Name ______________________________ Period __________ Date ____________

8-4
STUDENT PACKET

MATHLINKS GRADE 8
STUDENT PACKET 4
PATTERNS AND LINEAR FUNCTIONS 2

WORD BANK

Word or Phrase	Definition or Explanation	Example or Picture
explicit rule (for a sequence)		
function		
inductive reasoning		
linear function		
point of intersection		
rate		
slope (of a line)		
y-intercept		

GROWING SHAPES

Summary (Ready)

We will extend square and rectangle patterns. Then we will represent geometric measures in the patterns using input-output tables, a graphs, symbols, and words (the "fourfold way").

Goals (Set)

- Use variables, parentheses, and exponents in expressions.
- Use formulas to find perimeter and area of rectangles.
- Describe geometric patterns numerically, symbolically, graphically, and verbally.
- Plot ordered pairs that satisfy a specified condition.
- Informally connect the slope of a line to its context in a graph.

Warmup (Go)

Use inductive reasoning to complete each table. Write an explicit rule in words and symbols.

Table 1

Input (x)	Output (y)
1	1
2	2
3	3
4	
5	

Rule: If the input value is x, then the output value is:

____

In symbols:

y = ___________

Table 2

Input (x)	Output (y)
1	2
2	3
3	4
4	
5	

Rule: If the input value is x, then the output value is:

____

In symbols:

y = ___________

Table 3

Input (x)	Output (y)
1	2
2	4
3	6
4	
5	

Rule: If the input value is x, then the output value is:

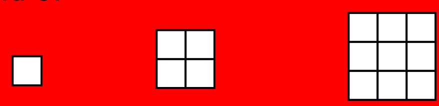
____

In symbols:

y = ___________

GROWING SQUARES

1. This is a pattern of growing squares built from unit squares. Continue the pattern for steps 4 and 5.



Step # 1 2 3 4 5

2. Complete the tables.

Table 1

Step number (n)	Length of side (L)
n	
Rule: L = ________	

Table 2

Step number (n)	Perimeter (P)
n	
Rule: P = ________	

Table 3

Step number (n)	Area (A)
n	
Rule: A = ________	

3. What is the perimeter of the figure in step #10?

   rule: ______________________

   substitute: __________________

   perimeter: __________________

4. If the perimeter of the figure is 84, what is the step number?

   rule: ______________________

   substitute: __________________

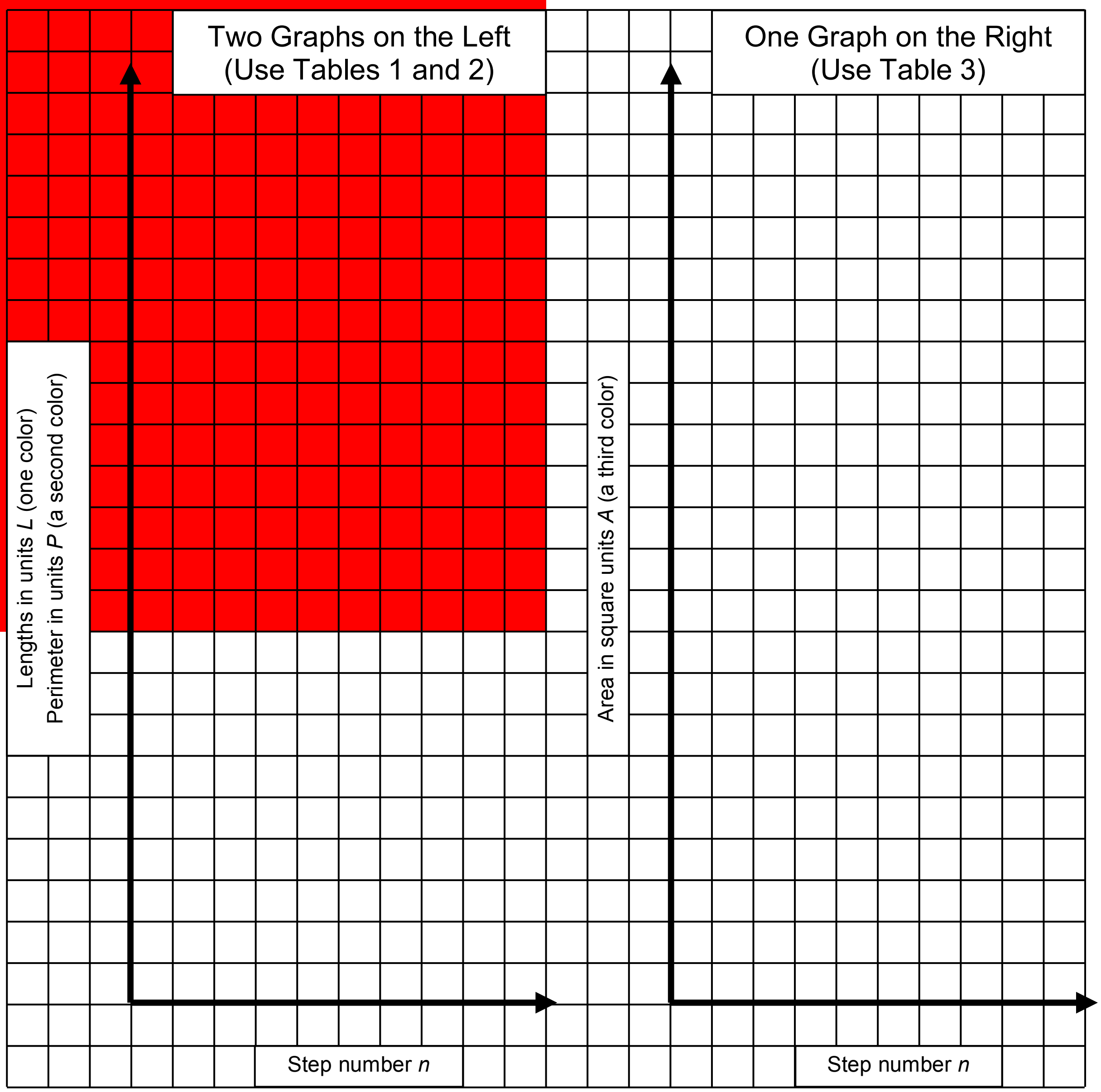
   step number: ________________

5. Use words or diagrams to explain how the length of the side and the perimeter of a square are related.

6. Use words or diagrams to explain how the length of the side and the area of a square are related.

GROWING SQUARES GRAPHS

1. Graph the data from the tables on the previous page. Scale the graphs appropriately.

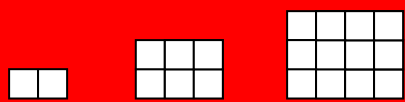


2. How is the graph on the right different from the two graphs on the left?

3. A linear function is a function whose graph is a line. Which of the rules describe linear functions? Explain.

GROWING RECTANGLES 1

1. This is a pattern of growing rectangles built from unit squares. Continue the pattern for steps 4 and 5.



Step # 1 2 3 4 5

2. Complete the tables.

Table 1

Step # (n)	base (b)
1	2
n	
Rule: b = ___________	

Table 2

Step # (n)	height (h)
1	1
n	
Rule: h = ___________	

Table 3

Step # (n)	Perimeter (P)
1	6
n	
Rule: P = ___________	

3. What is the base of the rectangle for step #12?

4. What is the height of the rectangle for step #14?

5. What is the perimeter of the rectangle for step #10?

6. If the base of the rectangle is 36, what is the step number?

GROWING RECTANGLES 1 (Continued)

All the tables on the previous page compare the step number to a length. This is because base, height, and perimeter are all linear measurements.

