



# Holyoke Public Schools Mathematics Curriculum Map Grade 4

## Size, Shape, and Symmetry

# Table of Contents

Curriculum Map Outline.....	4
Mathematic 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 Review.....	9
Investigations 1 – 4.....	10
End-of Unit Project.....	14
On-Demand Assessments.....	16
HPS Mathematics Scoring Rubric.....	18

## 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<sup>1</sup></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

## **Size, Shape, and Symmetry**

### **Probing Questions for Accountable Talk**

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

*What different units we can use when measuring length of an object?*

*How are benchmarks helpful?*

*What is the relationship among units of measure?*

*How do you find the perimeter?*

*How do you find area?*

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

#### **Continue from previous units:**

Ten Minute Math: Quick Images: 2D and Today's Number: Broken Calculator

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 4: Please review pages 28 – 30, 33-34 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:

- Use appropriate measurement tools to measure distance.
- Identify quadrilaterals as any four-sided closed figure.
- Know that a right angle measure 90 degrees, and use this as a landmark to find angles of 30, 45, and 60 degrees.
- Find the area of polygons using a square unit of measure.

## Math Content Standards:

- (4.M.1) Demonstrate an understanding of such attributes as length, area, weight, and volume and select the appropriate type of unit for measuring each attribute
- (4.M.2) Carry out simple unit conversions within a system of measurement
- (4.M.4) Estimate and find area and perimeter of a rectangle, triangle or irregular shape using diagrams, models, and grids, or by measuring
- (4.M.5) Identify and use appropriate metric and English units and tools (e.g. ruler, angle ruler, graduated cylinder, thermometer) to estimate, measure, and solve problems involving length, area, volume, weight, time, angle size, and temperature)
- (4.G.1) Compare and analyze attributes and other features of two- and three-dimensional geometric shapes
- (4.G.2) Describe, model, draw, compare, and classify two- and three- dimensional shapes
- (4.G.3) Recognize similar figures
- (4.G.4) Identify angles as acute, right, or obtuse
- (4.G.8) Identify and describe line symmetry in two-dimensional shapes

## Performance Standards:

- (M2d) Uses many types of figures and identifies the figures by their properties
- (M2e) Solves problems by showing relationships between and among figures
- (M2g) Uses basic ways of estimating and measuring the size of figures and objects in the real world including length, width, perimeter, and area
- (M2h) Uses models to reason about the relationship between the perimeter and area of rectangles in simple situations
- (M2i) Selects and uses units both formal and informal as appropriate for estimating and measuring quantities such as weight, length, area, volume, and time
- (M2j) Carries out simple unit conversions

# UNIT: SIZE, SHAPE, AND SYMMETRY

## End-of-Unit Project

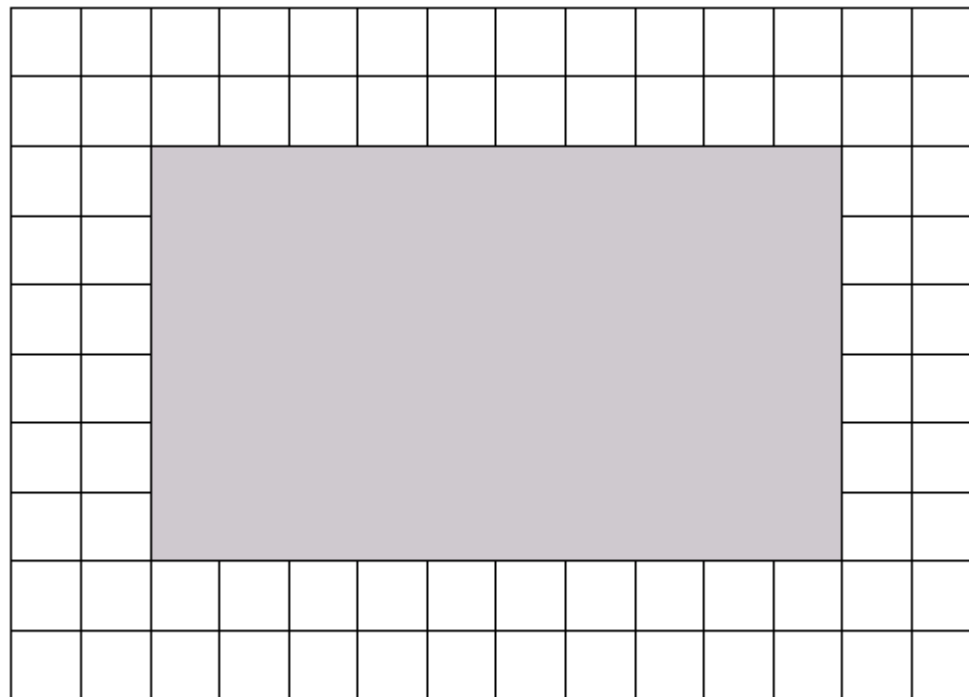
GRADE: 4

### End-of-Unit- Project

Student work should be placed in  
**portfolio.**

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

Thyra has a rectangular piece of colored paper. The shaded shape on the grid below represents Thyra's piece of paper.



