A. Mathematical Processes and D. Measurement
(From the WKCE-CRT Mathematics Assessment Framework, Beginning of Grade 10)

A. Mathematical Processes

• Use reasoning and logic to: perceive patterns, identify relationships, formulate questions, pose problems, make conjectures, justify strategies and test reasonableness of results.
• Communicate mathematical ideas and reasoning using the vocabulary of mathematics in a variety of ways, e.g., using words, numbers, symbols, pictures, charts, tables, diagrams, graphs, and models.
• Connect mathematics to the real world as well as within mathematics.
• Create and use representations to organize, record, and communicate mathematical ideas.
• Solve and analyze routine and non-routine problems.

D. Measurement *

D.b. Subskill: Direct Measurement
• Select and use tools with appropriate degree of precision to determine measurements directly.

D.c. Subskill: Indirect Measurement
• Determine the perimeter/area of two-dimensional figures.
• Determine the surface area/volume of three-dimensional figures.
• Solve for angles and segments in similar polygons.
• Use the Pythagorean Theorem to solve right triangle problems.

* Slightly modified to reflect “Sharing the 10th Grade Descriptors”
Examining the 10th Gr. Descriptors: What’s “New” for 8th Graders?

The 8th Grade Classroom Assessments Based on State Standards were created to reflect the 10th grade state descriptors and the MPS learning targets for 8th grade. The 10th grade state descriptors should be used by both 8th and 9th grade math teachers. See your MTL for the document, “Sharing the 10th Grade Descriptors”, or visit the Portal (math page, inside the teacher community), for the delineated shared responsibilities.

The 10th grade state descriptors contain both previously introduced and new concepts. It is the intent of the 8th - 9th Grades Math Assessment Pilot, after considerable feedback from Kevin McLeod, UWM Mathematics Professor and Co-Investigator, MMP, to emphasize the new concepts. Alerting teachers to what is new for 8th graders should have classroom implications.

The 8th grade math CABS are therefore split into two categories. First, a series of “Power CABS” which can be used to assess student understanding of concepts not found in earlier grade level state descriptors. Second, a series of CABS not denoted with “Power” which can be used to assess student understanding of concepts found in both earlier state descriptors and in the 10th grade descriptors.

The chart below identifies the descriptors that are new to 8th grade as determined by the 8th - 9th Grades Math Assessment Pilot, 2006-2007.

<table>
<thead>
<tr>
<th>Objective and Subskill</th>
<th>10th Gr. Descriptor that is “New”</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.b</td>
<td>“Select and use tools with appropriate level of accuracy”</td>
<td>New for 8th graders: they determine what’s “appropriate”</td>
</tr>
<tr>
<td>D.c</td>
<td>“Determine the perimeter/area of two-dimensional figures”</td>
<td>While perimeter and area of polygons/circles are introduced in previous grades, this descriptor allows for area/perimeter of “any” 2-d figure.</td>
</tr>
<tr>
<td>D.c</td>
<td>“Determine the surface area/volume of three-dimensional figures”</td>
<td>While surface and volume of specific figures are introduced in previous grades, this descriptor allows for surface area and volume of “any” 3-d figure.</td>
</tr>
<tr>
<td>D.c</td>
<td>“Solve for angles and segments in similar polygons”</td>
<td>While an earlier grade “draws similar figures using a scale factor”, 8th graders should solve for angles and segments in similar polygons.</td>
</tr>
<tr>
<td>D.c</td>
<td>“… use the Pythagorean Theorem to solve right-triangle problems”</td>
<td>This is a change in last year’s document, “Sharing the 10th Grade Descriptors”. 8th graders should be able to solve problems using the Pythagorean Theorem.</td>
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</table>
MPS Learning Target: Measurement

MPS Learning Target #4: Select and use appropriate tools and procedures to solve problems requiring direct measurements and indirect measurements (e.g., perimeter, area, surface area, volume, angles, and segments).

