Grade 4

Open-Ended Questions and Rubrics

PRIME2
Open-Ended Questions for Grades 4 and 5

Grade 4

Math topic	Task	All or optional	Rubric	EM
Algebra	Hexagon Desks*	All teachers	MARS	6.8
	Math Rules	Optional	MARS	
Multiplication	Stone Soup	Optional	PRIME2	Unit 5
	Line of Laundry	All teachers	MARS	Unit 5
Area & perimeter	Same Shape, Different Area	All teachers	PRIME2	8.5
	Tina's Rabbit Pen	Optional	PRIME2	8.5
Fractions	A Weighty Problem	All teachers	PRIME2	7.5, 7.7
Decimals	School Supplies	Optional	PRIME2	4.6

Grade 5

Math topic	Task	All or optional	Rubric	EM
Algebra	Hexagons in a Row	All	MARS	Unit 10
	Walls with Windows	Optional	MARS	Unit 10
Fractions	Finding Fractions*	All	CLA #2/EM	Unit 5
	Knowing Fractions	All	MARS	8.7
Volume	A Box of Cubes	All	MARS	Unit 11
	Boxes of Cubes	Optional	PRIME2	Unit 11

* Give the task to your students by January 24, 2013. Bring the student work from the task to the PRIME2 After-School Workshop on January 24. We will score it at the workshop.

PRIME2

Open-Ended Questions for Grades 4 and 5

The purpose of administering the open-ended tasks is to have your students gain familiarity and comfort with these types of tasks, and provide them with an opportunity to show the highest level of their mathematical thinking on problems.

BEFORE THE TASK
PRE-ACTIVITY
You may elect to design a pre-activity to get students used to the type of problem, and promote equal access to the task.

EXPECTATIONS FOR QUALITY WORK
Share with students what makes an excellent paper. You may refer to the highest score in the rubric and explain all the parts that will make the work successful. Include the importance of calculating accurately, clearly explaining their thinking if the problem calls for it, and organizing their work so someone else can understand it.

VOCABULARY AND CONTEXT
Go over any difficult or unfamiliar vocabulary, or words with multiple meanings. Discuss any context that may be unfamiliar.

DURING THE TASK
TIME
Allow students as much time as needed for them to complete the task. If you give it during one math period and some students have not finished, allow them more time during another part of the day.

SHOW ALL WORK
Have students show all their work. Some tasks may not have enough space provided for students to answer a question completely. You may provide paper for them to solve the entire problem on it. Let students know that in order for you to understand their mathematical thinking about the problem, you need to see all of their work.

TEACHER ROLE
Try not to offer much prompting during the task. Observe students as they work the task. Note how they approach the problem, where they get stuck, their level of perseverance, and any questions they want to ask you.

AFTER THE TASK
SCORE THE WORK
Use the rubric provided for each task to score the work. If possible, have a scoring session with grade level colleagues.

Bring the student work from Hexagon Desks (Grade 4) or Finding Fractions (Grade 5) to the PRIME2 After- School Workshop on January 24 where they will be scored collaboratively.

(OPTIONAL)
PROVIDE FEEDBACK
Give the task back to students with their score and any comments.

SHOW STUDENTS EXAMPLES OF EXCELLENT WORK
Cover the name of the students whose work you are showing, or show work from another class. Discuss with students what makes the paper an excellent one.
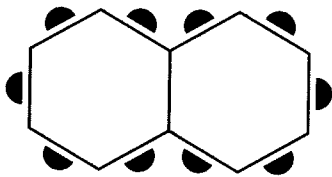
Hexagon Desks

This problem gives you the chance to:
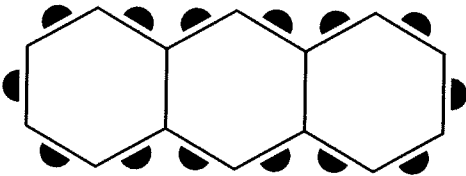• find and extend a number pattern
• plot and use a graph

Sarah finds how many students can sit around a row of desks. The top surface of each desk is a hexagon, and the hexagons are arranged in rows of different shapes.
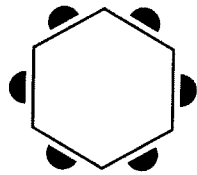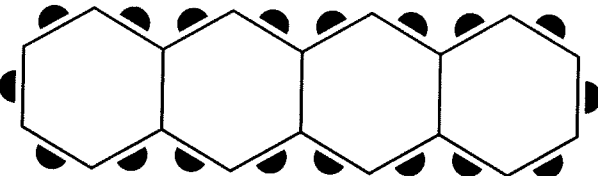

