



Holyoke Public Schools
Mathematics Curriculum Map
Grade 3

Solids and Boxes

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Curriculum Maps

GOALS:

1. To ensure that students are exposed to a rigorous curriculum in every school and every grade.
2. To have consistent instruction and assessment district wide.
3. To prepare students for the MCAS test.
4. To explain what is expected to be covered in each CMP or Investigations Unit.

EXPECTATIONS:

The district's expectation is for students to successfully meet the Massachusetts Mathematics Standards. In order to help facilitate this, teachers are required to follow the curriculum maps. The successful implementation of these maps requires teachers to thoroughly read each lesson in the TE and work through the project and problems in the map and the text prior to planning their lessons. Work should be kept in the binder with the curriculum map. Working through the math is an essential part of lesson planning, as it helps the teacher to better understand the concept being taught and the students' possible misunderstandings.

FEEDBACK TO STUDENTS:

Feedback needs to happen daily in the classroom. There are many ways to give feedback. Conferencing, observations, questions asked during your opening, work time and closing are all forms of feedback.

MAP COMPONENTS:

1. GENERAL PROBING QUESTIONS
2. UNIT SPECIFIC PROBING QUESTIONS
3. GOALS OF UNIT, CONTENT STANDARDS, & PERFORMANCE STANDARDS
4. PROJECT- to be done at end of unit and kept in the portfolio.
 - o STUDENT MASTER – for project
5. INVESTIGATIONS:
 - o NOTEBOOK - includes: 3 Ring Binder, Bound Notebook, Portfolio
 - o ACCOUNTABLE TALK – using probing questions
5. ON-DEMAND ASSESSMENTS - to be done during teaching of unit.
 - o STUDENT MASTERS- for on-demand assessments.

Mathematics

Evidence of Learning Artifacts

Artifact	K - 1	2 - 5	6 - 8
<i>3 Ring Binder (3R)*</i>	<ul style="list-style-type: none"> ○ Student Work¹ 	<ul style="list-style-type: none"> ○ Vocabulary ○ Student sheets¹ <p style="text-align: center;"><u>All work should be dated and listed by investigation</u></p>	<ul style="list-style-type: none"> ○ Math books ○ Vocabulary ○ Core Problems¹ ○ Student sheets <p style="text-align: center;"><u>All work should be dated and listed by investigation</u></p>
<i>Marble Notebook (MNB)</i>	<ul style="list-style-type: none"> ○ Journal entries² 	<ul style="list-style-type: none"> ○ Table of Contents ○ Problem of the day ○ Journal entries ○ Class work <p style="text-align: center;"><u>All work should be dated and listed by investigation in the Table of Contents</u></p>	<ul style="list-style-type: none"> ○ Table of Contents ○ Work time ○ Journal entries <p style="text-align: center;"><u>All work should be dated and listed by investigation in the Table of Contents</u></p>
<i>Portfolio³ (P)</i>	<ul style="list-style-type: none"> ○ On-demand tasks ○ Projects ○ Teacher anecdotal notes 	<ul style="list-style-type: none"> ○ On-demand tasks ○ Reflections ○ Projects <p style="text-align: center;"><u>All work should be dated and listed by investigation</u></p>	<ul style="list-style-type: none"> ○ On-demand tasks ○ Reflections ○ Projects <p style="text-align: center;"><u>All work should be dated and listed by investigation</u></p>

* Folders may be used in place of binders for these grade levels

¹ Send home at the end of each unit

² Use grade level math journals

³ All documents should be kept for the entire year

Solids and Boxes

Probing Questions for Accountable Talk

As students progress through this unit, they should be asked the following questions to assess their knowledge about the attributes of 2-Dimensional and 3-Dimensional shapes and linear measurement.

