MT Course of Study

MTA Specific Teaching Practices: Mathematics
MTA is a series of 9 mathematics and mathematics pedagogy tasks that must be completed in TaskStream.

MNC Specific Teaching Practices: Mathematics Pedagogy
MNC is a proctored, computer-based assessment containing 15 items covering mathematics pedagogy.

TABLE OF CONTENTS

PART I:  Suggested Preparation Strategy and Learning Resources

PART II:  MTA Task List and Task Clarifications

PART III: MT Topics and Objective Exams
PART I: Suggested Preparation Strategy and Learning Resources

1. **Enroll in LessonLab via your AAP in Available LRs.** The materials consist of a 2-CD set and a textbook by John A. Van de Walle. The materials are shipped via UPS at no charge to you. LessonLab is delivered via the internet, with the CDs used to support the video portions.

2. When the disks arrive, ‘open’ the first disk, and click on the Internet website icon which will take you to the LessonLab website. Register there using the Content Key Code found on the CD case. The website also contains an online syllabus. Work through the Topics in a systematic way, watching the videos, completing the imbedded To Do tasks and forum responses, and reading text assignments.

3. As you work through Lesson Lab you will learn material you need to complete the MTA tasks in TaskStream. Stop when you learn this material and complete the relevant task in TaskStream. Talk to your mentor about TaskStream access (especially if you are planning on working on the tasks ahead of the term in which MTA will be on your AAP). See Part II for more ideas.

4. When you have completed Lesson Lab and TaskStream, you will be almost ready to take the competency exam, MTC. Ask your mentor to release the PAMP, the preassessment for MTC, to you about a week before you’re ready to take the practice test. Take it under exam conditions! See Part III for more ideas.

**Learning Resources** (in addition to LessonLab, not to replace it!)

*APA format*


*Equations in MS Word*

From the WGU Student Portal communities, Secondary Math Programs Community > Files > Secondary Math Pro > Word Equation Editor

*Mathematics Lesson Plans*


*NCTM Illuminations* lesson plans. [http://illuminations.nctm.org/Lessons.aspx](http://illuminations.nctm.org/Lessons.aspx) [accessed March 2006]

Online Calculators

Other Textbooks

Other Websites
From the WGU Student Portal communities, Secondary Math Programs Community > News Items > Great Websites for Math Teachers
At [http://www.amazon.com](http://www.amazon.com), Books > Subjects > Nonfiction > Education > Secondary School > Mathematics
At [http://www.questia.com](http://www.questia.com), Education > Curriculum and Instruction > Science Education > Mathematics Instruction
PART II: MTA Task List and Task Clarifications

It is NOT recommended that complete the tasks by skipping around in LessonLab using this chart. This chart is a reference tool to assist you. Work through LessonLab systematically, stopping in these particular sections to work on the related task. LessonLab should provide you with enough information to get started, and often complete, these tasks. Feel free to use online or other resources (properly cited and referenced; see APA format resources above) to supplement your information. LessonLab does not require that you read the entire Van de Walle text, but you should refer to the index if you want more information on a topic.

<table>
<thead>
<tr>
<th>Task # and Topic</th>
<th>LessonLab Topic</th>
<th>Van de Walle Chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Problem Solving</td>
<td>Problem Solving</td>
<td>4</td>
</tr>
<tr>
<td>2. Technology Use</td>
<td>Technology Lesson Planning</td>
<td>6 2</td>
</tr>
<tr>
<td>3. Contributions</td>
<td>Case 2 Lesson Planning</td>
<td>6</td>
</tr>
<tr>
<td>4. Parallelogram</td>
<td>Case 1</td>
<td>20</td>
</tr>
<tr>
<td>5. Equivalence</td>
<td>Classroom Connections</td>
<td>15</td>
</tr>
<tr>
<td>6. Proportions</td>
<td>-</td>
<td>18</td>
</tr>
<tr>
<td>7. Census</td>
<td>Classroom Connections</td>
<td>21</td>
</tr>
<tr>
<td>8. Probability</td>
<td>Case 4</td>
<td>20</td>
</tr>
<tr>
<td>9. Procedures</td>
<td>Case 1 Case 2</td>
<td>4</td>
</tr>
</tbody>
</table>

Some notes about TaskStream Scoring:
1. Each task is scored 1, 2, 3, or 4 points in each of five to eight grading categories.
2. Scoring a 3 means you met the standard – you did what was expected, perfectly following directions. Scoring a 4 means you did exemplary work – you went above and beyond what was asked.
3. To pass, you must get a 3 or above in each grading category with the exception of at most a single score of 2; two or more 2s or any 1s means the task will be returned for revision.

