Unit 4: Title of Unit : Perimeter and Area

Content Area: **Mathematics**
Course(s): **Mathematics - Grade 3**
Time Period: **April**
Length: **3 Weeks**
Status: **Published**

Unit Overview

In this unit students will understand concepts of area and relate area to multiplication and to addition; recognize perimeter as an attribute of place figures and distinguish between linear and area measures.

Transfer

Students will be able to independently use their learning to..

fluently solve real world problems using geometric relations and measurements.

For more information, read the following article by Grant Wiggins.

http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=60

Meaning

Understandings

Students will understand….

- perimeter is measured by adding the side lengths
- area is measured in square units
- a figure that can be covered by n unit squares with no gaps or overlaps has an area of n square units
- if a rectangle is not on a grid, the area can be found by tiling it
- the dimensions of a rectangle are called its length and width
- to find the area of a rectangle, multiply the length by the width
- the formula for area is A = L x W
- a composite figure is made up of two or more figures
- find the area of a composite figure by decomposing it into smaller rectangles and then adding the area

of each rectangle
- two rectangles can have the same perimeter and different areas, or have the same perimeter and different areas, or have the same area and different perimeters

Essential Questions

Students will keep considering...

- Why do we measure?
- How do we obtain useful information from a set of data?
- How are perimeter and area related and how are they different?

Application of Knowledge and Skill

Students will know...

Students will know...

- How to find the perimeter of a figure
- How to find the area of a figure
- How to tile rectangles to find the area
- How to use a formula to find the area of a rectangle
- How to decompose a composite figure to find the area
- How to relate perimeter and area of rectangles

Students will be skilled at...

Students will be skilled at...

- finding the perimeter of shapes
- finding the area of figures on a grid
- tiling rectangles to find their areas
- finding the area of rectangles
- finding the area of composite figures
- describing rectangles that have the same area but different perimeters

Academic Vocabulary

Review Terms

- compare
- symbol
- decompose
- Distributive Property

New Vocabulary Terms

Chapter 13

- perimeter
- area
- unit square
- square unit
- area
- formula
- composite figure

Learning Goal 1

Students will be able to solve real-world and mathematical problems involving perimeter of polygons, compare rectangles with the same area and different perimeters, as well as rectangles with the same perimeter and different area, and solve for an unknown side length given the perimeter of a polygon.

Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

Daily Targets

Students will be able to...

- Explore finding the perimeter of a figure **(Ch. 13 Les 1 - DOK 3)**
- Find the unknown when solving problems involving perimeter **(Ch. 13 Les 2 - DOK 3)**

Students develop an understanding of the concept of perimeter by walking around the perimeter of a room, using rubber bands to represent the perimeter of a plane figure on a geoboard, or tracing around a shape on an interactive whiteboard. They find the perimeter of objects; use addition to find perimeters; and recognize the patterns that exist when finding the sum of the lengths and widths of rectangles.

Students use geoboards, tiles, and graph paper to find all the possible rectangles that have a given perimeter (e.g., find the rectangles with a perimeter of 14 cm.) They record all the possibilities using dot or graph paper, compile the possibilities into an organized list or a table, and determine whether they have all the possible rectangles.

Given a perimeter and a length or width, students use objects or pictures to find the missing length or width. They justify and communicate their solutions using words, diagrams, pictures, numbers, and an interactive whiteboard.

Students use geoboards, tiles, graph paper, or technology to find all the possible rectangles with a given area (e.g. find the rectangles that have an area of 12 square units.) They record all the possibilities using dot or graph paper, compile the possibilities into an organized list or a table, and determine whether they have all the possible rectangles. Students then investigate the perimeter of the rectangles with an area of 12.

