



Holyoke Public Schools  
Mathematics Curriculum Map  
Grade 5  
Growth Patterns

# Table of Contents

Curriculum Map Outline.....	4
Mathematics Evidence of Learning Artifacts.....	5
Probing Questions for Accountable Talk.....	6
Additional Probing Questions.....	7
Goals, Content Standards, & Performance Standards.....	8
End-of-Unit Project Preview.....	9
Investigations 1 & 2 .....	10
End-of-Unit Project.....	12
On-Demand Assessments.....	14
HPS Mathematics Scoring Rubric.....	16

## 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.
  - o STUDENT MASTER – for project
5. INVESTIGATIONS:
  - o NOTEBOOK - includes: 3 Ring Binder, Bound Notebook, Portfolio
  - o ACCOUNTABLE TALK – using probing questions
5. ON-DEMAND ASSESSMENTS - to be done during teaching of unit.
  - o STUDENT MASTERS- for on-demand assessments.

# Mathematics

## Evidence of Learning Artifacts

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

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

<sup>1</sup> Send home at the end of each unit

<sup>2</sup> Use grade level math journals

<sup>3</sup> All documents should be kept for the entire year

## Growth Patterns

### Probing Questions for Accountable Talk

As students progress through this unit, they should be asked the following questions to assess their knowledge about patterns, sequences, and functions.

- *How can you tell the rate at which a graph grows?  
How do graphs represent the relationship between two variables?*
- *What is the relationship between the different units of measure?*
- *What does it mean when a graph is curved up and to the right? (Down and to the left?)*
- *How does perimeter change as the rectangles grow? What does that look like on a graph? How does that graph compare with others?*
- *How can you compare the rates of growth in a line graph? How can the comparative steepness help you to compare these graphs?*
- *How do you know your rule works?*
- *Does your rule work every time?*
- *Explain the growth pattern in your graph.*
- *How do you write an algebraic expression?*
- *Describe the relationship between the algebraic expression, table, and graph.*

### ***Ten-Minute Math***

Ten-Minute Math:    Session 1.2 Estimation and Number Sense  
                                 Session 1.3 Practicing Place Value

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 24-25, 30 -31, for 2 Ten-Minute Math activities in this unit.

## 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:

- Create table and graphs to represent the relationship between two variables
- Use tables and graphs to compare two situations with constant rates of change
- Use symbolic notation to represent the value of one variable in terms of another variable in situations with constant rates of change

## Math Content Standards:

- (5.N.10) Demonstrate an understanding of how parentheses affect expressions involving addition, subtraction, and multiplication, and use that understanding to solve problems, e.g.,  $3 \times (4+2) = 3 \times 6$
- (5.P.1) Analyze and determine the rules for extending symbolic, arithmetic, and geometric patterns and progressions, e.g., ABBCCC; 1,5,9,13...:3,9,27
- (5.P.2) Replace variables with given values and evaluate/simplify, e.g.,  $2(O) + 3$  when  $O=4$ .
- (5.P.4) Represent real situations and mathematical relationships with concrete models, tables, graphs, and rules in words and with symbols, e.g., input-output tables.
- (5.P.6) Interpret graphs that represent the relationship between two variables in everyday situations
- (5.G.4) Using ordered pairs of whole numbers (including zero), graph, locate, and identify points, and describe paths on the Cartesian coordinate plane.
- (5.M.3) Solve problems involving simple unit conversions within a system of measurement.
- (5.D.2) Construct and interpret line plots, line graphs, and bar graphs. Interpret and label circle graphs.

## Performance Standards:

- (M3a) Uses linear patterns to solve problems; that is
- shows how one quantity determines another in a linear pattern
  - shows how one quantity determines another quantity in a functional relationship based on a linear pattern
- (M3b) Builds iterations of simple non-linear patterns, including multiplicative and squaring patterns with concrete materials, and recognizes that these patterns are not linear.
- (M3d) Uses letters, boxes, or other symbols to stand for any number, measured quantity, or object in simple situations with concrete materials
- (M4a) Collects and organizes data to answer a question or test a hypothesis by comparing sets of data
- (M4c) Makes statements and draws simple conclusions based on data; that is
- reads data in line plots, graphs, tables, and charts
  - interprets data to determine the reasonableness of statements about the data
- (M4e) Predicts results, analyzes data
- (M2c) Uses simple two dimensional coordinate systems to find locations on a map
- (M2f) Extends and creates geometric patterns using concrete and pictorial models
- (M2J) Carries out simple unit conversions, such as between cm and m

# UNIT: Growth Patterns

## 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.

Time (minutes)	Total Distance (miles)
1	0.5
2	1.0
3	1.5
4	2.5
5	2.0
6	3.0
7	4.0
8	5.0
9	5.5
10	6.0
11	6.5
12	7.0
13	7.0
14	7.0

- Use the table to make a graph of the trip.
- Write an algebraic expression that represents your graph.
- Describe the rate of change.

