2007

Green River

Regional Educational Cooperative

Grade 9

Mathematics

Measured Progress

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NOTE: Each item is aligned to a standard, but does not necessarily measure the entire standard.

Item 1 Installing Carpet

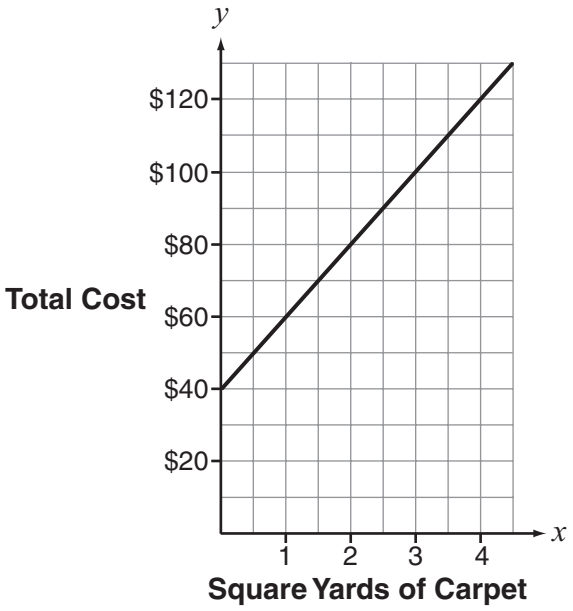
Standard: MA-HS-5.1.08: Patterns, Relations, and Functions – Students will identify the changes and explain how changes in parameters affect graphs of functions (linear, quadratic, absolute value, exponential) (e.g., compare $y = x$ squared, $y = 2x^2$, $y = (x - 4)^2$, and $y = x^2 + 3$).

Bloom's Taxonomy: Comprehension

Depth of Knowledge: Level 2

1. To install a special carpet, the Home Store charges two fees:
   - an initial preparation fee to prepare the floor for the carpet and
   - a fee for each square yard of the carpet that is installed.

   The store's salespersons use the graph below to quickly determine the total cost of installing different numbers of square yards of this carpet.



   a. Write the number that is the y-intercept of the line on the graph.

   b. Write the number that is the slope of the line.

c. Write the equation for the line in the graph. Let y represent the total cost and x represent the number of square yards installed.

d. Suppose that the store manager decides to increase the cost per yard of the carpet but not to change the preparation fee. Explain how this change will affect both the y-intercept and the slope of the line.

e. Suppose that the cost per yard is not changed but the preparation fee is increased. Explain how this change will affect both the y-intercept and the slope of the line.

BE SURE TO LABEL YOUR RESPONSES a, b, c, d, AND e.

Installing Carpet

Scoring Guide

Score	Description
4	The student response demonstrates an exemplary understanding of the concepts involved in identifying the values of the slope and y-intercept of a line graph and explaining how changes in the scenario affect these parameters.
3	The student response demonstrates a good understanding of the concepts involved in identifying the values of the slope and y-intercept of a line graph and explaining how changes in the scenario affect these parameters. Although there is significant evidence that the student was able to recognize and apply the concepts involved, some aspect of the response is missing or flawed. As a result the response merits 3 points.
2	The student response demonstrates a fair understanding of the concepts involved in identifying the values of the slope and y-intercept of a line graph and explaining how changes in the scenario affect these parameters. While some aspects of the task are completed correctly, others are not. The mixed evidence provided by the student merits 2 points.
1	The student response demonstrates a minimal understanding of the concepts involved in identifying the values of the slope and y-intercept of a line graph and explaining how changes in the scenario affect these parameters.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Sample Response:

Part a: $40

Part b: 20

Part c: $y = 20x + 40$

Part d: The slope will increase and the y-intercept will not change.

Part e: The y-intercept will increase and the slope will not change.

