



# Holyoke Public Schools

## Grade 6

### Shapes & Designs

# Table of Contents

<b>HOLYOKE PUBLIC SCHOOLS</b> .....	ERROR! BOOKMARK NOT DEFINED.
<b>CURRICULUM MAPS OUTLINE</b> .....	<b>6</b>
<b>Map Goals:</b> .....	<b>6</b>
<b>Expectations:</b> .....	<b>6</b>
<b>Feedback To Students:</b> .....	<b>6</b>
<b>Map Components:</b> .....	<b>7</b>
<b>MATHEMATICS EVIDENCE OF LEARNING ARTIFACTS</b> .....	<b>8</b>
<b>ACCOUNTABLE TALK</b> .....	<b>9</b>
<b>Probing Assessment Questions</b> .....	<b>9</b>
<b>Probing Questions – Teacher’s Role</b> .....	<b>9</b>
<b>Probing Questions – Student’s Role</b> .....	<b>9</b>
<b>Probing Questions - Suggestions</b> .....	<b>10</b>
<b>GOALS, CONTENT STANDARDS, &amp; PERFORMANCE STANDARDS</b> .....	<b>12</b>
<b>Unit Goals:</b> .....	<b>12</b>
<b>Math Content Standards:</b> .....	<b>12</b>
<b>Performance Standards:</b> .....	<b>14</b>
<b>INVESTIGATION 1: BEES AND POLYGONS</b> .....	<b>15</b>

<b>INVESTIGATION 2: POLYGONS AND ANGLES.....</b>	<b>16</b>
<b>INVESTIGATION 3: POLYGON PROPERTIES AND TILING .....</b>	<b>17</b>
<b>INVESTIGATION 4: BUILDING POLYGONS .....</b>	<b>18</b>
<b>Unit Project Scoring Guide .....</b>	<b>19</b>
<b>UNIT PROJECT - Geometric Shapes.....</b>	<b>20</b>
<b>Student Work: Question #10- Score Point 4.....</b>	<b>21</b>
<b>Student Work: Question #10- Score Point 3.....</b>	<b>22</b>
<b>Student Work: Question #10 - Score Point 2.....</b>	<b>23</b>
<b>Student Work: Question #10- Score Point 1.....</b>	<b>24</b>
<b>APPENDIX 2 VOCABULARY .....</b>	<b>25</b>
<b>Investigation 1: .....</b>	<b>25</b>
<b>Investigation 2: .....</b>	<b>25</b>
<b>Investigation 3: .....</b>	<b>25</b>
<b>Investigation 4: .....</b>	<b>25</b>
<b>APPENDIX 3 JOURNAL ENTRIES.....</b>	<b>26</b>
<b>Investigation 1: .....</b>	<b>26</b>
<b>Investigation 2: .....</b>	<b>26</b>
<b>Investigation 3.....</b>	<b>27</b>
<b>Investigation 4.....</b>	<b>27</b>

<b>APPENDIX 4 REFLECTIONS .....</b>	<b>28</b>
<b>MMR1 .....</b>	<b>28</b>
<b>MMR2 .....</b>	<b>28</b>
<b>MMR3 .....</b>	<b>28</b>
<b>MMR4 .....</b>	<b>28</b>
<b>APPENDIX 5 ON DEMAND TASKS .....</b>	<b>29</b>
<b>HPS Mathematics Scoring Rubric.....</b>	<b>30</b>
<b>Investigation 1A.....</b>	<b>31</b>
<b>Investigation 1B.....</b>	<b>32</b>
<b>Investigation 2.....</b>	<b>33</b>
<b>Investigation 3.....</b>	<b>34</b>
<b>Investigation 4.....</b>	<b>35</b>
<b>NOTES .....</b>	<b>36</b>

# 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
<b>3 Ring Binder</b>  <b>(3R)*</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>Marble Notebook</b>  <b>(MNB)</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>Portfolio<sup>3</sup></b>  <b>(P)</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

# 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 kinds of shapes/polygons will cover a flat surface?*
- *What do these shapes have in common?*
- *How do simple polygons work together to make complex shapes?*
- *How can angle measures be estimated?*
- *How much accuracy is needed in measuring angles?*

