



Holyoke Public Schools
Mathematics Curriculum Map
Grade 5

Measuring Polygons

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Curriculum Maps

GOALS:

1. To ensure that students are exposed to a rigorous curriculum in every school and every grade.
2. To have consistent instruction and assessment district wide.
3. To prepare students for the MCAS test.
4. To explain what is expected to be covered in each CMP or Investigations Unit.

EXPECTATIONS:

The district's expectation is for students to successfully meet the Massachusetts Mathematics Standards. In order to help facilitate this, teachers are required to follow the curriculum maps. The successful implementation of these maps requires teachers to thoroughly read each lesson in the TE and work through the project and problems in the map and the text prior to planning their lessons. Work should be kept in the binder with the curriculum map. Working through the math is an essential part of lesson planning, as it helps the teacher to better understand the concept being taught and the students' possible misunderstandings.

FEEDBACK TO STUDENTS:

Feedback needs to happen daily in the classroom. There are many ways to give feedback. Conferencing, observations, questions asked during your opening, work time and closing are all forms of feedback.

MAP COMPONENTS:

1. GENERAL PROBING QUESTIONS
2. UNIT SPECIFIC PROBING QUESTIONS
3. GOALS OF UNIT, CONTENT STANDARDS, & PERFORMANCE STANDARDS
4. PROJECT- to be done at end of unit and kept in the portfolio.
 - STUDENT MASTER – for project
5. INVESTIGATIONS:
 - NOTEBOOK - includes: 3 Ring Binder, Bound Notebook, Portfolio
 - ACCOUNTABLE TALK – using probing questions
5. ON-DEMAND ASSESSMENTS - to be done during teaching of unit.
 - STUDENT MASTERS- for on-demand assessments.

Mathematics

Evidence of Learning Artifacts

Artifact	K - 1	2 - 5	6 - 8
<i>3 Ring Binder (3R)*</i>	<ul style="list-style-type: none"> ○ Student Work¹ 	<ul style="list-style-type: none"> ○ Vocabulary ○ Student sheets¹ <p style="text-align: center;"><u>All work should be dated and listed by investigation</u></p>	<ul style="list-style-type: none"> ○ Math books ○ Vocabulary ○ Core Problems¹ ○ Lab sheets <p style="text-align: center;"><u>All work should be dated and listed by investigation</u></p>
<i>Marble Notebook (MNB)</i>	<ul style="list-style-type: none"> ○ Journal entries² 	<ul style="list-style-type: none"> ○ Table of Contents ○ Problem of the day ○ Journal entries ○ Class work <p style="text-align: center;"><u>All work should be dated and listed by investigation in the Table of Contents</u></p>	<ul style="list-style-type: none"> ○ Table of Contents ○ Work time ○ Journal entries <p style="text-align: center;"><u>All work should be dated and listed by investigation in the Table of Contents</u></p>
<i>Portfolio³ (P)</i>	<ul style="list-style-type: none"> ○ On-demand tasks ○ Projects ○ Teacher anecdotal notes 	<ul style="list-style-type: none"> ○ On-demand tasks ○ Reflections ○ Projects <p style="text-align: center;"><u>All work should be dated and listed by investigation</u></p>	<ul style="list-style-type: none"> ○ On-demand tasks ○ Reflections ○ Projects <p style="text-align: center;"><u>All work should be dated and listed by investigation</u></p>

* Folders may be used in place of binders for these grade levels

¹ Send home at the end of each unit

² Use grade level math journals

³ All documents should be kept for the entire year

Measuring Polygons

Probing Questions for Accountable Talk

As students progress through this unit, they should be asked the following questions to assess their knowledge about the attributes of 2-dimensional and 3-dimensional shapes, as well as how these attributes determine classification. They also develop ideas about linear measurement, area, the measurement of angles, and volume.

- *What are the different types of triangles? How do they compare? What is special about each?*
- *What are the characteristics of quadrilaterals? How are the different quadrilaterals the same/different?*
- *What is a regular polygon? What is a non regular polygon?*
- *What do you know about angles in triangles? How can this help you to determine the measure of unknown angles?*
- *What do you know about angles in polygons? How can this help you to determine the measure of unknown angles?*
- *How can area and perimeter change as the shape changes?*
- *How can the two shapes have the same area and not the same perimeter? The same perimeter and not the same area?*
- *What happens to the area of a square when the dimensions are doubled? A rectangle? Is this always true?*
- *What are some rules you can come up with for doubling dimensions?*

Ten-Minute Math

Continue from previous units

Ten-Minute Math: Quick Images: 2-D

New to this unit

Ten-Minute Math: Quick Survey, Session 2.1

Ten-Minute Math activities offer practice and review of key concepts at each grade level. After their initial introduction, these short activities, designed to take no longer than 10 minutes, support and balance the in-depth work of each curriculum unit.