7. Draw a vertical axis on the grid, label it “length,” and scale appropriately.

   Draw a horizontal axis on the grid, label it “step number,” and scale appropriately.

8. Draw graphs from the tables on the previous page. Use different colors and note the color used.

   a. Base vs. step #

      (color:________________)

   b. Height vs. step #

      (color:________________)

   c. Perimeter vs. step #

      (color:________________)

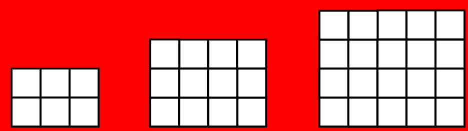
9. Draw a trend line for each graph to show each linear pattern, and label each line by name.

10. Use words such as slope, parallel, flat, steep, and intersect to describe how the graphs are the same and how they are different.

11. Which rules above could describe a linear function? Explain.

GROWING RECTANGLES 2

1. This is another pattern of growing rectangles built from unit squares. Continue the pattern for steps 4 and 5.



Step # 1 2 3 4 5

2. Complete the tables.

Table 1

Step # (n)	base (b)
1	3
n	
Rule: b = ________	

Table 2

Step # (n)	height (h)
1	2
n	
Rule: h = ________	

Table 3

Step # (n)	Perimeter (P)
1	10
n	
Rule: P = ________	

3. What is the base of the rectangle for step #18?

4. What is the height of the rectangle for step #24?

5. What is the perimeter of the rectangle for step #20?

6. If the base of the rectangle is 40, what is the step number?

GROWING RECTANGLES 2 (Continued)

All the tables on the previous page compare the step number to a length. This is because base, height, and perimeter are all linear measurements.

7. Draw a vertical axis on the grid, label it “length,” and scale appropriately.

   Draw a horizontal axis on the grid, label it “step number,” and scale appropriately.

8. Draw graphs from the tables on the previous page. Use different colors and note the color used.

   a. Base vs. step #

      (color:________________)

   b. Height vs. step #

      (color:________________)

   c. Perimeter vs. step #

      (color:________________)

9. Draw a trend line for each graph to show each linear pattern, and label each line by name.

10. Use words such as slope, parallel, flat, steep, and intersect to describe the graphs. How are they the same and how are they different?

11. Which rules above describe a linear functions? Explain.

GOING TO THE PARK

Summary (Ready)	Goals (Set)
We will use information about friends going to a park after school to help us understand time, distance, and rate of speed relationships using numbers, graphs, symbols, and words.	• Solve time-distance problems. • Interpret time-distance graphs. • Explore rates of change on a graph. • Understand the meaning of the points of intersection of two graphs. • Informally connect the slope of a line to its context in a graph.

Warmup (Go)

Ginger and Rudy are racing. Use the graph below to answer the following questions.

1. Who starts out faster? ______________________________

   How do you know? ______________________________

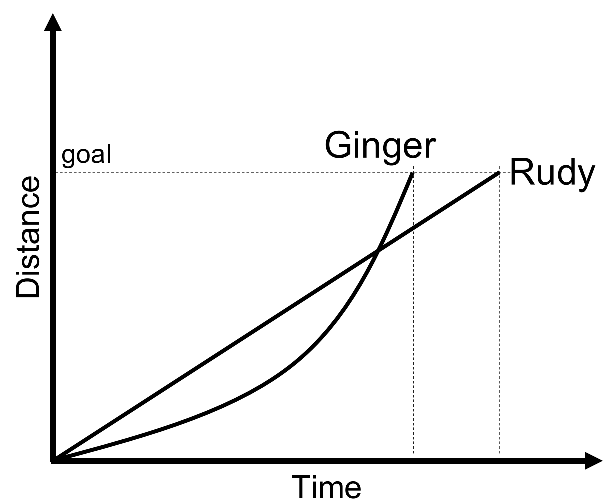
2. Who starts out slower? ____________ Does she ever catch up? ______________

   How do you know? ______________________________

3. Who wins the race? ______________________________

   How do you know? ______________________________

4. Which of the graphs could represent a linear function?



GOING TO THE PARK: PART 1

INTRODUCTION

A group of friends are going to meet at the park after school. They will all travel 90 meters straight down Euclid Street from the school to the park.

Herbie got a new digital camera and wants to use it to take pictures of her friends' journey. She will monitor their progress by taking nine pictures at six-second intervals from a building high above Euclid Street. She will lay the pictures down side-by-side, in order from the first picture to the last. She will then graph these images and analyze their movements.

Herbie starts to take pictures at exactly 3:00:00 PM. Ellie is already walking and got a head start. At 3:00:00 PM, she is already 36 meters from school. Daisy is jumping rope and moving at a constant rate. She leaves the school at 3:00:00 PM.