1 desk   6 students

2 desks   10 students
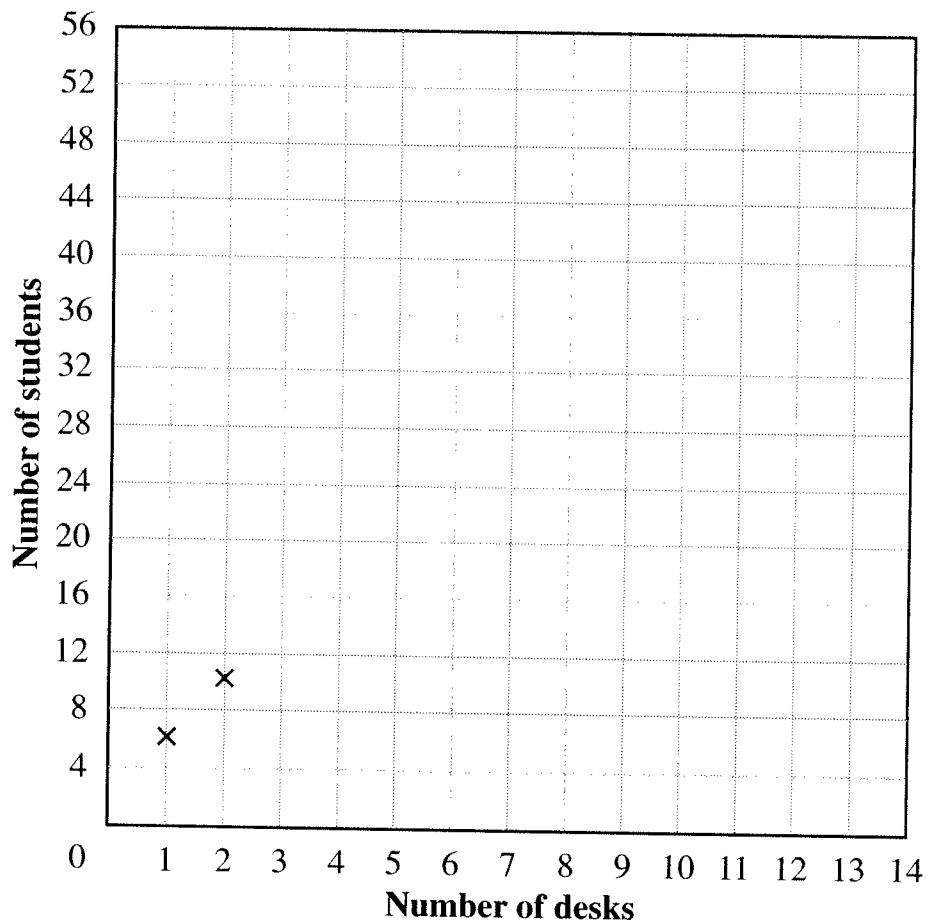

3 desks   14 students

4 desks

1. Complete Sarah's table.

Number of desks in a row	Number of students
1	6
2	10
3	
4	
5	
6	

Hexagon Desks   Test 4: Form A

2. On the grid, plot the results from the table you completed in question 1. The first two points have already been plotted for you.

3. Sarah says that 47 students can sit around a row of 11 desks.
Without drawing the desks, explain how you know that Sarah is wrong.

_____

_____

_____

_____

How many students can sit around a row of 11 desks?   _____

10

Hexagon Desks

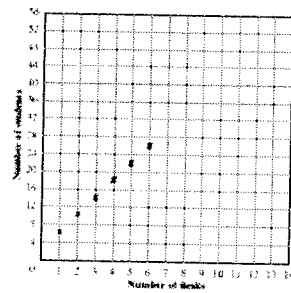| The core elements of performance required by this task are: • find and extend a number pattern • plot and use a graph Based on these, credit for specific aspects of performance should be assigned as follows:	Points	Section Points
1. Correctly completes the table: All four correct values: 2 points *Partial credit:* Three or two correct values: 1 point	2 (1)	2
2. Correctly plots the four values from the student's answer to question 1 on the grid: *Accept points in the correct square that are not on the horizontal grid lines.*	4 × 1	4
3. Correctly continues table or graph. or States that 47 is not an even number. or Gives a correct alternative reason. Gives correct answer as: **46 students**	2 or 2 or 2 2	4
Total Points		10