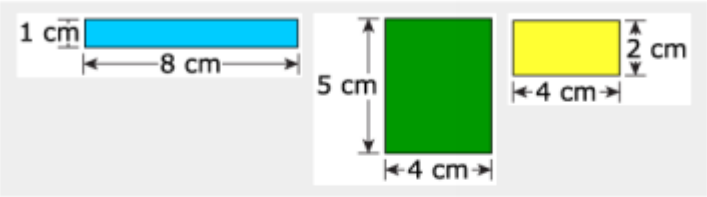
Area	Length	Width	Perimeter
12 sq. in.	1 in.	12 in.	26 in.
12 sq. in.	2 in.	6 in.	16 in.
12 sq. in	3 in.	4 in.	14 in.
12 sq. in	4 in.	3 in.	14 in.
12 sq. in	6 in.	2 in.	16 in.
12 sq. in	12 in.	1 in.	26 in.

The patterns in the chart allow the students to identify the factors of 12, connect the results to the commutative property, and discuss the differences in perimeter within the same area. This chart can also be used to investigate rectangles with the same perimeter. It is important to include squares in the investigation.

Examples:

Three rectangles are shown. Which two rectangles go in each box?

Drag and drop two of the rectangles into each box. The rectangles can be used more than once.



Same Area and Different Perimeters	Same Perimeter and Different Areas	Different Areas and Different Perimeters

A path is built around a pool in the shape of a rectangle. The pool is shaded blue.

The width of the pool is 7 yards. The area of the pool is 70 square yards.

- Find the length, in yards, of the pool.
- Find the perimeter, in yards, of the pool.

Enter your answers in the space provided. Enter **only** your answers.

Length of the pool: ☐ yards
Perimeter of the pool: ☐ yards

MA.3.MD.D	Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.
MA.3.MD.D.8	Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.

Learning Goal 2

Students will solve real-world problems involving rectangular, rectilinear, and composite area, using tiling to demonstrate the Distributive Property (decomposing) by showing that the area of a rectangle with side lengths. Calculate areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas.

A plane figure which can be covered without gaps or overlaps by n unit squares is said to have an area of n **square units.**

Daily Targets

Students will be able to....

- Count unit squares to find the area of a figure **(Ch. 13 Les 3 - DOK 3)**
- Use addition to measure the area of a figure **(Ch. 13 Les 4 - DOK 3)**
- Use tiling to find the area of rectangles **(Ch. 13 Les 5 - DOK 3)**
- Use the formula for area to find the area of rectangles **(Ch. 13 Les 6 - DOK 3)**
- Use the Distributive Property to find area **(Ch. 13 Les 7 - DOK 4)**
- Find the area of composite figure **(Ch. 13 Les 8 - DOK 4)**
- Recognize the relationship between area and perimeter **(Ch. 13 Les 9 - DOK 4)**

Examples:

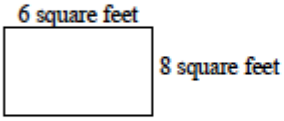
Students should tile rectangle then multiply the side lengths to show it is the same.

To find the area one could count the squares or multiply 3 x 4 = 12.

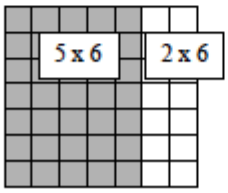
1	2	3	4
5	6	7	8
9	10	11	12

Students should solve real world and mathematical problems

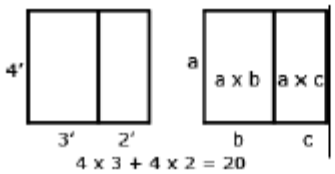
Example:
Drew wants to tile the bathroom floor using 1 foot tiles. How many square foot tiles will he need?



This standard extends students' work with the distributive property. For example, in the picture below the area of a 7 x 6 figure can be determined by finding the area of a 5 x 6 and 2 x 6 and adding the two sums.



Example:

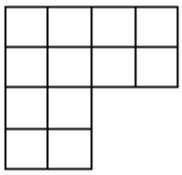


4 x 3 + 4 x 2 = 20

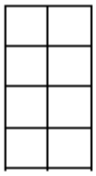
4 (3 + 2) = 20

4 x 5 = 20

This standard uses the word rectilinear. A rectilinear figure is a polygon that has all right angles.