Wisconsin Assessment Framework for Mathematics

Objective: D. Measurement
Subskill: Direct Measurement
Descriptor:
• Select and use tools with appropriate degree of precision to determine measurements directly.

Objective: A. Mathematical Processes
Descriptor:
• Solve and analyze routine and non-routine problems.

Find the measure of the angle shown below to the nearest degree.

Answer: ________________
Construct a $210^\circ$ angle.
What is the length in inches of the pack of gum shown in the figure below?

Answer_______________________________

How do you know?
MPS Learning Target: Measurement

MPS Learning Target #4: Select and use appropriate tools and procedures to solve problems requiring direct measurements and indirect measurements (e.g., perimeter, area, surface area, volume, angles, and segments).

Wisconsin Assessment Framework for Mathematics

Objective: D. Measurement
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• Select and use tools with appropriate degree of precision to determine measurements directly.

Objective: A. Mathematical Processes
Descriptors:
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• Create and use representations to organize, record, and communicate mathematical ideas.

The figure below shows an example of a picture and its frame. In the space given, draw a rectangular picture \(2 \frac{3}{4}\) inches by \(3 \frac{1}{2}\) inches, and draw a 1-inch frame around it.

Draw your picture and frame here:
Mathematics Grade 8
Classroom Assessment Based on Standards

Power CABS Identifier: “Pencil Length”

<table>
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<th>MPS Learning Target: Measurement</th>
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<td>MPS Learning Target #4: Select and use appropriate tools and procedures to solve problems requiring direct measurements and indirect measurements (e.g., perimeter, area, surface area, volume, angles, and segments).</td>
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<td>Objective: A. Mathematical Processes</td>
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<td>Descriptors:</td>
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<tr>
<td>• Connect mathematics to the real world as well as within mathematics.</td>
</tr>
<tr>
<td>• Solve and analyze routine and non-routine problems.</td>
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Which of these choices is the closest to the length of the pencil in the figure?

A. 9 cm
B. 10.5 cm
C. 12 cm
D. 13.5 cm
Explain how you made your choice.
MPS Learning Target: Measurement

MPS Learning Target #4: Select and use appropriate tools and procedures to solve problems requiring direct measurements and indirect measurements (e.g., perimeter, area, surface area, volume, angles, and segments).

Wisconsin Assessment Framework for Mathematics

Objective: D. Measurement
Subskill: Indirect Measurement
Descriptor:
• Determine the perimeter/area of two-dimensional figures.

Objective: A. Mathematical Processes
Descriptor:
• Solve and analyze routine and non-routine problems.

The figure below consists of 5 squares of equal area. The area of the whole figure is 245 cm\(^2\).

Find the area of one square.

Answer_________________

Find the length of one side of one square.

Answer_________________

Find the perimeter of the whole figure in centimeters.

Answer_________________

Developed by the Milwaukee Mathematics Partnership (MMP) with support by the National Science Foundation under Grant No. 0314898.
Mathematics Grade 8
Classroom Assessment Based on Standards

Power CABS Identifier: “Side of Square”

MPS Learning Target: Measurement

MPS Learning Target #4: Select and use appropriate tools and procedures to solve problems requiring direct measurements and indirect measurements (e.g., perimeter, area, surface area, volume, angles, and segments).

Wisconsin Assessment Framework for Mathematics

Objective: D. Measurement
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• Determine the perimeter/area of two-dimensional figures.

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• Use reasoning and logic to: perceive patterns, identify relationships, formulate questions, pose problems, make conjectures, justify strategies and test reasonableness of results.
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• Solve and analyze routine and non-routine problems.

The perimeter of a square is 81 inches. What is the length of one side of the square?
Answer: ________________

Sketch and label your model here.
MPS Learning Target: Measurement

MPS Learning Target #4: Select and use appropriate tools and procedures to solve problems requiring direct measurements and indirect measurements (e.g., perimeter, area, surface area, volume, angles, and segments).

Wisconsin Assessment Framework for Mathematics

Objective: D. Measurement
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• Create and use representations to organize, record, and communicate mathematical ideas.
• Solve and analyze routine and non-routine problems.

