LESSON PLAN
(Lecture 1 dan 2)

1. Faculty : Mathematics and Natural Sciences
2. Study Program : Mathematics Education
3. Course name/code : Number Theory & MAT312
4. UOC : Theory: 2 uoc ; Practicum: 0 uoc
5. Semester : 2; Time Allocation: 100 minutes/lecture
6. Basic of Competence : Understand of principle of mathematical induction and binomial theorem and related theorems and apply these to problem solving
7. Indicator of achievement :
   Lecture 1. Performing proof of mathematical statements using principal of induction
   Lecture 2.
   a. Applying binomial theorem to determine coefficients within raised two-term algebraic forms
   b. Performing proof of mathematical statements using binomial theorem
8. Topic/Section of topic : Principle of mathematical induction and binomial theorem
9. Lesson Activity : 

Lecture 1

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<th>Steps</th>
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<th>Time Allocation</th>
<th>Method</th>
<th>Media</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>-Informing syllabus -Making an agreement of lecture contract</td>
<td>20 minutes</td>
<td>Discussion</td>
<td>worksheet</td>
<td>A: 3 - 17</td>
</tr>
<tr>
<td>Main activities</td>
<td>-Recalling how to solve problem by induction or trial and check -Discussing principle of mathematical induction -Solving proof problems using principle of induction</td>
<td>70 minutes</td>
<td>Discussion</td>
<td>Excercise</td>
<td></td>
</tr>
<tr>
<td>Summing</td>
<td>-Wrapping up the use</td>
<td>10 minutes</td>
<td>Ask</td>
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</tbody>
</table>
of principle of mathematical inducation
- Informing problems to solve
- Informing the next topic is binomial theorem

**Lecture 2**

<table>
<thead>
<tr>
<th>Steps</th>
<th>Description</th>
<th>Time Allocation</th>
<th>Method</th>
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<th>Reference</th>
</tr>
</thead>
</table>
| Introduction   | - Asking students’ difficulty on solving problems related to induction principles  
- Recalling combination cases  
- Recalling a raised two-term algebraic expression | 15 minutes      | Discussion | worksheet | A: 18 – 31 |
| Main activities| - Discussing the proof of binomial theorem and related theorems (5 theorems)  
- Giving examples how to use theorem into problem solution and giving some problems to discuss | 80 minutes      | Discussion | Excercise |
| Summing up     | - Drawing conclusion on the use of binomial theorem  
- Informing the next topic | 5 minutes       | Ask       |           |             |

10. In Class Assessment : Participation or activeness in discussion

Yogyakarta, 15 Agustus 2009
Lecturer,

Endah Retnowati, M.Ed.
NIP. 19801228 200212 2 003
LESSON PLAN  
(Lecture 3, 4 and 5)

1. Faculty : Mathematics and Natural Sciences  
2. Program : Mathematics Education  
3. Course name/Code : Number Theory & MAT312  
4. Unit of Credit : Teori: 2 uoc, Praktik: 0 uoc  
5. Semester dan Time Allocation : Sem: 2, Time Allocation: 100 minutes/lecture  
6. Basic of Competence : Explaining divisibility, GCD and LCM and calculating GCD and LCM of integers  
7. Indicator of Achievement :  
   Lecture 3. Using divisibility to solve problems  
   Lecture 4. Determining GCD  
   Lecture 5. Determining LCM  
8. Topic/Section Topic : Divisibility  
9. Lecture Activity :

Lecture 3

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<thead>
<tr>
<th>Steps</th>
<th>Description</th>
<th>Time Allocation</th>
<th>Method</th>
<th>Media</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Introduction        | -Asking students’ difficulty on solving problems related to binomial theorem  
                      | -Recalling the concept of division of integers, to go further to the concept of divisibility | 15 minutes      | Discussion | worksheet | A: 33 – 37 |
| Main activities     | -Exposing the definition of divisibility  
                      | -Solving problems related to divisibility                                     | 80 minutes      | Individual work & presentation  
                      |                                                     |                 | Discussion Excercise |
### Lecture 4

