BRIDGES IN MATHEMATICS 3

GRADE 3 SUPPLEMENT

Set D6 Measurement: Area in Metric Units

Includes

Skills & Concepts

- ★ determine area by finding the total number of same-sized units of area that cover a shape without gaps or overlaps
- ★ select appropriate units, strategies, and tools for solving problems that involve estimating or measuring area
- ★ solve problems involving areas of rectangles and squares
- ★ find the areas of complex shapes by dividing those figures into basic shapes (e.g., rectangles, squares)
- ★ measure necessary attributes of shapes to use area formulas to solve problems

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Bridges in Mathematics Grade 3 Supplement
Set D6 Measurement: Area In Metric Units

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Bridges in Mathematics is a standards-based K–5 curriculum that provides a unique blend of concept development and skills practice in the context of problem solving. It incorporates the Number Corner, a collection of daily skill-building activities for students.

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Set D6 ★ Activity 1

ACTIVITY

Metric Rectangles

Overview

Students estimate and measure the area of paper rectangles in square centimeters, working toward increasingly efficient methods, including the use of the area formula.

Skills & Concepts

- ★ determine area by finding the total number of same-sized units of area that cover a shape without gaps or overlaps
- ★ select appropriate units, strategies, and tools for solving problems that involve estimating or measuring area
- ★ solve problems involving areas of rectangles and squares
- ★ find the areas of complex shapes by dividing those figures into basic shapes (e.g., rectangles, squares)
- ★ measure necessary attributes of shapes to use area formulas to solve problems

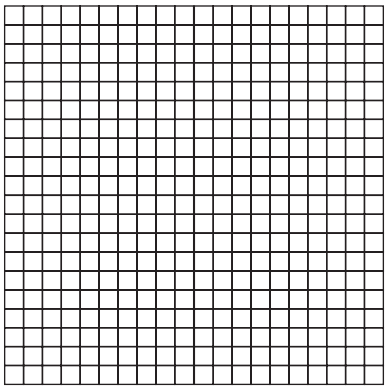
You'll need

- ★ Metric Rectangles (page D6.4, half-class set, run on 3 or 4 different colors of copy paper)
- ★ Metric Rectangles Record Sheet (page D6.5, class set)
- ★ a 20 cm × 30 cm piece of construction paper, any color
- ★ rulers (class set)
- ★ base 10 pieces (class set)

Instructions for Metric Rectangles

1. Distribute sets of base 10 pieces, and ask students to each place 1 small square unit in front of themselves. Ask them what the area of this single unit is in square centimeters. If necessary, have them measure the dimensions of the unit with the centimeter side of their ruler. Work with their input to establish the fact that a single base 10 unit has an area of exactly 1 square centimeter.

2. Ask students to work in groups of 4 to build a square with an area of exactly 400 square centimeters. After they've had a minute to work, have students share and compare their results.



Students *400 square centimeters isn't very big.*
Yeah, 400 square inches would be way bigger.
We just each got a mat because the mats have 100 square centimeters in them.

Activity 1 Metric Rectangles (cont.)

Teacher *How are you thinking about that, Kiara?*

Kiara *Well, one of the little squares is a square centimeter. There are 100 of those squares in a mat, so the mat must be 100 square centimeters.*

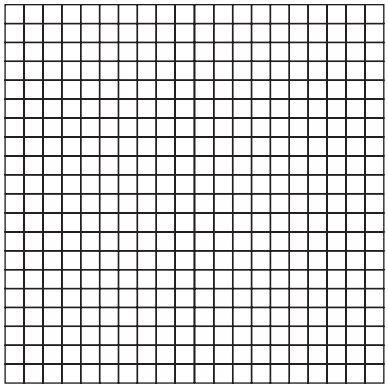
3. Ask each group to measure the dimensions of the square they've just built with the centimeter side of their ruler. What can they tell you about the square now? As volunteers share with the class, press them to explain their thinking.