Sample Student Responses

Installing Carpet

a) $40
b) $20
c) y = 20x+40
d) This will <u>not</u> change the y-intercept but will increase the slope of the line
e) This will not change the slope of the line but will increase the y intercept

Score Point: 4

A. $40

B. Slope = 20

C. $y = 20x + 40$

D. The slope would be greater because the line would be steeper. The y-intercept would get larger, also.

E. The y-intercept would get larger because you have a larger up-front fee, but the slope will stay the same

Score Point: 3

A. 40
B. 20

$(0,40)(1,60) = \frac{60-40}{1-0} = \frac{20}{1} = 20$

C. $y = 20x + b$
$60 = 20(1) + b$, $60 = 20 + b$, $40 = b$; $y = 20x + b$

D. there will be a larger slope and a steeper line, y will be larger also

E. the y-intercept will be larger and the slope will be smaller

Score Point: 2

a) $40 b) 2 c) y=mx+b

d) it will make it larger?

e) it will make it smaller?

Score Point: 1

Item 2 Truck Payments

Standard: MA-HS-1.3.01: Number Operations – Students will solve real-world and mathematical problems to specified accuracy levels by simplifying expressions with real numbers involving addition, subtraction, multiplication, division, absolute value, integer exponents, roots (square, cube), and factorials.

Bloom's Taxonomy: Application

Depth of Knowledge: Level 2

2. A truck costs $15,600. The dealer offers two payment plans.

Total cost =
first payment + monthly payments

- Plan A: A first payment of 20% of the cost of the truck followed by payments of $585 per month for 24 months
- Plan B: A first payment of $\frac{1}{3}$ of the cost of the truck followed by payments of $905 per month for 1 year

How much more will the truck cost with Plan A than with Plan B? Show your work or explain how you found your answer.

Truck Payments

Scoring Guide

Score	Description
4	The student response demonstrates an exemplary understanding of the Number Properties and Operations concepts involved in solving real-world problems by writing and simplifying expressions with real numbers.
3	The student response demonstrates a good understanding of the Number Properties and Operations concepts involved in solving real-world problems by writing and simplifying expressions with real numbers. Although there is significant evidence that the student was able to recognize and apply the concepts involved, some aspect of the response is missing or flawed. As a result the response merits 3 points.
2	The student response demonstrates a fair understanding of the Number Properties and Operations concepts involved in solving real-world problems by writing and simplifying expressions with real numbers. While some aspects of the task are completed correctly, others are not. The mixed evidence provided by the student merits 2 points.
1	The student response demonstrates a minimal understanding of the Number Properties and Operations concepts involved in solving real-world problems by writing and simplifying expressions with real numbers.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Sample Response:

Plan A: first payment = 0.20 × 15,600 = \$3,120

24 installments = 24 × 585 = \$14,040

Total cost = \$3,120 + \$14,040 = \$17,160

Plan B: first payment = 15,600 ÷ 3 = \$5,200

12 installments = 12 × 905 = \$10,860

Total cost = \$5,200 + 10,860 = \$16,060

Difference = 17,160 – 16,060 = \$1,100

Sample Student Responses

Truck Payments

PLAN A:

$(15,600 \times .20) + (585 \times 24) = \$17,160.00$

PLAN B=

$(\frac{1}{3} \times 15,600) + (905 \times 12) = \$16,060.00$

$$\begin{array}{r} \$17160.00 \\ -\ 16060.00 \\ \hline \end{array}$$

$\boxed{\$1,100.00}$

IT WILL COST $1,100.00 MORE

Score Point: 4

Plan A: $15,000 = 3,120 + 74,880

$78,000

Plan B: $15,000 = $5,200 + 10,860

$16,060

$78,000
$16,060
$61,940

$61,940

Score Point: 3

Plan A's final paymen would be 17,160 plans B final payment would be 26,920. The difference between plan A and Plan B is $9,760. The truck will cost 9,760 dollars more.

Score Point: 2

Plan A. First payment 3120 + 585 = 3705

Plan B. first payment 3900 + 905 = 4805

Plan A is 1,100 cheaper

Score Point: 1

Item 3 Tickets

Standard: MA-HS-5.3.03: Equations and Inequalities – Students will model, solve, and graph first-degree, two-variable equations and inequalities in real-world and mathematical problems.