- What attributes did you use to group your figures?
- *How did you distinguish between a prism and a pyramid?*
- *How did they come together to form the whole?*
- *Which patterns did you think would make an open box for a cube?*
- *What did you notice about the patterns that work?*
- *What shape would form the base of a triangle pyramid?*
- *What do you think the squares on the sides of the pattern can tell you?*
- *How did you know how many layers there would be/*

Classroom Routines and Ten Minute Math (GRADES K -3 HAVE CLASSROOM ROUTINES, 3 ALSO HAS 10MIN.MATH, 4-5 HAS 10 MINUTE MATH please adjust accordingly)

Classroom Routines: Unit 1, Session 1.1, “What’s the Temperature”

Ten Minute Math: Unit 1, Session 1.1, “Practicing Place Value,” Unit 1, Session 2.3 “More or Less?” Unit 4, Session 1.5 “Quick Images: 3-D”

Ten Minute Math activities and Classroom Routines 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 3: Please review pages 24, 28 -34, for 3 Ten Minute Math activities in this unit and pg. 40-42 for Classroom Routines: “What’s the Temperature?”

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:

- Identify and compare attributes of 3-dimensional solids.
- Determine the number of cubes (volume) that will fit in the box made by a given pattern.
- Design patterns for boxes that will hold a given number of cubes.

Math Content Standards:

- 3.G.2 Describe, model, draw, compare, and classify two-dimensional shapes, e.g., circles, triangles, and quadrilaterals. Identify and describe simple three-dimensional shapes, e.g., cubes, spheres, and pyra

Performance Standards

- (M2b) Visualizes and represents two dimensional views of simple rectangular three dimension shapes
(M2d) Uses many type of figures and identifies the figures by their properties

UNIT: Solids and Boxes

End-of-Unit Project

GRADE: 3

End-of-Unit Project (P)

Student work should be placed in **portfolio (P)**.

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

End-of-Unit Assessment: Unit 9, M36 from Resource Binder, “Resources Masters and Transparencies”

UNIT: SOLIDS AND BOXES

Investigation 1 (1.1 – 1.5)

DAYS: 5

GRADE: 3

<p>Evidence of Learning Artifacts</p> <p>Journal and Reflection questions should be posted and referred to at the beginning of the appropriate <i>Investigation</i>.</p> <p>Journal and Reflection entries need to be done in class as part of the closure and assessment.</p>	<p>(3R) – 3 ring binder; (MNB) – marble notebook; (P) – portfolio</p> <p>Vocabulary – prisms, pyramids, edges, faces, vertex, vertices, polyhedron, polyhedral, figure, rectangular prism, pyramid (3R)</p> <p>Work Time – Student Sheets 1- 15 (3R)</p> <p>Journal Entries – (MNB) *Maximum 5 minutes</p> <p>Inv. 1.1 Select one of the groups you made and tell why you put them in that group.</p> <p>Inv. 1.2 Explain how you chose which shape did not belong.</p> <p>Inv. 1.3 What kinds of figures could you build with your sticks and connectors? How are these different from the figures you could not build?</p> <p>Inv. 1.4 What was your strategy for building a polyhedron after reading its description?</p> <p>Reflection – Select a polyhedron and a non-polyhedron. Sketch each of them and describe them. Vocabulary to use: edges, faces, vertices. (P)</p>
<p>Accountable Talk</p> <p>To promote learning, explore solutions, and justify reasoning, conversations between students and students or students and teacher must be accountable – accountable to the learning community, to the mathematics discipline, and to rigorous thinking.</p>	<p><i>As a result of this Investigation, students should be able to talk and manipulate the vocabulary of the Investigation in response to this type of question:</i></p> <p>What is the same and what is different between the two shapes? Describe the shape. What attributes are useful in describing the shape? Did anyone use a different strategy? Which ones are easiest/hardest to make? Where do you see this shape outside the math class?</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: SOLIDS AND BOXES
Investigation 2 (2.1 – 2.3) DAYS: 3

