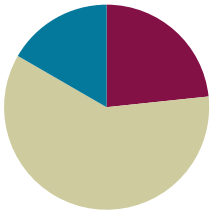
Lesson 27

Objective: Use rectangles to draw a robot with specified perimeter measurements, and reason about the different areas that may be produced.

Suggested Lesson Structure

Fluency Practice	(14 minutes)
Concept Development	(36 minutes)
Student Debrief	(10 minutes)
Total Time	**(60 minutes)**



Fluency Practice (14 minutes)

- Sprint: Multiply or Divide by 7 **3.OA.7** (10 minutes)
- Find the Area **3.MD.7** (4 minutes)

Sprint: Multiply or Divide by 7 (10 minutes)

Materials: (S) Multiply or Divide by 7 Sprint

Note: This Sprint builds fluency with multiplication and division facts using units of seven.

Find the Area (4 minutes)

Materials: (S) Personal white board

Note: This activity reviews Lesson 19.

T: (Project the rectangle with a width of 2 cm. Inside the rectangle, write Perimeter = 10 cm.) On your personal white board, write the length of this rectangle.

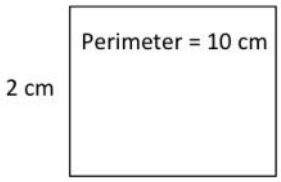
S: (Write 3 cm.)

T: (Write 3 cm on the length of the rectangle. Below the rectangle, write Area = ___.) On your board, write the area of this rectangle. Write a multiplication sentence if you need to.

S: (Write Area = 6 sq cm.)

T: Draw a different rectangle that has the same area.

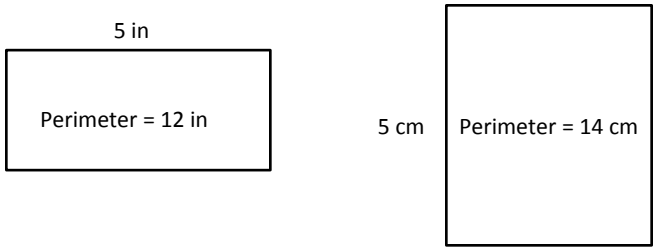
S: (Draw a 1 cm × 6 cm rectangle.)



NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

One way to differentiate the Multiply or Divide by 7 Sprint for students working above grade level is to make individualized performance goals. Students may enjoy recording and charting their completion time, seeking to improve their speed. Other goals may include good sportsmanship, persistence, high ambition, and leadership. Engage students in discussions of what constitutes excellence.

Repeat the process for the other rectangles.



Concept Development (36 minutes)

Materials: (T) Completed sample robot project, Evaluation Rubric (S) Ruler, 3 strings from Lesson 26, sample Problem Set (Template) (per pair), Problem Set

Note: Students may analyze one another's work anonymously. If that is best for the class, be sure that work is labeled with a number or symbol rather than with student names.

Part A: Robot Evaluation

T: (Project a sample robot as shown to the right. Consider using blank paper to cover the environment to help students focus on the robot.) Here is a finished robot. Let's analyze the work. How can we check the measurements and perimeter calculations?

S: We can use rulers to check the measurements and then add to double-check the perimeters.

T: (Pass out the Template, shown to the right.) To analyze the accuracy of this robot, I used my ruler to measure the widths and lengths of each body part and recorded them on the chart in front of you. Then, I calculated the perimeter of Rectangle A and checked it with the required perimeter, labeled in the final column. Check my calculation for Rectangle A. Does it match the required perimeter?

S: Yes. They are both 14 centimeters.

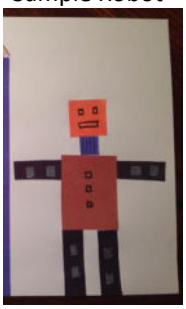
T: Work with a partner to finish calculating the rest of the perimeters using the given lengths and widths. If you find that your measurements differ from the required perimeter, put a star by the letter of the rectangle.

S: (Calculate the perimeters.)

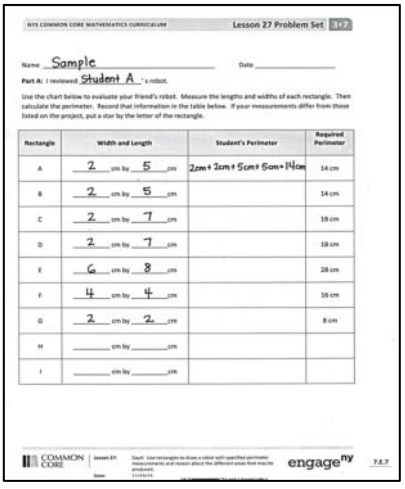
T: What did you find?