All Tasks
All tasks are scored on three common categories: Communication, Mechanics (grammar, punctuation, spelling, etc.), and Style (word choice, sentence structure, etc.).

Clarification
Your written work for all tasks must be easy to follow and understand, may have no more than 2 minor mechanical errors, and the sentence structure must be generally effective, the vocabulary solid, and the word choice accurate. Ensure you follow APA rules for format, especially for citations and references. TIP: Keep it plain and simple. Be detailed. Read your work out loud to hear the parts that may not be clear.
Exemplary work must be extremely clear and easy to understand, have no mechanical errors, and have highly varied sentence structure, vivid vocabulary, and accurate word choice.

**Task 1 “Problem Solving”**

Write an essay of 1,000 words describing a minimum of five (5) different problem solving strategies and process techniques that can be used to encourage flexibility and persistence in mathematics in grades 7-12. Discuss ways to approach a task, develop and select strategies, justify solutions and generalize problems. Include any references in a bibliography.

**Required Elements:**
1. Select at least 5 strategies
2. Justify solutions
3. Generalize problems
4. Bibliography with references in APA format

**Clarification**

You must discuss how to teach students to identify the important information and determine the problem to be solved. You must explain five problem-solving strategies or process techniques that students should learn to use. A process technique is a procedure that should be useful solving a broad variety of types of mathematical problems. You must explain how justifying solutions improves students’ ability to assess problems. To generalize a problem, a student must be able to recognize how that problem could be rephrased to apply to a broader variety of situations – for example, a student who can multiply two-digit numbers should be able to generalize that procedure to be able to multiply three-digit numbers. The bibliography must have adequate references and be in APA format.

Exemplary work states the goal of the problem both in words and mathematically, explains the five strategies clearly and well, and explains how justifying solutions helps students monitor their progress. The bibliography must have several references from different types of media sources.

**Task 2 “Technology Use”**

Develop a lesson plan to solve a system of two linear equations in two unknowns.
- Select three different sets of equations to demonstrate the three possibilities: intersection, parallelism, and colinearity.
- The lesson plan should include the lesson title, purpose of the lesson, the lesson objectives, pre-instructional techniques, and instructional procedures for the graphing calculator (TI-82, 83, or 84) or a computer to demonstrate the problem.
- Discuss the advantages of using technology in this task.
- Include a bibliography.
Clarification
The lesson plan must explain how the content can be applied to other mathematics or to real-world examples. It must include three sets of equations that demonstrate the three possibilities. The technology discussion must have clear and easy-to-follow steps and include a discussion of the visual and computation advantages. The bibliography must have adequate references and be in APA format.

Exemplary work will include examples of applications. It will include diagrams illustrating the three possibilities, and the technology discussion will have extremely well-explained steps and include a discussion of how conceptual understanding is improved and why work takes less time. An exemplary bibliography must have several references from different types of media sources.

Other Resources
Lesson Builder in TaskStream contains a fill-in-the-blank template for your optional use. You can then attach the lesson to your task. However, be sure that the template contains everything your task is asking for. Any lesson plan template you are used to using will be fine for this task, as long as it includes everything being asked for in this task. Lesson Plans should be detailed enough for a substitute teacher to pick it up and teach from it.

Task 3 “Contributions”

Create a lesson plan to describe the contributions of a non-Western culture to an area of mathematics. The lesson plan should include the lesson title, purpose of the lesson, the lesson objectives, instructional procedures or class participation, the important aspect(s) of the contribution, how the non-Western culture used this aspect of mathematics, and the implications on modern mathematics. Include a bibliography.