UNIT: Growth Patterns  
Investigation 1 (1.1 – 1.5)      DAYS: 5

GRADE: 5

<p><b>Evidence of Learning Artifacts</b></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><b>(3R) – 3 ring binder; (MNB) – marble notebook; (P) – portfolio</b></p> <p><i>Vocabulary</i> – rate of change, steady rate, steepness, variables, slope (3R)</p> <p><i>Work Time</i> – Student Sheets. 1-22 (3R)</p> <p><i>Journal Entries</i> – (MNB) *Maximum 5 minutes</p> <p><b>Inv. 1.1</b> What would a graph look like for someone who has grown at a slow, steady rate until they were eight, and then grew quickly from 8-10? Explain why.</p> <p><b>Inv. 1.2</b> How would a graph that showed a steady rate compare to a graph that showed someone who grew quickly?</p> <p><b>Inv. 1.3</b> If another animal, Rover, was 5 centimeters tall at birth, and grew at a rate of 4 centimeters a year, how tall would he be at age 80? Explain how you know.</p> <p><b>Inv. 1.4</b> None, due to assessment</p> <p><b>Inv. 1.5</b> Describe the graphs of Fastwalker and Trifoot. How are they similar? How are they different?</p> <p><i>Reflection</i> – Using two different colors, plot a graph that shows quick growth and slow growth. How do these lines compare? Explain your thinking. (P)</p>
<p><b>Accountable Talk</b></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: Growth Patterns**  
**Investigation 2 (2.1 – 2.8)                      DAYS: 8**  
**GRADE: 5**

<p><b>Evidence of Learning Artifacts</b></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><b>(3R) – 3 ring binder; (MNB) –marble notebook; (P) – portfolio</b></p> <p><i>Vocabulary</i> – area, perimeter, symbolic expression, algebraic expression(3R)</p> <p><i>Work Time</i> – Student Sheets 23-65 (3R)</p> <p><b>Journal Entries</b> – (MNB) *Maximum 5 minutes</p> <p><b>Inv. 2.1</b> Write a rule for any number of rows with 4 tiles in it. Explain why your rule works using words or symbols.</p> <p><b>Inv. 2.2</b> Is the perimeter of a rectangle with 20 rows of 3 double the perimeter of a rectangle with 10 rows of 3? Explain.</p> <p><b>Inv. 2.3</b> Write a rule for finding the total number tiles and the perimeter for any number of rows.</p> <p><b>Inv. 2.4</b> How does your perimeter change each time you add a row?</p> <p><b>Inv. 2.5</b> Considering what you know about a 2 Penny Jar and a Doubling Penny Jar, what do you think it would look like if we plotted more rounds on the graph? Explain.</p> <p><b>Inv. 2.6</b> How does the graph for the growing squares compare with the Doubling Penny Jar graph?</p> <p><b>Inv. 2.7</b> Predict the shape of a graph for Staircase Tower: Jumps of Three would look like.</p> <p><b>Inv. 2.8</b> None due to assessment.</p> <p><b>Reflection</b> – Describe how a graph represents a situation in which the rate of change is not constant. (P)</p>
<p><b>Accountable Talk</b></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>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>

# 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 patterns, sequences, and functions. 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**

<b>Time (minutes)</b>	<b>Total Distance (miles)</b>
<b>1</b>	<b>0.5</b>
<b>2</b>	<b>1.0</b>
<b>3</b>	<b>1.5</b>
<b>4</b>	<b>2.5</b>
<b>5</b>	<b>2.0</b>
<b>6</b>	<b>3.0</b>
<b>7</b>	<b>4.0</b>
<b>8</b>	<b>5.0</b>
<b>9</b>	<b>5.5</b>
<b>10</b>	<b>6.0</b>
<b>11</b>	<b>6.5</b>
<b>12</b>	<b>7.0</b>
<b>13</b>	<b>7.0</b>
<b>14</b>	<b>7.0</b>

- Construct a graph from the information on the table.**
- Write an algebraic expression that matches your graph.**
- Describe the rate of change.**

# On-Demand Assessments

(To be filed in portfolio)

## Growth Patterns 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: Growth Patterns

On-Demand Assessments

GRADE: 5

**On-Demand Assessments (P)**

Growth Patterns  
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 1.4, M17

***Inv. 2:*** Resource Binder: Session 2.8, M22-M25\*\*

\*Assessment Checklists should be kept with tracking sheets

**\*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