Bloom's Taxonomy: Application

Depth of Knowledge: Level 2

3. The drama club put on a play on Friday night. Some tickets were sold in advance and some tickets were sold at the door. A total of 300 tickets were sold.

   a. Using x to represent the number of tickets sold in advance, write an expression that represents the number of tickets sold at the door.

   The club charged \$3 for tickets sold in advance and \$4 for tickets sold at the door. The total amount of money collected from tickets was \$1072.

   b. Again using x to represent the number of tickets sold in advance, write **one** equation that can be used to find the number of \$3 tickets and the number of \$4 tickets sold. Your equation should contain no variables except x.

   c. How many \$3 tickets and how many \$4 tickets were sold? Show your work or explain how you found your answer.

Tickets

Scoring Guide

Score	Description
4	The student response demonstrates an exemplary understanding of the concepts involved in modeling and solving first-degree, two-variable equations in a real-world problem.
3	The student response demonstrates a good understanding of the concepts involved in modeling and solving first-degree, two-variable equations in a real-world problem. Although there is significant evidence that the student was able to recognize and apply the concepts involved, some aspect of the response is missing or flawed. As a result the response merits 3 points.
2	The student response demonstrates a fair understanding of the concepts involved in modeling and solving first-degree, two-variable equations in a real-world problem. While some aspects of the task are completed correctly, others are not. The mixed evidence provided by the student merits 2 points.
1	The student response demonstrates a minimal understanding of the concepts involved in modeling and solving first-degree, two-variable equations in a real-world problem.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Additional Notes

In part c, response does not have to use an algebraic solution in order to receive full credit.

Sample Response:

Part a: $300 - x$

Part b: $1072 = 3x + 1200 - 4x$

Part c: $-128 = -x$

$x = 128$

So 128 tickets were sold in advance and 300 – 128 = 172 were sold at the door.

Sample Student Responses

Tickets

(a) # sold at door = 300 − x

(b) 1072 = 3x + 4(300 − x)

(c) 1072 = 3x + 4(300 − x)

1072 = 3x + 1200 − 4x

1072 = −x + 1200

−1200 −1200

(−128 = −x)−1

128 = x

300 − 128 = 172

128 - $3 tickets

172 - $4 tickets

Score Point: 4

a. 300 − x = tickets sold at the door

b. 1072 − 3x ← tickets in advance once found will be able to find # of tickets sold at the door

c. $x + y = 300$

$3x + 4y = 1072$

$x = 300 - y$

$3(300 - y) + 4y = 1072$

$900 - 3y + 4y = 1072$

$-900 \qquad\qquad -900$

$y = 172$

172 tickets @ door were sold

300 − 172 = 128

128 tickets were sold in advance.