Clarification
The title, purpose, and objective of the lesson plan must be stated clearly. The plan must describe the areas of mathematics affected and how the culture used this aspect of mathematics. The implications on modern mathematics must be well-stated and relevant, and the lesson plan must include instruction as to how this aspect of mathematics is used today. Remember to narrow your topic down so that it fits into a typical class period. The bibliography must have adequate references and be in APA format.

An exemplary lesson plan will pique student interest and be motivating, will include questions and feedback to draw students into discussion, and will include plans for students to use this aspect of mathematics. An exemplary bibliography must have several references from different types of media sources.

Other Resources
Lesson Builder in TaskStream contains a fill-in-the-blank template for your optional use. You can then attach the lesson to your task. However, be sure that the template contains everything
your task is asking for. Any lesson plan template you are used to using will be fine for this task, as long as it includes everything being asked for in this task. Plans should be detailed enough for a substitute teacher to pick it up and teach from it.

**Task 4 “Parallelogram”**

Write an essay of no more than 1000 words describing how to teach students to develop a formula to find the area of a parallelogram. Identify the terms needed and the prerequisite skills the students would require. Include any visual aids, manipulatives, or geoboards that would be helpful to the students. Discuss any questions the teacher will ask students and questions the teacher might anticipate from the students. Include any references in a bibliography.

Students will be evaluated on communication, mechanics, and style.
Students will also be evaluated on the explanation of prerequisite skills needed, visual aids used, the procedure used, questions expected, and the bibliography.

**Clarification**
The essay must review prerequisite definitions and terms, and must include an explanation of how diagrams of rectangles and parallelograms will be used. The formula must be derived in such a way that it is clear, convincing, and works for all parallelograms. The list of teacher and student questions must show the ability to encourage and anticipate students’ thinking. The bibliography must have adequate references and be in APA format.

Exemplary work will include diagrams in the definitions and terms of prerequisite knowledge and convey a clear understanding of it. Visual aids will be explained well, be clear, and convey several ways of thinking about the problem. The formula derivation will be very clear and include excellent diagrams. The questions to and from the students will summarize and clarify the problem. An exemplary bibliography must have several references from different types of media sources.

**Other Resources**

Lesson Builder in TaskStream contains a fill-in-the-blank template for your optional use. You can then attach the lesson to your task. However, be sure that the template contains everything your task is asking for. Any lesson plan template you are used to using will be fine for this task, as long as it includes everything being asked for in this task. Plans should be detailed enough for a substitute teacher to pick it up and teach from it.

**Task 5 “Equivalence”**

Create a project to conceptually demonstrate equivalent fractions when working with fractions with unlike denominators. Define a fraction and its parts. Use at least two types of models to show equivalency. Describe how to teach students to manipulate the models. Discuss how to model and develop an equivalent fraction algorithm. Discuss any questions the teacher will ask students and questions the teacher anticipates from students. Include any references in a bibliography.
Students will be evaluated on communication, mechanics, and style. Students will also be evaluated on the definition of a fraction, explanation and use of two model types, formula derived for an algorithm, inclusion of questions to encourage student thinking, and the bibliography.

Clarification
A project is a multi-day, multi-hour assignment (the work can be done at home, in class, or both), usually with a written product and/or oral performance as an end-goal. The project must review the relevant terms and definitions. Two types of models, such as area, length, region, or set, must be explained and used by the students. Manipulatives may be used as models, but a model does not have to include manipulatives. The project must lead to the derivation of the equivalent fraction algorithm and have the students examine several examples. Sample questions must encourage student thinking. The bibliography must have adequate references and be in APA format.

An exemplary project will convey a clear understanding of the definitions and terms and include examples of terms. It will show more than two models and will include diagrams and good explanations of these models. It will encourage students to show multiple ways of thinking. The derivation of the algorithm will be explained well and include clear diagrams. It will include questions from and for the students that will help them summarize and clarify the models and the algorithm. An exemplary bibliography must have several references from different types of media sources.

Other Resources
Unit Builder in TaskStream contains a fill-in-the-blank template for your optional use. You can then attach the unit (or multi-day lesson) to your task. However, be sure that the template contains everything your task is asking for. Units should be detailed enough for a substitute teacher to pick it up and teach from it.