Implementing Investigations in Grade 5: Please review pages 35-36 for the Ten-Minute Math activities in this unit.

* This unit requires the use of the computer for the LogoPaths program. Time must be scheduled to use the computer lab for the appropriate sessions.

Additional Probing Questions for Accountable Talk

The teacher's role in probing for understanding is to ask questions that will:

- Clarify student understanding
- Get at the objective of the lesson
- Go deeper into the mathematics
- Uncover misconceptions and misunderstandings
- Compare and contrast

The students' role is to be an active participant by:

- Explaining their strategies
- Asking clarifying questions to teacher and other students
- Being active listeners
- Using the language of mathematics

When probing for understanding the teacher and students can use one or more of these suggested questions:

- Why are you using $< >$?
- What are the ways you could $< >$?
- What else do you know?
- How do you know that?
- Can you show that?
- What convention did you use here?
- What can you do if you do not know?
- What standard does this work apply to?
- Is this always true?
- How does this connect to other mathematics we have learned?
- What is the same and what are the differences between $< >$?
- Can you back that up?
- Where is the math in your sketch?
- What does the answer mean?
- Does the answer make sense?
- Could you have used another operation to solve this task?
- Can you give examples?
- Can you say it another way?
- What's the math?
- Tell me about the task in your own words?
- What are you trying to find?
- How did you make your estimate?
- Will your answer be an over-estimate or an under-estimate? Why?
- I noticed that you used $< \dots >$ to help you understand the task. Can you show us what you did and tell us how it helped you?
- Where do you see $< >$ in your $<$ model, diagram, number line, chart, etc. $>$?
- How can we see $< >$ in your $<$ model, diagram, number line, chart, etc. $>$?
- You have used a representation that is different from others that I've seen. Can you show us your $<$ model, diagram, number line, chart, etc. $>$, and tell us how it helped you?
- How did you decide to solve the task? Why did you choose that method?
- Did you try any method that didn't work?
 - Tell us what you tried.
 - Why didn't it work?
 - Would it ever work?

Goals, Content Standards, & Performance Standards

Unit Goals:

- Identify different quadrilaterals by attribute, and know that some quadrilaterals can be classified in more than one way.
- Use known angle size to determine the size of other angles
- Determine the perimeter and area of rectangles
- Identify mathematically similar polygons

Math Content Standards:

- (5.P.5) Solve problems involving proportional relationships using concrete models, tables, graphs, and paper-pencil methods.
- (5.G.1) Identify, describe, and compare special types of triangles (isosceles, equilateral, right) and quadrilaterals (square, rectangle, parallelogram, rhombus, trapezoid) e.g. recognize that all equilateral triangles are isosceles, but not all isosceles triangles are equilateral.
- (5.G.5) Describe and perform transformations on two-dimensional shapes, e.g. Translations, rotations, and reflections.
- (5.G.7) Determine if two triangles or two quadrilaterals are congruent by measuring sides or a combination of sides and angles, as necessary, or by the motions or a series of motions e.g. translations, rotations, and reflections.
- (5.M.1) Apply the concepts of perimeter and area to the solution of problems involving triangles and rectangles. Apply formulas where appropriate.
- (5.M.2) Identify, measure, describe, classify, and draw various angles. Draw triangles given two sides and the angle between them, or given two angles and the side between them, e.g. draw a triangle with one right angle and two sides congruent.
- (5.M.5) Find the sums of the measures of the interior angles in triangles by measuring the angles, and without measuring the angles.

Performance Standards:

- (M2d) Uses many types of figures (angles, triangles, squares, rectangles, rhombi, parallelograms, quadrilaterals, polygons, prisms, pyramids, cubes, circles, and spheres) and identifies the figures by their properties, e.g. symmetry, number of faces, two- or three-dimensionality, no right angles.
- (M2e) Solves problems by showing relationships among figures, e.g. using congruence and similarity, and using transformations including flips, slides, and rotations.
- (M2g) Uses basic ways of estimating and measuring the size of figures and objects in the real world, including length, width, perimeter, and area.
- (M2h) Uses models to reason about the relationship between the perimeter and area of rectangles in simple situations.