Table for question 1:

Number of desks in a row	Number of students
1	6
2	10
3	14
4	18
5	22
6	26

Fourth Grade- 2003

Math Rules

Margie is just learning about the fun of using math rules, so she decided to make up a few of her own. See if you can use Margie's rules to solve some problems.
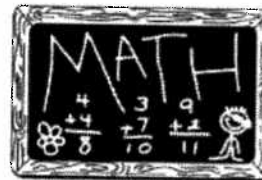
Rule 1: Take a number and add 17

Margie uses this rule to find the cost to charge for snacks and makes a small profit.
1. If she buys drinks for 26 cents, how much will she sell them for using rule 1?

Show how you used the rule.   _____ cents

Rule 2: Double a number and add 5

To make her party decorations from a pattern, Margie uses rule #2.
2a. How many inches high will the palm tree decoration be if she starts with a pattern 7 inches high?

_____ inches

2b. The Tiki Hut decoration is 15 inches high. What number did Margie start with?

Show how you figured it out.   _____ inches

Rule 3: Multiply by 4 then subtract 18.

3. Margie is trying to decide how many cookies she will need if 35 people are coming to the party. If she uses rule 3, how many cookies will she need?

Show how you figured it out.

_____cookies

4a. Write a rule to help Margie find the number of packages to buy.

| Plastic glasses come in packages of 8. |

Rule 4: _____

_____

b. Now use your rule to tell Margie the number of glass packages to buy for the party. Remember there are 35 people.

Show how you figured it out.

_____ packages

9

Math Rules!		Rubric
	points	section points
1. Gives correct answer **43** and shows some correct work.	1	
		1
2. a. Gives correct answer: **19** inches	1	
b. Gives correct answer: **5** inches	1	
Shows work such as:		
$15 - 5 = 10$	1	
$10/2 = 5$		3
3. Gives correct answer: **122** cookies	1	
Shows work such as:		
$35 \times 4 = 140$	1	
$140 - 18 = 122$		2
4. a. Writes a rule such as: "Divide the number by 8 and if there is a remainder add one."		
Partial Credit	2	
"Divide by 8, but doesn't address what to do if there is a remainder"	(1)	
b. Gives a correct answer: **5** packages and shows some correct work.	1	3
Total Points		**9**

Line of Laundry

Daniel likes to hang his laundry to dry on a clothes line in the backyard.

He needs: 3 clothes pins for each T-shirt
4 clothes pins for each pair of jeans
6 clothes pins for each towel

1. How many clothes pins does he use when he hangs out one
T-shirt, one pair of jeans, and one towel? Show how you figured it out.

Daniel only has 20 clothes pins. What can he hang on the line?

He must hang at least one of each different item.

2. Find two different way he can hang five items.

	Number of items	Number of clothes pins
T-shirts		
Jeans		
Towels		
Total	5	

	Number of items	Number of clothes pins
T-shirts		
Jeans		
Towels		
Total	5	

3. Explain why he cannot hang more than 5 items.

Line of Laundry Grade 4   Rubric

The core elements of performance required by this task are: • use numbers in a flexible way Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Gives correct answer: **13** Shows work such as: 3 + 4 + 6	1 1	2
2. *Gives the following possible combinations:*	2x2	4
3. Gives a correct explanation such as: If granny puts one of each item on the line, she uses 13 clothes pins, and she only has 20 clothes pins. Using the 7 clothes pins she has left, she could hang out 2 more T-shirts. **or** 1 more T-shirt and 1 more pair of jeans. Accept: She doesn't have enough clothes pins	1	1
Total Points		**7**

Table within section 2:

	Number of items	Number of clothes pins
T-shirts	2	6
Jeans	2	8
Towels	1	6
Total	5	20

	Number of items	Number of clothes pins
T-shirts	3	9
Jeans	1	4
Towels	1	6
Total	5	19

Stone Soup

A group of six travelers came into a small town. They were very hungry, but nobody in the town offered them any food. One of the travelers announced that she would make Stone Soup. "How do you make Stone Soup?" asked a townsperson.

