



Holyoke Public Schools

Grade 7

Data Distributions

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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.

- *Is there anything surprising about the data and their distribution?*
- *Where do the data cluster in the distribution?*
- *How can I use the mean or median and range to help me understand and describe a data distribution?*
- *What strategies can I use to compare two different data sets?*

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?*

Goals, Content Standards, & Performance Standards

Unit Goals:

- *Recognize that variability occurs whenever data are collected*
- *Describe the variability in the distribution of a given data set*
- *Identify sources of variability, including natural variability, and variability that results from measurement*
- *Determine whether to use the mean or median to describe a distribution*
- *Use the shape of distribution to estimate the location of the mean and the median*
- *Use a variety of representations, including tables, bar graphs, and line plots to display distributions*
- *Understand and use counts or percents to report frequencies of occurrence of data*
- *Compare the distributions of data sets using their centers (mean, median, and mode, variability (outliers and range) and shape (clusters and gaps)*
- *Decide if a difference among data values or summary measures matters*
- *Develop and use strategies to compare data sets to solve problems*

Math Content Standards:

- *(7.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.*
- *(7.P.3) Create and use symbolic expressions for linear relationships and relate them to verbal, tabular, and graphical representations.*
- *(7.P.4) Solve linear equations using tables, graphs, models, and algebraic methods.*
- *(7.P.5) Identify, describe, and analyze linear relationships between two variables. Compare positive rate of change, e.g., $y = 3x + 1$, to negative rate of change, e.g., $y = -3x + 1$*
- *(7.P.6) Use linear equations to model and analyze problems involving proportional relationships. Use technology as appropriate.*

Performance Standards:

- *(M4a) Collects data, organizes data, and displays data with tables, charts, and graphs that are appropriate with the nature of the data..*
- *(M4b) Analyzes data with respect to characteristics of frequency and distribution, including mode and range.*
- *(M4c) Analyzes appropriately central tendencies of data by considering mean and median.*
- *(M4d) Makes conclusions and recommendations based on data analysis.*
- *(M4e) Critiques the conclusions and recommendations of other's statistics.*
- *(M4f) Considers the effects of missing or incorrect information.*

Investigation 1: Making Sense of Variability

Objectives Investigations 1.1 – 1.5	Pacing: 5 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 1</p>
	<p><u>Core Problems</u>²: Data Distributions, Investigation 1 ACE Problems: # 8-11, 3-7, 12, 13</p>
	<p><u>Work Time</u>¹: Data Distributions, Problems 1.1 – 1.5</p>
	<p><u>Journal Entries</u>¹: Appendix 3, Inv 1.1 – 1.5</p>
	<p><u>On Demand Tasks</u>³: Appendix 5, Investigation 1</p>
	<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: Making Sense of Measures of Center

Objectives Investigations 2.1 – 2.4	Pacing: 6 days
<p style="text-align: center;">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>Vocabulary²: Appendix 2, Investigation 2</p>
	<p>Core Problems²: Data Distributions , Investigation 2 ACE Problems: # 1, 3, 6, 7,</p>
	<p>Work Time¹: Data Distributions, Problems 2.1 – 2.4</p>
	<p>Journal Entries¹: Appendix 3, Inv 2.1 – 2.4</p>
	<p>On Demand Tasks³: Appendix 5, Investigation 2</p>
	<p>Mathematical Reflection³ Appendix 4, MMR2:</p>
<p style="text-align: center;">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>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: Comparing Distributions: Equal Numbers of Data Values

<p><u>Objectives</u> Investigations 3.1 – 3.4</p>	<p><u>Pacing:</u> 7 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 3</p> <hr/> <p><u>Core Problems</u>²: Data Distributions, Investigation 3 ACE Problems: # 1, 2, 9 – 13, 3, 4, 17, 5, 6, 18 – 22, 7, 8</p> <hr/> <p><u>Work Time</u>¹: Data Distributions, Problems 3.1 – 3.4</p> <hr/> <p><u>Journal Entries</u>¹: Appendix 3, Inv 3.1 – 3.4</p> <hr/> <p><u>On Demand Tasks</u>³: Appendix 5, Investigation 3</p> <hr/> <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*