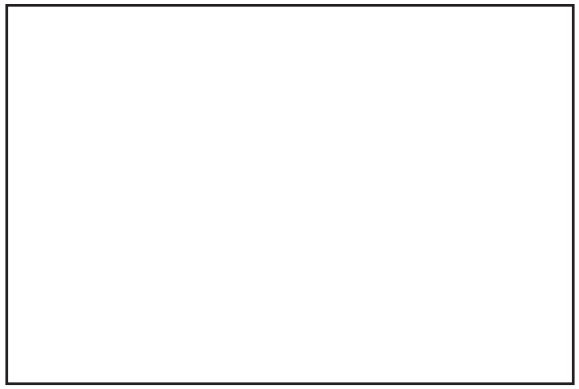
Gage *It's 20 centimeters on both sides.*

Teacher *What is the* area *of your square, and how do you know?*

Students *It's 400 square centimeters because that's what you told us to do.*
It's 100 square centimeters because we used 4 mats, and each mat is 100 square centimeters.
If you just multiply 20 × 20, it makes 400.

4. Now hold up the construction paper rectangle you've prepared. Ask students to estimate the area in square centimeters, using their base 10 square as a visual benchmark.





Students *That paper rectangle is definitely more than 400 square centimeters.*
I think it's just longer along one side. Can we hold it up against our square?

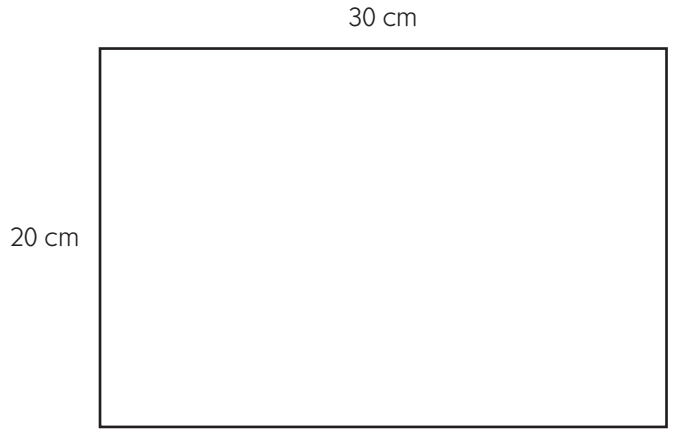
Teacher *Sure, here it is. If you want to stand up where you are so you can see what Gilberto is doing, go ahead. Raise your hand if you have an estimate. What do you think the area of the paper rectangle is in square centimeters?*

Students *More than 400. Maybe about 500.*
It's 20 centimeters along the side, but maybe more like 30 along the top.
I think it's about 2 mats bigger than our square, so it's probably 600 square centimeters.

5. Now ask students to pair-share ideas for finding the actual area of the construction paper rectangle. Challenge them to think of a method that's more efficient than covering the paper with base 10 pieces. Some may propose laying the paper rectangle on top of square they just built with base 10 pieces. Others may suggest covering it with base 10 mats. Implement some of their suggestions. If it doesn't come from the class, propose measuring the side and top of the rectangle in centimeters and multiplying the two numbers. Ask students to evaluate your suggestion. Will it work? Will it yield the same answer as the other methods? Why or why not?

Activity 1 Metric Rectangles (cont.)