GRADE: 3

<p>Evidence of Learning Artifacts</p> <p>Journal and Reflection questions should be posted and referred to at the beginning of the appropriate <i>Investigation</i>.</p> <p>Journal and Reflection entries need to be done in class as part of the closure and assessment.</p>	<p>(3R) – 3 ring binder; (MNB) –marble notebook; (P) – portfolio</p> <p><i>Vocabulary</i> – pattern, net (3R)</p> <p><i>Work Time</i> – Student Sheets 16-22 (3R)</p> <p><i>Journal Entries</i> – (MNB) *Maximum 5 minutes Inv. 2.1 Describe the strategy you used to create open box patterns. Inv. 2.2 How is the 2-cube box different from the 1-cube box?</p> <p><i>Reflection</i> – How is the triangular pyramid different from the 1- and 2-cube boxes? How is it similar? Explain in words and pictures. (P)</p>
<p>Accountable Talk</p> <p>To promote learning, explore solutions, and justify reasoning, conversations between students and students or students and teacher must be accountable – accountable to the learning community, to the mathematics discipline, and to rigorous thinking.</p>	<p><i>As a result of this Investigation, students should be able to talk and manipulate the vocabulary of the Investigation in response to this type of question:</i></p> <p>Is that the only way you can do it? Did the order that you made your box matter? If your pattern didn't work at first, could you change it to make it work? How did you know...? Can you solve the problem in a different way? Does your answer make sense? What was your strategy?</p> <p><i>These are some recommended questions that you might use. Others can be found at the beginning of the map and on the probing question sheet in the district mathematics guide.</i></p>

UNIT: SOLIDS AND BOXES
Investigation 3 (3.1 – 3.5) DAYS: 6

GRADE: 3

<p>Evidence of Learning Artifacts</p> <p>Journal and Reflection questions should be posted and referred to at the beginning of the appropriate <i>Investigation</i>.</p> <p>Journal and Reflection entries need to be done in class as part of the closure and assessment.</p>	<p>(3R) – 3 ring binder; (MNB) –marble notebook; (P) – portfolio</p> <p><i>Vocabulary</i> – volume (3R)</p> <p><i>Work Time</i> – Student Sheets 23-34 (3R)</p> <p><i>Journal Entries</i> – (MNB) *Maximum 5 minutes</p> <p>Inv. 3.1 What strategies do you use to figure out how many cubes will fit in a box?</p> <p>Inv. 3.2 What strategy did you use to design a box to hold 12 cubes?</p> <p>Inv. 3.3 How did you know how many layers there would be?</p> <p>Inv. 3.4 What strategies did you use to design a box with 16 cubes?</p> <p><i>Reflection</i> – Explain how knowledge of multiplication and division can help you solve the riddles about boxes? (P)</p>
<p>Accountable Talk</p> <p>To promote learning, explore solutions, and justify reasoning, conversations between students and students or students and teacher must be accountable – accountable to the learning community, to the mathematics discipline, and to rigorous thinking.</p>	<p><i>As a result of this Investigation, students should be able to talk and manipulate the vocabulary of the Investigation in response to this type of question:</i></p> <p style="padding-left: 40px;">How did you know...?</p> <p style="padding-left: 40px;">Can you solve the problem in a different way?</p> <p style="padding-left: 40px;">Does your answer make sense?</p> <p style="padding-left: 40px;">What was your strategy?</p> <p><i>These are some recommended questions that you might use. Others can be found at the beginning of the map and on the probing question sheet in the district mathematics guide.</i></p>

End-of-Unit Project

Student work should be placed in **portfolio (P)**.

The project is the culminating assessment which will allow students to apply what they learned about the components and properties of different solids and designing patterns for boxes that hold a given number of cubes.. It is written in MCAS form to give students the experience of answering an open-response question.

NAME: _____

DATE: _ _

End-of-Unit Project

End-of-Unit Assessment: Unit 9, M36 from Resource Binder, “Resources Masters and Transparencies”

- **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.**

Name _____

Date _____



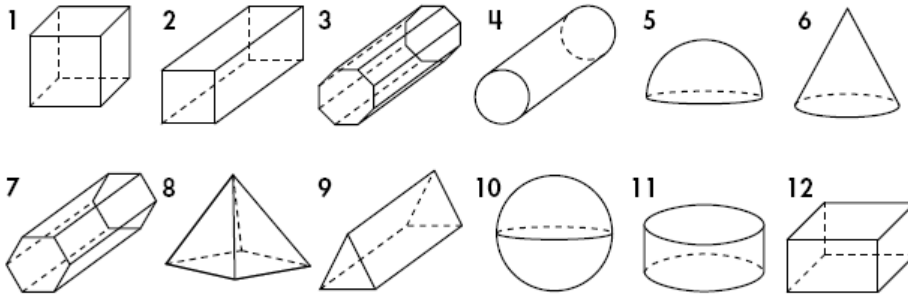
Solids and Boxes

End-of-Unit Assessment (page 1 of 5)



1A. Pick two solids from the set of geometric solids pictured below.