## **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:

- *Investigate the symmetries of a shape- rotation or reflection.*
- *Understand some important properties of polygons and recognize polygonal shapes both in and out of the classroom.*
- *Estimate the measure of any angle using reference to a right angle and other benchmark angles.*
- *Use an angle ruler.*
- *Determine which polygons fit together to cover a flat surface and why.*
- *Explain the property of triangles that makes them useful as a stable structure for building.*
- *Draw or sketch polygons with certain properties.*
- *Reason about and solve problems involving shapes*

### Math Content Standards:

*(7G1)Analyze, apply and explain relationships between the number of sides and the sums of interior angle measures of a polygon*

*(7G3)Demonstrate an understanding of the relationships of angles formed by intersecting lines, including parallel lines cut by a transversal*

*(7G4)Graph points and identify coordinates of points on the Cartesian coordinate plane (in all four quadrants)*

*(7G6)Predict the results of translations and reflections of figures on unmarked or coordinate planes and draw the transformed figure*

*(7N3) Represent numbers in scientific notation (positive powers of 10 only) and use that notation in problem situations*

(

## **Performance Standards:**

- *M2a) Is familiar with assorted two- and three- dimensional objects, including squares, triangles, other polygons, circles, cubes, rectangular prisms, pyramids, spheres, and cylinders.*
- *(M2b) Identifies similar and congruent shapes and uses transformations in the coordinate plane*
- *(M2e) Recognizes similarity and rotational and bilateral symmetry in two- and three-dimensional figures.*
- *(M2f) Analyzes and generalizes geometric patterns, such as tessellations and sequences of shapes.*
- *(M2g) Measures angles.*

# Investigation 1: Bees and Polygons

<p><b><u>Objectives</u></b> Investigations 1.1 – 1.3</p>	<p><b><u>Pacing:</u></b> 3 days</p>
<p style="text-align: center;"><b><i>Evidence of Learning Artifacts</i></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><u>Vocabulary</u></b><sup>2</sup>: <a href="#">Appendix 2</a>, Investigation 1</p> <hr/> <p><b><u>Core Problems</u></b><sup>2</sup>: Shapes &amp; Designs, Investigation 1 ACE Problems # 1-2, 6-8, 13-16</p> <hr/> <p><b><u>Work Time</u></b><sup>1</sup>: Shapes &amp; Designs, Problems 1.1 – 1.3</p> <hr/> <p><b><u>Journal Entries</u></b><sup>1</sup>: <a href="#">Appendix 3</a>, Inv 1.1,1.2,1.3</p> <hr/> <p><b><u>On Demand Tasks</u></b><sup>3</sup>: <a href="#">Appendix 5</a>, Investigation 1</p> <hr/> <p><b><u>Mathematical Reflection</u></b><sup>3</sup> <a href="#">Appendix 4</a>, MMR1:</p>
<p style="text-align: center;"><b><i>Accountable Talk</i></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>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"> <li>○ How did you know that?</li> <li>○ How can you use ...?</li> <li>○ Can you show another way?</li> <li>○ What convention did you use?</li> </ul> <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: Polygons and Angles

<b>Objectives</b> Investigations 2.1 – 2.5	<b>Pacing:</b> 5 days
<p style="text-align: center;"><b><i>Evidence of Learning Artifacts</i></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><u>Vocabulary</u><sup>2</sup>:</b> <a href="#">Appendix 2</a>, Investigation 2</p>
	<p><b><u>Core Problems</u><sup>2</sup>:</b> Shapes &amp; Designs , Investigation 2 ACE Problems: : # 1-2, 29, 4, 5, 36, 15-17, 18, 21, 22, 24-26</p>
	<p><b><u>Work Time</u><sup>1</sup>:</b> Shapes &amp; Designs, Problems 2.1 – 2.5</p>
	<p><b><u>Journal Entries</u><sup>1</sup>:</b> <a href="#">Appendix 3</a>, Inv 2.1, 2.2, 2.3, 2.4, 2.5</p>
	<p><b><u>On Demand Tasks</u><sup>3</sup>:</b> <a href="#">Appendix 5</a>, Investigation 2</p>
	<p><b><u>Mathematical Reflection</u><sup>3</sup></b> <a href="#">Appendix 4</a>, MMR2:</p>
<p style="text-align: center;"><b><i>Accountable Talk</i></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>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"> <li>○ How did you know...?</li> <li>○ How can you justify...?</li> <li>○ Does your answer make sense?</li> <li>○ Can you draw me a diagram?</li> <li>○</li> </ul> <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: Polygon Properties and Tiling