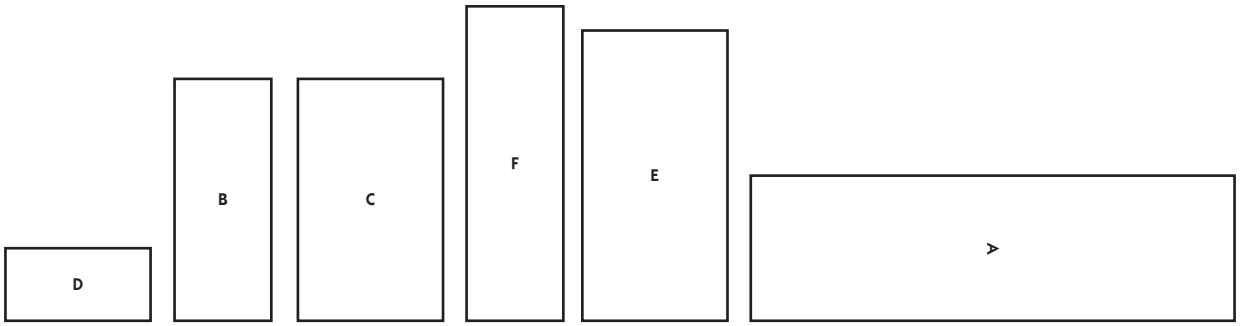
6. Tape the paper rectangle to the board. Ask a volunteer to measure and label the dimensions as the others watch. Record the numbers on the board and then have students multiply them. Ask them to comment on the results. Does the method work? Why?



20 cm × 30 cm = 600 square cm

7. Ask students to take their base 10 squares apart and put the pieces back in their bags for now. Then have them pair up, or assign partners. Give each pair a copy of the Metric Rectangles blackline. (If you give each pair at a table a different color sheet, they'll be able to keep track of their own rectangles more easily.) Have them work together to cut apart the 6 rectangles along the heavy lines.

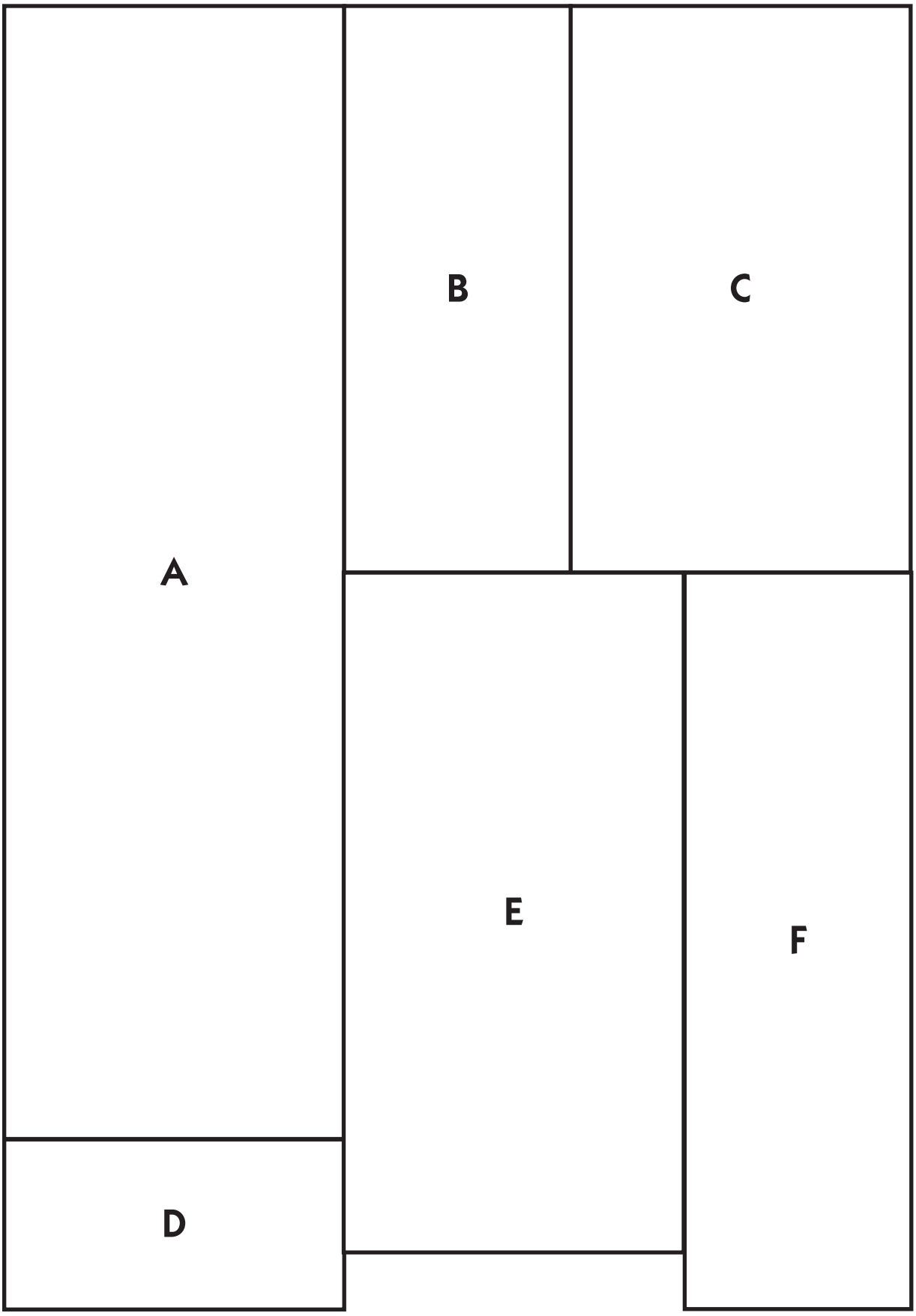
8. Let students know that in a minute, they'll be estimating and finding the area of each rectangle in square centimeters. Before they do, ask them to use their estimation skills to place the 6 in order, from smallest to largest area. Have them discuss their thinking with their partners as they sequence the rectangles, and then choose a few volunteers to share their ideas with the class.