1. Approximately how far is 90 meters? ______________________________

2. How many pictures is Herbie going to take? __________

   How long will Herbie wait between snapping pictures? __________

3. Beginning at 3:00:00 PM, record the first six times that Herbie will snap pictures.

   3:00:00 __________ __________ __________ __________ __________

4. Complete the table showing distances from school.

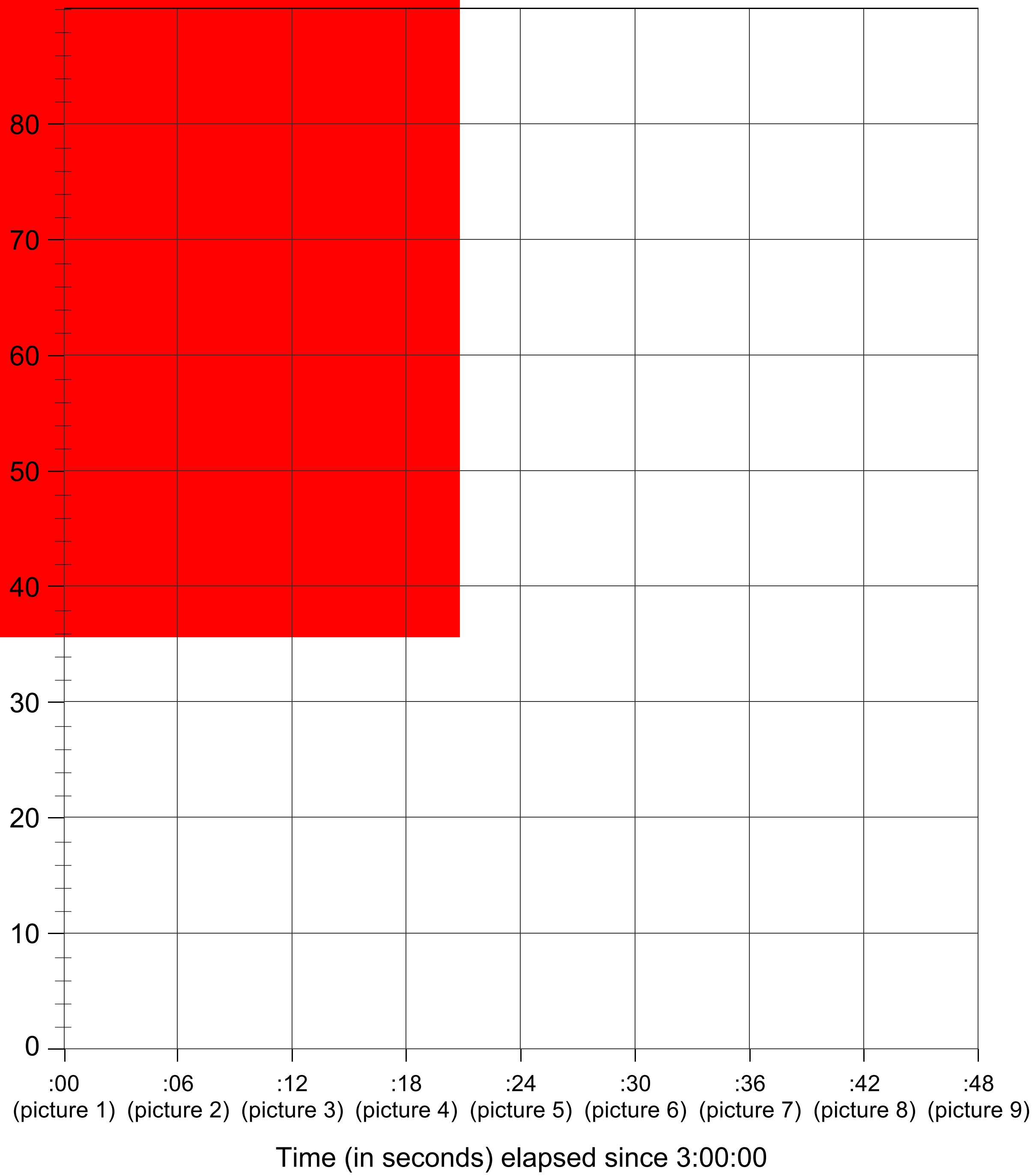
Picture #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Ellie's distance from school (in meters)	36	42	48	54	60	66	72	78	84
Daisy's distance from school (in meters)	0	12	24	36	48				

5. Does Ellie reach the park by the time Herbie finishes taking pictures? __________

6. Does Daisy reach the park by the time Herbie finishes taking pictures? ________

GOING TO THE PARK: PART 1 RECORDING SHEET

1. Graph the information from the table for Ellie and Daisy. Show trend lines for each graph.



2. If possible, mark and label the coordinate that shows the time when the girls are the same distance from school.

3. If possible, mark and label the coordinates that show when each of the girls reaches the park.

DAISY'S JOURNEY

Suppose that Daisy continues to jump rope through all 9 of Herbie's pictures.

1. Complete the following information about Daisy's journey.

Picture #	1	2	3	4	5	6	7	8	9
Time (in seconds)	0	6	12	18	24				
Distance (in meters)	0	12	24						

2. Write a rule that describes the relationship between Daisy's time and distance.

   In words: Daisy's distance from school is ________________________________

   In symbols: D = ______________

3. Could this rule represent a linear function? Explain

4. Use the information from problem 1 to complete the table below.

Pictures	Change in Distance (in meters)	Elapsed Time (in seconds)	Rate of change $\left(\frac{\text{meters}}{\text{second}}\right)$
1 to 2	12 – 0 = 12	6 – 0 = 6	$\frac{12\text{m}}{6\text{ sec}} = \frac{2\text{m}}{1\text{ sec}}$
1 to 3			
2 to 4			

5. In the last column in the table above, what do you notice about the rates of change?

6. How is the rate of 2 meters per second represented on the graph of Daisy's trend line?

7. On the graph, we will call the vertical change per unit of horizontal change the __________ of the line. Daisy's trend line is an example of a line with a ____________ __________.

ELLIE'S JOURNEY

Suppose that Ellie continues to walk through all 9 of Herbie's pictures.

1. Complete the following information about Ellie's journey.

Picture #	1	2	3	4	5	6	7	8	9
Time (in seconds)	0	6	12	18	24				
Distance (in meters)	36	42	48	54					

2. Ellie thinks the rule to describe her time and distance is $D = 36 + t$. Is she correct? ________ Give two examples to support your answer.

3. Use the information from problem 1 to complete the table below.

Pictures	Change in Distance (in meters)	Elapsed Time (in seconds)	Rate of change $\left(\frac{\text{meters}}{\text{second}}\right)$
1 to 2	$42 - 36 = 6$	$6 - 0 = 6$	$\frac{6\text{ m}}{6\text{ sec}} = \frac{1\text{ m}}{1\text{ sec}}$
1 to 4			
3 to 4			

4. In the last column in the table above, what do you notice about the rates of change?

5. How is the rate of 1 meter per second represented on the graph of Ellie's trend line?

6. On the graph, we will call the vertical change per unit of horizontal change the ___________ of the line.

GOING TO THE PARK: PART 2

Now, Herbie will take nine more pictures of Charlie and Duke going back to school, starting at 3:15:00. Again she will wait 6 seconds between snapping pictures. Charlie left earlier and is waiting 60 meters from the school. Duke is already at the park at 3:15:00. He leaves the park on his roller skates to go back to school for soccer practice at a steady rate.