UNIT: Measuring Polygons

End-of-Unit Project

GRADE: 5

End-of-Unit Project (P)

Student work should be placed in **portfolio (P)**.

The project is the culminating assessment which will allow students to apply what they learned in the unit. It is written in MCAS form to give students the experience of answering an open-response question.

Harry planned a rectangular garden that was 40 feet long and 10 feet wide.

- a. What was the perimeter of the garden that Harry planned? Show and explain how you got your answer.
- b. What was the area of the garden that Harry planned? Show and explain how you got your answer.
- c. Suppose Harry decided to change the shape of his garden to a square with the same area as the rectangle. What would be the perimeter of the square garden? Show and explain how you got your answer.

UNIT: Measuring Polygons
Investigation 1 (1.1 – 1.7) DAYS: 7

GRADE: 5

<p>Evidence of Learning Artifacts</p> <p>Journal and Reflection questions should be posted and referred to at the beginning of the appropriate <i>Investigation</i>.</p> <p>Journal and Reflection entries need to be done in class as part of the closure and assessment.</p>	<p>(3R) – 3 ring binder; (MNB) – marble notebook; (P) – portfolio</p> <p>Vocabulary – right, acute, obtuse, equilateral, scalene, isosceles, quadrilateral, parallel, trapezoid, parallelogram, rectangle, rhombus, square, supplementary, convex, regular, hexagon, heptagon, octagon, pentagon, decagon, interior angle, exterior angle (3R)</p> <p>Work Time – Student Sheets 1-25 (3R)</p> <p>Journal Entries – (MNB) *Maximum 5 minutes</p> <p>Inv. 1.1 What attributes can we use to classify triangles?</p> <p>Inv. 1.2 – 1.3 How are squares, rectangles, rhombuses, and parallelograms the same and different?</p> <p>Inv. 1.4 What is the difference between regular polygons and non-regular polygons?</p> <p>Inv. 1.5 Why is the sum of the angles in triangles different than the sum of the angles in quadrilaterals?</p> <p>Inv. 1.6 What strategies can you use to determine angle measures?</p> <p>Inv. 1.7 None, due to assessment.</p> <p>Reflection – Describe the relationship between parallelograms, rectangles, rhombuses, and squares. Use pictures and words. (P)</p>
<p>Accountable Talk</p> <p>To promote learning, explore solutions, and justify reasoning, conversations between students and students or students and teacher must be accountable – accountable to the learning community, to the mathematics discipline, and to rigorous thinking.</p>	<p><i>As a result of this Investigation, students should be able to talk and manipulate the vocabulary of the Investigation in response to this type of question:</i></p> <p>How did you know that? How can you use ...? Can you show another way? What convention did you use?</p> <p><i>These are some recommended questions that you might use. Others can be found at the beginning of the map and on the probing question sheet in the district mathematics guide.</i></p>

UNIT: Measuring Polygons
Investigation 2 (2.1 – 2.6) DAYS: 6

GRADE: 5

<p>Evidence of Learning Artifacts</p> <p>Journal and Reflection questions should be posted and referred to at the beginning of the appropriate <i>Investigation</i>.</p> <p>Journal and Reflection entries need to be done in class as part of the closure and assessment.</p>	<p>(3R) – 3 ring binder; (MNB) –marble notebook; (P) – portfolio</p> <p><i>Vocabulary</i> – perimeter, area, dimension (3R)</p> <p><i>Work Time</i> – Student Sheets 27-47 (3R)</p> <p><i>Journal Entries</i> – (MNB) *Maximum 5 minutes</p> <p>Inv. 2.1 What patterns did you notice in the area of the squares? What patterns did you notice in the perimeter of the squares? Why do you think this is happening?</p> <p>Inv. 2.2 What do you think would happen to the area and perimeter of the square if we tripled the sides?</p> <p>Inv. 2.3 If the perimeter of a square or rectangle doubles, what happens to the area? Why?</p> <p>Inv. 2.4 Can two rectangles with different perimeters have the same area? Explain.</p> <p>Inv. 2.5 Can two rectangles with the same perimeter have a different area?</p> <p>Inv. 2.6 None, due to assessment.</p> <p><i>Reflection</i> – What happens to rectangles and squares when the sides are doubled? Explain your answer with words and diagrams. (P)</p>
<p>Accountable Talk</p> <p>To promote learning, explore solutions, and justify reasoning, conversations between students and students or students and teacher must be accountable – accountable to the learning community, to the mathematics discipline, and to rigorous thinking.</p>	<p><i>As a result of this Investigation, students should be able to talk and manipulate the vocabulary of the Investigation in response to this type of question:</i></p> <p>How did you know...?</p> <p>Can you solve the problem in a different way?</p> <p>Can you make a rule for the pattern?</p> <p>Does your answer make sense?</p> <p>What was your strategy?</p> <p><i>These are some recommended questions that you might use. Others can be found at the beginning of the map and on the probing question sheet in the district mathematics guide.</i></p>

