning of remainders by modeling division problems</li><li>• Reason about and solve problem situations that involve more than one operation in multi-step problems</li></ul>

#### *Mathematics of the task:*

- Understand equal groups in relationship to multiplication and division
- Use decimals in context
- Think of alternative ways of buying a given number of hats
- Identify the best price from alternatives

#### *According to teacher observations, this is what fifth graders knew and were able to do:*

- Multiply accurately
- Use repeated addition to find multiple quantities of the same thing

#### *Areas of difficulty for fifth graders:*

- Finding out the number of packages needed to make 20 sets
- Recognizing when to use multiplication and division in a context
- Finding alternative ways to buy 20 hats
- Using at least 2 values to make a comparison

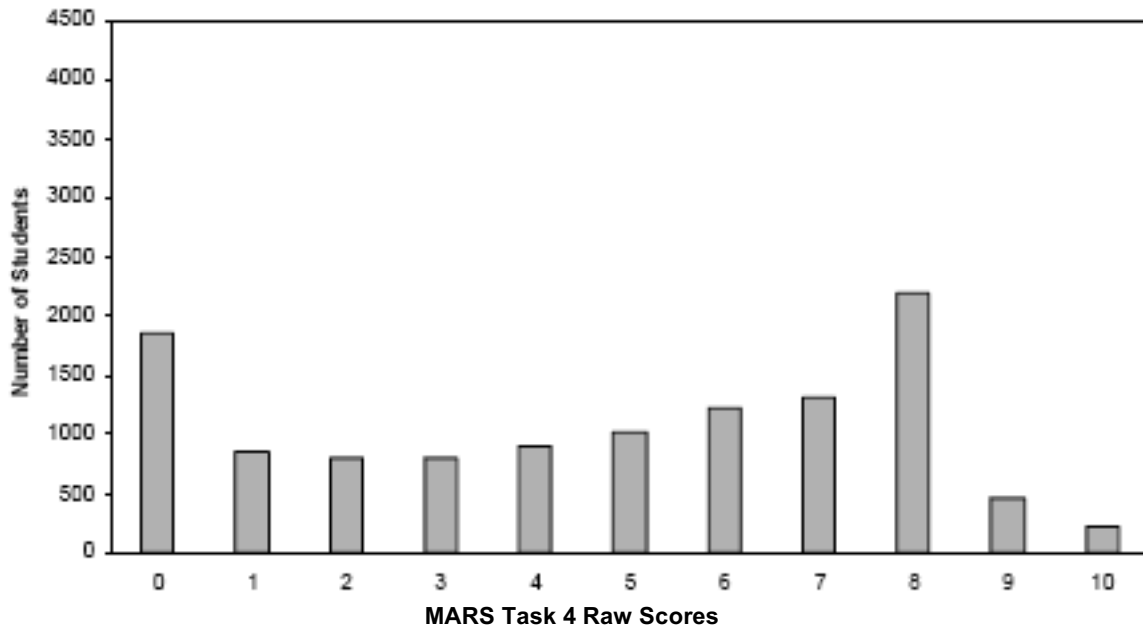
**Task 4 – Pepe’s Party**

Mean: 4.64      StdDev: 3.06

Table 28: Frequency Distribution of MARS Test Task 4, Grade 5

Task 4 Scores	Student Count	% at or below	% at or above
0	1858	16.0%	100.0%
1	844	23.2%	84.0%
2	795	30.1%	76.8%
3	801	37.0%	69.9%
4	908	44.8%	63.0%
5	1027	53.6%	55.2%
6	1215	64.1%	46.4%
7	1301	75.3%	35.9%
8	2197	94.2%	24.7%
9	460	98.1%	5.8%
10	220	100.0%	1.9%

Figure 37: Bar Graph of MARS Test Task 4 Raw Scores, Grade 5



The maximum score available for this task is 10 points.  
 The minimum score for a level 3 response, meeting standards, is 5 points.