S: These perimeters are all correct!

Sample Robot



Sample Problem Set Template



T: What is next on our list?

S: Checking that the body is double the perimeter of an arm and that the neck is half the perimeter of the head.

T: Do that now. Record your calculations, and then check your answer with a partner's.

S: (Record.) It is done correctly. A perimeter of 28 centimeters for the robot's body is double 14 centimeters, and 8 centimeters for the robot's neck is half of 16 centimeters.

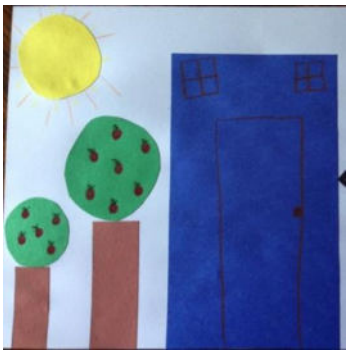
T: Each of you will analyze a classmate's robot just as we did this one. Write your classmate's name on your Problem Set. Confirm the measurements and perimeters calculated by your classmate with your ruler. (Distribute a classmate's work to each student, and circulate to answer the questions that arise.)

Part B: Robot Environment Evaluation

In Part B, students use the same process as in Part A to evaluate a different classmate's robot environment. Each student uses her three strings to measure nonrectangular items like the sun and the tree tops. Make sure to discuss how these circular measurements most likely do not produce exact numbers. Provide examples of perimeter measurements that are appropriate to call *about 25 centimeters*.

If time permits, have students evaluate a different classmate's robot or robot environment.

Sample Robot Environment

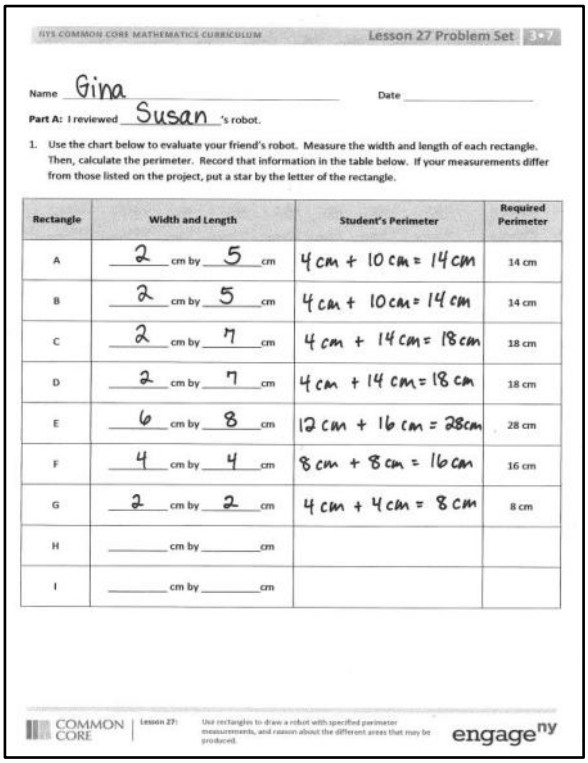


Student Debrief (10 minutes)

Lesson Objective: Use rectangles to draw a robot with specified perimeter measurements, and reason about the different areas that may be produced.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.



NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 27 Problem Set 3•7

Name Gina Date

Part A: I reviewed Susan 's robot.

1. Use the chart below to evaluate your friend's robot. Measure the width and length of each rectangle. Then, calculate the perimeter. Record that information in the table below. If your measurements differ from those listed on the project, put a star by the letter of the rectangle.

