



Holyoke Public Schools

Grade 8

Say It with Symbols

Table of Contents

HOLYOKE PUBLIC SCHOOLS	ERROR! BOOKMARK NOT DEFINED.
CURRICULUM MAPS OUTLINE	6
Map Goals:	6
Expectations:	6
Feedback To Students:	6
Map Components:	7
MATHEMATICS EVIDENCE OF LEARNING ARTIFACTS	8
ACCOUNTABLE TALK	9
Probing Assessment Questions	9
Probing Questions – Teacher’s Role	9
Probing Questions – Student’s Role	10
Probing Questions - Suggestions	10
UNIT GOALS, CONTENT STANDARDS, & PERFORMANCE STANDARDS	12
Unit Goals:	12
Math Content Standards:	12
Performance Standards:	13
INVESTIGATION 1: EQUIVALENT EXPRESSIONS	14

INVESTIGATION 2: COMBINING EXPRESSIONS	15
INVESTIGATION 3: SOLVING EXPRESSIONS.....	16
INVESTIGATION 4: LOOKING BACK AT FUNCTIONS.....	17
INVESTIGATION 5: REASONING WITH SYMBOLS	18
APPENDIX 1 UNIT PROJECT	19
Unit Project Scoring Guide	19
Exercise Program	20
Student Work: Question 28 - Score Point 4.....	21
Student Work: Question 28 - Score Point 3.....	22
Student Work: Question 28 - Score Point 2.....	23
Student Work: Question 28 - Score Point 1.....	24
APPENDIX 2 VOCABULARY	25
Investigation 1:	25
Investigation 2:	25
Investigation 3:	25
Investigation 4:	25
Investigation 5:	25
APPENDIX 3 JOURNAL ENTRIES.....	26
Investigation 1:	26

Investigation 2:	26
Investigation 3.....	26
Investigation 4.....	27
Investigation 5.....	27
APPENDIX 4 REFLECTIONS	28
MMR1	28
MMR2	28
MMR3	28
MMR4	28
MMR5	28
APPENDIX 5 ON DEMAND TASKS	29
Mathematics Scoring Rubric.....	30
Investigation 1.....	31
Investigation 2.....	32
Investigation 3.....	33
Investigation 4.....	34
Investigation 5.....	35
NOTES	36

Curriculum Maps Outline

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

Mathematics Evidence of Learning Artifacts

Artifact	K - 1	2 - 5	6 - 8
3 Ring Binder (3R)*	<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>
Marble Notebook (MNB)	<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>
Portfolio³ (P)	<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

Accountable Talk

Probing Assessment Questions

As students progress through this unit, they should be asked the following questions to assess their specific knowledge of the unit.

What expression or equation represents the pattern or relationship in a context?

What information do you get from an equivalent expression for a quantity?

How can you tell if two or more expressions are equivalent?

What operations can transform a given equation or expressions into an equivalent form that can be used to answer a question?

What patterns of change do the equations or expression represent?

How can symbolic reasoning help confirm a conjecture?

Probing Questions – Teacher’s Role

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*

Probing Questions – Student’s Role

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*

Probing Questions - Suggestions

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 <...> 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?

Unit Goals, Content Standards, & Performance Standards

Unit Goals:

Model situations with symbolic statements

Write equivalent expressions

Determine if different symbolic expressions are mathematically equivalent

Interpret the information equivalent expressions represent in a given context

Determine which equivalent expression to use to answer a particular question

Solve linear equations involving parentheses

Use equations to make predictions and decisions

Analyze equations to determine the patterns of change in tables and graphs that the equation represents

Understand how and when to use symbols to display relationships, generalizations, and proofs

Math Content Standards:

(8.N.12) Select and use appropriate operations – addition, subtractions, multiplication, division, and positive integer exponents – to solve problems with rational numbers, including negatives.

(8.P.1) Extend, represent, analyze, and generalize, a variety of patterns with tables, graphs, words, and, when possible, symbolic expressions. Include arithmetic and geometric progressions, e.g., compounding.