Erica *You can definitely tell that D is the smallest and A is the biggest. C is bigger than B and E is bigger than F, but we're not really sure about whether C or F is bigger.*

9. Ask students to get out their rulers (if they haven't done so already), and give each student a copy of the Metric Rectangles Record Sheet. Review the instructions on the sheet with the class. Have them continue to work in pairs even though each student needs to complete his or her own sheet. Encourage them to use the base 10 pieces to help estimate the areas of their cut-out rectangles. Some students may want or need to lay the base 10 strips and mats directly on top of their paper cut-outs to find the actual area of each, while others will probably choose to measure the side lengths and multiply.

Metric Rectangles



NAME _____ **DATE** _____

Metric Rectangles Record Sheet

1 Work with your partner to cut out the 6 rectangles and put them in order, from smallest to largest area.

2 After you've agreed on the order, write the letters of the rectangles where you think they belong in the boxes below.

Smallest Area → **Largest Area**					

3 Estimate the area of each rectangle and then measure it in square centimeters. Remember to label your work with the correct units (square centimeters). Record your work on the chart below.

Rectangle Letter	Your Estimate in square centimeters (sq. cm)	Actual Area in square centimeters (sq. cm)

Set D6 ★ Activity 2

ACTIVITY

Ladybug Dream House

Overview

Students estimate and measure area in square centimeters as they draw floor plans for ladybug dream houses.

Skills & Concepts

- ★ determine area by finding the total number of same-sized units of area that cover a shape without gaps or overlaps
- ★ select appropriate units, strategies, and tools for solving problems that involve estimating or measuring area
- ★ solve problems involving areas of rectangles and squares
- ★ find the areas of complex shapes by dividing those figures into basic shapes (e.g., rectangles, squares)
- ★ measure necessary attributes of shapes to use area formulas to solve problems

You'll need

- ★ Centimeter Grid Paper (page D6.11, class set plus a transparency)
- ★ Ladybug Dream House Planning Sheet (pages D6.9 and D6.10, class set)
- ★ rulers (class set)
- ★ calculators (half-class set)