"You need a big pot, some water, and a large stone." The townspeople, very curious to see how Stone Soup was made, gathered together the materials. The travelers started to cook the soup over a fire they made. Once the soup began to boil, one of the travelers said, "This will be tasty soup, but a truly delicious Stone Soup has other ingredients.

The townspeople, now even more curious, asked what extra ingredients might be added. "Well, for each person, we would need 2 carrots, 3 green onions, and five pieces of meat."

What ingredients are needed to make a delicious stone soup for the six travelers?

What ingredients are needed to make a delicious stone stoup for ten people?

What ingredients are needed to make a delicious stone soup for 25 people?

Rubric for Stone Soup

2 points	Determines 12 baby carrots, 18 green onions and 30 pieces of meat are needed for 6 travelers.
1 point	Uses an appropriate method for finding the ingredients for 6 travelers, but makes a calculation error and does not arrive at the correct amounts.
2 points	Determines 20 baby carrots, 30 green onions and 50 pieces of meat are needed for 6 travelers.
1 point	Uses an appropriate method for finding the ingredients for 10 travelers, but makes a calculation error and does not arrive at the correct amounts.
2 points	Determines 50 baby carrots, 75 green onions and 125 pieces of meat are needed for 25 travelers.
1 point	Uses an appropriate method for finding the ingredients for 25 travelers, but makes a calculation error and does not arrive at the correct amounts.
2 points	Shows a table, an array, skip counting, drawing or appropriate multiplication equations to determine answers.
2 points	Gives a clear explanation of how answers were determined.
1 point	Gives an explanation but it is unclear or incomplete.
	Total Possible = 10 points

Same Area, Different Shape

Create three figures with different shapes that have the same area as the figure below.
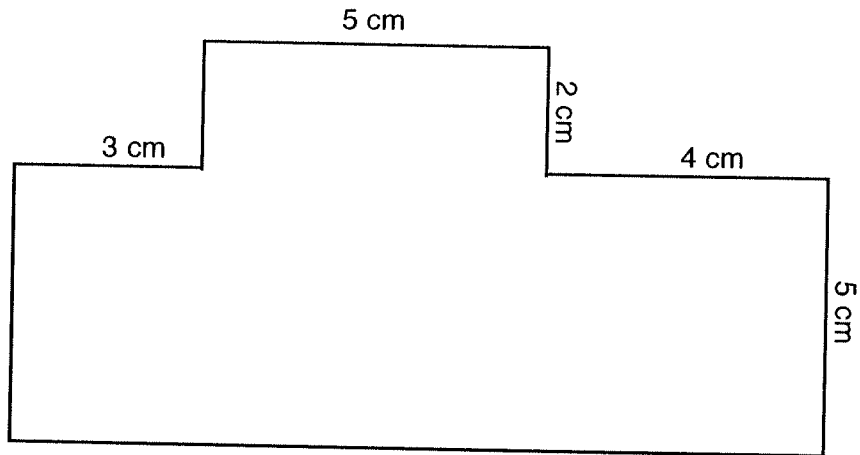
Explain how you know that your drawings have the same area as the original figure.

Analytic Rubric for Same Area, Different Shape
Grade 4 Open-Ended Question

Creates 3 figures with an area of 70 square units

6 points   Creates 3 different figures that each have an area of 70 square units

4 points   Creates 2 different figures that each have an area of 70 square units

2 points   Creates 1 figure that has an area of 70 square units

Explains why figures are the same area as original figure

6 points   Explanation is clear for each figure drawn, and includes dimensions
                and calculations that clearly show the area to be 70 square units

4 points   Explanation is partial or incomplete. Some but not all figures are
                addressed

2 points   Explanation is given, but is incorrect or does not address why the
                areas are 70 square units

Tina's Rabbit Pen

Name_____ **Date**_____

Show all of your work for each question.

Tina wants to build a rabbit pen for her pet rabbit, Fluffy. She wants it to have an area of 120 square feet. The shape of the pen will be a rectangle. The dimensions (the length and the width) will be whole numbers.

1) What are all of the possible dimensions for Tina's rabbit pen?

2) Tina wants the rabbit pen to have the smallest perimeter so that she can save money on the fence. Which length and width will she use?

3) If Tina's rabbit pen could be 240 square feet, what length and width would she use to get the smallest perimeter? Explain how you figured it out.