(8.P.2) Evaluate simple algebraic expressions for given variable values, e.g., $3a^2 - b$ for $a = 3$ and $b = 7$.

(8.P.3) Demonstrate an understanding of the identity $(-x)(-y) = xy$. Use this identity to simplify algebraic expressions, e.g., $(-2)(-x + 2) = 2x + 4$.

(8.P.4) Create and use symbolic expressions and relate them to the verbal, tabular, and graphical representations.

(8.P.7) Set up and solve linear equations and inequalities with one or two variables, using algebraic methods, models, and/or graphs.

Performance Standards:

(M3a) Discover, describe, and generalize patterns.

(M3b) Represent relationships with tables, graphs, and verbal or symbolic rules.

(M3b) Find solutions for unknown quantities in linear equations and in simple equations and inequalities

Investigation 1: Equivalent Expressions

<p><u>Objectives</u> Investigations 1.1 – 1.4</p>	<p><u>Pacing:</u> 4 days</p>
<p style="text-align: center;"><i>Evidence of Learning Artifacts</i></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><u>Vocabulary</u>²: Appendix 2, Investigation 1</p> <hr/> <p><u>Core Problems</u>²: Say It With Symbols, Investigation 1 ACE Problems: # 1, 3 – 6, 8 – 9, 12 – 14, 18 – 20, 25 – 26, 51</p> <hr/> <p><u>Work Time</u>¹: Say It With Symbols, Problems 1.1 – 1.4</p> <hr/> <p><u>Journal Entries</u>¹: Appendix 3, Inv 1.1 – 1.4</p> <hr/> <p><u>On Demand Tasks</u>³: Appendix 5, Investigation 1</p> <hr/> <p><u>Mathematical Reflection</u>³ Appendix 4, MMR1:</p>
<p style="text-align: center;"><i>Accountable Talk</i></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>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:</p> <ul style="list-style-type: none"> ○ How did you know that? ○ How can you use ...? ○ Can you show another way? ○ What convention did you use? <p>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.</p>

1. *Marble Note Book*
2.3- *Ring Binder*
3. *Portfolio*

Investigation 2: Combining Expressions

Objectives Investigations 2.1 – 2.3	Pacing: 3 days
<p style="text-align: center;"><i>Evidence of Learning Artifacts</i></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><u>Vocabulary</u>²: Appendix 2, Investigation 2</p>
	<p><u>Core Problems</u>²: Say It With Symbols , Investigation 2 ACE Problems: # 2 – 8, 12 – 15, 19 – 20, 27 – 29, 39</p>
	<p><u>Work Time</u>¹: Say It With Symbols, Problems 2.1 – 2.3</p>
	<p><u>Journal Entries</u>¹: Appendix 3, Inv 2.1 – 2.3</p>
	<p><u>On Demand Tasks</u>³: Appendix 5, Investigation 2</p>
	<p><u>Mathematical Reflection</u>³ Appendix 4, MMR2:</p>
<p style="text-align: center;"><i>Accountable Talk</i></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>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:</p> <ul style="list-style-type: none"> ○ How did you know that? ○ How can you use ...? ○ Can you show another way? ○ What convention did you use? <p>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.</p>

1 .Marble Note Book

2.3 -Ring Binder

3. Portfolio

Investigation 3: Solving Expressions

Objectives Investigations 3.1 – 3.2	Pacing: 2 days
<p style="text-align: center;"><i>Evidence of Learning Artifacts</i></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><u>Vocabulary</u>²: Appendix 2, Investigation 3</p>
	<p><u>Core Problems</u>²: Say It With Symbols, Investigation 3 ACE Problems: #1, 4 – 15, 30, 31, 34, 49</p>
	<p><u>Work Time</u>¹: Say It With Symbols, Problems 3.1 – 3.2</p>
	<p><u>Journal Entries</u>¹: Appendix 3, Inv 3.1 – 3.2</p>
	<p><u>On Demand Tasks</u>³: Appendix 5, Investigation 3</p>
	<p><u>Mathematical Reflection</u>³ Appendix 4, MMR3:</p>
<p style="text-align: center;"><i>Accountable Talk</i></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>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:</p> <ul style="list-style-type: none"> ○ How did you know that? ○ How can you use ...? ○ Can you show another way? ○ What convention did you use? <p>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.</p>