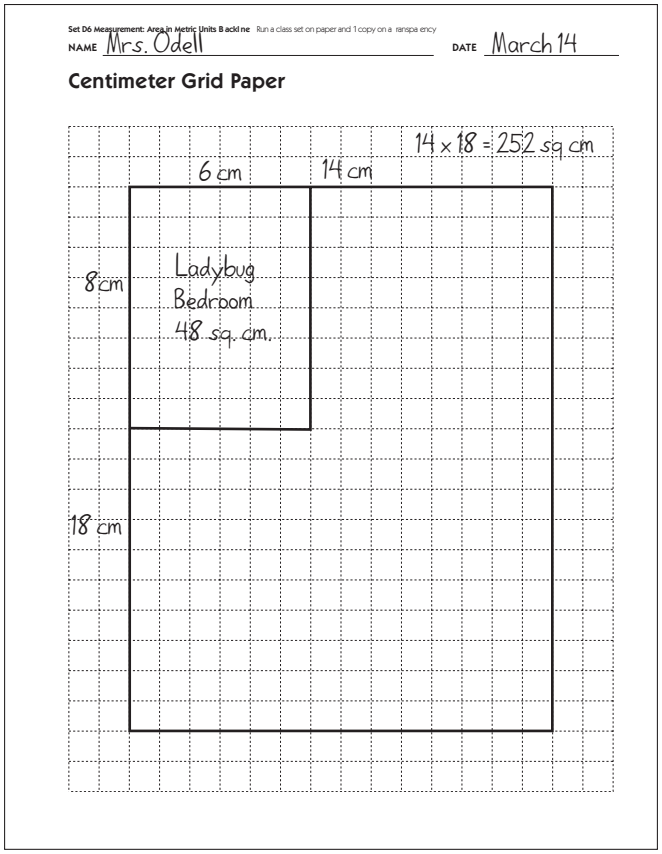
Instructions for Ladybug Dream House

1. Place the Centimeter Grid Paper on display at the overhead. Tell students that they have been hired to design and draw the plans for the Ladybug family's new house. As students watch, use your ruler to draw a 14-by-18-centimeter rectangle on the grid. These are the outside dimensions of the Ladybug Dream House. Ask students to pair-share estimates of the total area of the house in square centimeters. Have volunteers share and explain their estimates. Then work with input from the class to find the actual area, using methods the students suggest. If it doesn't come from the class, ask them to use their calculators to confirm their results by multiplying the dimensions of the rectangle.

2. Give each students each a sheet of Centimeter Grid Paper. Ask them to draw a 14 × 18 centimeter rectangle on their own sheet, using their ruler to help make the lines straight.

3. As students watch, draw a 6 × 8 centimeter rectangle in one of the corners of the house floor plan at the overhead. Explain that this is one of the bedrooms. Ask students to estimate the area of the rectangle you just drew and then work with you to find the actual area. Label the room with its dimensions, area, and room name. Then ask students to choose a place on their ladybug floor plan to draw and label a 6 × 8 centimeter bedroom. Let them know that they can place it anywhere in the house they want, but they'll want to make good use of the space because the Ladybug family needs lots of other rooms.

Activity 2 Ladybug Dream House (cont.)



4. Give each students a copy of the Ladybug Dream House Planning Sheet. Review both pages with the class. Be sure students understand that the rooms listed on the first page have to be at least as big as the areas specified on the sheet, but can be bigger. Remind students that they can put the rooms anywhere in the house they want. Encourage them to make optimal use of the space, because they may want to design extra rooms and put in hallways, as suggested on the second page.

5. When students understand what to do, let them go to work. Circulate to provide encouragement and assistance as needed.

Extension

- If some of your students need an extra challenge, encourage them to make rooms that aren't square or rectangular. They can make some of the rooms triangular, hexagonal, or even irregular as long as they use the area specifications on the first sheet and follow the grid lines when they can so they're able to calculate the area of each room.

INDEPENDENT WORKSHEET

See Set D6 Independent Worksheet 1 for more practice estimating and measuring area in metric units.