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 describing variability and comparing groups. It is written in MCAS form to give students the experience of answering an open-response question.</p> <p>The unit project is called ‘PIZZA PROBLEM’ and the student handout for the project can be found in Appendix 1</p> <p>Problem is taken from Student Book, <i>Looking Back and Looking Ahead</i> pg 86. Answers can be found in Teachers’ Manual Use HPS Scoring Guide to score project.</p>
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1. portfolio

NAME: _____

DATE: _____

UNIT PROJECT: PIZZA PROBLEM

- *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.*

How do frozen pizzas compare with the real thing? The table on the next page displays some information about frozen pizza ratings.

1. Make a graph showing the number of Calories in one slice of each frozen pizza.
 - a. What is the typical number of Calories per slice of pizza?
 - b. Describe the variability in the number of Calories per slice of frozen pizza.
 - c. Now, show separate distributions for cheese pizzas and for pepperoni pizzas. Compare the Calories in a slice of cheese pizza to those in a slice of pepperoni pizza. Do cheese pizzas have more Calories than pepperoni pizzas? Explain.

2. Make a graph showing the cost per slice of each frozen pizza.
 - a. What is the typical cost per slice of pizza?
 - b. Describe the variability in the cost per slice of frozen pizza.
 - c. Now, show separate distributions for cheese pizzas and for pepperoni pizzas. Compare the cost of a slice of cheese pizza to that of a slice of pepperoni pizza. Do pepperoni pizzas cost more than cheese pizzas? Explain.

Frozen Pizza Ratings

Product	Overall Rating	Cost per Slice	Calories per Slice	Fat (g)
Cheese Pizza A	VG	\$0.98	364	15
Cheese Pizza B	VG	\$1.23	334	11
Cheese Pizza C	VG	\$0.94	332	12
Cheese Pizza D	VG	\$1.92	341	14
Cheese Pizza E	VG	\$0.84	307	9
Cheese Pizza F	VG	\$0.96	335	12
Cheese Pizza G	VG	\$0.80	292	9
Cheese Pizza H	VG	\$0.96	364	18
Cheese Pizza J	VG	\$0.91	384	20
Cheese Pizza K	VG	\$0.89	333	12
Cheese Pizza L	G	\$0.94	328	14
Cheese Pizza M	G	\$1.02	367	13
Cheese Pizza N	G	\$0.92	325	13
Cheese Pizza P	G	\$1.17	346	17
Cheese Pizza Q	F	\$0.54	299	9
Cheese Pizza R	F	\$1.28	394	19
Cheese Pizza S	F	\$0.67	322	14
Pepperoni Pizza A	VG	\$0.96	385	18
Pepperoni Pizza B	VG	\$0.88	369	16
Pepperoni Pizza C	VG	\$0.90	400	22
Pepperoni Pizza D	VG	\$0.88	378	20
Pepperoni Pizza E	G	\$0.89	400	23
Pepperoni Pizza F	G	\$0.87	410	26
Pepperoni Pizza G	G	\$1.28	412	25
Pepperoni Pizza H	F	\$1.26	343	14
Pepperoni Pizza J	F	\$1.51	283	6
Pepperoni Pizza K	F	\$0.74	372	20
Pepperoni Pizza L	F	\$0.64	367	20
Pepperoni Pizza M	F	\$1.62	280	4

SOURCE: Consumer Reports

Appendix 2 Vocabulary

Investigation 1:

- *variability, categorical data, numerical data, value bar graph, ordered bar graph, line plots*

Investigation 2:

- *mean, median, mode, outlier, distribution, measures of center*

Investigation 3:

- *continue to develop vocabulary from previous investigations*

Appendix 3 Journal Entries

Investigation 1:

Investigation 1.1:

Do you think we can estimate and make general statements about more or less of each color used by The Mars Company?

Investigation 1.2:

What does it mean to predict a trend?

Investigation 1.3:

Compare the line plots and describe the variability in the data. What could account for outliers?

Investigation 1.4:

How are the ordered value bar graph and the line plots related?

Investigation 2:

Investigation 2.1

In what way is the mean a typical value for a data set?

