

Assistant to the Superintendent



Holyoke Public Schools Mathematics Curriculum Map Grade 5

Number Puzzles & Multiple Towers

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 - 3	10
End-of-Unit Project.....	13
On-Demand Assessments.....	15
HPS Mathematics Scoring Rubric.....	17

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

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

Number Puzzles and Multiple Towers Probing Questions for Accountable Talk

As students progress through this unit, they should be asked the following questions to assess their knowledge about problems that involve multiplication and division.

- *Will breaking a number into factors help solve the problem?*
- *What do the factors and multiples of the numbers tell about the situation?*
- *How do you find the factors of the numbers?*
- *How do you find the multiples of a number?*
- *What common factors and common multiples do the numbers have?*
- *What strategies did you use to solve the division problem?*
- *What strategy helped you with division problems?*
- *What strategies do you use in solving a problem such as $126/14$?*
- *What strategies do you feel confident using solving a problem with a 2-digit divisor?*
- *How can you use multiples to solve division problems?*

Ten-Minute Math

Ten-Minute Math: Session 1.1 – Quick Images: Seeing Numbers
Session 2.2 – Number Puzzles

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 28-29, 32-34, for the 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:

- Find the factors of a number
- Solve multiplication problems efficiently
- Solve division problems with 1-digit and 2-digit divisors

Math Content Standards:

- (5.N.8) Apply the number theory concepts of common factor, common multiple, and divisibility rules for 2, 3, 5, and 10 to the solution of problems. Demonstrate an understanding of the concepts of prime and composite numbers.
- (5.N.9) Solve problems involving multiplication and division of whole numbers.
- (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.N.12) Accurately and efficiently multiply and divide (using double-digit divisors) whole numbers.
- (5.N.14) Estimate products of whole numbers. Use a variety of strategies and judge the reasonableness of the answer.

Performance Standards:

- (M1a) Adds, subtracts, multiplies, and divides whole numbers, with and without calculators.
- (M1f) Describes and compares quantities by using whole numbers up to 10,000; that is:
- finds, identifies, and sorts numbers by their properties, e.g., odd, even, multiple, square.
- (M6a) Adds, subtracts, multiplies, and divides whole numbers correctly; that is:
- Knows single digit addition, subtraction, **multiplication, and division facts**;
 - Multiplies and divides numbers with one or 2 digits.
- (M7a) Uses appropriate mathematical terms, vocabulary, and language, based on prior conceptual work.
- (M7b) Shows mathematical ideas in a variety of ways, including words, numbers, symbols, pictures, charts, graphs, tables, diagrams, and models.
- (M7c) Explains solutions to problems clearly and logically, and supports solutions with evidence, in both oral and written work.

UNIT: Number Puzzles and Multiple Towers

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.

Vicente made three dozen cookies for the student council bake sale. He wants to package them in small bags with the same number of cookies in each bag.

- a. List all of the ways Vicente can package the cookies**
- b. If you were Vicente how many cookies could you put in each bag? Why?**

Vicente spent \$5.40 on ingredients for the cookies. The student council will pay him back for the money he spent. For each of the answers in (a), determine how much the student council should charge for each bag of cookies so they make a profit yet still get students to buy cookies.

Question Bank Prime Time Book, pg.14, #19

UNIT: Number Puzzles and Multiple Towers
 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 – multiplication, division, factor, product, array, dimensions of an array, unmarked array, multiplication combination, multiple (3R)</p> <p>Work Time – Student Sheets: 1-24 (3R0)</p> <p>Journal Entries – (MNB)</p> <p>Inv. 1.1 Explain the difference between a factor and a multiple.</p> <p>Inv. 1.2 What strategy can you use to solve number problems?</p> <p>Inv. 1.3 Are there clues to help you find multiple combinations? Explain.</p> <p>Inv. 1.4 Figure out some combination with 150 as the product. What is the combination with two factors that works and how did you think of that?</p> <p>Inv. 1.5 What number property did you find most useful to solve number puzzles? Explain.</p> <p>Inv. 1.6 How do you know when you have found all of the factors for a number?</p> <p>Inv. 1.7 What is prime factorization?</p> <p>Reflection – How can 4×3 help you to find multiple combinations for 120? (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: Number Puzzles and Multiple Towers
Investigation 2 (2.1 – 2.7) 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><i>Vocabulary</i> – representation, distributive property, associative property, less than, greater than, even, odd, square number, prime (3R)</p> <p><i>Work Time</i> – Student Activity Book pgs. 25 – 46 (3R)</p> <p><i>Journal Entries</i> – (MNB)</p> <p>Inv. 2.1 Explain a strategy that you find useful in solving multiplication problems.</p> <p>Inv. 2.2 Explain the distributive property using the area model.</p> <p>Inv. 2.3 What strategies can you use to determine which product is greater?</p> <p>Inv. 2.4 -2.5 How can multiplication clusters help you to solve a more difficult multiplication problem?</p> <p>Inv. 2.6 What strategy do you use as a first step in solving multiplication problems? Why?</p> <p>Inv. 2.7 None</p> <p><i>Reflection</i> – Write a story problem for 35×21. Solve the problem and explain what strategy you used to solve it. (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 style="padding-left: 40px;">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>

UNIT: Number Puzzles and Multiple Towers
Investigation 3 (3.1 – 3.8) DAYS: 8

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> – dividend, divisor, quotient, multiple (3R)</p> <p><i>Work Time</i> – Student Sheets: 47-71 (3R)</p> <p><i>Journal Entries</i> – (MNB)</p> <p style="padding-left: 20px;">Inv. 3.1 How are dividend, divisor, and quotient related?</p> <p style="padding-left: 20px;">Inv. 3.2 What are landmark multiples?</p> <p style="padding-left: 20px;">Inv. 3.3 What strategy do you find most useful for solving division problems? Explain.</p> <p style="padding-left: 20px;">Inv. 3.4 How can a multiplication problem help you to solve a division problem?</p> <p style="padding-left: 20px;">Inv. 3.5 How can breaking a dividend into parts help you to solve a division problem?</p> <p style="padding-left: 20px;">Inv. 3.6 -3.7 How did you decide which quotient was greater when comparing division problems?</p> <p style="padding-left: 20px;">Inv. 3.8 Assessment, no journal</p> <p><i>Reflection</i> – Explain the relationship between multiplication and division (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 style="padding-left: 40px;">How did you know...?</p> <p style="padding-left: 40px;">Can you solve the problem in a different way?</p> <p style="padding-left: 40px;">Does your answer make sense?</p> <p style="padding-left: 40px;">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 multiplication and division. 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.**

Vicente made three dozen cookies for the student council bake sale. He wants to package them in small bags with the same number of cookies in each bag.

- List all of the ways Vicente can package the cookies**
- If you were Vicente how many cookies could you put in each bag? Why?**

Vicente spent \$5.40 on ingredients for the cookies. The student council will pay him back for the money he spent. For each of the answers in (a), determine how much the student council should charge for each bag of cookies so they make a profit yet still get students to buy cookies.

On-Demand Assessments

(To be filed in portfolio)

Number Puzzles and Multiple Towers 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: Number Puzzles and Multiple Towers

On-Demand Assessments

GRADE: 5

On-Demand Assessments (P)

Number Puzzles and Multiple Towers 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, Sessions 1.5 and 1.6, M32-M34*

Inv. 2: Resource Binder: Session 2.7, M51**

Inv. 3: None due to Assessment

*Assessment Checklists should be kept with tracking sheets.(if there is an assessment that we are asking them to use

****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