How could this figure be decomposed to help find the area?



This portion of the decomposed figure is a 4 x 2.

This portion of the decomposed figure is 2 x 2.

4 x 2 = 8 and 2 x 2 = 4

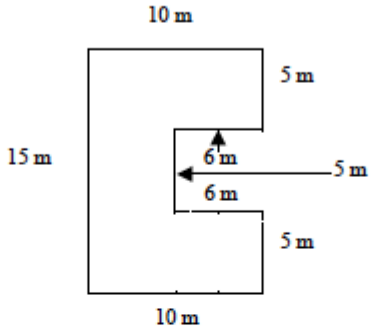
So 8 + 4 = 12

Therefore the total area of this figure is 12 square units

Example:

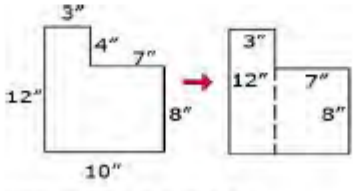
A storage shed is pictured below. What is the total area?

How could the figure be decomposed to help find the area?



Example:

Students can decompose a rectilinear figure into different rectangles. They find the area of the figure by adding the areas of each of the rectangles together.

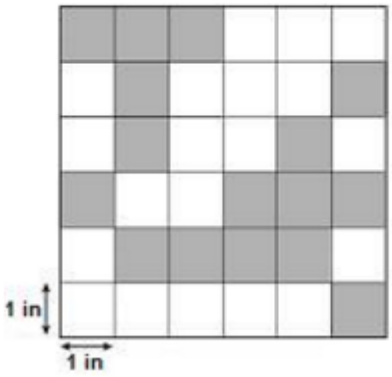


area is 12 x 3 + 8 x 7 =

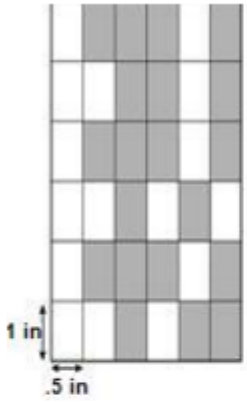
92 sq inches

In which figure is the combined area of the shaded squares 20 square inches?

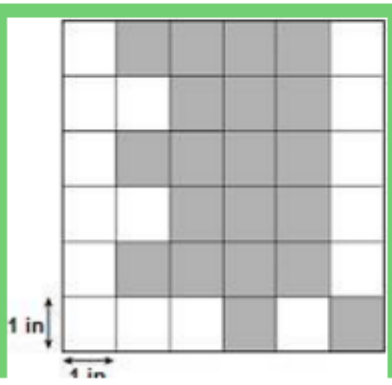
A.



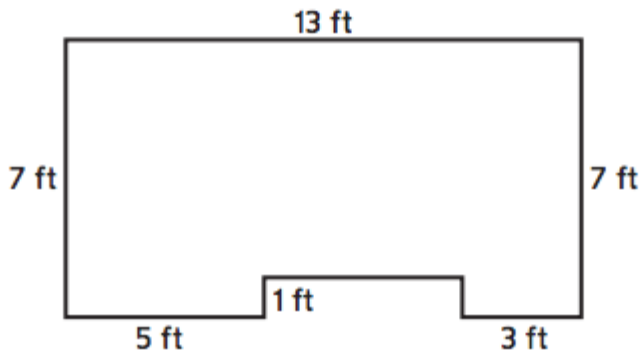
B.



C.



An architect is designing a floor plan that looks like the following. 3.MD.7d



Find the area of the floor plan. Show your work.