Rectangle	Width and Length	Student's Perimeter	Required Perimeter
A	2 cm by 5 cm	4 cm + 10 cm = 14 cm	14 cm
B	2 cm by 5 cm	4 cm + 10 cm = 14 cm	14 cm
C	2 cm by 7 cm	4 cm + 14 cm = 18 cm	18 cm
D	2 cm by 7 cm	4 cm + 14 cm = 18 cm	18 cm
E	6 cm by 8 cm	12 cm + 16 cm = 28cm	28 cm
F	4 cm by 4 cm	8 cm + 8 cm = 16 cm	16 cm
G	2 cm by 2 cm	4 cm + 4 cm = 8 cm	8 cm
H	cm by cm		
I	cm by cm		

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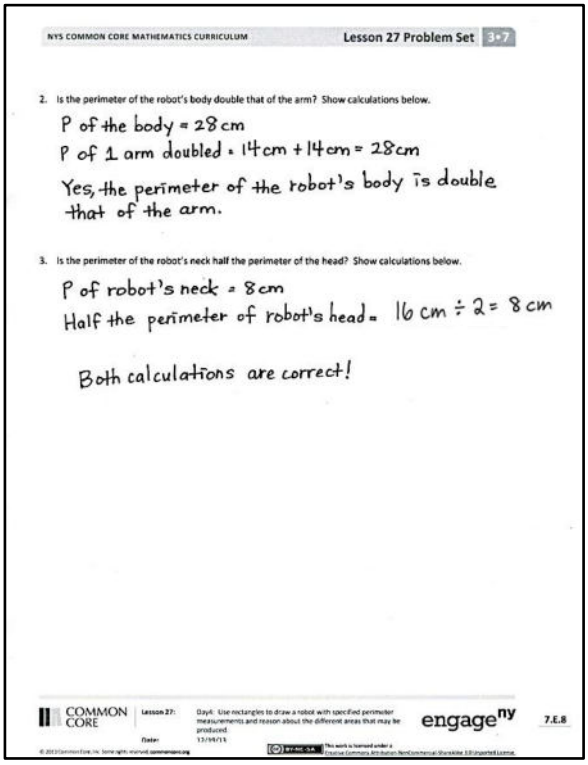
Any combination of the questions below may be used to lead the discussion.

MP.3

- How was the student work you checked similar to the design you created? How was it different?
- How was checking the student work different from creating your design yesterday? If you could go back and change your design, would you? If so, in what ways?
- What did you learn about the areas of rectangles that have the same perimeters? How does this help you better understand the relationship between area and perimeter?

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students' understanding of the concepts that were presented in today's lesson and planning more effectively for future lessons. The questions may be read aloud to the students.



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2. Is the perimeter of the robot's body double that of the arm? Show calculations below.

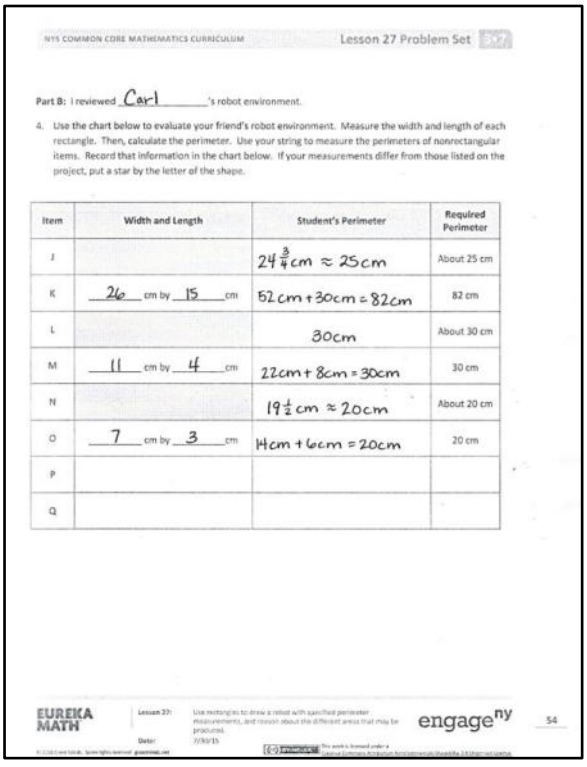
P of the body = 28 cm
P of 1 arm doubled = 14cm + 14cm = 28cm

Yes, the perimeter of the robot's body is double that of the arm.

3. Is the perimeter of the robot's neck half the perimeter of the head? Show calculations below.

P of robot's neck = 8cm
Half the perimeter of robot's head = 16 cm ÷ 2 = 8 cm

Both calculations are correct!



NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 27 Problem Set 3•7

Part B: I reviewed Carl 's robot environment.

4. Use the chart below to evaluate your friend's robot environment. Measure the width and length of each rectangle. Then, calculate the perimeter. Use your string to measure the perimeters of nonrectangular items. Record that information in the chart below. If your measurements differ from those listed on the project, put a star by the letter of the shape.