<p><b><u>Objectives</u></b> Investigations 3.1 – 3.4</p>	<p><b><u>Pacing:</u></b> 6 days</p>
<p style="text-align: center;"><b><i>Evidence of Learning Artifacts</i></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><u>Vocabulary</u></b><sup>2</sup>: <a href="#">Appendix 2</a>, Investigation 3</p> <p><b><u>Core Problems</u></b><sup>2</sup>: Shapes &amp; Designs, Investigation 3 ACE Problems: #1, 2, 3-6, 9, 13-14</p> <p><b><u>Work Time</u></b><sup>1</sup>: Shapes &amp; Designs, Problems 3.1 – 3.4</p> <p><b><u>Journal Entries</u></b><sup>1</sup>: <a href="#">Appendix 3</a>, Inv 3.1, 3.2, 3.3, 3.4</p> <p><b><u>On Demand Tasks</u></b><sup>3</sup>: <a href="#">Appendix 5</a>, Investigation 3</p> <p><b><u>Mathematical Reflection</u></b><sup>3</sup>: <a href="#">Appendix 4</a>, MMR3:</p>
<p style="text-align: center;"><b><i>Accountable Talk</i></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>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"> <li>○ What is your strategy?</li> <li>○ How could you check that ..... is correct?</li> <li>○ Could you begin with a different step?</li> <li>○ Does .... make sense given the information in the problem?</li> </ul> <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: Building Polygons

<p><b><u>Objectives</u></b> Investigation 4.1- 4.3</p>	<p><b><u>Pacing:</u></b> 5 day</p>
<p style="text-align: center;"><b><i>Evidence of Learning Artifacts</i></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><u>Vocabulary</u><sup>2</sup>:</b> <a href="#">Appendix 2</a>, Investigation 4</p> <p><b><u>Core Problems</u><sup>2</sup>:</b> Shapes &amp; Designs, Investigation 4 ACE Problems#1 – 5, 19-20, 25-28</p> <p><b><u>Work Time</u><sup>1</sup>:</b> Shapes &amp; Designs, Problem 4.1- 4.3</p> <p><b><u>Journal Entries</u><sup>1</sup>:</b> <a href="#">Appendix 3</a>, Inv 4.1, 4.2, 4.3</p> <p><b><u>On Demand Tasks</u><sup>3</sup>:</b> <a href="#">Appendix 5</a>, Investigation 4</p> <p><b><u>Mathematical Reflection</u><sup>3</sup></b> <a href="#">Appendix 4</a>, MMR4:</p>
<p style="text-align: center;"><b><i>Accountable Talk</i></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>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"> <li>○ Is there a way to write ....?</li> <li>○ Does .... help you find the answer?</li> </ul> <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  
1. Marble Note Book  
2. Appendix 1 Unit Project

<b>Project <sup>1</sup></b>	<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 <a href="#">Appendix 1</a></p>
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Student work should be placed in portfolio

*1. portfolio*

## Unit Project Scoring Guide

Score	Description
<b><u>4</u></b>	The student response demonstrates an exemplary understanding of the Geometry concepts involved in identifying polygons based on their properties, including types of interior angles, parallel sides, and congruence of sides.
<b><u>3</u></b>	The student response demonstrates a good understanding of the Geometry concepts involved in identifying polygons based on their properties, including types of interior angles, parallel sides, and congruence of sides. Although there is significant evidence that the student was able to recognize and apply the concepts involved, some aspect of the response is flawed. As a result the response merits 3 points.
<b><u>2</u></b>	The student response demonstrates a fair understanding of the Geometry concepts involved in identifying polygons based on their properties, including types of interior angles, parallel sides, and congruence of sides. While some aspects of the task are completed correctly, others are not. The mixed evidence provided by the student merits 2 points.
<b><u>1</u></b>	The student response demonstrates a minimal understanding of the Geometry concepts involved in identifying polygons based on their properties, including types of interior angles, parallel sides, and congruence of sides.
<b><u>0</u></b>	The student response contains insufficient evidence of an understanding of the Geometry concepts involved in identifying polygons based on their properties, including types of interior angles, parallel sides, and congruence of sides to merit any points.