1. Marble Note Book
2.3- Ring Binder
3. Portfolio

Investigation 4: Looking Back at Functions

<p><u>Objectives</u> Investigation 4.1 (Only)</p>	<p><u>Pacing:</u> 1 day</p>
<p style="text-align: center;"><i>Evidence of Learning Artifacts</i></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><u>Vocabulary</u>²: Appendix 2, Investigation 4</p> <p><u>Core Problems</u>²: Say It With Symbols, Investigation 4 ACE Problems: #1 – 2, 21 – 23</p> <p><u>Work Time</u>¹: Say It With Symbols, Problem 4.1</p> <p><u>Journal Entries</u>¹: Appendix 3, Inv 4.1</p> <p><u>On Demand Tasks</u>³: Appendix 5, Investigation 4</p> <p><u>Mathematical Reflection</u>³ Appendix 4, MMR4:</p>
<p style="text-align: center;"><i>Accountable Talk</i></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>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:</p> <ul style="list-style-type: none"> ○ How did you know that? ○ How can you use ...? ○ Can you show another way? ○ What convention did you use? <p>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.</p>

1. Marble Note Book
2.3- Ring Binder
3. Portfolio

Investigation 5: Reasoning With Symbols

Objectives Investigations 5.1 – 5.3	Pacing: 3 days
<p style="text-align: center;"><i>Evidence of Learning Artifacts</i></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><u>Vocabulary</u>²: Appendix 2, Investigation 5</p>
	<p><u>Core Problems</u>²: Say It With Symbols, Investigation 5 ACE Problems: #1 – 7, 9 – 11, 19 – 28, 32 – 37</p>
	<p><u>Work Time</u>¹: Say It With Symbols, Problem 5.1 – 5.3</p>
	<p><u>Journal Entries</u>¹: Appendix 3, Inv 5.1 – 5.3</p>
	<p><u>On Demand Tasks</u>³: Appendix 5, Investigation 5</p>
	<p><u>Mathematical Reflection</u>³ Appendix 4, MMR5:</p>
<p style="text-align: center;"><i>Accountable Talk</i></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>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:</p> <ul style="list-style-type: none"> ○ How did you know that? ○ How can you use ...? ○ Can you show another way? ○ What convention did you use? <p>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.</p>

1. Marble Note Book

2.3- Ring Binder

3. Portfolio

Appendix 1 Unit Project

<p><i>Project</i>¹</p> <p>Student work should be placed in portfolio</p>	<p>The project is the culminating assessment, which will allow students to apply what they learned about the use of algebraic notation and reasoning. It is written in MCAS form to give students the experience of answering an open-response question.</p> <p>The unit project is called ‘Exercise Program’ and the student handout for the project can be found in Appendix 1</p>
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1. portfolio

Unit Project Scoring Guide

4	The student response demonstrates an exemplary understanding of the Patterns, Relations, and Algebra concepts involved in the use of tables to represent linear growth patterns. Given a verbal description, the student completes a table of values, analyzes the sequential pattern in order to create an equation, and then uses the equation to predict a real-world outcome.
3	The student response demonstrates a good understanding of the Patterns, Relations, and Algebra concepts involved in the use of tables to represent linear growth patterns. Although there is significant evidence that the student recognizes and applies the concepts involved, some aspect of the response is flawed. As a result, the response merits 3 points.
2	The student response demonstrates a fair understanding of the Patterns, Relations, and Algebra concepts involved in the use of tables to represent linear growth patterns. While some aspects of the task are completed correctly, others are not. The mixed evidence provided by the student merits 2 points.
1	The student response demonstrates a minimal understanding of the Patterns, Relations, and Algebra concepts involved in the use of tables to represent linear growth patterns.
0	The student response contains insufficient evidence of an understanding of the Patterns, Relations, and Algebra concepts involved in the use of tables to represent linear growth patterns to merit any points.