Circle the two you have chosen.



Describe each solid you chose. List at least three characteristics of each one.

1B. List at least two ways that the solids you chose are like each other. List at least two ways that they are different.

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Name _____

Date _____



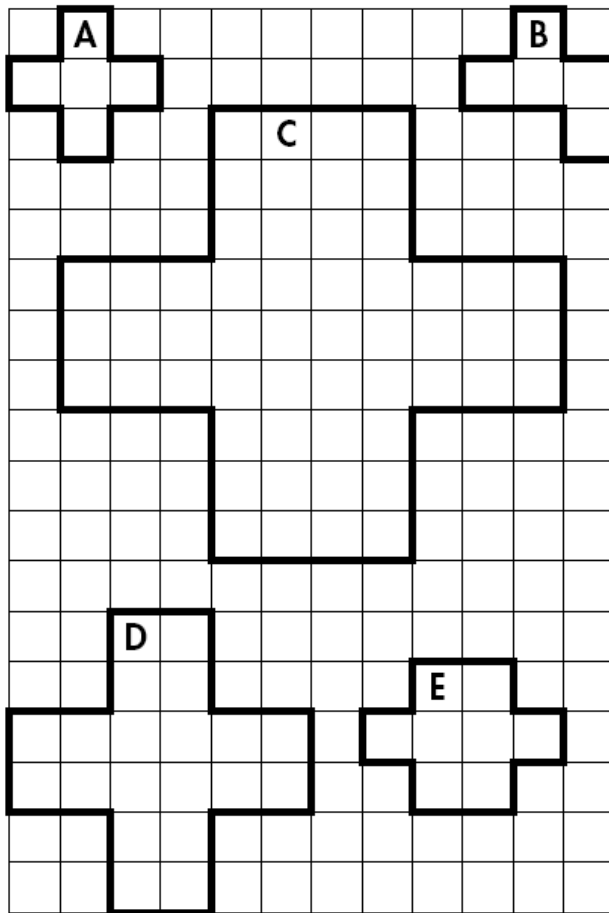
Solids and Boxes

End-of-Unit Assessment (page 2 of 5)

2A. The grid paper below shows the patterns for 5 boxes to hold cubes. How many cubes will each box hold?

Box A _____ Box B _____ Box C _____

Box D _____ Box E _____



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Name _____

Date _____



Solids and Boxes

End-of-Unit Assessment (page 3 of 5)



2B. In the space below, explain how you figured out the number of cubes that will fit in Box C.