UNIT: Measuring Polygons
Investigation 3 (3.1 – 3.5) DAYS: 5

GRADE: 5

<p>Evidence of Learning Artifacts</p> <p>Journal and Reflection questions should be posted and referred to at the beginning of the appropriate <i>Investigation</i>.</p> <p>Journal and Reflection entries need to be done in class as part of the closure and assessment.</p>	<p>(3R) – 3 ring binder; (MNB) –marble notebook; (P) – portfolio</p> <p><i>Vocabulary</i> – similar (3R)</p> <p><i>Work Time</i> – Student Sheets 49-63 (3R)</p> <p><i>Journal Entries</i> – (MNB) *Maximum 5 minutes</p> <p>Inv. 3.1 What does it mean for two shapes to be similar? Inv. 3.2 What patterns did you notice as you built similar hexagons? Inv. 3.3 What happens to the area in similar figures? Inv. 3.4 Explain your strategy for making the similar hexagons? Inv. 3.5 None, due to assessment.</p> <p><i>Reflection</i> – Describe the growth pattern of similar figures. Why do you think this happens? Will this always be true? (P)</p>
<p>Accountable Talk</p> <p>To promote learning, explore solutions, and justify reasoning, conversations between students and students or students and teacher must be accountable – accountable to the learning community, to the mathematics discipline, and to rigorous thinking.</p>	<p><i>As a result of this Investigation, students should be able to talk and manipulate the vocabulary of the Investigation in response to this type of question:</i></p> <p>How did you know...? Can you solve the problem in a different way? Does your answer make sense? What was your strategy?</p> <p><i>These are some recommended questions that you might use. Others can be found at the beginning of the map and on the probing question sheet in the district mathematics guide.</i></p>

End-of-Unit Project

Student work should be placed in **portfolio (P)**.

The project is the culminating assessment which will allow students to apply what they learned about the attributes of 2-dimensional and 3-dimensional shapes, as well as how these attributes determine classification. They also develop ideas about linear measurement, area, the measurement of angles, and volume. It is written in MCAS form to give students the experience of answering an open-response question.

NAME: _____

DATE: _____

End-of-Unit Project

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all work (diagrams, tables, and computations) on your answer sheet.**
- **If you do the work in your head, explain in writing how you did the work.**

Harry planned a rectangular garden that was 40 feet long and 10 feet wide.

- a. What was the perimeter of the garden that Harry planned? Show and explain how you got your answer.
- b. What was the area of the garden that Harry planned? Show and explain how you got your answer.
- c. Suppose Harry decided to change the shape of his garden to a square with the same area as the rectangle. What would be the perimeter of the square garden? Show and explain how you got your answer.

Scoring Guide - Score Point 4

Ⓐ The rectangular garden that Harry planned had 100 feet as its perimeter. How I got that answer is I ^{got} $2 \times$ its length $40 = 80 + 2 \times$ its width $10 = 20$. So $80 + 20 = 100$.

Ⓑ The area for Harry's garden plan was 400. All I did to get that answer was its length $40 \times$ its width $10 = 400$.

Ⓒ If Harry wanted to change the shape to a square but keep the same area, 400, the perimeter of the square garden would be 80. It would be 80 because all sides would be 20 and $4 \times$ the length of a side $20 = 80$.
 $4 \times 20 = 80$.