NAME: _____

DATE: _____

Exercise Program

- 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.

Currently, Irina exercises a total of 135 minutes during each week. She is planning to begin the following new exercise program.

- The exercise program will last 6 weeks.
 - During each week of the program, she will exercise 15 minutes more than she exercised the previous week.
- a.) In the table below, week 0 shows the number of minutes per week Irina exercised before she started the new program. Complete the table to show the number of minutes that Iris will exercise during each of the 6 weeks if she follows her new exercise program.
- b.) For the data shown in the table, write an equation that shows the relationship between w and n .
- c.) Based on the equation you wrote in part (b), what is the total number of minutes Iris will exercise in week 20 if she continues her exercise program beyond 6 weeks? Show or explain how you got your answer.

**Minutes of Exercise
During Each Week**

Week (w)	Number of Minutes (n)
0	135
1	
2	
3	
4	
5	
6	

2006 MCAS Grade 8 Mathematics

Student Work: Question 28 - Score Point 4

a)

Week (w)	Number of Minutes (n)
0	135
1	150
2	165
3	180
4	195
5	210
6	225

b) $n = 15w + 135$

c) Week 20
 $n = 15w + 135$
 $n = 15 \cdot 20 + 135$
 $n = 435$

The total number of minutes Irina will exercise in week 20 if she continues her exercise program beyond 6 weeks is 435 minutes.

2006 MCAS Grade 8 Mathematics

Student Work: Question 28 - Score Point 3

(A) Minutes of Exercise During each week

Week (w)	Number of min. (n)
0	135
1	150
2	165
3	180
4	195
5	210
6	225

(B) $135 + 15 = n$
minutes of Exercise During each week

(C)

Week	Number of min
7	240
8	255
9	270
10	285
11	300
12	315
13	330
14	345
15	360
16	375
17	390
18	405
19	420
20	435

2006 MCAS Grade 8 Mathematics

Student Work: Question 28 - Score Point 2

a)

week (w)	number of minutes
0	135
1	150
2	160
3	180
4	195
5	210
6	225

b) $w + 15 = N$

c) Irina will exercise 465 minutes a week for 20 weeks. What I did was add fifteen to each new week.

6	240	14	375
7	255	15	390
8	270	16	405
9	285	17	420
10	300	18	435
11	315	19	450
12	330	20	465
13	345		
14	360		

2006 MCAS Grade 8 Mathematics

Student Work: Question 28 - Score Point 1

B. $w + 1(n+15) = n$

C. Iring will exercise for 515 minutes in week 6
To get my answer I kept on adding 15 to week 6
and adding 9 weeks,

A.

Week (w)	# of min (n)
0	135
1	150
2	165
3	180
4	185
5	200
6	215

Appendix 2 Vocabulary

Investigation 1:

- *equivalent expressions, commutative property, distributive property, factored form, expanded form, yield, profit, loss Insert*

Investigation 2:

- *combine, substitute, probability, recall, income, expense, predict*

Investigation 3:

- *properties of equality, non-zero numbers, subscript*

Investigation 4:

- *function, generate*

Investigation 5:

- *square of a number*

Appendix 3 Journal Entries

Investigation 1:

Investigation 1.1:

How do the parts of the equation relate to the elements of the problem?

Investigation 1.2:

What strategies can you use for checking whether two expressions are equivalent?

Investigation 1.3:

How can you use the distributive and commutative properties to show that expressions are equivalent?

Investigation 1.4:

Explain the differences between expanded form and factored form.

Investigation 2:

Investigation 2.1

What strategies can you use for checking whether two expressions are equivalent?