Item	Width and Length	Student's Perimeter	Required Perimeter
J		$24\frac{3}{4}$ cm ≈ 25cm	About 25 cm
K	26 cm by 15 cm	52 cm + 30cm = 82cm	82 cm
L		30cm	About 30 cm
M	11 cm by 4 cm	22cm + 8cm = 30cm	30 cm
N		$19\frac{1}{2}$ cm ≈ 20cm	About 20 cm
O	7 cm by 3 cm	14cm + 6cm = 20cm	20 cm
P			
Q			

A

Number Correct: _____

Multiply or Divide by 7

1.	2 × 7 =	
2.	3 × 7 =	
3.	4 × 7 =	
4.	5 × 7 =	
5.	1 × 7 =	
6.	14 ÷ 7 =	
7.	21 ÷ 7 =	
8.	35 ÷ 7 =	
9.	7 ÷ 7 =	
10.	28 ÷ 7 =	
11.	6 × 7 =	
12.	7 × 7 =	
13.	8 × 7 =	
14.	9 × 7 =	
15.	10 × 7 =	
16.	56 ÷ 7 =	
17.	49 ÷ 7 =	
18.	63 ÷ 7 =	
19.	42 ÷ 7 =	
20.	70 ÷ 7 =	
21.	___ × 7 = 35	
22.	___ × 7 = 7	
23.	___ × 7 = 70	
24.	___ × 7 = 14	
25.	___ × 7 = 21	
26.	70 ÷ 7 =	
27.	35 ÷ 7 =	
28.	7 ÷ 7 =	
29.	14 ÷ 7 =	
30.	21 ÷ 7 =	
31.	___ × 7 = 42	
32.	___ × 7 = 49	
33.	___ × 7 = 63	
34.	___ × 7 = 56	
35.	49 ÷ 7 =	
36.	63 ÷ 7 =	
37.	42 ÷ 7 =	
38.	56 ÷ 7 =	
39.	11 × 7 =	
40.	77 ÷ 7 =	
41.	12 × 7 =	
42.	84 ÷ 7 =	
43.	14 × 7 =	
44.	98 ÷ 7 =	

B

Number Correct: _____

Improvement: _____

Multiply or Divide by 7

1.	1 × 7 =	
2.	2 × 7 =	
3.	3 × 7 =	
4.	4 × 7 =	
5.	5 × 7 =	
6.	21 ÷ 7 =	
7.	14 ÷ 7 =	
8.	28 ÷ 7 =	
9.	7 ÷ 7 =	
10.	35 ÷ 7 =	
11.	10 × 7 =	
12.	6 × 7 =	
13.	7 × 7 =	
14.	8 × 7 =	
15.	9 × 7 =	
16.	49 ÷ 7 =	
17.	42 ÷ 7 =	
18.	56 ÷ 7 =	
19.	70 ÷ 7 =	
20.	63 ÷ 7 =	
21.	___ × 7 = 7	
22.	___ × 7 = 35	
23.	___ × 7 = 14	
24.	___ × 7 = 70	
25.	___ × 7 = 21	
26.	14 ÷ 7 =	
27.	7 ÷ 7 =	
28.	70 ÷ 7 =	
29.	35 ÷ 7 =	
30.	21 ÷ 7 =	
31.	___ × 7 = 21	
32.	___ × 7 = 28	
33.	___ × 7 = 63	
34.	___ × 7 = 49	
35.	56 ÷ 7 =	
36.	63 ÷ 7 =	
37.	42 ÷ 7 =	
38.	49 ÷ 7 =	
39.	11 × 7 =	
40.	77 ÷ 7 =	
41.	12 × 7 =	
42.	84 ÷ 7 =	
43.	13 × 7 =	
44.	91 ÷ 7 =	

Name _____ Date _____

Part A: I reviewed _____'s robot.

1. Use the chart below to evaluate your friend's robot. Measure the width and length of each rectangle. Then, calculate the perimeter. Record that information in the chart below. If your measurements differ from those listed on the project, put a star by the letter of the rectangle.