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M38 Unit 9

Session 3.5

Name _____

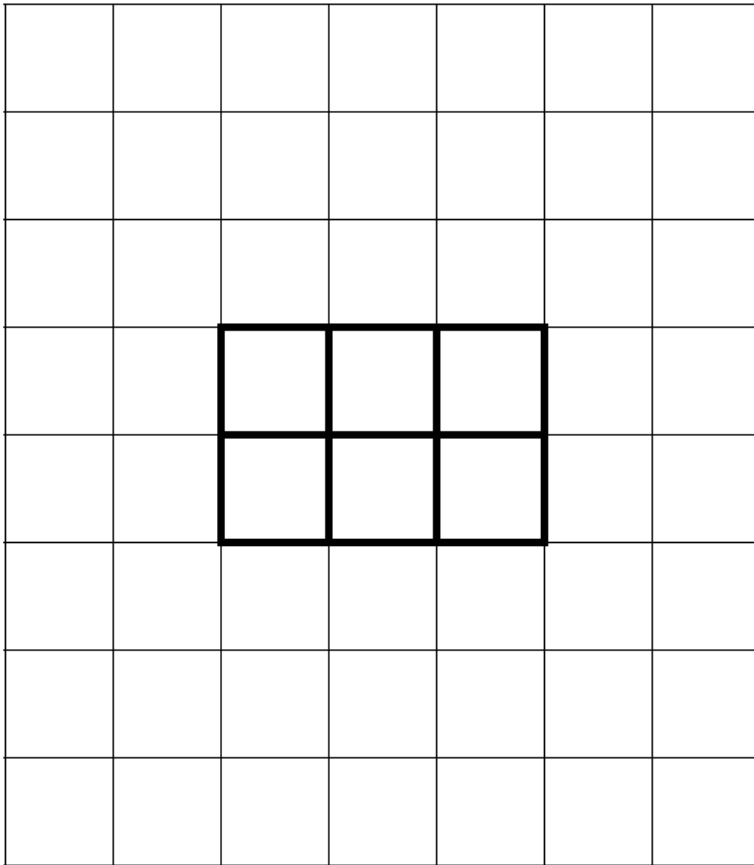
Date _____



Solids and Boxes

End-of-Unit Assessment (page 4 of 5)

- 3A.** The dark squares in the pattern below make the bottom of a rectangular box. Draw sides on the pattern to make a box (without a top) that will hold 6 cubes.



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Session 3.5

Unit 9

M39

Name _____

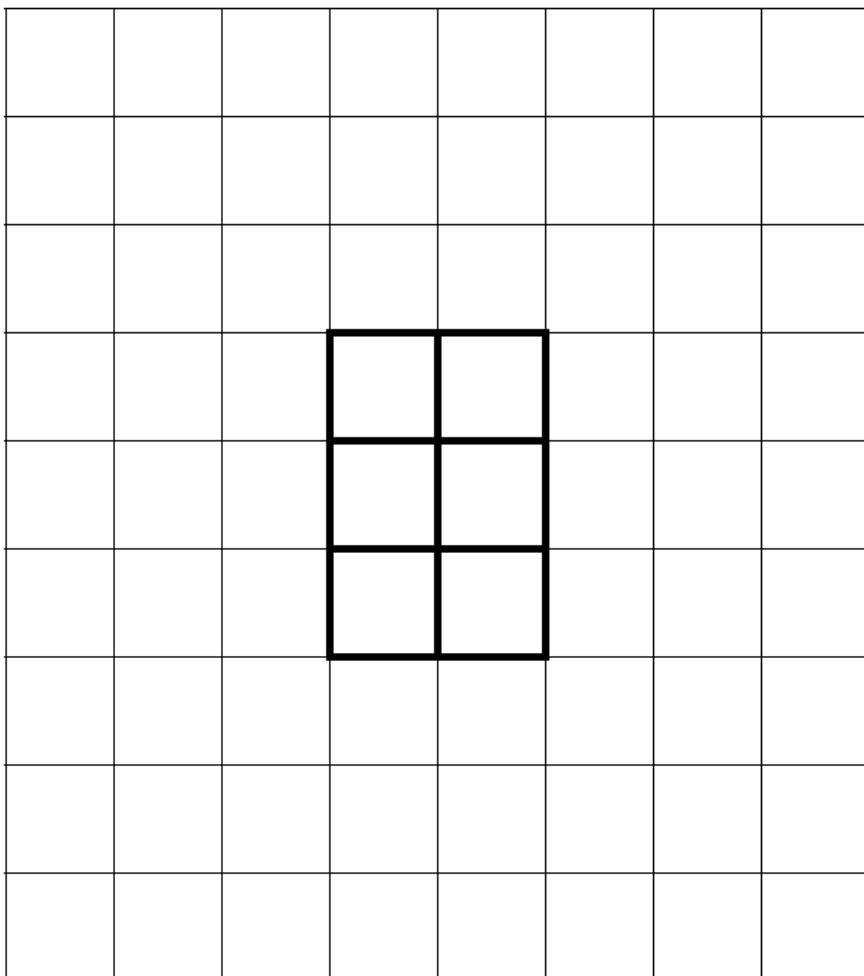
Date _____



Solids and Boxes

End-of-Unit Assessment (page 5 of 5)

- 3B.** The dark squares in the pattern below make the bottom of a rectangular box. Draw sides on the pattern to make a box (without a top) that will hold 18 cubes.



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On-Demand Assessments

(To be filed in portfolio)

Solids and Boxes Investigations

In class individualized On-Demand tasks assess knowledge of mathematical facts, operations, concepts, and skills, and their efficient application to problem solving. The results of these different forms of assessment provide rich profiles of students' achievements in mathematics and serve as the basis for identifying curricula and instructional approaches to best develop their talents.