Investigation 2.2

Does $2.50(600 - 500r) - 500 = 1000 - 1250r$? Explain your answer

Investigation 3

Investigation 3.1

Summarize your strategies for solving equations having parentheses.

Investigation 3.2

Describe how you could use a table or a graph to solve an equation.

Investigation 4

Investigation 4.1

Which form of the equation, $w = -250(t - 5)$ or $-250t + 1,250$, would an engineer most likely use to represent a situation? Why?

Investigation 5

Investigation 5.1

Show why this puzzle works:

Pick a number, then add 5; Multiply by 2, then divide by 10; Subtract 1, then multiply by 5.

Your result is the number you picked at the beginning

Investigation 5.2

What can you say about the sum and product of two numbers (2 evens, 2 odds, and an even & an odd)? Explain your answers. Use sometimes, always, and never in your answer

Appendix 4 Reflections

MMR1

What does it mean to say that two expressions are equivalent ?

MMR2

What are the advantages and disadvantages of working with one equation rather than two or more equations in a given situation?

MMR3

Describe some general strategies for solving linear equations, including those with parentheses. Give examples that illustrate your strategies.

MMR4

Does the expanded form or the factored form help you find the answer more easily? Why? [pg. 71 #1]

MMR5

Describe how and why you could use symbolic statements to show relationships or generalizations.

Describe how you can show that your generalizations are correct. [pg. 84 # 1 – 2]

Appendix 5 On Demand Tasks

CMP2: Say It With Symbols

<p><i>On-Demand Tasks</i></p> <p><u><i>Additional Practice & Skills Workbook</i></u></p> <p><u><i>Assessment Resources</i></u></p> <p>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.</p>	<p><u><i>After Inv. 1</i></u> ADDITIONAL PRACTICE AND SKILLS WORKBOOK pg. 109 #5 – 8 and pg. 111 # 13a]</p> <p><u><i>After Inv. 2</i></u> ADDITIONAL PRACTICE AND SKILLS WORKBOOK pg. 119 # 29 ADDITIONAL PRACTICE AND SKILLS WORKBOOK pg. 120 # 33- 40</p> <p><u><i>After Inv. 3</i></u> ADDITIONAL PRACTICE AND SKILLS WORKBOOK pg. 129 # 9 – 19 and pg. 127 #25</p> <p><u><i>After Inv. 4</i></u> ADDITIONAL PRACTICE AND SKILLS WORKBOOK pg. 132 3a – c</p> <p><u><i>After Inv. 5</i></u> ADDITIONAL PRACTICE AND SKILLS WORKBOOK pg. 132 3a – c</p>
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HPS Mathematics Scoring Rubric

Score	Description
<u>4</u>	The response shows a <u>comprehensive</u> understanding of the mathematical concept(s) and/or procedures embodied in the task(s). It indicates that the student has <u>completed the task(s)</u> correctly, using mathematically sound procedures. It contains <u>clear, complete explanations</u> and/or <u>adequate work required</u> .
<u>3</u>	The response shows a <u>general</u> understanding of the mathematical concept(s) and/or procedures embodied in the task(s). It indicates that the student has <u>completed the task(s)</u> , using mathematically sound procedures. It contains <u>complete explanations</u> and/or <u>adequate work required</u> .
<u>2</u>	The response shows a <u>basic</u> understanding of the mathematical concept(s) and/or procedures embodied in the task(s). It addresses <u>most aspects of the task(s)</u> , using mathematically sound procedures. It may contain a correct solution but provides <u>incomplete procedures, reasoning and/or explanations</u> . It may reflect <u>some misunderstandings</u> of the underlying mathematical concepts and/or procedures.
<u>1</u>	The response shows a <u>minimal</u> understanding of the mathematical concepts and/or procedures embodied in the task(s). It addresses <u>some elements of the task(s)</u> correctly but reaches an <u>inadequate solution and/or provides reasoning that is faulty or incomplete</u> . It exhibits <u>multiple flaws related to a misunderstanding of important aspects</u> of the task(s), misuse of mathematical procedures, or faulty mathematical reasoning. It reflects a <u>lack of essential understanding</u> of the underlying mathematical concepts. It may contain a correct numerical answer but <u>the required work is not provided</u> .
<u>0</u>	The response is <u>completely incorrect, irrelevant, or incoherent</u> , or contains a correct response arrived at using an <u>obviously incorrect procedure</u> .