Investigation 2.2

What did you understand from the use of the Balance Model to study data?

Investigation 2.3

How does the use of reference lines help to compare distributions?

Investigation 2.4

When a data value is changed to one that is larger, how does the mean change to keep every thing in balance? What about when a data value is changed to one that is smaller?

Investigation 3

Investigation 3.1

When a data value is changed to one that is larger, how does the mean change to keep every thing in balance?
What about when a data value is changed to one that is smaller?

Investigation 3.2

Describe how you can use fractions, percents, and ratios to make comparisons.

Investigation 3.3

Describe your strategy for comparing equal size data sets to solve problems.

Investigation 3.4

Is one distribution more variable than another? How do you know?

Appendix 4 Reflections

MMR1

Describe how displaying data in tables or graphs can help identify patterns or determine what is typical about a distribution,

MMR2

- A. When the mean and the median are the same or very similar, what does this indicate about the shape of the distribution?
- B. When the mean and median are more different than similar what does this indicate about the shape of the distribution?
- C. Medians and means are called measures of centers. Why do you think this is so?

MMR3

- A. What does consistency mean when it refers to reaction time?
- B. What does quickness mean when it refers to reaction times?
- C. Identify a different situation in which you would compare consistency and quickness in performance? What does consistency or quickness mean in this situation?

CMP2: Data Distributions

<p><i>On-Demand Tasks</i></p> <p><u><i>Additional Practice & Skills</i></u> <u><i>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> ACE p. 16 #1 & 2</p> <p><u><i>After Inv. 2</i></u> 2006 MCAS Questions – 19, 24</p> <p><u><i>After Inv. 3</i></u> 2006 MCAS Questions – 27, 35</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.

1. a. Use the M&M's[®] data for Bag 1, Bag 2, and Bag 3. For each bag, make a bar graph that shows the percent of each color found.

Candy Colors

Bag Number	Green	Yellow	Orange	Blue	Brown	Red	Total
1	3	10	9	5	10	18	55
2	5	12	4	6	19	11	57
3	7	10	9	4	16	12	58
4	4	14	2	1	14	19	54
5	12	7	8	7	14	13	61
6	10	9	6	5	15	8	53
7	11	11	6	6	12	12	58
8	8	15	5	3	16	10	57
9	2	11	4	4	24	12	57
10	5	7	4	1	26	13	56
11	6	13	4	4	15	18	60
12	5	8	4	2	23	16	58
13	9	13	4	4	14	11	55
14	9	10	5	5	14	14	57
15	5	19	5	2	13	14	58
Total	101	169	79	59	245	201	854

- b. Write two or more comparison statements that describe the distribution of colors for the three bags.
- c. Is there some plan to the distribution of colors in the bags? Explain.

NAME: _____

DATE: _____

Investigation 1 (con't)

2.
 - a. Use the totals in the last row of the table for each color of candies. Make a bar graph for these data that shows the percent of each color found in the 15 bags.
 - b. Describe the data by writing two or more comparison statements.
 - c. Look back at the bar graph you made for Problem 1.1, Question B. Compare this graph with the graph you made in part (a). How would you now answer the question, “Did the Mars Company plan a specific distribution of colors of M&M’s[®] candies?” Explain.

NAME:

DATE:

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.*

1. The list below shows the ages of the students in Mario's computer class.

15, 13, 12, 14, 12, 14, 15, 13, 14, 16, 14
--

What is the range of the ages of the students in the class?

2.

Jiro bowled 7 games in a tournament. The list below shows his scores for those 7 games.

149, 160, 180, 155, 160, 137, 158

What is the mode of Jiro's scores?

- A.** 155
- B.** 157
- C.** 158
- D.** 160

NAME: _____

DATE: _____

Investigation 3

Sina's goal is to exercise a mean of 45 minutes per day for one week. For the first 6 days of the week, she exercised 35, 40, 37, 42, 45, and 50 minutes.

What is the number of minutes Sina must exercise on the 7th day of the week to reach her goal exactly?

- | | | | |
|-----------|------------|-----------|------------|
| A. | 21 minutes | B. | 42 minutes |
| C. | 49 minutes | D. | 66 minutes |

NOTES