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

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

## UNIT PROJECT - Geometric Shapes

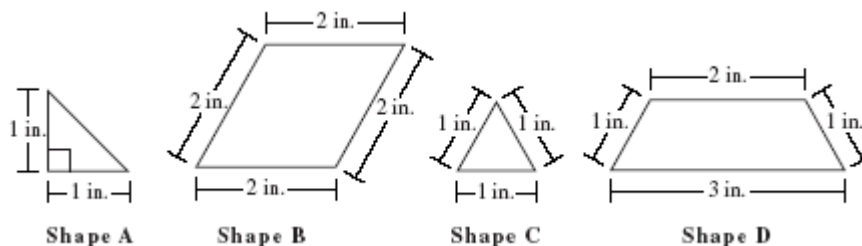
- *BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.*
- *Show all work (diagrams, tables, and computations) on your answer sheet.*
- *If you do the work in your head, explain in writing how you did the work.*

2004, Mathematics - Grade 6  
Question 10: Open-Response  
Reporting Category: Geometry

Four geometric terms are listed in alphabetical order below.

Equilateral Triangle      Rhombus      Right Isosceles Triangle      Trapezoid

Four different shapes are represented below.



- Which one of the geometric terms listed above **most accurately** describes Shape A? Explain how you know your answer is correct.
- Which one of the geometric terms listed above **most accurately** describes Shape B? Explain how you know your answer is correct.
- Which one of the geometric terms listed above **most accurately** describes Shape C? Explain how you know your answer is correct.
- Which one of the geometric terms listed above **most accurately** describes Shape D? Explain how you know your answer is correct.
- .

## 2004 MCAS Grade 6 Mathematics

### Student Work: Question #10- Score Point 4

- a. Right Isosceles Triangle most accurately describes shape A. I know my answer is correct because two sides are the same length, the shape is a triangle, and it has a right angle.
- b. Rhombus most accurately describes shape B. I know my answer is correct because a rhombus has all sides same length and parallel sides.
- c. Equilateral Triangle most accurately describes shape C. I know my answer is correct because shape C is a triangle and because all the sides are the same length.
- d. Trapezoid most accurately describes shape D. I know this because the shape has two sides parallel.

## 2004 MCAS Grade 6 Mathematics

### Student Work: Question #10- Score Point 3

A) Right Isosceles Triangle.

It is correct because it is a right angle it is closed and a triangle.

B) Rhombus it is a Rhombus because it has all equal sides.

C) Equilateral Triangle all sides are equal.

D) trapezoid. I chose trapezoid because it has four sides.

## 2004 MCAS Grade 6 Mathematics

### Student Work: Question #10 - Score Point 2

a) right Isosceles triangle  
because the triangle has a  
right angle and it has 2  
sides with the same length  
which is and Isosceles  
triangle

b) trapezoid because that is  
what a trapezoid is a  
weird figure with ~~two~~ equal  
sides

c) equilateral triangle because  
all of its sides are equal.

d) a Rhombus because that  
is what a rhombus looks like.

## 2004 MCAS Grade 6 Mathematics

### Student Work: Question #10- Score Point 1

A) right Isosceles Triangle  
cause theres a right  
angel in it



B) Rhombus

C) Trapezoid

D) equilateral triangle

## Appendix 2 Vocabulary

### **Investigation 1:**

- *polygon, vertex, vertices, line segment, equilateral triangle, Isosceles triangles, scalene triangle, rectangle, square, parallelogram, reflection symmetry, line symmetry, rotational symmetry, regular polygon, tiling*

### **Investigation 2:**

- *ray, vertex, degrees, right angle, parallel lines, transversal, angle ruler, coordinate grids, adjacent angles, supplementary angles, midpoint, perpendicular lines, acute angle, obtuse angle, straight angle*

### **Investigation 3:**

- *angle sum, interior angle, exterior angle, degree, hexagon, octagon, pentagon, central angle*

### **Investigation 4:**

- *quadrilateral, diagonal*

# Appendix 3 Journal Entries

## **Investigation 1:**

### ***Investigation 1.1:***

Is a rectangle a parallelogram?. Why or why not?