Show 3 different ways that you could find the area of these identical figures.
To the right of each figure, show all your work.

10 units
5 units
4 units
12 units

10 units
5 units
4 units
12 units

10 units
5 units
4 units
12 units
Mathematics Grade 8
Classroom Assessment Based on Standards

Power CABS Identifier: “Construct a Polygon”

MPS Learning Target: Measurement
MPS Learning Target #4: Select and use appropriate tools and procedures to solve problems requiring direct measurements and indirect measurements (e.g., perimeter, area, surface area, volume, angles, and segments).

Wisconsin Assessment Framework for Mathematics
Objective: D. Measurement
Subskill: Indirect Measurement
Descriptor:
• Determine the perimeter/area of two-dimensional figures.

Objective: A. Mathematical Processes
Descriptors:
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• Create and use representations to organize, record, and communicate mathematical ideas.
• Solve and analyze routine and non-routine problems.

On the grid below, draw a non-rectangular, non-triangular closed figure with an area of 12 square units.
Explain how you know the area is 12 square units.
Mathematics Grade 8
Classroom Assessment Based on Standards

**Power CABS Identifier: “Rectangular Lot”**

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<tr>
<td>Descriptor:</td>
</tr>
<tr>
<td>• Determine the perimeter/area of two-dimensional figures.</td>
</tr>
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**Objective: A. Mathematical Processes**

**Descriptors:**

• Use reasoning and logic to: perceive patterns, identify relationships, formulate questions, pose problems, make conjectures, justify strategies and test reasonableness of results.
• Communicate mathematical ideas and reasoning using the vocabulary of mathematics in a variety of ways, e.g., using words, numbers, symbols, pictures, charts, tables, diagrams, graphs, and models.
• Create and use representations to organize, record, and communicate mathematical ideas.
• Solve and analyze routine and non-routine problems.

A rectangular lot has a perimeter of 200 feet. The width of the lot is 40 feet. What is its length?

A. 50 feet  
B. 60 feet  
C. 80 feet  
D. 120 feet  
E. 160 feet

Construct a scale model of this rectangular lot. Include a key for the scale you chose.
**MPS Learning Target: Measurement**

**MPS Learning Target #4:** Select and use appropriate tools and procedures to solve problems requiring direct measurements and indirect measurements (e.g., perimeter, area, surface area, volume, angles, and segments).

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**Wisconsin Assessment Framework for Mathematics**

**Objective: D. Measurement**

**Subskill: Indirect Measurement**

**Descriptor:**

- Determine the perimeter/area of two-dimensional figures.

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**Objective: A. Mathematical Processes**

**Descriptors:**

- Use reasoning and logic to: perceive patterns, identify relationships, formulate questions, pose problems, make conjectures, justify strategies and test reasonableness of results.
- Communicate mathematical ideas and reasoning using the vocabulary of mathematics in a variety of ways, e.g., using words, numbers, symbols, pictures, charts, tables, diagrams, graphs, and models.
- Connect mathematics to the real world as well as within mathematics.
- Create and use representations to organize, record, and communicate mathematical ideas.
- Solve and analyze routine and non-routine problems.

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Ms. Smith wants to buy carpet to cover the floors completely in her family room and dining room. Her dining room is 12 feet by 14 feet. Her family room is twice as long and twice as wide.

Since the dimensions of the family room are double the dimensions of the dining room, Ms. Smith thinks the area is doubled also.

Is she correct? ________________

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Explain your answer using words, pictures, and/or numbers.
MPS Learning Target: Measurement
MPS Learning Target #4: Select and use appropriate tools and procedures to solve problems requiring direct measurements and indirect measurements (e.g., perimeter, area, surface area, volume, angles, and segments).

Wisconsin Assessment Framework for Mathematics
Objective: D. Measurement
Subskill: Indirect Measurement
Descriptor:
• Determine the perimeter/area of two-dimensional figures.