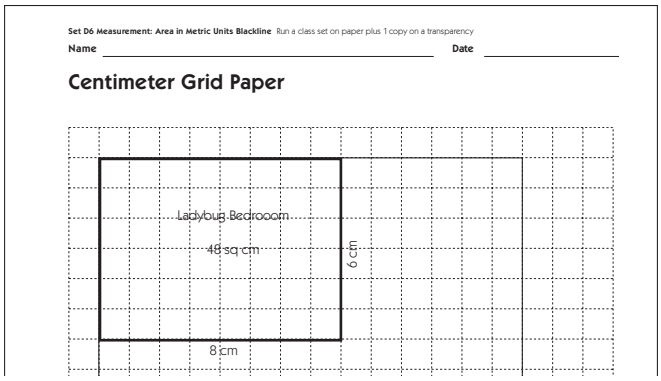
NAME _____ **DATE** _____

Ladybug Dream House Planning Sheet page 1 of 2

Congratulations! The Ladybug family has hired you to design and draw the plans for their new house.

1 Draw a rectangle on your grid paper that is 14 centimeters by 18 centimeters. Use your ruler to help make the lines straight. This is the outside of your Ladybug Dream House.

2 Inside the house, wherever you'd like, draw a rectangle that is 6 centimeters by 8 centimeters for one of the bedrooms. Record the dimensions, the area, and the name of the room on your plan. Your work will look something like this:



3 Design your Ladybug Dream House by adding the rooms listed below. The rooms have to be at least as big as the number of square centimeters on the chart, but you can make them bigger if you want. Label each one with its dimensions and the actual area. (Hint: Leave space between the rooms for hallways.)