1. Beginning at 3:15:00, record the first six times that Herbie will snap pictures.

   __________ __________ __________ __________ __________ __________

2. Complete the table showing distances from school.

Name	**Picture #** (Picture 1 starts at 0 seconds. Herbie took a picture every 6 seconds.)								
Picture #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Charlie's distance from school (in meters)	60	60							
Duke's distance from school (in meters)	90	72							

3. Does Charlie get back to school by the time Herbie finishes taking her pictures? If so, when?

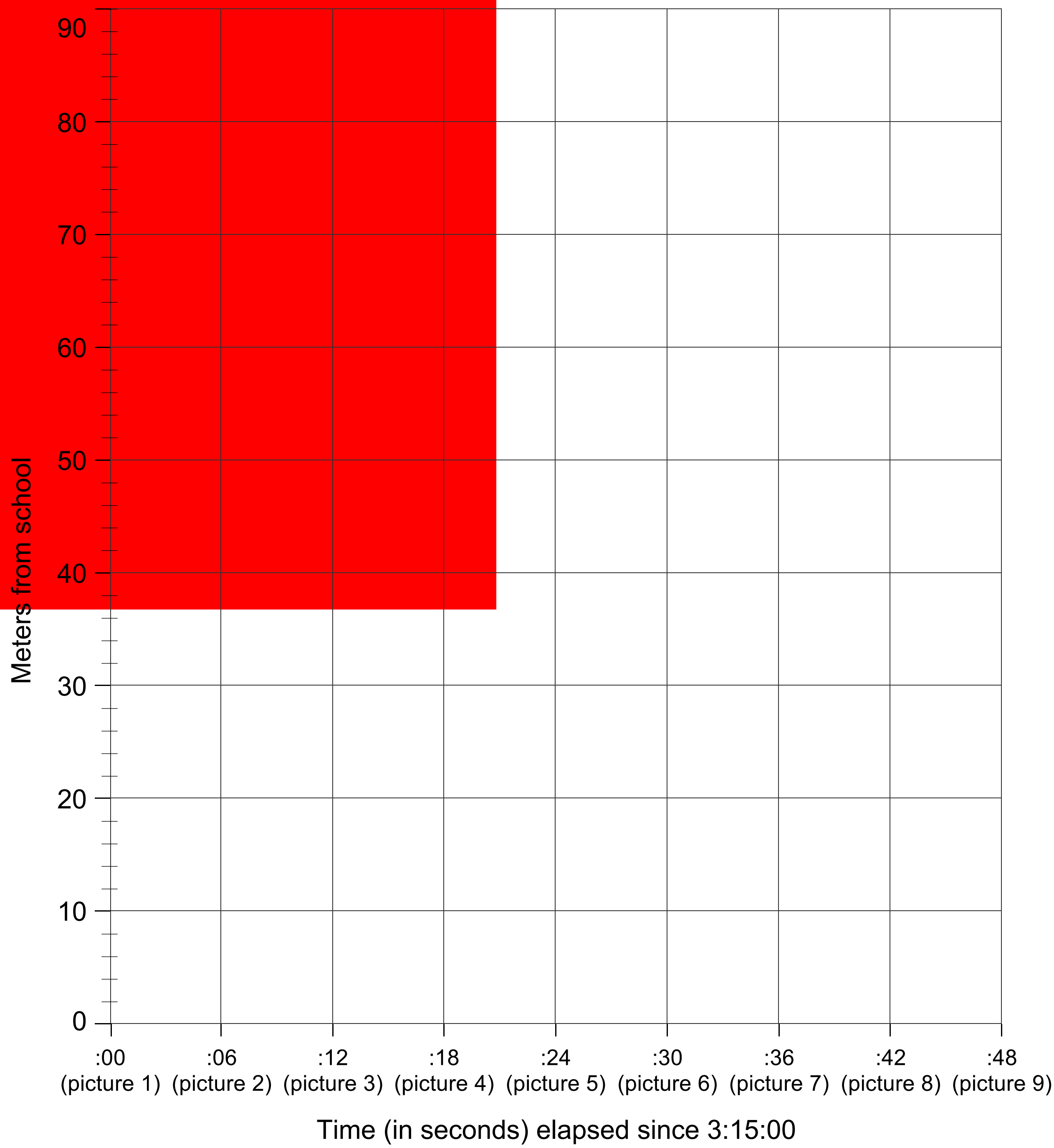
   How do you know?

4. Does Duke get back to school by the time Herbie finishes taking her pictures? If so, when?

   How do you know?

GOING TO THE PARK: PART 2 RECORDING SHEET

1. Graph the information from the table about Charlie and Duke.



2. If possible, mark and label the coordinate that shows when the boys are the same distance from school.

3. If possible, mark and label the coordinates that show when the boys reach the school.

DUKE'S JOURNEY

Suppose that Duke continues to roller skate through all 9 of Herbie's pictures.

1. Complete the following information about Duke's journey.

Picture #	1	2	3	4	5	6	7	8	9
Time (in seconds)	0	6	12	18					
Distance (in meters)	90	72	54						

2. Circle the explicit rule that describes the relationship between Duke's time and distance.

$D = 12t$ $D = -3t + 90$ $D = 3t$

3. Use the information from problem1 to complete the table below.

Pictures	Change in distance (in meters)	Elapsed Time (in seconds)	Rate $\left(\frac{\text{meters}}{\text{second}}\right)$
1 to 2	72 – 90 = -18	6 – 0 = 6	$\frac{-18\text{ m}}{6\text{ sec}} = \frac{-3\text{ m}}{1\text{ sec}}$
1 to 3			
2 to 4			

4. What do you notice about the rates of change between pictures?

5. How is this represented on the graph of Duke's trend line?

6. How long does it take Duke to roller skate to school?

7. Duke is NOT traveling at a negative rate of speed, which is impossible. Rather, Duke is traveling in the *opposite* direction as the others, at a rate of 3 meters per second.

   Duke's trend line is an example of a line with a ________________ ___________.

CHARLIE'S JOURNEY

Suppose that Charlie remains 60 meters from school through all 9 of Herbie's pictures.

1. Complete the following information about Charlie's journey.

Picture #	1	2	3	4	5	6	7	8	9
Time (in seconds)	0	6	12	18					
Distance (in meters)	60	60	60						

2. Write a rule that describes the relationship between Charlie's time and distance.

____

3. Use the information from problem 1 to complete the table below.

Pictures	Change in distance (in meters)	Elapsed Time (in seconds)	Rate $\left(\frac{\text{meters}}{\text{second}}\right)$
1 to 2	60 – 60 = 0	6 – 0 = 6	$\frac{0\text{ m}}{6\text{ sec}} = \frac{0\text{ m}}{1\text{ sec}}$
1 to 4			
3 to 4			

4. What do you notice about the rates of change between pictures?

5. How is this represented on the graph of Charlie's trend line?

6. Charlie's trend line is an example of a line with a ______________ __________.

STACKING CUPS

Summary (Ready)	Goals (Set)
We will measure and record heights of stacked cups, and represent the data using numbers, graphs, and algebraic symbols. Then we will estimate a line that fits the data.	• Use numbers, graphs, and symbols to represent data. • Understand and estimate a line that fits the data. • Draw conclusions based on data displays.