Objective: A. Mathematical Processes
Descriptors:
• Use reasoning and logic to: perceive patterns, identify relationships, formulate questions, pose problems, make conjectures, justify strategies and test reasonableness of results.
• Communicate mathematical ideas and reasoning using the vocabulary of mathematics in a variety of ways, e.g., using words, numbers, symbols, pictures, charts, tables, diagrams, graphs, and models.
• Solve and analyze routine and non-routine problems.

Find the area of the region that is **not** shaded in the figure below.

```
8 units

7 units

4 units

2 units

10 units

9 units

Answer: ______________________
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Explain your answer using numbers, pictures, and/or words.
MPS Learning Target: Measurement

MPS Learning Target #4: Select and use appropriate tools and procedures to solve problems requiring direct measurements and indirect measurements (e.g., perimeter, area, surface area, volume, angles, and segments).

Wisconsin Assessment Framework for Mathematics

Objective: D. Measurement
Subskill: Indirect Measurement
Descriptor:
• Determine the perimeter/area of two-dimensional figures.

Objective: A. Mathematical Processes
Descriptors:
• Use reasoning and logic to: perceive patterns, identify relationships, formulate questions, pose problems, make conjectures, justify strategies and test reasonableness of results.
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• Solve and analyze routine and non-routine problems.

This figure is divided into four rectangles, as shown, with the smallest being a square. Find the area of the shaded region.

<table>
<thead>
<tr>
<th>78 ft.²</th>
<th>36 ft.²</th>
<th>43 ft.²</th>
</tr>
</thead>
</table>

Answer: ____________________

Explain your answer using numbers, words, and/or pictures.
**Mathematics Grade 8**

**Classroom Assessment Based on Standards**

*Power CABS Identifier: “Circle in a Square”*

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**MPS Learning Target: Measurement**

**MPS Learning Target #4:** Select and use appropriate tools and procedures to solve problems requiring direct measurements and indirect measurements (e.g., perimeter, area, surface area, volume, angles, and segments).

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**Wisconsin Assessment Framework for Mathematics**

**Objective: D. Measurement**

**Subskill: Indirect Measurement**

**Descriptor:**
- Determine the perimeter/area of two-dimensional figures.

**Objective: A. Mathematical Processes**

**Descriptors:**
- Use reasoning and logic to: perceive patterns, identify relationships, formulate questions, pose problems, make conjectures, justify strategies and test reasonableness of results.
- Communicate mathematical ideas and reasoning using the vocabulary of mathematics in a variety of ways, e.g., using words, numbers, symbols, pictures, charts, tables, diagrams, graphs, and models.
- Solve and analyze routine and non-routine problems.

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The area of the square in the figure below is 36 square units. What is the area of the circle?

![Square and Circle](image)

Answer: ____________________

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Explain your answer; show all your work.

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Developed by the *Milwaukee Mathematics Partnership* (MMP) with support by the National Science Foundation under Grant No. 0314898.
Mathematics Grade 8
Classroom Assessment Based on Standards

CABS Identifier: “Suzanne’s Logic’

MPS Learning Target: Measurement

MPS Learning Target #4: Select and use appropriate tools and procedures to solve problems requiring direct measurements and indirect measurements (e.g., perimeter, area, surface area, volume, angles, and segments).

Wisconsin Assessment Framework for Mathematics

Objective: D. Measurement
Subskill: Indirect Measurement
Descriptor:
• Determine the perimeter/area of two-dimensional figures.

Objective: A. Mathematical Processes
Descriptors:
• Use reasoning and logic to: perceive patterns, identify relationships, formulate questions, pose problems, make conjectures, justify strategies and test reasonableness of results.
• Communicate mathematical ideas and reasoning using the vocabulary of mathematics in a variety of ways, e.g., using words, numbers, symbols, pictures, charts, tables, diagrams, graphs, and models.
• Create and use representations to organize, record, and communicate mathematical ideas.