Score Point: 3

a. $300 - x = t$

b. $1072 - 3x = x - 4(1072 - 3x)$

c. Use the above equation

$1072 - 3x = x - 4(1072 - 3x)$

$1072 - 3x = x - 4288 - 12x$

$+12x$

$1072 - 3x = 13x - 4288$

$+4288 \qquad +4288$

$5360 - 3x = 13x$

$+3x \quad +3x$

$\frac{5360}{16} = \frac{16x}{16}$

$335 = x$

335 were \$3 tickets

737 were \$4 tickets

Score Point: 2

a.) $300 - x =$ # of tickets sold at door

b.) $300 - 3x = 4x$

c.) 60 tickets were sold for each

$$300 - 3x = 4x$$
$$+3x \quad +3x$$
$$300 = 5x$$
$$60 = x$$

Score Point: 1

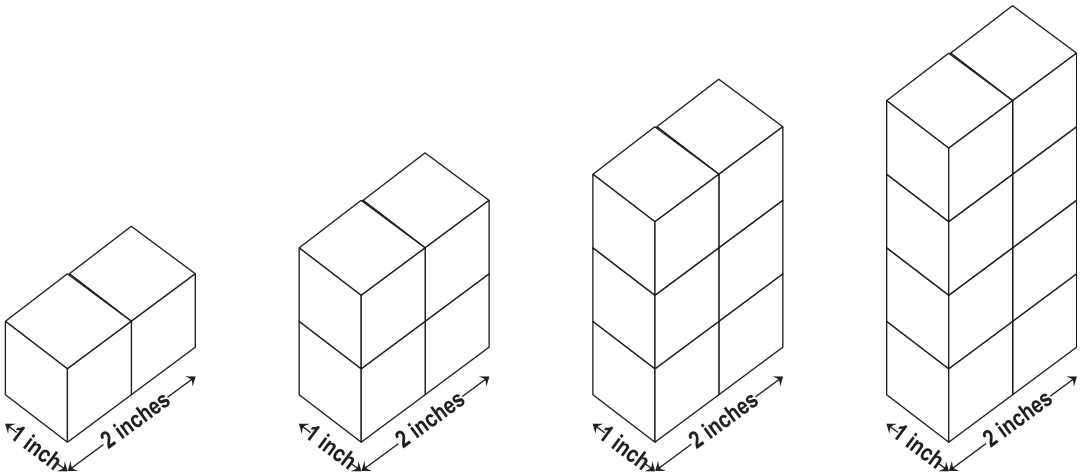
Item 4 Fred's Towers

Standard: MA-HS-5.1.01: Patterns, Relations, and Functions – Students will identify multiple representations (tables, graphs, equations) of functions (linear, quadratic, absolute value, exponential) in real-world or mathematical problems.

Bloom's Taxonomy: Analysis

Depth of Knowledge: Level 3

4. Fred is making towers like the ones shown below. Each new tower has a different height. He glues two one-inch cubes together to form a piece one inch wide and two inches long. He stacks these to make his towers, then paints all faces of each completed tower except the bottom.



Height	# painted faces
1	8
2	14
3	20
4	26
5	
6	
7	
8	
n	

a. Copy and complete the chart on the previous page into your Student Response Booklet to show the height of the towers and the number of faces painted.

b. Describe in words a rule you could use to find the number of painted faces if you know the height.

c. Write an algebraic expression to represent the number of cube faces covered with paint if the tower were n cubes high.

Fred's Towers

Scoring Guide

Score	Description
4	The student response demonstrates an exemplary understanding of the concepts involved in identifying multiple representations of a function.
3	The student response demonstrates a good understanding of the concepts involved in identifying multiple representations of a function. Although there is significant evidence that the student was able to recognize and apply the concepts involved, some aspect of the response is missing or flawed. As a result the response merits 3 points.
2	The student response demonstrates a fair understanding of the concepts involved in identifying multiple representations of a function. While some aspects of the task are completed correctly, others are not. The mixed evidence provided by the student response merits 2 points.
1	The student response demonstrates a minimal understanding of the concepts involved in identifying multiple representations of a function.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Sample Response:

Part a:

Height	# painted faces
1	8
2	14
3	20
4	26
5	32
6	38
7	44
8	50
n	$6n + 2$

Part b: I added 6 to get the next number.

Part c: $6n + 2$

Sample Student Responses

Fred's Towers

A)

1	8
2	14
3	20
4	26
5	32
6	38
7	44
8	50
9	56

B) If you know the height you multiply it by 6 and add 2 to get the painted sides

C) n x 6 + 2 = painted faces

Score Point: 4

(a)

Hieght	# Painted faces
1	8
2	14
3	20
4	26
5	42
6	50
7	58
8	66
n	

(b) take the hieght and divide it by 1 inch, that would be your # of blocks. Take that #, multiply by 6, because there 3 sides for each ½ tower, and add 2 because of the top of the tower.

(c) $n \cdot 6 + 2$

Score Point: 3

A-

Height	#paintedfaces
1	8
2	14
3	20
4	26
5	32
6	38
7	44
8	50
n	56

B-If you look at #s 1-4 you can figure out that it goes up 6 each time.

C- $n \times 8 = 56$

$n \times x = 4$

Score Point: 2

Height	# Painted Faces
1	8
2	14
3	20
4	26
5	32
6	38
7	44
8	50
9	56
10	62

They all went By six

Score Point: 1