

**Master of Science in Teaching Specialization in  
Middle School Mathematics Education**

**Assessment #2 Written and Oral Projects and Reports**

**MATH 526 Take-Home Exam 2**

**and**

**MATH 526 Take-Home Exam 2:  
Program Standards and Performance Indicators**

- ① Prove Theorem 11 (Part II)
- ② Prove Theorem 14 (Part II)
- ③ a) Find the prime factorizations of each of 336 and 1584 and use them to find  $\gcd(336, 1584)$ .  
 b) Use the Euclidean algorithm to find  $\gcd(336, 1584)$  and to write it as a linear combination of 336 and 1584.
- ④ Suppose that  $g(x)$  is a monic polynomial of degree 2 in  $F[x]$ , and that  $g(x)$  has exactly one root  $c$  in  $F$ . Find the irreducible factors of  $g(x)$  and write  $g(x)$  as a product of monic irreducibles.

- ⑤ Let  $\triangle ABC$  be in  $E, H,$  or  $S$ . Prove that  

$$AB = AC \iff m\angle ACB = m\angle ABC.$$

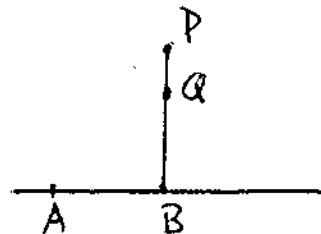
(Hint: Both proofs involve showing that  $\triangle ABC \cong \triangle ACB$ . No other points or lines need be introduced.)

- ⑥ Let  $\angle ACD$  be an exterior angle of  $\triangle ABC$ . Compare  $m\angle ACD$  with  $m\angle ABC + m\angle BAC$  (larger, smaller, equal?) in each of the cases  $E, H, S$ . Explain using results from the course.

- ⑦ Let  $P$  be a pole for the line  $\overleftrightarrow{AB}$  on  $S$ .  
 Let  $Q$  be a point in  $\overline{PB}$ .

Answer TRUE or FALSE, and explain, for each of:

- a)  $m\angle PAB = 90$
- b)  $m\angle PAQ + m\angle QAB = 90$
- c)  $QA = QB$
- d)  $\epsilon(APB) = \epsilon(AQB)$  (excess)



## Assessment #2 Written and Oral Projects and Reports

### Master of Science in Teaching Specialization in Middle School Mathematics Education MATH 526 Take-Home Exam 2: Program Standards and Performance Indicators

#### Item 1

##### Knowledge of Reasoning and Proof

- Develop and evaluate mathematical arguments and proofs
- Select and use various types of reasoning and methods of proof

##### Knowledge of Mathematical Communication

- Use the language of mathematics to express ideas precisely
- Organize mathematical thinking through communication

##### Knowledge of Mathematical Connections

- Recognize and use connections among mathematical ideas

##### Knowledge of Different Perspectives on Algebra

- Explore, analyze, and represent patterns, relations, and functions
- Represent and analyze mathematical structures
- Investigate equality, equations, and proportional relationships

#### Item 2

##### Knowledge of Reasoning and Proof

- Develop and evaluate mathematical arguments and proofs
- Select and use various types of reasoning and methods of proof

##### Knowledge of Mathematical Communication

- Use the language of mathematics to express ideas precisely
- Organize mathematical thinking through communication

##### Knowledge of Mathematical Connections

- Recognize and use connections among mathematical ideas

##### Knowledge of Different Perspectives on Algebra

- Explore, analyze, and represent patterns, relations, and functions
- Represent and analyze mathematical structures
- Investigate equality, equations, and proportional relationships

#### Item 3

##### Knowledge of Mathematical Problem Solving

- Apply and adapt a variety of appropriate strategies to solve problems
- Build new mathematical knowledge through problem solving

##### Knowledge of Mathematical Connections

- Recognize and use connections among mathematical ideas

##### Knowledge of Number and Operation

- Develop the mathematics that underlies the procedures used for operations involving whole numbers, integers, and rational numbers
- Use properties involving number and operations, mental computation, and computational estimation
- Apply the fundamental ideas of number theory

##### Knowledge of Different Perspectives on Algebra

- Explore, analyze, and represent patterns, relations, and functions
- Represent and analyze mathematical structures
- Investigate equality, equations, and proportional relationships

#### Item 4

##### Knowledge of Mathematical Problem Solving

- Apply and adapt a variety of appropriate strategies to solve problems

#### Knowledge of Reasoning and Proof

- Select and use various types of reasoning and methods of proof

#### Knowledge of Mathematical Communication

- Use the language of mathematics to express ideas precisely
- Organize mathematical thinking through communication

#### Knowledge of Different Perspectives on Algebra

- Explore, analyze, and represent patterns, relations, and functions
- Represent and analyze mathematical structures
- Investigate equality, equations, and proportional relationships

### Item 5

#### Knowledge of Reasoning and Proof

- Develop and evaluate mathematical arguments and proofs
- Select and use various types of reasoning and methods of proof

#### Knowledge of Mathematical Communication

- Use the language of mathematics to express ideas precisely
- Organize mathematical thinking through communication

#### Knowledge of Mathematical Connections

- Recognize and use connections among mathematical ideas

#### Knowledge of Geometries

- Demonstrate knowledge of core concepts and principles of Euclidean geometry in two and three dimensions.
- Exhibit knowledge of informal proof
- Build and manipulate representations of two- and three-dimensional objects and perceive an object from different perspectives
- Analyze properties and relationships of geometric shapes and structures
- Apply transformation and use congruence, similarity, and line or rotational symmetry

### Item 6

#### Knowledge of Problem Solving

- Apply and adapt a variety of appropriate strategies to solve problems
- Build new mathematical knowledge through problem solving

#### Knowledge of Reasoning and Proof

- Develop and evaluate mathematical arguments and proofs
- Select and use various types of reasoning and methods of proof

#### Knowledge of Mathematical Communication

- Use the language of mathematics to express ideas precisely
- Organize mathematical thinking through communication

#### Knowledge of Mathematical Connections

- Recognize and use connections among mathematical ideas

#### Knowledge of Geometries

- Demonstrate knowledge of core concepts and principles of Euclidean geometry in two and three dimensions.
- Exhibit knowledge of informal proof
- Build and manipulate representations of two- and three-dimensional objects and perceive an object from different perspectives
- Analyze properties and relationships of geometric shapes and structures

### Item 7

#### Knowledge of Problem Solving

- Apply and adapt a variety of appropriate strategies to solve problems
- Build new mathematical knowledge through problem solving

#### Knowledge of Reasoning and Proof

- Develop and evaluate mathematical arguments and proofs
- Select and use various types of reasoning and methods of proof

#### Knowledge of Mathematical Communication

- Use the language of mathematics to express ideas precisely
- Organize mathematical thinking through communication

#### Knowledge of Mathematical Connections

- Recognize and use connections among mathematical ideas

#### Knowledge of Geometries

- Demonstrate knowledge of core concepts and principles of Euclidean geometry in two and three dimensions.
- Exhibit knowledge of informal proof
- Build and manipulate representations of two- and three-dimensional objects and perceive an object from different perspectives
- Analyze properties and relationships of geometric shapes and structures