Scoring Guide - Score Point 3

Ⓐ The perimeter of the garden Harry planned was 100 feet.
 $(40 + 40 + 10 + 10 = 100)$

Ⓑ The area of the garden Harry planned is 400 feet. $(40 \times 10 = 400)$

Ⓒ The area of a square garden could be 20 feet long and 20 feet wide.
 $(20 \times 20 = 400)$

a. The perimeter in Harry's garden is 100 feet. I found this out by adding $40+40$, and the answer was 80. Then I added $10+10$, and the answer was 20. Lastly, I added $80+20$, and that equaled to 100.

b. The area of Harry's garden is 400 square feet. I found this out by multiplying, 40×10 .

c. If Harry changed the shape of his garden, but kept the area the same, the perimeter would also be the same. I found this out because the perimeter is just the outside of the area, so if he keeps the area, the outside of it will still be the same.

Scoring Guide - Score Point 1

a. you would add the sides up to get the perimeter, and it is 50.

B. you would do length x width, and it is 400.

C. you would do side x side which is 100.

$$\begin{array}{r} \text{A } 40 \\ + 10 \\ \hline 50 \end{array} \quad \begin{array}{r} \text{B } 40 \\ \times 10 \\ \hline 400 \\ \hline 400 \end{array}$$

$$\begin{array}{r} 10 \\ \times 10 \\ \hline 100 \\ \hline 100 \end{array}$$

(A) If the rectangular garden was forty feet then you would have to divide the garden into four parts you would get 10 feet for the perimeter.

(B) Harry's garden is 40 feet and the width is 20 feet so you get an area total of 80 feet because the garden in length is 40 feet and $20 + 20 = 40$ so it would be $40 + 40 = 80$.

(C) Harry change the shape of his garden to a square but it still would be the same perimeter because just because we change it does not mean it is different.

On-Demand Assessments

(To be filed in portfolio)

Measuring Polygons Investigations

In class individualized On-Demand tasks assess knowledge of mathematical facts, operations, concepts, and skills, and their efficient application to problem solving. The results of these different forms of assessment provide rich profiles of students' achievements in mathematics and serve as the basis for identifying curricula and instructional approaches to best develop their talents.

UNIT: Measuring Polygons

On-Demand Assessments

GRADE: 5

On-Demand Assessments (P)

Measuring Polygons Investigations

In class individualized On-Demand tasks assess knowledge of mathematical facts, operations, concepts, and skills, and their efficient application to problem solving. The results of these different forms of assessment provide rich profiles of students' achievements in mathematics and serve as the basis for identifying curricula and instructional approaches to best develop their talents.

Inv. 1: Resource Binder: Session 1.7, M17*

Inv. 2: Resource Binder: Session 2.6, M19*

Inv. 3: Resource Binder: Session 3.5, M20-M22*

***Please refer to the section in the Teacher's Unit Guide entitled, "Professional Development" for examples of student work for each assessment.**



Holyoke Public Schools

2007 - 2008

Mathematics

Scoring Rubric

Score point 4:

The response shows a *comprehensive* understanding of the mathematical concept(s) and/or procedures embodied in the task(s). It indicates that the student has *completed the task(s) correctly*, using mathematically sound procedures. It contains *clear, complete explanations* and/or *adequate work required*.

Score point 3:

The response shows a *general* understanding of the mathematical concept(s) and/or procedures embodied in the task(s). It indicates that the student has *completed the task(s)*, using mathematically sound procedures. It contains *complete explanations* and/or *adequate work required*.

Score point 2:

The response shows a *basic* understanding of the mathematical concept(s) and/or procedures embodied in the task(s). It addresses *most aspects of the task(s)*, using mathematically sound procedures. It may contain a correct solution but provides *incomplete procedures, reasoning and/or explanations*. It may reflect *some misunderstandings* of the underlying mathematical concepts and/or procedures.

Score point 1:

The response shows a *minimal* understanding of the mathematical concepts and/or procedures embodied in the task(s). It addresses *some elements of the task(s) correctly* but reaches an *inadequate solution and/or provides reasoning that is faulty or incomplete*. It exhibits *multiple flaws related to a misunderstanding of important aspects* of the task(s), *misuse* of mathematical procedures, or faulty mathematical reasoning. It reflects a *lack of essential understanding* of the underlying mathematical concepts. It may contain a correct numerical answer but the *required work is not provided*.

Score point 0:

The response is *completely incorrect, irrelevant, or incoherent*, or contains a correct response arrived at using an *obviously incorrect procedure*.

NOTES