• Solve and analyze routine and non-routine problems.

Suzanne was working on problems with area and perimeter of rectangles. She decided that if you increase the perimeter of a rectangle, you also increase the area.

Do you agree with Suzanne? ________________

Why? Support your answer with specific examples.
MPS Learning Target: Measurement

MPS Learning Target #4: Select and use appropriate tools and procedures to solve problems requiring direct measurements and indirect measurements (e.g., perimeter, area, surface area, volume, angles, and segments).

Wisconsin Assessment Framework for Mathematics

Objective: D. Measurement
Subskill: Indirect Measurement
Descriptor:
• Determine the surface area/volume of three-dimensional figures.

Objective: A. Mathematical Processes
Descriptors:
• Communicate mathematical ideas and reasoning using the vocabulary of mathematics in a variety of ways, e.g., using words, numbers, symbols, pictures, charts, tables, diagrams, graphs, and models.
• Solve and analyze routine and non-routine problems.

All the small blocks are the same size. Which stack of blocks has a different volume from the others?

A.  
B.  
C.  
D.  

Answer: _________________

How do you know?
What is the surface area of the closed oatmeal container below?

Answer: ___________________

Show how you solved this problem using words, numbers and/or pictures.
MPS Learning Target: Measurement

MPS Learning Target #4: Select and use appropriate tools and procedures to solve problems requiring direct measurements and indirect measurements (e.g., perimeter, area, surface area, volume, angles, and segments).

Wisconsin Assessment Framework for Mathematics

Objective: D. Measurement
Subskill: Indirect Measurement
Descriptor:
• Determine the surface area/volume of three-dimensional figures.

Objective: A. Mathematical Processes
Descriptors:
• Communicate mathematical ideas and reasoning using the vocabulary of mathematics in a variety of ways, e.g., using words, numbers, symbols, pictures, charts, tables, diagrams, graphs, and models.
• Create and use representations to organize, record, and communicate mathematical ideas.
• Solve and analyze routine and non-routine problems.

Find the surface area of this shape. Answer __________________
Find the volume of this shape. Answer __________________

Explain how you found your answers. Use words, pictures, and/or numbers to help you explain.
Oranges are packed in boxes for shipping. The average diameter of the oranges is 6 cm, and the boxes are 60 cm. long, 36 cm. wide, and 24 cm. deep.

How many oranges can be packed in a box?

Answer: _____________________

Explain your answer using words, pictures, and/or numbers.
Given Triangles ABC and EFG:
What is the length of side AC? What is the measure of angle B? What is the measure of angle F?

Answer: ________________  Answer: ________________  Answer: ________________
Mathematics Grade 8
Classroom Assessment Based on Standards

Power CABS Identifier: “Sam’s Sandbox”

MPS Learning Target: Measurement

MPS Learning Target #4: Select and use appropriate tools and procedures to solve problems requiring direct measurements and indirect measurements (e.g., perimeter, area, surface area, volume, angles, and segments).

Wisconsin Assessment Framework for Mathematics

Objective: D. Measurement
Subskill: Indirect Measurement
Descriptor:
• Use right-triangle trig functions and the Pythagorean Theorem to solve right-triangle problems

Objective: A. Mathematical Processes
Descriptors:
• Use reasoning and logic to: perceive patterns, identify relationships, formulate questions, pose problems, make conjectures, justify strategies and test reasonableness of results.
• Communicate mathematical ideas and reasoning using the vocabulary of mathematics in a variety of ways, e.g., using words, numbers, symbols, pictures, charts, tables, diagrams, graphs, and models.
• Connect mathematics to the real world as well as within mathematics.
• Create and use representations to organize, record, and communicate mathematical ideas.
• Solve and analyze routine and non-routine problems.

Sam is building a triangular sandbox for her little brother. She has already installed two of the sides at a right angle. One of these sides is 9 feet long, and the other side is 12 feet long.

Sketch this triangle and label the given sides.
How long will the third side have to be?

Answer: __________________

How did you solve this problem? Show all your work.