Rubric for Tina's Rabbit Pen

0 – 16 points	*1) Dimensions of a 120 square foot rectangle* Student receives 2 points for each set of dimensions found. There are 8 possibilities:						
	1 X 120	2 X 60	3 X 40	5 X 24	6 X 20	8 X 15	10 X 12

4 points	*2) Dimensions of the smallest perimeter of a 120 square foot rectangle* Student finds the dimensions for the smallest perimeter: 10 X 12 or 12 X 10. Student may name one set or both sets.
2 points	Student names one dimension, either the length or width, correctly, but not both

6 points	*3) Dimensions of the smallest perimeter of a 240 square foot rectangle* Student finds the smallest perimeter for 240 square feet: 15 X 16 or 16 X 15. Student may name one set or both sets.
3 points	Student names one dimension, either the length or width, correctly, but not both.

6 points	*4) Explanation* • Student provides clear explanation about how the smallest perimeter was determined. The explanation may include a generalization such as 'the closest length and width to a square gives the smallest perimeter.' The explanation contains mathematically correct justification.
3 points	• Student provides partial explanation. It is lacking in clarity or has a small mathematical error.
1 point	• Student provides explanation, but it is unclear or incomprehensible.

Total possible points: 32	

Name _____ Date _____

A Weighty Problem

María works as a clerk at a fruit stand. Instead of using a digital scale, she uses a pan scale like the one seen below.
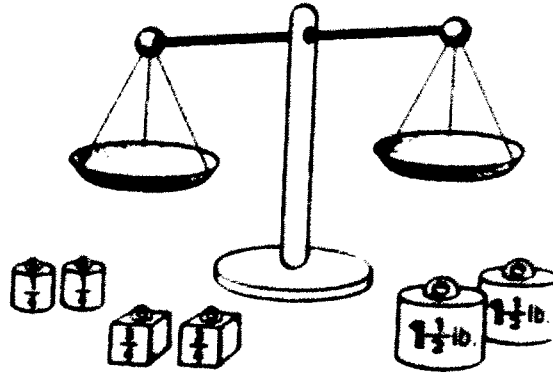
She can use this scale and the 6 iron weights (two ¼ pound weights, two ¾ pound weights, and two 1½ pound weights) to weigh any amount from ¼ pound to 5 pounds in ¼ pound intervals.

Mark wants 2 ¾ pounds of grapes. Explain how María can use the scale to measure this.

Cecilia wants 3 ½ pounds of oranges. Explain how María can use the scale to measure this.

Ashley wants 2 pounds of apples. Explain how María can use the scale to measure this.

Finally, explain how María could use this pan scale to measure 10 pounds of bananas.

Rubric for A Weighty Problem

2 points	Accurately computes weights to make 2 ¾ lbs. Possible solutions include: 1 ½ + ¾ + ¼ + ¼ 1 ½ + 1 ½ on one side of scale & ¼ on the other side of the scale.
1 point	Provides a written explanation of how 2 ¾ lbs. was achieved
2 points	Accurately computes weights to make 3 ½ lbs. Possible solutions include: 1 ½ + 1 ½ + ¼ + ¼ 1 ½ + ¾ + ¾ + ¼ + ¼ 1 ½ + 1 ½ + ¾ on one side of scale & ¼ on the other side of the scale.
1 point	Provides a written explanation of how 3 ½ lbs. was achieved
2 points	Accurately computes weights to make 2 lbs. Possible solutions include: 1 ½ + ¼ + ¼ ¾ + ¾ + ¼ + ¼ 1 ½ + ¾ on one side of scale & ¼ on the other side of the scale.
1 point	Provides a written explanation of how 2 lbs. was achieved
3 points <u>or</u>	Provides a reasonable explanation for how to weigh 10 pounds, such as weighing 5 pounds two times, or weighing any other smaller increments that add up to 10
1 point	Provides a partial explanation for how to weigh 10 pounds
	Total Possible = 12

Name_____ Date_____

School Supplies

During the summer, Julia received a letter with a list of supplies she should buy for the start of the school year. Her father gave her $20 to spend. He told her she can keep the change if there was any.

Here is the list:

> 4 folders
> calculator
> lined paper (pack of 200)
> ruler (with both standard and metric)
> one set of 24 felt tip pens
> backpack
> 10 pencils

Julia decided to look at flyers from two stores, Super Value and Big Bargain, and find out the prices for the things she needed. She might only have enough time to go to one store to buy everything.