Room	Minimum Area (the room has to be at least this big)	Actual Area (sq. cm)
Ladybug Kids' Bedroom	40 sq. cm	
Ladybug Baby's Room	20 sq. cm	
Ladybug Bathroom	24 sq. cm	
Ladybug Living Room	64 sq. cm	
Ladybug Kitchen	32 sq. cm	

Ladybug Dream House Planning Sheet page 2 of 2

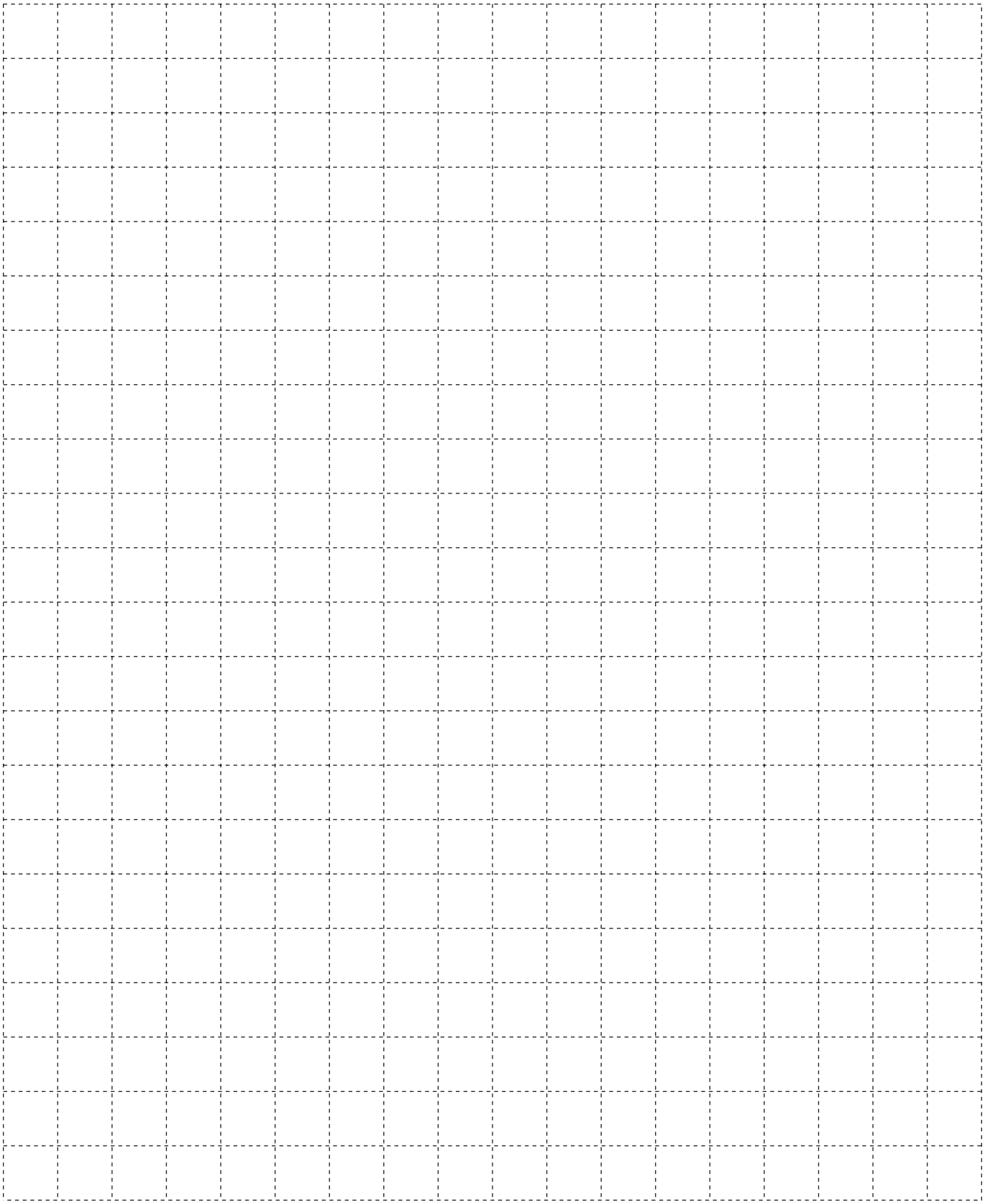
4 If there is any space left after you've drawn the rooms listed on the first page, design your own rooms. (Perhaps the Ladybug family needs a computer room, a guest room, a playroom, an art room, a music room, or some other creative spaces?) Label each one of your extra rooms with its dimensions, area and name. Also, list them below. You can pick the best size for each extra room you design.