<table>
<thead>
<tr>
<th>Steps</th>
<th>Description</th>
<th>Time Allocation</th>
<th>Method</th>
<th>Media</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>- Recalling the use of GCD concept learned at primary school</td>
<td>20 minutes</td>
<td>Discussion</td>
<td>worksheet</td>
<td>A: 38 – 49</td>
</tr>
<tr>
<td></td>
<td>- Giving problems of GCD of hundred numbers</td>
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<tr>
<td>Main activities</td>
<td>- Discussing the definition of GCD for</td>
<td>75 minutes</td>
<td>Discussion</td>
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<tr>
<td></td>
<td>- Discussing theorems related to GCD</td>
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<tr>
<td></td>
<td>- Solving problems</td>
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<tr>
<td>Summing up</td>
<td>- Wrapping up the GCD theorems</td>
<td>5 minutes</td>
<td>Ask</td>
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<tr>
<td></td>
<td>- Informing the following topic, which is LCM</td>
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### Lecture 5

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<th>Method</th>
<th>Media</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>- Recalling the use of LCM concept learned at primary school</td>
<td>15 minutes</td>
<td>Discussion</td>
<td>Worksheet</td>
<td>A: 49 – 54</td>
</tr>
<tr>
<td></td>
<td>- Giving problems of LCM of hundred numbers</td>
<td></td>
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<tr>
<td>Main activities</td>
<td>- Discussing the definition of LCM for</td>
<td>80 minutes</td>
<td>Discussion</td>
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<tr>
<td></td>
<td>- Discussing theorems related to LCM</td>
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</tbody>
</table>
| Summing up       | - Discussing theorems related to LCM  
|                 | - Solving problems  
|                 | - Wrapping up the LCM theorems  
|                 | - Informing the following topic, which is System of Numerical Basis | 5 minutes | Ask |

10. In Class Assessment : Participation or activeness in discussion

Yogyakarta, 15 Agustus 2009
Lecturer,

Endah Retnowati, M.Ed.
NIP. 19801228 200212 2 003
Lampiran-2

LESSON PLAN
(Lecture 6)

1. Faculty : Mathematics and Natural Sciences
2. Program : Mathematics Education
3. Course/Kode : Number Theory & MAT312
4. Unit of Credit : Teori: 2 uoc, Praktik: 0 uoc
5. Semester dan Time Allocation : Sem: 2, Time Allocation : 100 minutes/lecture
6. Basic of Competence : Representing integer on its basis used in system of position and canonic form
7. Indicator of Achievement :
   a. Changing representation of an integer on particular basis
   b. Determining results of operations of integers with non-decimal basis
8. Topic/Section Topic : Numerical Basis
9. Lecture Activity :

<table>
<thead>
<tr>
<th>Steps</th>
<th>Description</th>
<th>Time Allocation</th>
<th>Method</th>
<th>Media</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>-Recalling numerical systems commonly use in daily life</td>
<td>20 minutes</td>
<td>Discussion</td>
<td>Worksheet</td>
<td>A: 55 – 68</td>
</tr>
<tr>
<td></td>
<td>-Recalling numerical bases learned at secondary schools</td>
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<tr>
<td>Main activities</td>
<td>-Students discuss numerical bases and how to convert numerics into different base as well as how to do operation on non-decimal basis</td>
<td>75 minutes</td>
<td>Discussion</td>
<td>Excercise</td>
<td></td>
</tr>
<tr>
<td>Summing up</td>
<td>-Wrapping up</td>
<td>5 minutes</td>
<td>Ask</td>
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<tr>
<td></td>
<td>- Informing the next topic</td>
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10. In Class Assessment : Participation or activeness in discussion

Yogyakarta, 15 Agustus 2009
Lecturer,
Endah Retnowati, M.Ed. NIP. 19801228 200212 2 003
LESSON PLAN
(Pertemuan 7)

1. Faculty : Mathematics and Natural Sciences
2. Program Studi : Mathematics Education
3. Course/Kode : Number Theory & MAT312
4. Unit of Credit : Teori: 2 uoc, Praktik: 0 uoc
5. Semester dan Time Allocation : Sem: 2, Time Allocation: 100 minutes/lecture
6. Basic of Competence : Understanding prime numbers and unique factorization
7. Indicator of Achievement :
   a. Testing prime number
   b. Determining prime factors and applying in problem solving
8. Topic/Section Topic : Prime factorisation
9. Lecture Activity :
10.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Description</th>
<th>Time Allocation</th>
<th>Method</th>
<th>Media</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Introduction     | -Recalling the meaning of factor  
                    -Asking the factors of an integer  
                    -Recalling first prime numbers and composit numbers | 10 minutes      | Discussion | Worksheet | A: 69 – 86 |
|                  |                                                                              |                 |            |          |           |
| Main activities  | -Discussing prime factors of an integer  
                    -Discussion the use of prime factorisation to determine LCM and GCD  
                    -Discussion on Euclides Theorem  
                    -Solving proof problems related to prime number | 85 minutes      | Discussion | Excercise |           |
| Summing up       | -Wrapping up about prime number and prime                                    | 5 minutes       | Ask        |          |           |
11. In Class Assessment : Participation or activeness in discussion