Task 6 “Proportions”
Design a project to demonstrate the use of proportional reasoning with percentage problems. Define ratio, proportion, and percent as well as their relationships.
- Use examples to explain the meaning of terms.
- Model a conceptual approach to introduce the cross-product algorithm.
- Discuss any questions the teacher will ask students and questions the teacher should anticipate from students.
- Include any references in a bibliography.

Clarification
A project is a multi-day, multi-hour assignment (the work can be done at home, in class, or both), usually with a written product and/or oral performance as an end-goal. The project must discuss the role of fractions and multiplicative properties in the definitions. It should give various examples with at least two types of percentage problems. The project should lead
student to a hands-on and conceptually-based development of the cross-product algorithm. The project should diagram how students will set up ratios. The sample questions for and from students should encourage and anticipate students’ thinking. The bibliography must have adequate references and be in APA format.

An exemplary project will show a clear understanding of the definitions and will include examples. At least three types of percentage problems should be given. The directions for the students’ use of the model must be clear, and the model must lead the students to derive the cross-product algorithm. The sample questions for and from the students must summarize and clarify the problem. An exemplary bibliography must have several references from different types of media sources.

Other Resources

Unit Builder in TaskStream contains a fill-in-the-blank template for your optional use. You can then attach the unit (or multi-day lesson) to your task. However, be sure that the template contains everything your task is asking for. Units should be detailed enough for a substitute teacher to pick it up and teach from it.

Task 7 “Census”

Provide a worksheet for the students containing the total U.S. population for each ten-year period from 1900 to 2000 as well as the information the students will need to project the population for 2010 and 2020. Include definitions of the terms used, graphs to create, and give the necessary statistical formulas to calculate the predictions. Applications with a graphics calculator may be used. List questions about what factors influence the growth and decline of a population, the source of the U.S. Census data, and information about the U.S. POPCLOCK projection on the worksheet. Provide an answer sheet for the worksheet. Include references in a bibliography.

Web Links:

Clarification

The worksheet you are providing has two parts. The first is informational and must include the U.S. Census data and have clear directions for the students. It will give the students the information they need to complete the second part. The second part will be the assignment you want the students to complete. An answer key must also be provided. The worksheet must define the relevant terms and discuss how projections could be influenced by population changes. Items in the second part must evoke discussions about how projections can be influenced by population changes. The bibliography must have adequate references and be in APA format.

An exemplary worksheet will be well-presented and easy to understand. Screenshots from a graphing calculator and directions for using one will be part of an exemplary worksheet. Exemplary questions encourage students to think about and discuss ways to apply population
changes to the model. An exemplary bibliography must have several references from different types of media sources.

**Task 8 “Probability”**

GIVEN A deck of 52 cards containing 13 each of red, blue, green, and yellow cards. Each of the 13 cards has a different value associated with it. There are 4 cards of like value, but different colors in each deck.

**Task Statement** Create a project to describe the details of determining the probability of drawing 2 red cards one after each other from the deck; the cards are returned to the deck, and the probability of drawing three cards with the same value one after the other from the deck.

- Define all the terms used and their relationship to the project.
- Explain and compare both dependent and independent events as well as the theoretical and experimental probabilities of the project.
- Produce a sample chart of outcomes that could occur and be produced by the students.
- Include any references in a bibliography.

**Clarification**

A project is a multi-day, multi-hour assignment (the work can be done at home, in class, or both), usually with a written product and/or oral performance as an end-goal. The project should include a review the relevant definitions and terms. It should have the students discuss the dependence and independence of the two situations and explain the difference between how to determine theoretical and experimental probabilities. The sample chart should be clear, easy to read, and address both situations. The bibliography must have adequate references and be in APA format.

An exemplary project conveys a clear understanding of the definitions. It evokes several ways of thinking from the students and includes clear diagrams and useful visual aids. The theoretical and experimental probability computations are explained and accurate in an exemplary project, and more than one kind of sample chart is developed. An exemplary bibliography must have several references from different types of media sources.