1 in.

- What is the area, in square inches, of the piece of paper? Show your work or explain how you got your answer.
- What is the perimeter, in inches, of the piece of paper? Show your work or explain how you got your answer.
- Thyra cut the paper into 2 smaller rectangles that were each the same size. What is the perimeter, in inches, of each of the smaller rectangles? Show your work or explain how you got your answer.

# UNIT: SIZE, SHAPE, AND SYMMETRY

Investigation 1 (1.1 – 1.5)

DAYS: 5

GRADE: 4

<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><b>Vocabulary</b> – area, volume, perimeter, linear measurement, inch, foot, yard, centimeter, meter, benchmark (3R)</p> <p><b>Work Time</b> – Student Activity Sheets pgs. 1 - 14 (3R)</p> <p><b>Journal Entries</b> – (MNB)</p> <p><b>Inv. 1.1</b> What are some of the common measures of length?</p> <p><b>Inv. 1.2</b> We use two systems of measurement in the United States (US standard and metric) In which system will you find yards?</p> <p><b>Inv. 1.3</b> If you were to measure the perimeter of your desk using inches, how would the measure change if you measured in centimeters?</p> <p><b>Inv. 1.4</b> When measuring length, what are some important things to consider?</p> <p><b>Inv. 1.5</b> When given the measurement of three sides of a 4-sided figure what strategy could you use to figure out the perimeter of the whole figure?</p> <p><b>Reflection</b> – What are some common mistakes one can make when using a ruler? (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: SIZE, SHAPE, AND SYMMETRY  
Investigation 2 (2.1 – 2.5)                      DAYS: 5

GRADE: 4

<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><b>Vocabulary</b> – polygon, line segment, endpoint, vertex, vertices, orientation, trapezoid, equilateral triangle, parallelogram, hexagon, prefix (3R)</p> <p><b>Work Time</b> – Student Activity Book 15 - 36(3R)</p> <p><b>Journal Entries</b> – (MNB)</p> <p style="padding-left: 20px;"><b>Inv. 2.1</b> Describe the attributes that all polygons must have.</p> <p style="padding-left: 20px;"><b>Inv. 2.2</b> What is the difference between a regular and non-regular polygon?</p> <p style="padding-left: 20px;"><b>Inv. 2.3</b> Create at least two rules that fit the attributes of a trapezoid.</p> <p style="padding-left: 20px;"><b>Inv. 2.4</b> What are some attributes that make some quadrilaterals different from others?</p> <p style="padding-left: 20px;"><b>Inv. 2.5</b> None due to assessment.</p> <p><b>Reflection</b> – Draw three different polygons and describe their attributes. (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 style="padding-left: 40px;">How did you know...?</p> <p style="padding-left: 40px;">How can you justify...?</p> <p style="padding-left: 40px;">Does your answer make sense?</p> <p style="padding-left: 40px;">Can you draw me a diagram?</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: SIZE, SHAPE, AND SYMMETRY  
Investigation 3 (3.1 – 3.5)                      DAYS: 5

GRADE: 4

<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><b>Vocabulary</b> – probability, certain, impossible, likely, unlikely, maybe (equally likely), chance, definite, outcome (3R)</p> <p><b>Work Time</b> – Student Activity Sheets #39 – 52 (3R)</p> <p><b>Journal Entries</b> – (MNB)</p> <p><b>Inv. 3.1</b> How would you describe the difference between an event in the maybe category and an event in the unlikely category?</p> <p><b>Inv. 3.2</b> How can you decide where to place an event on the likelihood line?</p> <p><b>Inv. 3.3</b> If a coin was tossed 10 times, what would you expect the outcomes to be and why?</p> <p><b>Inv. 3.4</b> How do the data from the 3 different experiments compare? How do the results compare with your predictions?</p> <p><b>Inv. 3.5</b> None due to assessment</p> <p><b>Reflection</b> – Choose one of the experiments in the Investigations and describe the shape of the data set using as much math vocabulary from this unit as you can. (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>What is your strategy? How could you check that ..... is correct? Could you begin with a different step? Does .... make sense given the information in the problem?</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: SIZE, SHAPE, AND SYMMETRY**  
**Investigation 4 (4.1 – 4.6)                      DAYS: 6**