MA.3.MD.C.5	Recognize area as an attribute of plane figures and understand concepts of area measurement.
MA.3.MD.C.6	Measure areas by counting unit squares (square cm, square m, square in, square ft, and non-standard units).
MA.3.MD.C.5a	A square with side length 1 unit, called “a unit square,” is said to have “one square unit” of area, and can be used to measure area.
MA.3.MD.C.5b	A plane figure which can be covered without gaps or overlaps by n unit squares is said to have an area of n square units.
MA.3.MD.C.7a	Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.
MA.3.MD.C.7b	Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.
MA.3.MD.C.7c	Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning.
MA.3.MD.C.7d	Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.
MA.3.MD.D.8	Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.
MA.K-12.1	Make sense of problems and persevere in solving them.
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Formative Assessment and Performance Opportunities

Performance Tasks:

Chapter 13 Performance Task: **A Home for Apples** DOK 2, DOK 3: Write fractions from scenarios revolving round making charm necklaces. Locate fractions on a number line and identify equivalent fractions both with and without a number line. (TM 820PT1-PT2)

Chapter Projects Available in Student Book:

Chapter 13 A Measurement Museum (pg. 745-746)

- Am I Ready Assessments
- Chapter quizzes
- Chapter tests
- Check My Progress Assessments
- Graded classwork
- Homework
- Link It
- Projects
- Student interviews
- Teacher observation

Summative Assessment

- Projects
- Unit tests
- Quizzes
- Performance Based Assessments
- Link It

21st Century Life and Careers and Technology

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
TECH.8.1.5.D	Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
TECH.8.1.5.D.2	Analyze the resource citations in online materials for proper use.
TECH.8.1.5.D.CS1	Advocate and practice safe, legal, and responsible use of information and technology.
TECH.8.1.5.E	Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.
TECH.8.1.5.E.CS3	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.

Accodomations and Modifications

- preteach and/or reteach
- small group instruction or one-on-one (parent volunteer)
- manipulatives whenever necessary (hands-on approach)
- extra brain breaks
- use noise buffers whenever appropriate (headphones or earbuds)
- sensory tools- ex: rubber band around chair to allow for movement
- "act it out" approach
- work with a partner; allow to ask & answer questions
- use a highlighter so students can trace easier

- allow a student to use a highlighter to trace larger numbers
- allow for physical activity to practice skills (ex: jump 5 times; have a large number line and have student hop to each number while counting aloud)
- sing songs/dance to reinforce or introduce skills
- have students "choral respond" (for ex: teacher says sentence aloud; students repeat it to a peer
- small group instruction
- perfomance tasks
- English Language Support Interactive Guide
- Beyond Level Enrichment Resources
- clickers
- challenge problems
- StMath
- Real-World Problem Solving Readers (appoaching level, on level, beyond level, and Spanish)

Interdisciplinary connections

- Students at Work (Real-World Problem Solving Teacher Guide p. 11) (3.MD.3 Students will represent and interpret data.) - Focuses on students earning money and reaching a goal. Students will use fractions and decimals to solve problems.

Economic decision making involves setting goals and identifying the resources available to achieve those goals.

Unit Resources

- XtraMath https://xtramath.org/#/home/index
- AAA Math http://www.aaamath.com/
- Aleks online supplement
- brainpop http://www.brainpop.com/
- Cool Math 4 kids http://www.coolmath4kids.com/
- English Language Learners Support in My Math
- Fact Dash in connect ed
- Funbrain http://www.funbrain.com/
- illustrative mathematics http://www.illustrativemathematics.org
- Link It https://www.linkit.com/testtaker/testtaker/testtaker.html

- Math Fact Cafe http://www.mathfactcafe.com/
- Math Playground http://www.mathplayground.com/
- McGraw Hill Chapters 11-13
- multilingual glossary in connect ed
- NCTM illuminations http://illuminations.nctm.org/
- PARCC http://www.parcconline.org/
- Power up for PARCC in connect ed
- Project Based Learning associated to chapters
- Reteach/enrich lessons in My MAth
- RTI guide in My Math
- Spanish Resources in Connect ed