### ***Investigation 1.2:***

Describe the difference between reflection symmetry and rotation symmetry

### ***Investigation 1.3:***

Will non-regular triangles tile? Show your work. stion

## **Investigation 2:**

### ***Investigation 2.1***

Draw an example and explain how you know it is less than a right angle.

### ***Investigation 2.2***

What is your strategy for deciding whether an angle is right, acute, obtuse, straight, or none of these? Show and explain.

### ***Investigation 2.3***

When using a protractor or an angle ruler what things do you need to check to make sure you are making accurate measurements?

### ***Investigation 2.4***

Will the angle measure change when the sides are extended? Explain why or why not?

### ***Investigation 2.5***

When given one angle in a parallelogram, how do you find the other three angles?

## **Investigation 3**

### ***Investigation 3.1***

If a regular polygon has thirty sides, what will be the sum of all the angles in that polygon? Explain why your answer makes sense.

### ***Investigation 3.2***

What is the sum of any polygon with  $N$  sides? Explain.

### ***Investigation 3.3***

Draw and give an example of two different figures that will tile a plane?

### ***Investigation 3.4***

What pattern do you see in the sizes of the interior angles as the number of sides increases?

## **Investigation 4**

### ***Investigation 4.1***

How can you decide whether any three lengths will make a triangle?

### ***Investigation 4.2***

Give four side lengths that will build a quadrilateral and explain how you know it will work?

### ***Investigation 4.3***

Is it possible to build one quadrilateral, is it also possible to build a different quadrilateral with the same four segments? Explain.

# Appendix 4 Reflections

## MMR1

Using one shape at a time, which regular polygons will fit together to tile a surface? Which regular polygons cannot tile a surface? Why do you think that some shapes make tilings and some do not?

## MMR2

What does it mean for two lines to be parallel? If two parallel lines are intersected by a transversal, what patterns can you expect to find in the measures of the angles formed? [pg. 53 #3]

## MMR3

What is the angle sum of a triangle? A quadrilateral? A hexagon? A polygon with  $N$  sides? Describe how you can find the measure of each interior angle of a regular polygon. As the number of sides in a regular polygon increases, what happens to the measure of an interior angle? Describe how you can find the sum of the measures of the exterior angles of a polygon. [pg. 69 # 1 & 2]

## MMR4

Is it possible for an isosceles triangle to be a right triangle? Explain why or why not? Explain why triangles are important in building structures. [pg. 82 #3]

# Appendix 5 On Demand Tasks

## CMP2: Shapes & Designs

<p><b><i>On-Demand Tasks</i></b></p> <p><b><u><i>Additional Practice &amp; Skills</i></u></b></p> <p><b><u><i>Workbook</i></u></b></p> <p><b><u><i>Assessment Resources</i></u></b></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 Problems 3-5, 9</p> <p><u><i>After Inv. 2</i></u> ACE Problems 19, 20</p> <p><u><i>After Inv. 3</i></u> ACE Problems 11,12</p> <p><u><i>After Inv. 4</i></u> ACE Problems 9-14</p>
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## HPS Mathematics Scoring Rubric

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

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

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

### Investigation 1A

- *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.*
- 3.** Examine Shapes L, R, and N from the Shapes Set (or look at the drawings from Problem 1.1). How are these polygons alike? How are they different?
- 4.** Examine Shapes A, I, P, and T from the Shapes Set (or look at the drawings from Problem 1.1). How are these polygons alike? How are they different?
- 5.** Tell whether each statement is *true* or *false*. Justify your answers.
- a.** All squares are rectangles.
  - b.** All rectangles are parallelograms.
  - c.** All rectangles are squares.
  - d.** There is no rectangle that is not a parallelogram.

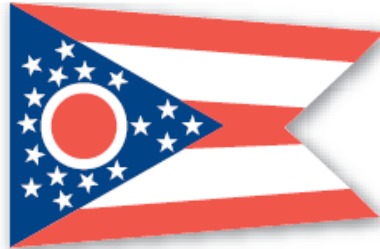
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### Investigation 1B

9. Here are three state flags.



Arizona



Ohio



New Mexico

- a. Describe the lines of symmetry in each whole flag.
- b. Do any of the shapes or designs within the flags have rotation symmetry? If so, which ones?
- c. Design your own flag. Your flag should have at least one line of symmetry. Your flag should also include three shapes that have rotation symmetry. List the shapes in your flag that have rotation symmetry.