**GRADE: 4**

<p style="text-align: center;"><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> –symmetrical, square units, pentagon (3R)</p> <p><i>Work Time</i> – Student Activity Sheets 51 - 75 (3R)</p> <p><i>Journal Entries</i> – (MNB)</p> <p><b>Inv. 4.1</b> What were some of the ways that you measured your design?</p> <p><b>Inv. 4.2</b> What did you notice about the number of triangles it takes, and the number of trapezoids it takes to cover a given area?</p> <p><b>Inv. 4.3</b> How did you know that each piece of the crazy cake was the same size?</p> <p><b>Inv. 4.4</b> Using a geoboard, describe your strategy for finding the area of a polygon.</p> <p><b>Inv. 4.5</b> How did you determine the area of a rectangle that was partially covered?</p> <p><b>Inv. 4.6</b> How did you find the area of a triangle?</p> <p><i>Reflection</i> – Use a piece of graph paper and draw an irregular polygon and explain and show your strategy for finding the area. (P)</p>
<p style="text-align: center;"><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 style="padding-left: 40px;">What is your strategy?  How could you check that ..... is correct?  Could you begin with a different step?  Does .... make sense given the information in the problem?</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**.

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

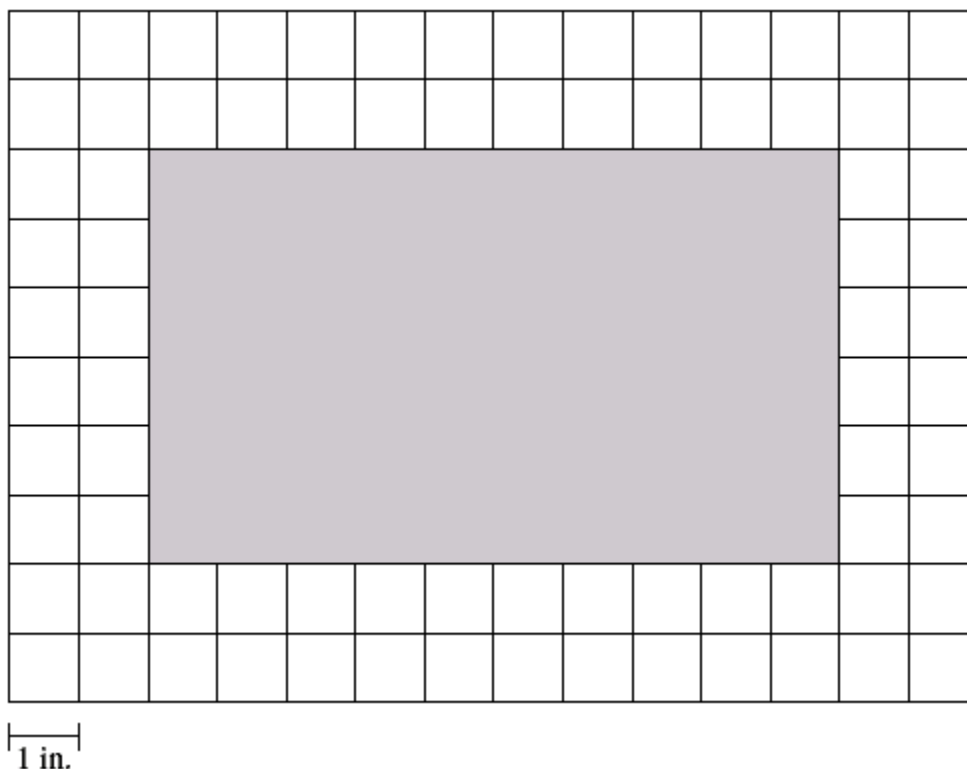
**End-of-Unit Project**  
**Size, Shape, and Symmetry**  
**Grade 4**

NAME: \_\_\_\_\_

DATE: \_\_\_\_\_

- **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.**

Thyra has a rectangular piece of colored paper. The shaded shape on the grid below represents Thyra's piece of paper.



- a. What is the area, in square inches, of the piece of paper? Show your work or explain how you got your answer.
- b. What is the perimeter, in inches, of the piece of paper? Show your work or explain how you got your answer.
- c. Thyra cut the paper into 2 smaller rectangles that were each the same size. What is the perimeter, in inches, of each of the smaller rectangles? Show your work or explain how you got your answer.

# On-Demand Assessments

## Size, Shape, and Symmetry

### *Investigations*

(Work placed in portfolio)

In class individualized On-Demand Assessments 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: SIZE, SHAPE, AND SYMMETRY

## On-Demand Assessments

GRADE: 4

### On-Demand Assessments (P)

#### Size, Shape, and Symmetry 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:** Session 1.3, M8 Checklist\*, M13\*\*

**Inv. 2:** Session 2.5, M21\*\*

**Inv. 3:** Session 3.3, M22 Checklist\*

**Inv. 4:** Session 4.7, M27-M28\*\*

\*Assessment Checklist 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