**Task 9 “Procedures”**

Teacher's actions encourage students to think, question, solve problems, and discuss their ideas, strategies, and solutions.

**Task Statement** Write an essay of 1000 words describing a variety (at least 5 methods) of specific questions and strategies that encourage students to discuss their ideas, procedures, rules and definitions that they used to solve a problem. Discuss ways (at least 4) in which justification of solutions improves students' relational understanding of mathematics. Include any references in a bibliography.

**Clarification**
The essay should describe at least 5 specific questions and strategies (such as “stepping back” or “exploring the solutions of others”) and explain why they encourage students to discuss their ideas, procedures, rules and definitions that they used to solve a problem. The essay should give at least 4 ways in which justification of solutions improves students’ relational understanding (such as “it improves problem-solving ability”). The bibliography must have adequate references and be in APA format.

An exemplary essay should have clear descriptions of more than 5 strategies and/or include some elaborated extension strategies. It clearly explains the need for students to justify answers. An exemplary bibliography must have several references from different types of media sources.
PART III: MT Topics and Objective Exams

MT Objective Exams: PAMP and MTC
Ask your mentor to release the preassessment for MTC, the PAMP, to you about a week before you’re ready to take the practice test. Take it under exam conditions! Be sure to review the list of topics below before taking the objective exam. Use the table of topics below to find out what to study and where to find it.

Competency 602.5.1: Teaching Methods – Mathematics (Secondary) (p100169)
The graduate provides effective, research-based mathematics curriculum instruction.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Relevant portion of the Available LRs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe how to determine whether students should use a calculator,</td>
<td>• Lesson Lab Topic: Technology</td>
</tr>
<tr>
<td>given specific curricular examples at different grade levels from</td>
<td></td>
</tr>
<tr>
<td>5-12.</td>
<td></td>
</tr>
<tr>
<td>Determine the prerequisite skills that students would need in order</td>
<td>• Lesson Lab Topic: Case 1</td>
</tr>
<tr>
<td>to be successful in solving a given problem from the grades 7-12</td>
<td>• Van de Walle Chapter 3</td>
</tr>
<tr>
<td>curriculum.</td>
<td>• Lesson Lab Topic: Case 2</td>
</tr>
<tr>
<td>Identify the most common errors made by a hypothetical class of</td>
<td>• Lesson Lab Topic: Case 3</td>
</tr>
<tr>
<td>students on a given set of mathematics problems, determine the probable</td>
<td>• Lesson Lab Topic: Case 4</td>
</tr>
<tr>
<td>causes, specify how to verify the causes, and describe how to correct</td>
<td>• Lesson Lab Topic: Case 5</td>
</tr>
<tr>
<td>specific errors.</td>
<td>• Van de Walle Chapter 4</td>
</tr>
<tr>
<td>Describe a variety of techniques for encouraging curiosity towards</td>
<td>• Lesson Lab Topic: Case 1</td>
</tr>
<tr>
<td>mathematics for students in grades 5-6, 7-9, and 9-12.</td>
<td>• Van de Walle Chapter 3</td>
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<td></td>
<td>• Lesson Lab Topic: Case 2</td>
</tr>
<tr>
<td></td>
<td>• Lesson Lab Topic: Case 3</td>
</tr>
<tr>
<td></td>
<td>• Van de Walle Chapter 23</td>
</tr>
<tr>
<td></td>
<td>• Lesson Lab Topic: Case 4</td>
</tr>
<tr>
<td>Task</td>
<td>Relevant Topics</td>
</tr>
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<td>---------------------------------------------------</td>
</tr>
</tbody>
</table>
| Describe how to use the graphing calculator and the computer in a lesson involving a given problem from grades 7-12. | MTA Task 2  
Lesson Lab Topic: Technology  
Lesson Lab Topic: Case 5  
Van de Walle Chapter 4 |
| Write a lesson plan in which the contributions of non-Western cultures to an area of mathematics are emphasized. | MTA Task 3  
Lesson Lab Topic: Case 2  
Lesson Lab Topic: Lesson Planning  
Van de Walle Chapter 6 |
| Describe how to teach students in 8th grade to determine the area of a given parallelogram. | MTA Task 4  
Lesson Lab Topic: Case 1 |
| Identify the prerequisite skills that are required to compute the area of a parallelogram. | Lesson Lab Topic: Case 1  
Lesson Lab Topic: Classroom Connections |
| Describe how to teach the concept of equivalence when working with fractions with unlike denominators. | MTA Task 5  
Lesson Lab Topic: Classroom Connections |
| Describe how to use proportional reasoning with percentage problems. | MTA Task 6 |
| Describe the relationship between student success in math and student attitudes about math. | Lesson Lab Topic: Case 3  
Lesson Lab Topic: Disposition & Attitudes  
Van de Walle Chapter 4  
Van de Walle Chapter 7  
Lesson Lab Topic: Case 5 |
| List and describe a variety of problem solving techniques that can be used to encourage flexibility and persistence in solving mathematics problems. | MTA Task 1  
Lesson Lab Topic: Problem Solving  
Van de Walle Chapter 4  
Lesson Lab Topic: Case 1  
Van de Walle Chapter 3  
Lesson Lab Topic: Case 3  
Van de Walle Chapter 23  
Lesson Lab Topic: Case 4  
Lesson Lab Topic: Disposition & Attitudes |
| Describe the prerequisite skills and concepts a student should understand before being introduced to problems in which they divide a decimal number by a decimal number. | • Van de Walle Chapter 4  
• Van de Walle Chapter 7 |
| Describe how you would teach students to use given data to predict the population of the U.S. in 2010 and 2020 and discuss situations that might affect the growth rate of the population. | • MTA Task 7  
• Lesson Lab Topic: Classroom Connections  
• Van de Walle Chapter 21 |
| Discuss the concept of truncating and rounding decimal numbers, making clear what each technique is and describing their place in the secondary curriculum. | • Lesson Lab Topic: Problem Solving  
• Van de Walle Chapter 4 |
| Describe the steps used to teach the formula for circumference of a circle. | • Lesson Lab Topic: Classroom Connections  
• Lesson Lab Topic: Case 2 |
| Identify technological tools that would be used to assist students in understanding a given problem type. | • Lesson Lab Topic: Technology |
| Identify examples of probability problem types in each of the grades 7-9. | • Lesson Lab Topic: Case 4 |
| List the steps used to teach students how to find the probability of obtaining four heads when flipping a coin four times. | • Lesson Lab Topic: Case 4 |
| Describe how to solve a given problem that requires the calculation of a probability. | • MTA Task 8  
• Lesson Lab Topic: Case 4 |
| Teach a multi-step math problem from the secondary mathematics curriculum | • Lesson Lab Topic: Case 1  
• Lesson Lab Topic: Case 5 |
using the effective mathematics teaching model.