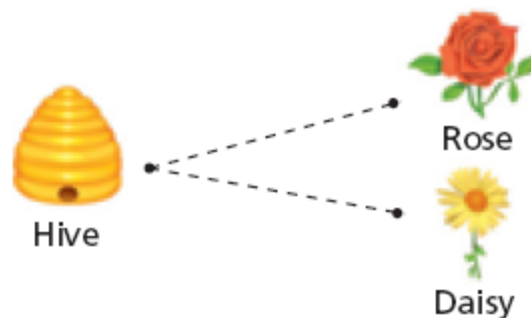
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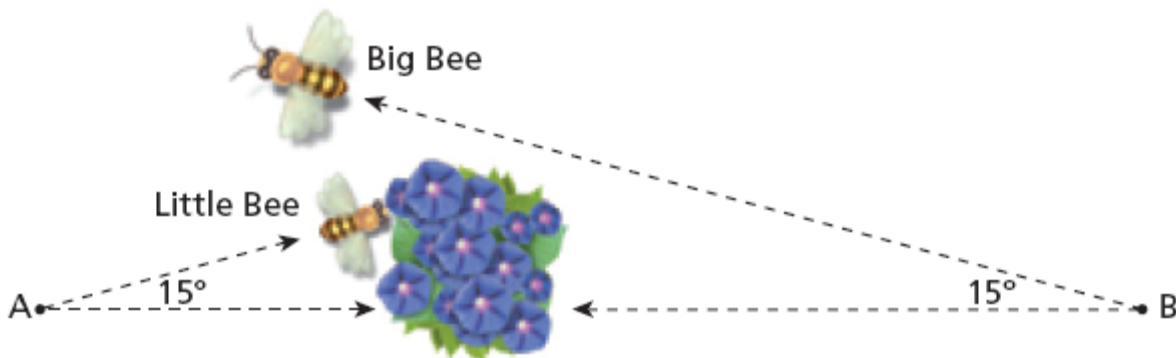
## Investigation 2

- 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.

**19.** A bee leaves the hive and wants to fly to a rose but instead ends up at a daisy. How many degrees did the bee travel off course? Estimate your answer. Then check your answer with an angle ruler.



**20.** Little Bee left point A for a flower patch. Big Bee left point B for the same flower patch. However, both bees were  $15^\circ$  off course. Little Bee landed on the patch and Big Bee did not. Explain why Big Bee did not hit the patch and Little Bee did, if they were both off course by  $15^\circ$ .



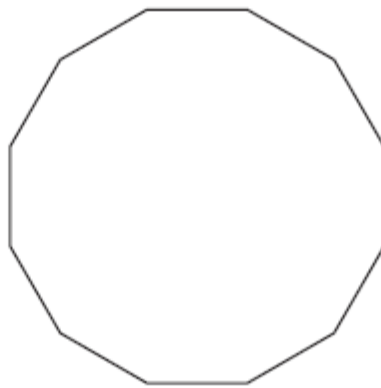
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### Investigation 3

- *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.*

- 11.** This figure is a regular dodecagon. A dodecagon has 12 sides.
- What is the sum of the measures of the angles of this polygon?
  - What is the measure of each angle?
  - Can copies of this polygon be used to tile a surface? Explain.



- 12. Multiple Choice** Which of the following will tile a plane?
- regular heptagon and equilateral triangle
  - square and regular octagon
  - regular pentagon and regular hexagon
  - regular hexagon and square

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.*

#### **Follow these directions for Exercises 9–12.**

- If possible, build a quadrilateral with the given set of side lengths. Sketch your quadrilateral.
  - Tell whether your quadrilateral is the only one that is possible. Explain.
  - If a quadrilateral is not possible, explain why.
9. Side lengths of 5, 5, 8, and 8
  10. Side lengths of 5, 5, 6, and 14
  11. Side lengths of 8, 8, 8, and 8
  12. Side lengths of 4, 3, 5, and 14
13. Which set(s) of side lengths from Exercises 9–12 can make each of the following shapes?
- a. a square
  - b. a quadrilateral with all angles the same size
  - c. a parallelogram
  - d. a quadrilateral that is not a parallelogram
14. A quadrilateral with four equal sides is called a **rhombus**. Which set(s) of side lengths from Exercises 9–12 can make a rhombus?

# NOTES