UNIT: SOLIDS AND BOXES

On-Demand Assessments

GRADE: 3

<p>On-Demand Assessments (P)</p> <p><u>Solids and Boxes</u> Investigations</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>Inv. 1:</u> Resource Binder: Session 1.4, M12</p> <p><u>Inv. 2:</u> none</p> <p><u>Inv. 3:</u> Resource Binder: Session 3.3 M32. . .</p> <p>*Assessment Checklists should be kept with tracking sheets.</p> <p>*Please refer to the section in the Teacher's Unit Guide entitled, "Professional Development" for examples of student work for each assessment.</p>
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Assessment Checklist: Building Polyhedra from Descriptions



Student	Correctly builds the polyhedra	Uses the reference sheet or wooden models to build	Builds without use of the reference sheet or wooden models	Cannot correctly build the polyhedra

Name _____

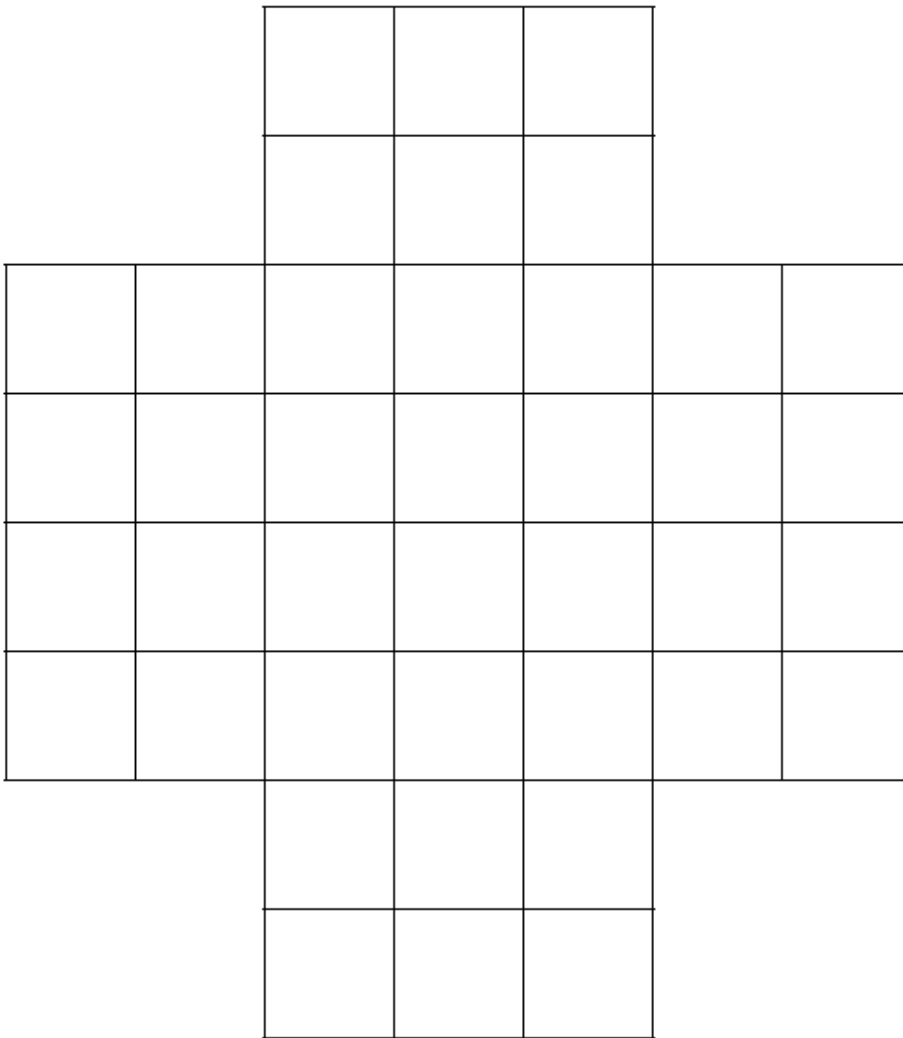
Date _____



Solids and Boxes

Assessment: Writing About How Many Cubes

Determine how many cubes will fill the box made from this pattern. Then explain how you got your answer.



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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