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| **Lesson name/number**: Explore Perimeter and Area | **Materials**:Cm dot paper (2 pg/student plus extras)Cm grid paper with a leaf traced on it and copied (1 pg/pair of students) (leaf should be 50-90 square cm and irregular shaped—maple or oak)ruler with cm3”x5” Index cards (1 per group)Small and large paperclips (1 per group)staples stapled into paper (1 per group)base 10 blocks 1s, 10s and 100s ( 1 each per group)Colored pencilsCut string (about 1 foot long. 1 per pair of students)Student Activity book pages: 285, 286, 287Real world measurement handout (1 per page)  |
| **Big idea(s)**: Area measures the space inside a 2D shape and perimeter measures the outline around a 2D shape. |
| **Textbook**: Math ExpressionsGrade 3 |
| **Learning goals**: Find perimeter of a 2D shape by counting linear units including centimeters to find perimeter. Find perimeter in centimeters by using string and a ruler.Find area of a of a 2D shape by counting square units including square centimetersKnow that centimeters is a unit of length and square centimeters is a unit of area.Estimate perimeter and area of irregular shapesDetermine whether a real world situation involves finding area or perimeter.Find area of a rectangle using multiplication. |
| **Standards** (from grade 3 CCSS): CCSS.Math.Content.3.MD.C. standards: 5a,b6 (square cm and feet)7a (all) and b (solving problems with areas)8 (finding perimeters from given side lengths) |
| **Lesson Description**:**Activity 1: Find Area and Perimeter on a Dot Array** (details in Teachers Manual pgs 610-612) : * Draw rectangles on dot paper (students draw a rectangle following instructions).

Discuss:* To make a line with a given length, 1 more dots are connected than the length (length is spaces between dots, not number of dots)
* Perimeter is the area around the rectangle.
* ***Math Talk:*** **Ask** students to find the perimeter of the rectangle and give a thumbs up when they have an answer. **Ask** students to share their strategies for finding the perimeter (counting, adding, multiplying by 2)
* Draw a square cm. Discuss how to name a square unit (square cm, or cm2)
* Area inside a figure is the number of square cm.
* ***Math Talk:*** **Ask** students to figure out the area of the rectangle and give a thumbs up when they have an answer. **Ask** students to share their strategies for finding the area (counting, adding multiplying). Discuss counting, adding and multiplying as ways find the area. **Planned addition to Teachers Manual:** Draw another rectangle and have children practice finding the area by multiplying or adding.
* Reminds students that cm is a length unit and square cm is an area unit.
* Draw another shape and have students practice finding the perimeter and area.
* Individual practice: page 285.

**Activity 2: Find Area by Counting Whole- and Half-Squares** (details in Teachers Manual pg 613)* ***Discussion and Partner Work:*** Have students turn to Activity Book page 286. Point out the triangular parts of the shape. **Ask** how a triangular part compares to a unit square (1/2 of a square unit, 2 triangles make a square). Direct students work with their table partners to talk about how to find the area of the first figure and decide what strategy to share with the class. **Ask** students to share how they figured out the area. Discuss the counting halves and putting together halves strategies.
* Direct students to work with their **partners** on the rest of page 286. Remind students to take turns figuring out the four remaining problems. Suggest that students take turns explaining to their partner how they found the solutions.

**Activity 3: Find Area and Perimeter in Real World Situations** (details in the Teacher’s Manual page 614)* ***Math Talk:*** Direct students to turn to Student Activity book page 287. Read aloud the first question. **Ask** whether this is a question about area or perimeter. Direct students to give a thumbs up when they have decided. Ask students to share whether they think it is a question about area or perimeter and why.
* Direct students to make a scale drawing of the situation on their dot paper. Explain what a scale drawing is (using the notion of pretending that the dots are 1 foot apart). Direct students to write answers to 12 and 13. Check on students work. Note which students are having difficulty. When most students are done, **ask** a student to share how they solved the problem. **Ask** if anyone solved it a different way. Emphasize a multiplication solution.
* Repeat this process with the second question and problems 14 and 15.