Rectangle	Width and Length	Student's Perimeter	Required Perimeter
A	_____ cm by _____cm		14 cm
B	_____ cm by _____cm		14 cm
C	_____ cm by _____cm		18 cm
D	_____ cm by _____cm		18 cm
E	_____ cm by _____cm		28 cm
F	_____ cm by _____cm		16 cm
G	_____ cm by _____cm		8 cm
H	_____ cm by _____cm		
I	_____ cm by _____cm		

2. Is the perimeter of the robot's body double that of the arm? Show calculations below.

3. Is the perimeter of the robot's neck half the perimeter of the head? Show calculations below.

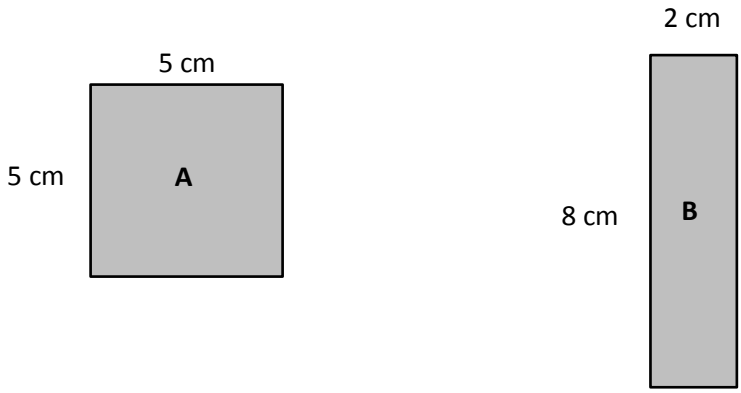
Part B: I reviewed _____'s robot environment.

4. Use the chart below to evaluate your friend's robot environment. Measure the width and length of each rectangle. Then, calculate the perimeter. Use your string to measure the perimeters of nonrectangular items. Record that information in the chart below. If your measurements differ from those listed on the project, put a star by the letter of the shape.

Item	Width and Length	Student's Perimeter	Required Perimeter
J			About 25 cm
K	_____ cm by _____cm		82 cm
L			About 30 cm
M	_____ cm by _____cm		30 cm
N			About 20 cm
O	_____ cm by _____cm		20 cm
P			
Q			