Room	Area (in sq. cm)

5 If you have time, use colored pencils to add doorways, ladybug furniture, and other fun features to your house plan.

NAME _____ **DATE** _____

Centimeter Grid Paper



NAME _____ **DATE** _____

Set D6 ★ Independent Worksheet 1

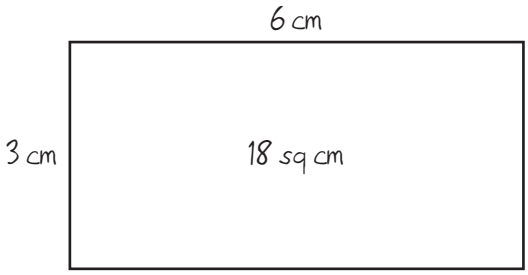
INDEPENDENT WORKSHEET

Measuring Area in Metric Units

1 For each rectangle below
- estimate the area
- use the centimeter side of your ruler to measure the dimensions
- find the area in square centimeters (multiply the dimensions or use base 10 pieces)
- label the rectangle with its dimensions and area

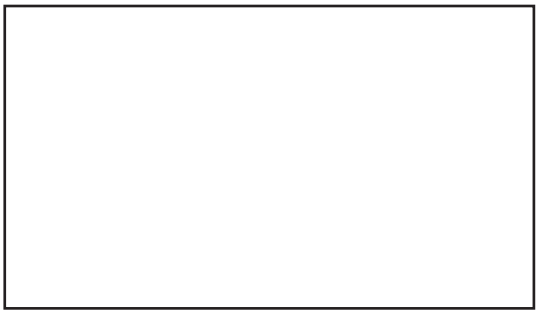
example

Estimate: 24 sq cm



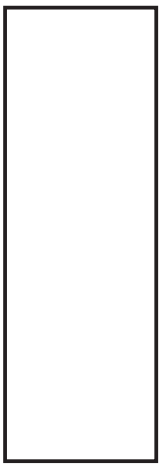
a

Estimate: _____sq cm



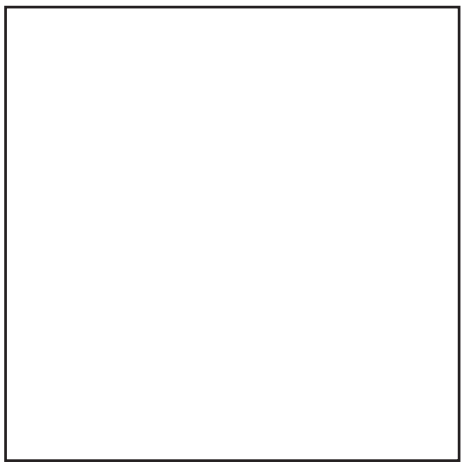
b

Estimate: _____sq cm



c

Estimate: _____sq cm



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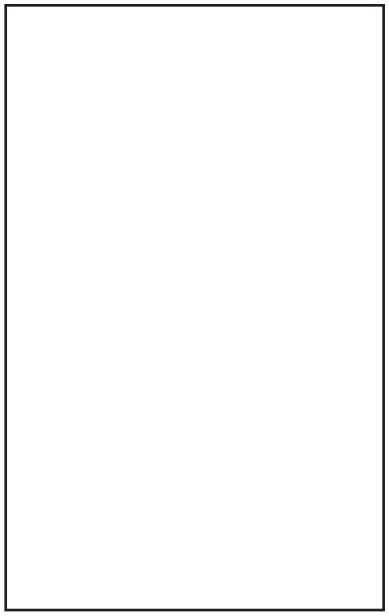
Independent Worksheet 1 Measuring Area in Metric Units (cont.)

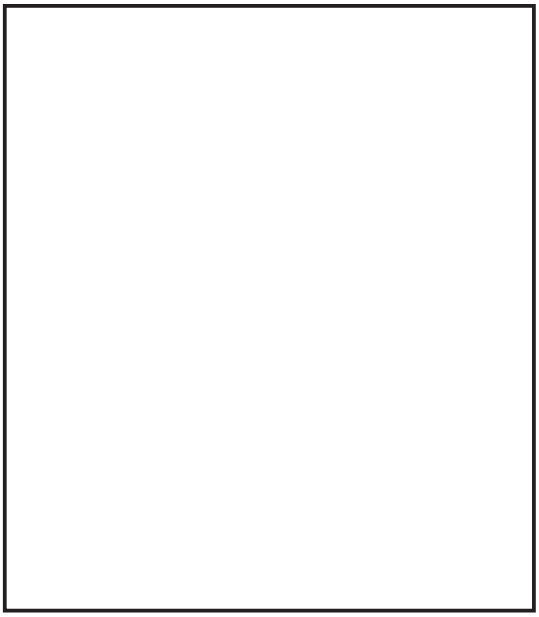
d

Estimate: _____sq cm



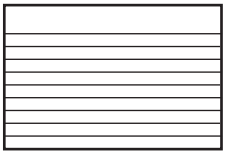
e

Estimate: _____sq cm



2 Estimate the area of the first object on the chart below in square centimeters. Record your estimate. Using base 10 pieces or a ruler, find the area of the object and record the measurement. Find the difference between your estimate and the actual measurement. Record the difference in the last column.

3 Continue estimating, finding the area, and finding the difference for the other three objects. Use what you know about the area of the first object to estimate the others.

Object	Your Estimate (in sq cm)	Actual Area (in sq cm)	The Difference (in sq cm)
a An Index Card 			

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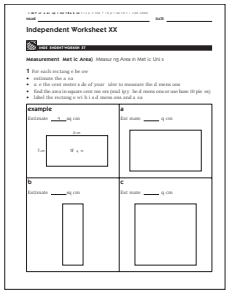
Independent Worksheet 1 Measuring Area in Metric Units (cont.)

Object	Your Estimate (in sq cm)	Actual Area (in sq cm)	The Difference (in sq cm)
b This Worksheet 			
c Cover of a Chapter Book 			
d Top of your Calculator