1) Make a list or chart showing which store is cheaper for everything she needs.

2) She may have time to go to both stores. Which items are cheaper at Super Value, and which items are cheaper at Big Bargain? Tell how much change she would get if she had time to go to both stores.
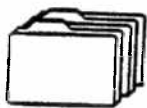
SUPER VALUE

BACK TO SCHOOL SPECIALS!!!
ALL PRICES INCLUDE TAX

SPIRAL NOTEBOOKS
$.89 each

SCISSORS–$.99

FOLDERS
4 FOR $1.00

Felt Tip Pens
8 colors–$0.60
24 colors–$0.78
64 colors–$1.10

PENS–erasable
5 pack – $1.25

PENCILS–$.69 each
5 pack–$.99

LINED PAPER
200 SHEETS–$.79

RULERS
Standard – $.59
Standard/Metric – $.69

SCHOOL BACK PACK
$9.99

Pencil Sharpener
$.99

BOOK COVERS
Buy 4 get one free
$.69 each

ERASERS–LARGE
3 pack for $1.59

1/2 off special
ABC Calculator–regular price $8.00

BIG BARGAIN!

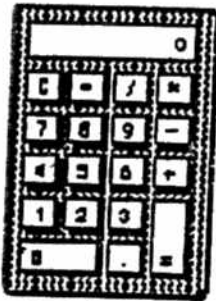## Super School Savings!
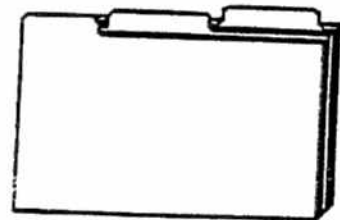### All Prices Include Tax

CALCULATOR

$6.99

LINED PAPER
200 sheets

FREE
with purchase
of calculator

regular price – $.79

Folders
$.20 each

ERASERS – large
$.49 each

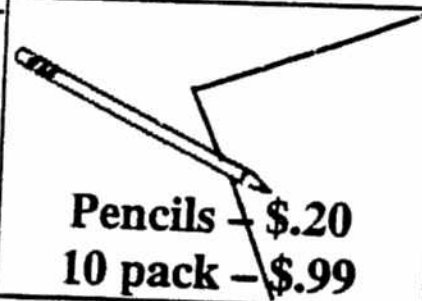## CLIPBOARD
$1.39

BOOK COVERS
5 FOR $3.00

GLUE
4 OZ BOTTLE
$.89

Backpack
$7.99

RULERS
Standard – $.39
Standard/Metric – $.49

SPIRAL NOTEBOOK
$.99 NOTES

Felt Tip Pens each
pack
8 colors $.69
24 colors $.99
64 colors $2.49

Pencils – $.20
10 pack – $.99

SCISSORS
$1.25

PENS – ball point
7 pack – $.99

Paper clips – $.69

Rubric for School Supplies Task

Level	Description
4	Work is clearly organized. The correct list of items from each store is given with correct costs for each item. The ½ price calculator for Super Value and free lined paper from Big Bargain are included. The total cost of items from each store is accurately calculated: Super Value items total $19.23 and Big Bargain items total $18.25. The cheaper items from each store are given. Super Value: calculator, paper, pens; Big Bargain: folders, ruler, backpack, pencils. The correct change if both stores are used is shown: $4.16.
3	Work is organized. The correct list of items from each store is given, but there are minor errors: either 1 or 2 costs for items are incorrect or there is a minor error in the total calculation. Alternatively, the list of total items is mostly but not all correct, and the cost per item and the totals are correct. Most of the cheaper items from each store are given. The amount of change is correctly calculated given the items chosen. Alternatively, all of the cheaper items are shown but or there is a minor error in the amount of change.
2	Significant errors in one or two of the following: list of items from each store, cost per item, calculations of the total amounts. No attempt to answer question 2, or significant errors in determining the cheaper items from each store and the amount of change.
1	Work is incomplete and/or problem misinterpreted, for example: all items from both stores are listed; items from only one store are listed; items listed are not relevant to information given in the problem. Significant errors in calculations. No attempt to answer question 2, or misinterpretation of question 2.
0	No attempt to answer problem