Yogyakarta, 15 Agustus 2009
Lecturer,

Endah Retnowati, M.Ed.
NIP. 19801228 200212 2 003
LESSON PLAN
(Lecture 8 dan 9)

1. Faculty : Mathematics and Natural Sciences
2. Program : Mathematics Education
3. Course/Kode : Number Theory & MAT312
4. Unit of Credit : Teori: 2 uoc, Praktik: 0 uoc
5. Semester dan Time Allocation : Sem: 2, Time Allocation : 100 minutes/lecture
6. Basic of Competence : Explaining congruence concept and applying the concept to linear congruency, Diophantine equation and related problems
7. Indicator of Achievement :
   - Lecture 8. Explain definition and properties of congruences and implement these to problem solving and Diophantine equation
   - Lecture 9. Solving linear congruences and linear congruence systems
8. Topic/Section Topic : Congruences
9. Lecture Activity :

**Lecture 8**

<table>
<thead>
<tr>
<th>Steps</th>
<th>Description</th>
<th>Time Allocation</th>
<th>Method</th>
<th>Media</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>-Recalling the concept of divisibility of an integer</td>
<td>15 minutes</td>
<td>Discussion</td>
<td>Worksheet</td>
<td>A: 87 – 123</td>
</tr>
</tbody>
</table>
| Main activities| -Explaining the definition of congruence
-Students individually solving congruence problems and problem solving on number operation with congruency, and the show it up in the front | 80 minutes      | Discussion | Excercise |           |
| Summing up     | -Wrapping up the notation and definition of congruence
-Informing the next | 5 minutes       | Ask        |           |           |
Lecture 9

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<thead>
<tr>
<th>Steps</th>
<th>Description</th>
<th>Time Allocation</th>
<th>Method</th>
<th>Media</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>-Asking the solution of a two congruency problems</td>
<td>10 minutes</td>
<td>Discussion</td>
<td>Worksheet</td>
<td>A: 123 – 135</td>
</tr>
<tr>
<td>Main activities</td>
<td>-Explaining linear congruences</td>
<td>85 minutes</td>
<td>Discussion</td>
<td>Excercise</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Discussion on how to solve linear congruences</td>
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<tr>
<td></td>
<td>-Discussion on Diophantine’s equation</td>
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<tr>
<td></td>
<td>-Explaining system of linear congruences</td>
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<td></td>
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<tr>
<td></td>
<td>-Discussion on how to solve system of linear congruences</td>
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</tr>
<tr>
<td>Summing up</td>
<td>-Drawing conclusion on the general procedure to solve congruences</td>
<td>5 minutes</td>
<td>Ask</td>
<td></td>
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<tr>
<td></td>
<td>-Informing the next meeting is a written examination</td>
<td></td>
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</tbody>
</table>

10. In Class Assessment : Participation or activeness in discussion

Yogyakarta, 15 Agustus 2009
Lecturer,

Endah Retnowati, M.Ed.
NIP. 19801228 200212 2 003
LESSON PLAN
(Week 10)

1. Faculty : Mathematics and Natural Sciences
2. Program : Mathematics Education
3. Course/Kode : Number Theory & MAT312
4. Unit of Credit : Teori: 2 uoc, Praktik: 0 uoc
5. Semester dan Time Allocation : Sem: 2, Time Allocation: 100 minutes/lecture
6. Basic of Competence : 
7. Indicator of Achievement : 
8. Topic/Section Topic to Lecture 9 (Congruences) : Lecture 1 (Principle of Mathematical Induction)
9. Lecture Activity : Mid-Term Exam (No Lecture)
10. Assessment : Exam Score

Yogyakarta, 15 Agustus 2009
Lecturer,

Endah Retnowati, M.Ed.
NIP. 19801228 200212 2 003
1. Faculty: Mathematics and Natural Sciences
2. Program: Mathematics Education
3. Course/Kode: Number Theory & MAT312
4. Unit of Credit: Teori: 2 uoc, Praktik: 0 uoc
5. Semester dan Time Allocation: Sem: 2, Time Allocation: 100 minutes/lecture
6. Basic of Competence: Explaining fermat’s theorem, wilson’s theorem and apply to problem solving
7. Indicator of Achievement:
   a. Performing proof of fermat’s theorem and apply the theorem in problem solving
   b. Performing proof of wilson’s theorem and apply the theorem in problem solving
   c. Testing prime numbers using these theorems
8. Topic/Section Topic: Fermat’s dan Wilson’s Theorem
9. Lecture Activity:

<table>
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<tr>
<th>Steps</th>
<th>Description</th>
<th>Time Allocation</th>
<th>Method</th>
<th>Media</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>-Recalling number sequence of modulo m and least resydu sequence modulo m</td>
<td>15 minutes</td>
<td>Discussion</td>
<td>Worksheet</td>
<td>A: 136 – 153</td>
</tr>
<tr>
<td>Main activities</td>
<td>-Discussion on: The proof of Fermat’s theorem The use of the theorem to determine composite numbers and related problems -Discussion on: The proof of wilson’s theorem The use of the theorem to solve congruences and other problems</td>
<td>80 minutes</td>
<td>Discussion</td>
<td>Exercise</td>
<td></td>
</tr>
<tr>
<td>Summing up</td>
<td>-Drawing the use of the theorems -Informing the next topic is arithmetic functions</td>
<td>5 minutes</td>
<td>Ask</td>
<td></td>
<td></td>
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</tbody>
</table>
10. In Class Assessment : Participation or activeness in discussion

Yogyakarta, 15 Agustus 2009
Lecturer,

Endah Retnowati, M.Ed.
NIP. 19801228 200212 2 003
Lampiran-2

LESSON PLAN
(Lecture 12 dan 13)

1. Faculty : Mathematics and Natural Sciences
2. Program : Mathematics Education
3. Course/Kode : Number Theory & MAT312
4. Unit of Credit : Teori: 2 uoc, Praktik: 0 uoc
5. Semester dan Time Allocation : Sem: 2, Time Allocation : 100 minutes/lecture
6. Basic of Competence : Explaining arithmetic functions and solve these to solve problems
7. Indicator of Achievement :
   Lecture 12
   a. Giving example of τ (tau) function and applying the theorem in problem solving
   b. Giving example of σ (sigma) function and applying the theorem in problem solving
   Lecture 13
   c. Giving example of Mobius (μ = mu) and applying the theorem in problem solving
   d. Giving example of greatest integer function and applying the theorem in problem solving
8. Topic/Section Topic : Arithmetical Functions
9. Lecture Activity :

Lecture 12

<table>
<thead>
<tr>
<th>Steps</th>
<th>Description</th>
<th>Time Allocation</th>
<th>Method</th>
<th>Media</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>-Recalling divisibility</td>
<td>10 minutes</td>
<td>Discussion</td>
<td>Worksheet</td>
<td>A: 154 – 169</td>
</tr>
<tr>
<td>Main activities</td>
<td>-Describing the definitions of tau function and related theorem</td>
<td>85 minutes</td>
<td>Discussion</td>
<td>Excercise</td>
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<tr>
<td></td>
<td>-Discussion on function of sigma, double function and giving examples as well as solving problems</td>
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<tr>
<td>Summing up</td>
<td>-Drawing the kinds of arithmetic functions</td>
<td>5 minutes</td>
<td>Ask</td>
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</table>
Lecture 13

<table>
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<tr>
<th>Steps</th>
<th>Description</th>
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<th>Method</th>
<th>Media</th>
<th>Reference</th>
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</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>-Recalling square numbers and unsquared numbers</td>
<td>10 minutes</td>
<td>Discussion</td>
<td>Worksheet</td>
<td>A: 169 – 184</td>
</tr>
<tr>
<td>Main activities</td>
<td>-Explaining the definition of function of mobius</td>
<td>85 minutes</td>
<td>Discussion</td>
<td>Excercise</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Discussion on formula of inverse of mobius, function of greatest integer</td>
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<td></td>
<td>and applying arithmetic functions on problem solving</td>
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<tr>
<td>Summing up</td>
<td>-Drawing conclusion of function of mobius and greatest integer</td>
<td>5 minutes</td>
<td>Ask</td>
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<tr>
<td></td>
<td>-Informing the next topic is Euler’s theorem</td>
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10. In Class Assessment : Participation or activeness in discussion

Yogyakarta, 15 Agustus 2009
Lecturer,

Endah Retnowati, M.Ed.
NIP. 19801228 200212 2 003
LESSON PLAN
(Lecture 14)