NAME: _____

DATE: _____

Investigation 1

- *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.*

Write two expressions that are equivalent to the given expression.

a.) $7(x - 4)$

c) $x(5 - 6) + 13x - 10$

b.) $2.5(8 - 2x) + 5(x + 1)$

d) $3(x + 10) - 3(2 - 4x)$

For the pair of expressions, show that they are equivalent by drawing a rectangle divided into four sections. Label the sections to support your argument.

$$32 \times 47 \text{ and } 1,200 + 80 + 210 + 14$$

NAME: _____

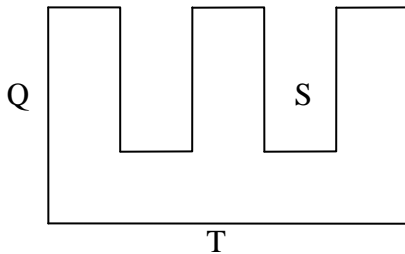
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Investigation 2

- *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.*

Refer to the figure below to answer parts (a) – (e)

- If $Q = 4$ meters, $S = 3$ meters, and $T = 7$ meters, what is the perimeter of the figure?
- If $Q = 3$ meters, $S = 2.5$ meters, and $T = 4$ meters, what is the perimeter of the figure?
- Using the variables Q , S , and T , write three equations for the perimeter P of the figure.
- Using the values for part (a), find the perimeter of the figure using each of the equations. Check or revise your equations if you do not get the same perimeter in each case.
- Show that your three expressions for the perimeter are equivalent.



NAME: _____

DATE: _____

Investigation 3

- *BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.*
- *Show all work (diagrams, tables, and computations) on your answer sheet.*
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Solve each equation for the indicated variable.

a.) $3k + 16 = 5k$

b.) $n + 4n - 22 = 7n$

c.) $8h - 10h = 3h + 25$

d.) $y + 2(y - 5) = 2y + 2$

e.) $5e = 3e + 6$

f.) $2(x - 7) = 3x$

g.) $7n + 6n - 5 = 4n + 4$

h.) $-9x + 7 = 3x = 19$

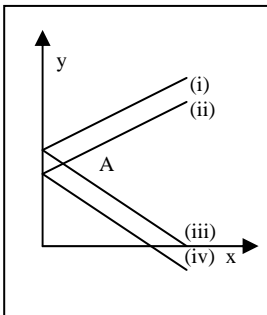
Below are graphs of four linear equations and their equations are given. Match each equation with its graph and give reasons for your choices.

a.) $y = 0.5x + 3$

b.) $y = -0.5x + 6$

c.) $y = 0.5x + 6$

d.) $y = -0.5x + 3$



NAME: _____

DATE: _____

Investigation 4

- *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.*

Susan has a piggy bank into which she puts only nickels. The amount of money in dollars D in the bank is given by $D = n/20$, where n is the number of nickels in the piggy bank.

- a.) If Susan has 80 nickels in her piggy bank, how many dollars does she have?
- b.) If Susan has 94 nickels in her piggy bank, how many dollars does she have?
- c.) Based on your answers to parts (a) and (b), explain why the equation makes sense.

NAME: _____

DATE: _____

Investigation 5

- *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.*

Three of the following expressions are equivalent. Choose the expression that is *not* equivalent to the others and explain how you can tell without using a calculator, that it is not equivalent.

a.) $8x - 12x + 4$

c.) $12x - 16x + 4$

b.) $4 - 4x$

d.) $4(1 - 4x)$

NOTES