Most students, 84%, could find the cost of 20 party hats at 30 cents each. About half the students could find the cost of paper plates and paper cups and calculate one of the options for buying party hats. About 1/4 of the students could find all of the costs for part one and either find the best price by calculating the combination of packages and individual hats or miss the best price because they only calculated all singles or all packages. Less than 2% of the students could meet all the demands of the task including finding 3 ways to buy 20 party hats. 16% of the students scored no point on the task. 80% of the students with this score attempted the task.



## Pepe's Party

<b>Points</b>	<b>Understandings</b>	<b>Misunderstandings</b>
<b>0</b>	80% of the students with this score attempted the task.	Students did not understand how to think about equal groups. Some just read numbers off the ad. Some students used addition instead of multiplication. 7% of thought 20 sets of silver would cost 30 cents, 6% thought \$30, and 7% bought 3 groups of 20 silver ware sets for \$18.
<b>1</b>	Students could find the cost of 20 individual party hats.	Students had difficulty with paper plates. 12% of the students thought 20 plates would cost \$2.75. 5% bought 20 pkg. of plates for \$55 Difficulty for cups – 11% thought the cost would be the same as the pkg. price of \$1.50 9% thought the price would be \$30.
<b>5</b>	Students could find all of the costs for part one and either find the best price by calculating the combination of packages and individual hats or miss the best price because they only calculated all singles or all packages.	Students had difficulty with the idea of a comparison. 10% only found the cost of 20 single hats for \$6.00. 11% thought the best price was \$4.50 (all packages). They didn't consider buying a combination.
<b>8</b>	11% of the students only gave the best price and the combination of single and packages.	Students didn't look to prove that their price was better than other alternatives.
<b>9</b>		Students didn't consider the cost of 20 single hats. They only compared the combination with all packages.
<b>10</b>	Students could reason about the number of packages or sets needed to yield 20 total items and use addition or multiplication to find the cost of the 20 items. Students could reason about 3 alternatives for buying 20 hats and determine the best buy. They understood that making a comparison includes considering alternatives.	

## Pepe's Party

### Implications for Instruction

Students need many experiences using multiplication and division in context, finding how many groups fit into a total and finding the total of a group of items. Students need a good understanding of operations with whole numbers before working with decimals and fractions. Students should be exposed to a variety of problem situations to help them learn about when to apply each operation.

Students need to also reason about making comparisons. Are there different ways of getting the same amount? Students need to find the cost of each option, before deciding on the best buy or use logic to eliminate other alternatives. To make a comparison there must be alternatives to compare against.

Some students need work on decimal place value. They don't understand how to carry when adding numbers with decimals and make an extra place behind the decimal point. Other students misplace the decimal when multiplying. Students need to develop an understanding of size with relation to operations with decimals. This might involve work with estimation, but might mean a deeper investigation with manipulatives into the meaning of decimals.

### Ideas for Action Research - Number Operation Interviews

Students need exposure to a variety of types of situations involving the number operations of multiplication and division. When first starting to think about operation, numbers should be chosen so that students can model the action or operation of the story with objects like cubes or chips. The three major problem types are multiplication, partitive division and measurement division.

*Multiplication – equal groups with the total unknown*

Betty has 4 bags of cookies. There are 9 cookies in each bag. How many cookies does Betty have altogether?

*Partitive or sharing– equal groups: Size of groups unknown*

Betty has 36 cookies. She wants to make a bag for each of her 4 friends. How many cookies should she put in each bag?

*Measurement- number of groups unknown*

Betty has 36 cookies. She wants to make snack bags with 9 cookies in each bag. How many bags does she need?

Try designing a set of problems containing some of each problem type. Do some one-on-one student interviews. Allow students to do direct modeling, using cubes or discs to act out their thinking. Take notes on types of errors. Ask questions, but don't push students beyond their comfort level or tell them they are incorrect. Keep track of which type of tasks students could solve and try to pinpoint where their thinking went wrong for other task types.

Make a list of the misconceptions you noticed in student thinking. Discuss with their misconception with grade level teammates, special education teachers, math coaches, or teachers from earlier grades. What kinds of intervention strategies did the group come up as a result of your research? What further experiences do these students need?