1. Faculty : Mathematics and Natural Sciences
2. Program Studi : Mathematics Education
3. Course/Kode : Number Theory & MAT312
4. Unit of Credit : Teori: 2 uoc, Praktik: 0 uoc
5. Semester dan Time Allocation : Sem: 2, Time Allocation : 100 minutes/lecture
6. Basic of Competence : Explain phi function and Euler theorem and apply in problem solving
7. Indicator of Achievement :
   a. Solving problems related to phi function
   b. Prove Euler function and apply the theorem in problem solving
8. Topic/Section Topic : Phi Function and Euler’s Theorem
9. Lecture Activity :

<table>
<thead>
<tr>
<th>Steps</th>
<th>Description</th>
<th>Time Allocation</th>
<th>Method</th>
<th>Media</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>-Recalling least resydu of modulo m of an integer</td>
<td>5 minutes</td>
<td>Discussion</td>
<td>Worksheet</td>
<td>A: 185 – 206</td>
</tr>
<tr>
<td>Main activities</td>
<td>-Menjelaskan definisi sistem residu sederhana</td>
<td>90 minutes</td>
<td>Discussion</td>
<td>Excercise</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Describing the definition of function of phi euler</td>
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<tr>
<td></td>
<td>-Discussion on the proof of Euler’s theorem</td>
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<tr>
<td></td>
<td>-Solving related problems</td>
<td></td>
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</tr>
<tr>
<td>Summing up</td>
<td>-Drawing the application of Euler’s theorem</td>
<td>5 minutes</td>
<td>Ask</td>
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</tr>
</tbody>
</table>
10. In Class Assessment: Participation or activeness in discussion  
Yogyakarta, 15 Agustus 2009  
Lecturer,  

Endah Retnowati, M.Ed.  
NIP. 19801228 200212 2 003
Lampiran-2

LESSON PLAN
(Lecture 15 dan 16)

1. Faculty : Mathematics and Natural Sciences
2. Program : Mathematics Education
3. Course/Kode : Teori Bilangan & MAT312
4. Unit of Credit : Teori: 2 uoc, Praktik: 0 uoc
5. Semester dan Time Allocation : Sem: 2, Time Allocation : 100 minutes/lecture
6. Basic of Competence : Determine primitive root and index and apply in problem solving
7. Indicator of Achievement :
   
   **Lecture 15**
   a. Determine order of an integer modulo m
   b. Solving problems related to primitive roots

   **Lecture 16**
   c. Determine indices of integers and solve related problems

8. Topic/Section Topic : Primitive Roots and Indices
9. Lecture Activity :

**Lecture 15**

<table>
<thead>
<tr>
<th>Steps</th>
<th>Description</th>
<th>Time Allocation</th>
<th>Method</th>
<th>Media</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>-Recalling Euler’s theorem</td>
<td>15 minutes</td>
<td>Discussion</td>
<td>Worksheet</td>
<td>A: 207 – 227</td>
</tr>
<tr>
<td>Main activities</td>
<td>-Describing the definition of order and related theorem</td>
<td>80 minutes</td>
<td>Discussion</td>
<td>Excercise</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Describing the definition of primitive root</td>
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</tr>
<tr>
<td></td>
<td>-Discussion on the proof of Lagrange’s theorem</td>
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<tr>
<td></td>
<td>-Determining the primitive roots or the number of primitive roots of an integer</td>
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</tbody>
</table>
## Lecture 16

<table>
<thead>
<tr>
<th>Steps</th>
<th>Description</th>
<th>Time Allocation</th>
<th>Method</th>
<th>Media</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction</strong></td>
<td>-Asking the primitive roots of an integer</td>
<td>5 minutes</td>
<td>Discussion</td>
<td>Worksheet</td>
<td>A: 228 – 237</td>
</tr>
<tr>
<td><strong>Main activities</strong></td>
<td>-Describing the definition and properties of index</td>
<td>90 minutes</td>
<td>Discussion</td>
<td>Excercise</td>
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<td></td>
<td>-Creating a table of indices</td>
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<td></td>
<td>-Using indices to solve congruence problems</td>
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<tr>
<td><strong>Summing up</strong></td>
<td>-Wrapping up the concept of index</td>
<td>5 minutes</td>
<td>Ask</td>
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<td></td>
<td>-Informing the material cover in the final examination</td>
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10. In Class Assessment : Participation or activeness in discussion

Yogyakarta, 15 Agustus 2009
Lecturer,

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