Warmup (Go)

Graph each set of ordered pairs, connect them in order to a form shapes, and name each shape.

1. (Quadrant I)
   (2.5, 1), (2.5, 5), (6.5, 5), (6.5, 1)

shape: _______________

2. (Quadrant II)
   (-3, 3), (-7, 3), (-8, 6), (-5, 8), (-2, 6)

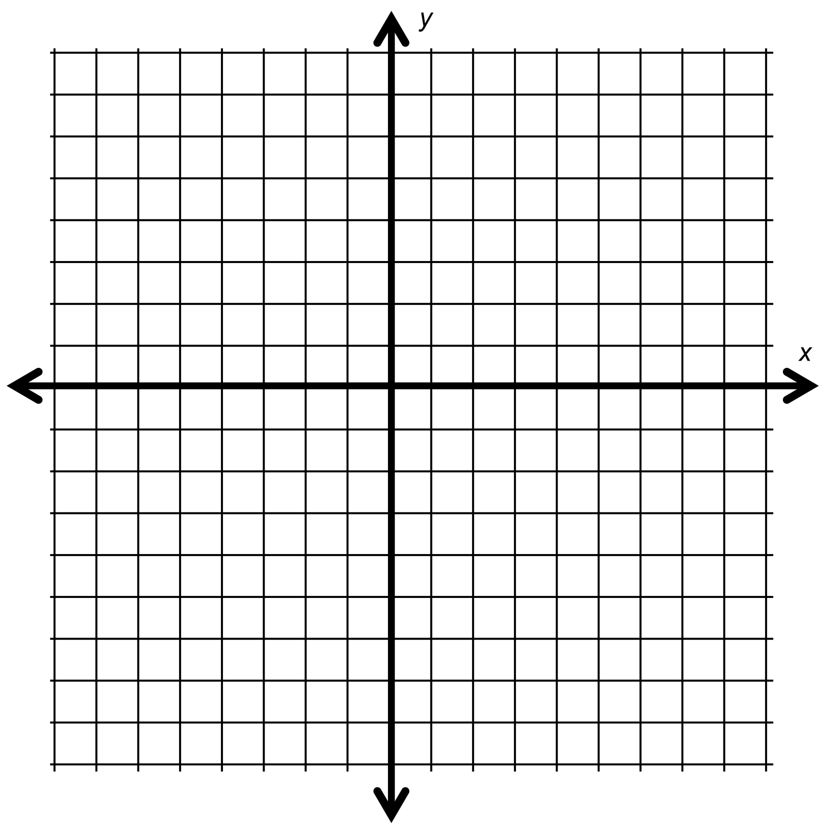
shape: _______________

3. (Quadrant III)
   $(-4, -3\frac{1}{2})$, $(-7, -7\frac{1}{2})$, $(-1, -7\frac{1}{2})$

shape: _______________

4. (Quadrant IV)
   (3, -2), (1, -4), (1, -6), (3, -8),
   (5, -8), (7, -6), (7, -4), (5, -2)

shape: _______________



STACKING CUPS: TABLE, GRAPH, AND RULES

You will measure heights of cups as you stack them together and then analyze the data.

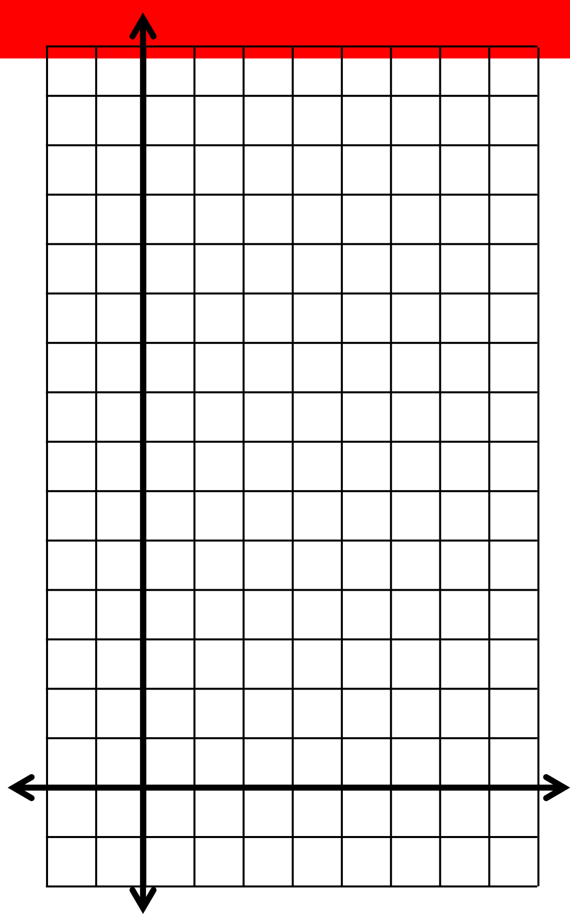
1. What is an appropriate unit of measure? ________________________,

   rounded to the nearest ________________________.

2. Measure and record the height of the first cup. Place a second cup inside the first, and measure and record the new height. Continue this process a few more times with different numbers of cups.

Number of cups (x)	1	2	3	4			
Height (y)							

3. Graph the ordered pairs and sketch a line that fits the data. Scale the axes as needed.



4. We might say that the height of the stack depends on the number of cups in the stack, so the independent variable is

   ____________________________,

   and the dependent variable is

   ____________________________.

5. What might be a good recursive rule for the height (in words)?

6. What might be a good explicit rule for the height (using symbols)?

7. For the line you sketched to fit the data, what do you think is the significance of the y-values corresponding to x-values that are not integers (as in x = 1.5)?

STACKING CUPS: ANALYSIS

1. How did you determine a line to fit your data?

2. How did you determine the recursive rule?

3. What part of the cup represents the difference between the heights in successive cup measurements?

4. How does this difference relate to the numbers in the table?

5. Where is this difference visible on the graph?

6. Estimate the slope of your line that fits the data.

7. Estimate the height (in centimeters) of:

   a. A stack of 10 cups

   b. A stack of 100 cups

8. If you extended your line to $x = 0$, approximately where would it intersect the y-axis? In other words, name the y-intercept.