**Activity 4: Estimate Perimeter and Area in the Real World** (adapted from Teacher’s Manual pg 615-616) * ***Benchmark Investigation***
	+ Have students measure the width of their finger, the width of the paper clips and the length of the staple with the cm side of the ruler.
	+ **Ask** students which is closest to being a centimeter. Which ones are larger than a centimeter? Which ones are smaller?
	+ Have students measure a base 10 10-stick and compare its length to the length of their hand and the width of their hand. **Ask** students: how long is the 10-stick? Is the length of your hand longer or shorter than 10 cm? Is the width of your hand more or less than 10 cm?
	+ **Ask** students how many square centimeters the base 10 100-flat covers. **Ask** students to compare their hand to the 100-flat: is their hand more, less or about the same area as the 100-flat? Record the benchmarks on the board.
* ***Estimation and measurement with partners instructions***
	+ Show a copy of the Real World Measurement page on the SMART Board. Point out the two objects they will be finding the area and perimeter of (the index card and the leaf). **Ask**:
		- Which object could we measure with a ruler to find the area and perimeter?
		- What makes the leaf hard to measure with a ruler?
		- How could we use string to help us find the perimeter?
		- How could we use the grid to help us find the area?
		- Why don’t we need a grid to find the area of the index card?
	+ Hold up an index card and the leaf picture at real-size. **Ask**:
		- Which looks like it has a bigger area? Why do you think so? (the leaf is smaller because you can hold the index card over it to cover it)
		- Which looks like it has a longer perimeter? Why do you think so? (the perimeter of the leaf is a bit longer than the perimeter of the index card. I expect students to disagree about which looks longer)
* Direct students to
	1. Estimate the perimeter and area of the index card using a benchmark that is close to a centimeter (refer to the list on the board). *Each partner should make an estimate and should record their estimate below their name* (show students the recording sheet). Encourage students to find two different ways to make their estimates (using different benchmark tools)
	2. Measure and calculate the perimeter and area using a ruler and addition and multiplication. Explain that they are allowed to use a calculator. *Remind students to take turns* when measuring with the ruler and when adding and multiplying with the calculator to find the perimeter and area,
	3. Measure the perimeter of the leaf using string and a ruler
	4. Estimate the area of the leaf by counting and combining square centimeters on the grid. Show on the SMART board leaf how to color in some partial squares with the same color to show which ones were put together to make a whole square. *Remind students to work with their partners* to decide which parts would fit together well to make a whole square. Suggest that one way partners could work together is to *take turns* finding parts that would make a whole square.
* Walk around during student work time and remind students to *work* *together* or *take turns* to figure out the measurements.
* If some groups finish early, provide blank grid paper and ask them to find another shape in the classroom that they could find the area and perimeter for.
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| **Students work 205 and 206 as homework**. Page 205 has individual practice  |
| **Identify inquiry components:** In the math talk parts of **activity 1**, students are reasoning about area and perimeter to find numerical answers. Students are sharing their strategies and mathematical reasoning with each other. Students are answering the question: how can we find the area and perimeter of a rectangle on a grid by adding and multiplying?In **activity 4**, students are investigating area and perimeter with real world objects (index card). The objects don’t fit perfectly in a centimeter grid, so students have to extend their skills from a problem where you can follow the grid to one that requires estimation. Students are investigating the question: how can we find the area and perimeter of shapes that don’t fit nicely on a grid? |
| **Identify and discuss collaborative components**: **In activity 2**, students work together with their partners to identify half-squares and use them to find a total area.**In activity 4**, students work together to find the area and perimeter of shapes that are not on a grid. Some parts of the activity that encourage students to collaborate effectively are:* Partners share the same recording sheet.
* Each partner has a place to record their estimates in part 1 (so both students have something to write and do)
* Partners are directed to take turns measuring with the ruler and putting together units for estimating the leaf area.
* Partners will need to work together to use string to trace around the perimeter of the leaf shape is easiest when two people work together.
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**Real World Measurement**:

1. With your partner, estimate the length, width, perimeter and area of the index card. Tell how you estimated.

|  |  |  |
| --- | --- | --- |
| name: |  | name: |
| perimeter |  |  |
| area |  |  |
| How did you estimate? |  |

Now measure the length and width of the index card in centimeters using a ruler. Use addition and multiplication to find the perimeter and area. You may use a calculator to help you multiply.

|  |  |  |
| --- | --- | --- |
| Measured length |  |  |
| Measured width |  |  |
| Perimeter |  |  |
| Area |  |  |

2. Use string and a ruler to find the perimeter of the leaf. Use the grid to find the area of the leaf.