| Describe how to provide students with opportunities to solve a problem that is structurally similar to another given problem. | • Lesson Lab Topic: Case 3  
• Lesson Lab Topic: Case 4  
• Lesson Lab Topic: Case 5  
• Van de Walle Chapter 4 |
| Describe effective instruction when students are correct but uncertain, by asking students to describe procedures, rules and/or definitions they employed to arrive at the solution. | • MTA Task 9  
• Lesson Lab Topic: Case 1  
• Lesson Lab Topic: Case 2 |
| Identify errors that are likely to occur in specific areas of mathematics. | • Lesson Lab Topic: Case 2  
• Lesson Lab Topic: Case 3 |
| Identify errors in student responses to mathematics problems. | • Lesson Lab Topic: Problem Solving  
• Van de Walle Chapter 4  
• Lesson Lab Topic: Case 2 |
| Analyze errors to detect patterns that reflect misunderstandings and misconceptions in math. | • Lesson Lab Topic: Problem Solving  
• Van de Walle Chapter 4  
• Lesson Lab Topic: Classroom Connections  
• Lesson Lab Topic: Case 2 |
| Specify procedures for correcting misunderstandings and misconceptions that result in error patterns. | • Lesson Lab Topic: Case 1  
• Lesson Lab Topic: Case 2 |
| Discuss how to teach English language content-based reading and writing skills to all students. |