9. Although zero cups would have zero height, the line does **not** pass through the point (0, 0). Why?

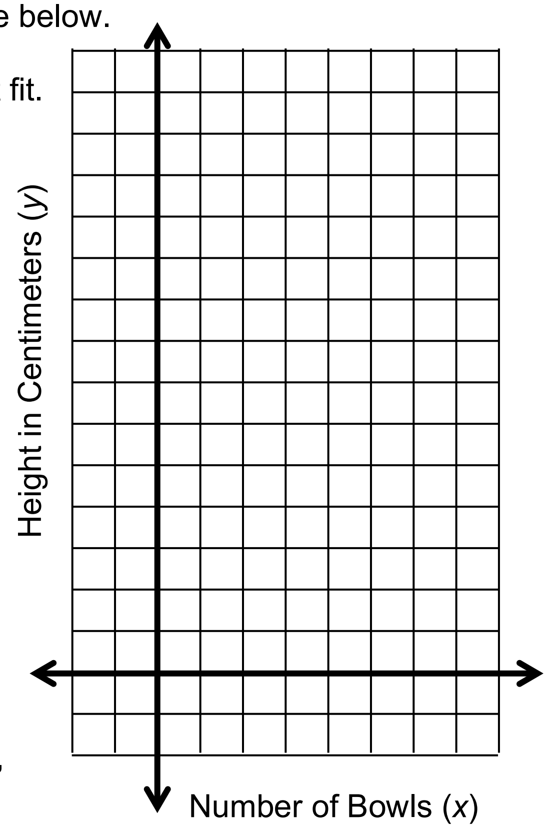
STACKING BOWLS

Maxine measured and recorded the height of a bowl in centimeters. Then she placed a second bowl inside the first, measured and recorded the new height, and continued this process a few more times.

1. Write reasonable heights for 5 and 6 bowls in the table below.

2. Graph the ordered pairs below and draw a line of best fit.

Number of bowls (x)	Height in cm (y)
1	4.2
2	6.3
3	8.2
4	10.3
5	
6	



3. The independent variable is ____________________,

   and the dependent variable is __________________.

4. What might be a good recursive rule for the height (in words)?

5. What might be a good explicit rule for the height (using words and/or symbols)?

6. For the line you sketched to fit the data, what do you think is the significance of the y-values corresponding to x-values that are not integers (as in $x = 1.5$)?

SKILL BUILDERS, VOCABULARY, AND REVIEW

SKILL BUILDER 1

Compute.

1. $4-\frac{1}{3}$	2. $\frac{2}{6}+\frac{2}{5}$	3. $2\frac{1}{4}+3\frac{5}{8}$
4. $2\frac{5}{6}+1\frac{3}{4}$	5. $5\frac{3}{4}-2\frac{2}{3}$	6. $6\frac{1}{5}-3\frac{1}{4}$

Place parentheses in the equations below to make true statements.
Write "none needed" if the equation is already true.

7. $48 - 6 \div 3 \cdot 2 = 7$	8. $-12 \cdot 6 - 4 + 2 = -48$

Simplify.

9. $75 \div 3 \bullet 5^2$	10. $-6 - 9(2 - 6)$

Use a mental strategy to solve each equation.

11. $-6(x + 1) = -48$	12. $\frac{x-10}{4} = -2$

SKILL BUILDER 2

Compute.

1. (-7) + (9)	2. (16) + (-12)	3. (-32) + (-42)
4. (-50) – (-20)	5. (50) – (-20)	6. (10) – (16)
7. (10) – (-16)	8. (16) – (-10)	9. (0) – (73)
10. (-7) • (-9)	11. $\frac{-56}{-8}$	12. -3(-7)(-4)

Solve each inequality mentally. Then graph the solutions by drawing a ray. Check a point on the ray.

13. $6x > -30$ Solution: Graph:  Check a point on the ray.	14. $x + (-4) \leq -2$ Solution: Graph:  Check a point on the ray.

Place parentheses in the equations below to make true statements.
Write “none needed” if the equation is already true.

15. 24 ÷ 2 + 1 • 3 = 24	16. 24 ÷ 2 + 1 • 3 = 39

SKILL BUILDER 3

Compute.

1. $\frac{3}{5} \bullet \frac{3}{4}$	2. $\frac{5}{12} \bullet \frac{9}{10}$	3. $1\frac{2}{3} \bullet 2\frac{3}{4}$
4. $\frac{9}{10} \div \frac{3}{5}$	5. $\frac{3}{5} \div \frac{9}{10}$	6. $1\frac{2}{3} \div 2\frac{3}{4}$

Simplify.

7. $18 \div 2 \bullet 3 \div 4$	8. $18 \div (2 \bullet 3) \div 4$
9. $5 - 10 \div (-2) + 3(-4 - 2)$	10. $\dfrac{5-10}{(-2)+3(-4-2)}$
11. $\dfrac{-3(2-6)^2}{3 \bullet 5 + 1}$	12. $-3(2-6)^2 \div 3 \bullet 5 + 1$

SKILL BUILDER 4

Compute.

1. 3.08 + 1.91	2. 10.55 – 2.3	3. 0.8 • 0.3
4. 1.3 • 3.4	5. 0.48 ÷ 1.2	6. 6.4 ÷ 0.02

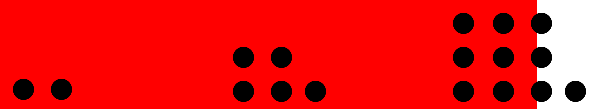
Write the expressions using symbolic notation. Evaluate for the given values of the variables.

7. expression in words	The cost of green shirts is *g*, and the cost of pink shirts is *p*. What is the cost of 6 green shirts and 8 pink shirts?
expression in symbols	
evaluate for *g* = \$8.50, *p* = \$11.00	

8. expression in words	The number of DVDs is *d*, and they are being equally shared by a group of girls (*g*) and boys (*b*). What is the number of DVDs each person gets?
expression in symbols	
evaluate for *d* = 56, *g* = 3, *b* = 4	