Name _____ Date _____

1. Record the perimeters and areas of Rectangles A and B in the chart below.

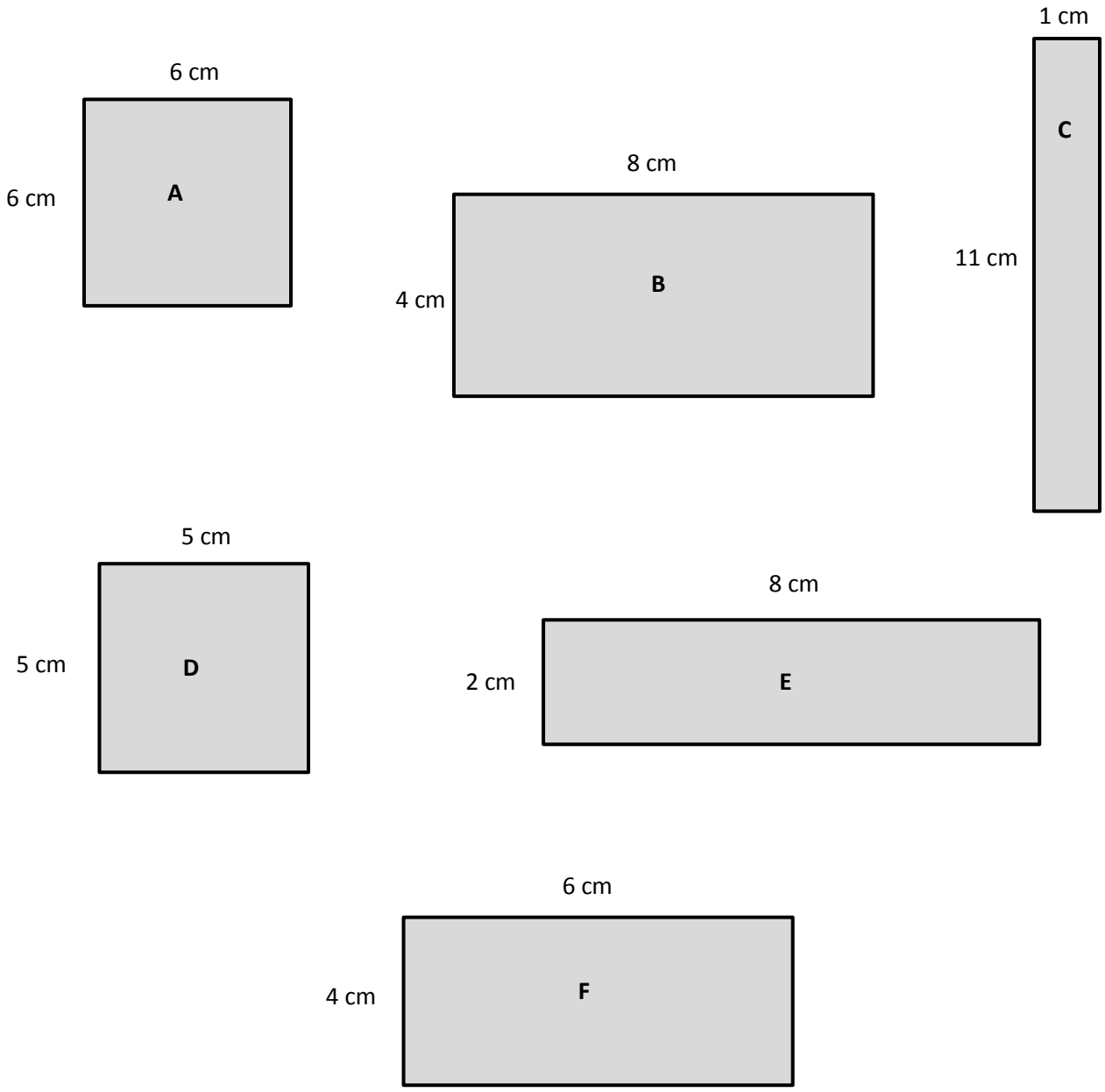


Rectangle:	Width and Length:	Perimeter	Area
A	_____ cm by _____ cm		
B	_____ cm by _____cm		

2. What is the same about Rectables A and B? What is different?

Name _____ Date _____

Record the perimeters and areas of the rectangles in the chart on the next page.



1. Find the area and perimeter of each rectangle.

Rectangle	Width and Length	Perimeter	Area
A	_____ cm by _____cm		
B	_____ cm by _____cm		
C	_____ cm by _____cm		
D	_____ cm by _____cm		
E	_____ cm by _____cm		
F	_____ cm by _____cm		

2. What do you notice about the perimeters of Rectangles A, B, and C?

3. What do you notice about the perimeters of Rectangles D, E, and F?

4. Which two rectangles are squares? Which square has the greater perimeter?

Name _____ Date _____

Evaluation Rubric

4	3	2	1	Subtotal
Perimeter calculations for all shapes are correct, and both evaluations of a classmate's project have been completed.	Perimeter calculations include 1 to 2 errors, and both evaluations of a classmate's project have been completed.	Perimeter calculations include 3 to 4 errors, and at least 1 evaluation of a classmate's project has been completed.	Perimeter calculations include 5 or more errors, and at least 1 evaluation of a classmate's project has been completed.	_____/4

Name _____ Date _____

Evaluation Rubric

4	3	2	1	Subtotal
Perimeter calculations for all shapes are correct, and both evaluations of a classmate's project have been completed.	Perimeter calculations include 1 to 2 errors, and both evaluations of a classmate's project have been completed.	Perimeter calculations include 3 to 4 errors, and at least 1 evaluation of a classmate's project has been completed.	Perimeter calculations include 5 or more errors, and at least 1 evaluation of a classmate's project has been completed.	_____/4

NYS COMMON CORE MATHEMATICS CURRICULUM **Lesson 27 Problem Set** 3•7

Name Sample Date _____

Part A: I reviewed Student A 's robot.

Use the chart below to evaluate your friend's robot. Measure the lengths and widths of each rectangle. Then calculate the perimeter. Record that information in the table below. If your measurements differ from those listed on the project, put a star by the letter of the rectangle.

Rectangle	Width and Length	Student's Perimeter	Required Perimeter
A	2 cm by 5 cm	2cm + 2cm + 5cm + 5cm = 14cm	14 cm
B	2 cm by 5 cm		14 cm
C	2 cm by 7 cm		18 cm
D	2 cm by 7 cm		18 cm
E	6 cm by 8 cm		28 cm
F	4 cm by 4 cm		16 cm
G	2 cm by 2 cm		8 cm
H	_____ cm by _____ cm		
I	_____ cm by _____ cm		

COMMON CORE | Lesson 27: Day4: Use rectangles to draw a robot with specified perimeter measurements and reason about the different areas that may be produced. Date: 12/19/13 engage^ny 7.E.7

sample Problem Set