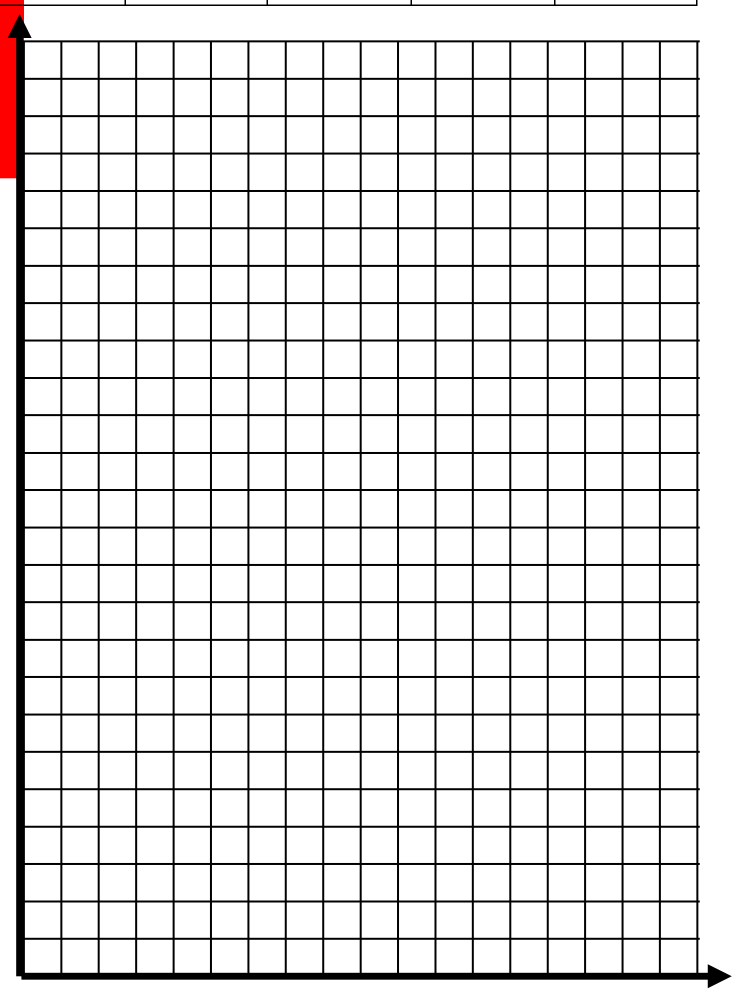
SKILL BUILDER 5

Draw the next step suggested by this pattern. Then complete the table and find a rule for the number of dots at step *n*.



step1 step 2 step 3 step 4

Step #	0	1	2	3	4	5	50	*n*
Number of dots								
Break apart numbers								



1. Label the horizontal and vertical axes and graph the data points.

2. Recursive Rule:

3. Explicit Rule:

4. How many dots are in step #100?

5. In what step number are there exactly 626 dots?

6. Is this a linear function? Explain.

SKILL BUILDER 6

For each explicit rule, complete the input-output table.

1.

x	0		1		2		Rule:
y		0		1		2	$y = x - 2$

2.

x	0		1		2		Rule:
y		0		1		2	$y = 2x + 4$

3.

x	0		1		2		Rule:
y		0		1		2	$y = \frac{1}{2}x$

Find the missing values in each input-output table, and write an explicit rule for the data.

4.

x	y
1	7
2	9
3	11
	13
5	
6	

Rule: y = ____________

5.

x	y
-3	
4	-24
12	-72
0	0
	-6
	6

Rule: y = ____________

6.

x	y
-15	-5
0	
9	3
42	14
	-1
	1

Rule: y = ____________

SKILL BUILDER 7

Rick is saving to buy a pair of tickets to the UCLA football game against USC at the end of the season. Since the demand is very high, this will cost \$240. He has \$60 saved already. He will save \$30 per month.

1. Use a table to determine how long it will take Rick to save enough money to buy the tickets.

# of months (x)	0	1								
total saved in \$ (y)	60									

2. Write an equation of the form $y = mx + b$ that can be used to find the total amount saved.

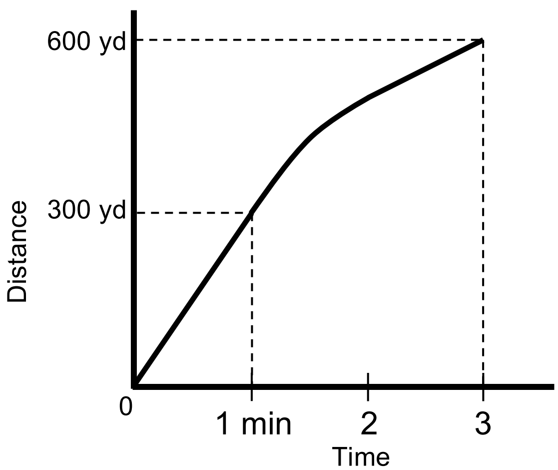
   Let m be the amount of money Rick is going to save each month.
   Let b be the amount of money Rick already has saved.
   Let x be the number of months he has been saving.
   Let y be total amount saved.

3. Use your equation to determine how long it will take Rick to save enough money to buy the tickets.

4. Find all combinations of nickels, dimes, and quarters that can make exactly \$0.65.

SKILL BUILDER 8

Pat went jogging at the park. Use the graph to complete the table.



	Time period	Distance traveled	Average rate of speed
1.	From 0 minutes to 1 minute		
2.	From 1 minute to 3 minutes		
3.	From 0 minutes to 3 minutes		

4. In what part of the jog did Pat run faster, the initial one minute or the last three minutes? Explain by referencing numbers and the shape of the graph.

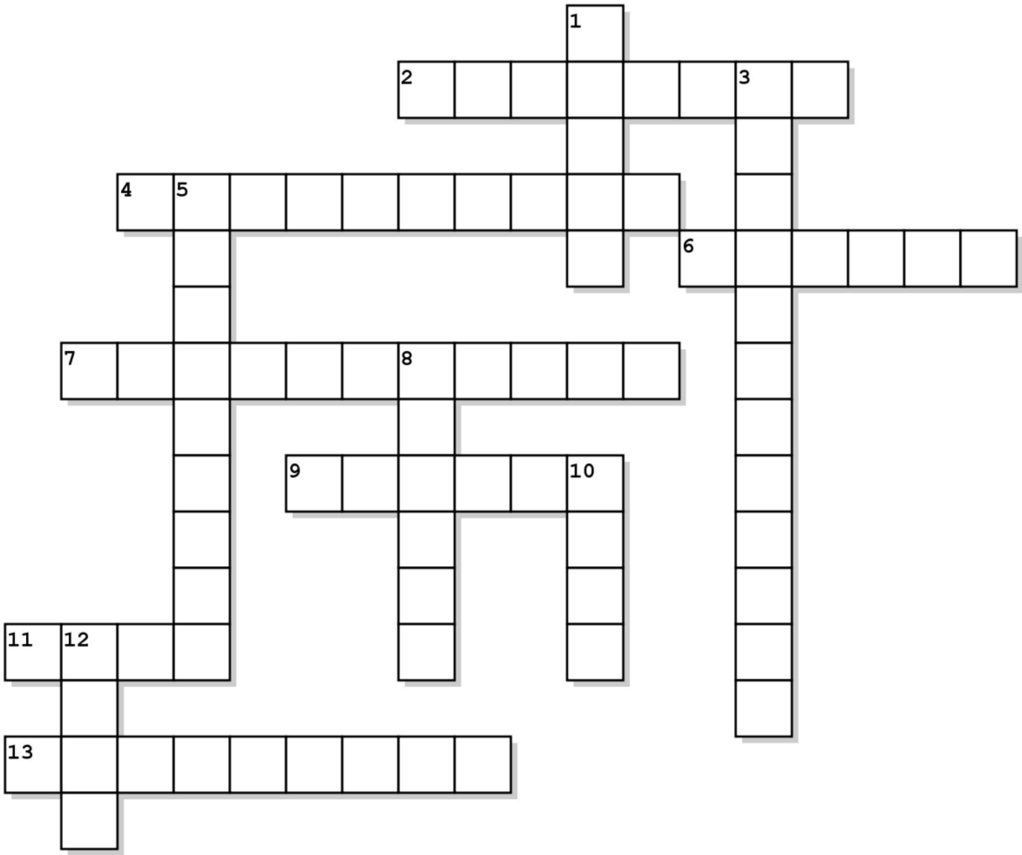
5. Could this graph represent a linear function? Explain.

Write an equation to match each statement. Then use a mental strategy to solve for the unknown value.

6. Paul has 36 strawberries, which is 3 times the number of strawberries that Barry has. How many strawberries does Barry have?

7. Kim ate 24 grapes on Tuesday. On Tuesday, she ate 13 less grapes than she did on Monday. How many grapes did she eat on Monday?

FOCUS ON VOCABULARY



Across

2 _________ rule (an input-output rule for a sequence)

4 *y*-coordinate at which a graph crosses the *y*-axis

6 altitude of a figure

7 tables, graphs, symbols, words (2 words)

9 function whose graph is a line

11 side of a polyhedron

13 distance around a polygon

Down

1 rate of change of a linear function

3 point of _________ (where two lines meet)

5 _____ reasoning is reasoning based on examples

8 distance

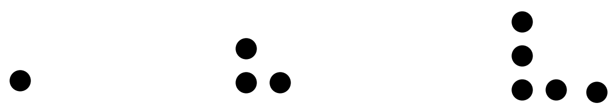
10 ratio with units attached

12 measure of size, expressed in square units

SELECTED REPONSE

Show your work on a separate sheet of paper and choose the best answer(s).

1. The first three steps of a growing shape are shown below. Which choice gives the correct output value for the input value x = 5, and a correct explicit rule?



Step # (x)		1	2	3			x
Number of dots (y)		1	3	5			

A. 7; $y = 2x + 1$ B. 9; $y = 2x + 1$

C. 7; $y = 2x – 1$ D. 9; $y = 2x – 1$

2. Jesse starts walking at noon at a constant rate. The table shows the distance he travels at several 5-second intervals past noon.

Time (in seconds past noon)	0	5	10	15	20	25	30	35	40
Distance (in meters)	0	10	20	30	40	50	60	70	80

What is a rule for the relationship between the distance and time traveled by Jesse?

A. $d = t + 5$ B. $d = 2t$ C. $d = t + 10$ D. $d = 5t$

3. In front of the grocery store, Darryl notices the shopping carts stacked together, and measures the lengths of the stacks of different numbers of carts. Which explicit rule below corresponds to the data in the table?

Number of carts (x)	1	2	3	4	5
Length in meters (y)	1.8	2.1	2.4	2.7	3.0

A. $y = x + 0.3$ B. $y = x + 1.8$ C. $y = 0.3x + 1.5$ D. $y = 0.3x + 1.8$

KNOWLEDGE CHECK

Show your work on a separate sheet of paper and write your answers on this page.

4.1 Growing Shapes

1. Write a numerical expression for step 4.

$5 + (2 \bullet 1)$	$5 + (2 \bullet 2)$	$5 + (2 \bullet 3)$	
step 1	step 2	step 3	step 4

2. Write a variable expression for the pattern illustrated above for step n.

4.2 Going to the Park

Jamal starts rollerblading at 8:00:00 AM. The table below shows the distance Jamal travels at four-second intervals after 8:00:00 AM.

3. Complete the table using the established pattern.

Time (seconds past 8:00:00 AM)	0	4	8	12	16	20	24	28
Distance (meters traveled)	0	20	40	60				

4. Write a rule about the relationship between Jamal's time and distance.

In words: Distance = ______________________________

In symbols: D = ______________________________

4.3 Stacking Cups

Marisol made a table showing the height of a stack of plates for a given number of plates.

Number of Plates (x)	1	2	3	4	5
Height of Plates (y)	2.2 cm	2.4 cm	2.6 cm	2.8 cm	3.0 cm

5. Make a graph of the data. Be sure to label the axes and give your graph a title.

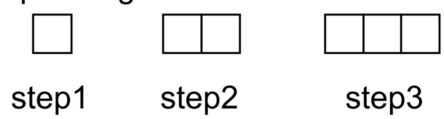
6. Write a rule to determine the height of the plates given the number of plates.

7. What will be the height of 27 plates?

HOME-SCHOOL CONNECTION

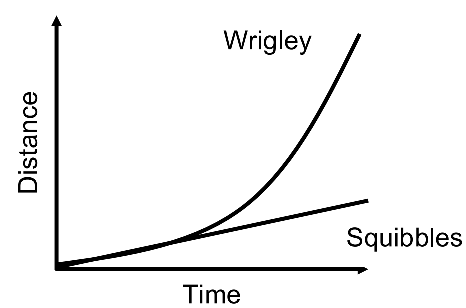
Here are some questions to review with your young mathematician.

1. Use inductive reasoning to complete the table and find an explicit rule for the sequence. The first three steps are given.



Step # (x)		1	2	3	4	5	6	x
Perimeter (y)		4	6	8	10			

2. Two dogs, Wrigley and Squibbles, are running in the park to retrieve a ball. Based on the graph, who is running faster? How can you tell?



Yuki made a table showing the heights of stacks of dishes.

Number of dishes (x)	1	2	3	4	5
Height of dishes (y)	2.25 in	2.75 in	3.25 in	3.75 in	4.25 in

3. Make a graph of Yuki's data.

4. Write an explicit rule for the sequence that fits the data.

5. Use your rule to predict the height of a stack of 10 dishes.

6. Explain why the y-intercept of this graph is NOT 0, even though the height of zero dishes is 0.

Parent (or Guardian) Signature ___________________________

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COMMON CORE STATE STANDARDS – MATHEMATICS

STANDARDS FOR MATHEMATICAL CONTENT	
8.EE.5	Graph proportional relationships, interpreting the unit rate as the slope of the graph. ~~Compare two different proportional relationships represented in different ways.~~ ~~*For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*~~
8.EE.8a	Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.
8.EE.8c	Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.*
8.F.2	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*
8.F.3	Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function* $A = s^2$ *giving the area of a square as a function of its side length is not linear because its graph contains the points (1, 1), (2, 4) and (3, 9), which are not on a straight line.*
8.F.4	Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.
8.F.5	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.
8.SP.2	Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.
8.SP.3	Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.*

STANDARDS FOR MATHEMATICAL PRACTICE	
MP2	Reason abstractly and quantitatively.
MP4	Model with mathematics.
MP6	Attend to precision.
MP7	Look for and make use of structure.

9 7 8 1 6 1 4 4 5 2 1 2 6