TEXAS A&M UNIVERSITY COMMERCE
COLLEGE OF SCIENCE, AGRICULTURE AND ENGINEERING
DEPARTMENT OF MATHEMATICS

MATH 500-01W Discrete Mathematics
COURSE SYLLABUS: Fall 2014

Instructor: Tingxiu Wang, Ph.D.
Office Phone: 903-886-5958 **Office Hours:** Virtual (eCollege) and on Campus
Email: tingxiu.wang@tamuc.edu M-F 10am-11am or by appointment
Can email the instructor through eCollege.

Office: Binnion 306
Faculty Website: http://faculty.tamuc.edu/twang/

Instructor Communication Policy: Student course-related questions or concerns are answered usually within 24 hours during week days (M-F).

Class Meeting Time: Regularly log into our online course
Class Location: eCollege (Pearson Learning Studio)

Important Date: Also see Appendix B
Test 1: Friday, Sept. 26, 2014
Test 2: Wednesday, October 22, 2014
Test 3: Wednesday, November 19, 2014
Project Due: 11:59 PM, Monday, Dec. 8, 2014

COURSE INFORMATION

Course: MATH 500, Discrete Mathematics, 4 credit hours

Course Description: Study of formal logic; sets; functions and relations; principle of mathematical induction; recurrence relations; and introductions to elementary number theory; counting (basic combinatorics); asymptotic complexity of algorithms; graph theory; and NPcompleteness. Prerequisite: Consent of the instructor.

Required Text: We will use the following two books published by the American Mathematical Society and available for purchase through the society's online bookstore.

- *A Discrete Transition to Advanced Mathematics* by Bettina Richmond and Thomas Richmond, published by the American Mathematical Society (ISBN-13:978-0821847893) http://www.ams.org/bookstore?fn=20&arg1=mathcomb&ikey=AMSTEXT-3.
  **This textbook has a free student solutions manual, which can be downloaded from the same website.

- *Discrete Mathematics in the Schools*, edited by J. Rosenstein, D. Franzblau, and F. Roberts, ISBN-13: 978-0821804483.
  http://www.ams.org/bookstore?fn=20&arg1=mathcomb&ikey=DIMACS-36-S

Required Articles:

- Xing Yuan, Mathematical Fallacy Proofs, MIT student projects.
  Available for free download from MIT Open Courseware:
  http://ocw.mit.edu/courses/mathematics/18-304-undergraduate-seminar-in-discrete-mathematics-spring-2006/projects/fallacy_yuan.pdf

- Keith Hirst, CLASSIFYING STUDENTS' MISTAKES IN CALCULUS
  2nd International Conference on the Teaching of Mathematics Proceedings, Greece 2002
  Available for free download from:
  http://www.math.uoc.gr/~ictm2/Proceedings/pap31.pdf

Student Learning Outcomes:

At the end of this course students will be able to

- Prove or solve selected problems in theories and applications of Combinatorics, Functions, Graph, Logic, Numbers, and Sets.
- Develop some examples of discrete mathematics used in Grade 7-12 classes.
- Analyze some mathematics mistakes made by students of Grades 7-12.

COURSE REQUIREMENTS

Evaluation methods can include grading homework, chapter or major tests, quizzes, and computer assignments.

Attendance: Online attendance is required. Online attendance in this course is determined by your log in and participation in our course in eCollege. It is critical you keep up with the pace of this class. Once you are behind the pace, you can get lost easily and have difficulty to catch up. You are strongly suggested to study ahead of our pace.

Students are required to participate in the discussion areas, watching video lectures and submission of required materials within our course in eCollege.

Glossary: This course has numerous terms. Understanding glossary is essential for this course. Thus you are required to edit a file of glossary and the explanation/definition of each glossary in the order of pages they appear. Specify the page number of each glossary. You will lose partial credit without

the explanation and page number where it appears. Discussion with your classmates is allowed, but the paper you submit must be your own work. Plagiarism is prohibited. Do not share your paper with your classmates, and do not ask your classmates for a file of glossaries.

The file of glossary must be prepared by Microsoft Word, and submitted to the Dropbox in eCollege **every week before 11:59 p.m. each Sunday, Central Time.** Glossaries are worth of 40 points.

Homework: Without doing homework, one cannot learn. Thus, homework must be done and submitted to show your study and attendance.

Homework assignments are worth of 120 points. Please see Appendix A for the list of homework assignments. They will not be graded but will be checked for how many questions are completed and if necessary work is presented. Missing questions and answers without work do not earn credit.

You may work together and discuss homework on the Student Lounge of eCollege. You may also ask your instructor in the Virtual Office. The textbook and student solutions manual have answer keys and solutions for some homework assignments.

You must submit your homework weekly, due by 11:59 p.m each Sunday, Central Time. Submit your homework to the Dropbox at eCollege. The assignment you submit must be your own work. Plagiarism is prohibited.

Extra Credit: To enhance communication and study, you are encouraged to post your correct homework solutions on **Doc Sharing** at eCollege.

When you post your paper for a homework assignment on Doc Sharing for extra credit, please use a description like, Assignment 1 on Pages 8-9, #3, 4, 9.

When you correct mistakes and errors, use a description like, "Correction on #3 of Assignment N (or Page #), posted by XYZ (name of the student)."

The first person posting a homework assignment (not one question) will receive three (3) extra points. The second person posting the same assignment will get two (2) extra points, and the third will get one (1) extra points.

All other students have a chance to earn extra points by discovering mistakes and errors in the posted papers within two days (48 hours, excluding 11:59 p.m. Friday to 11:59 p.m. Sunday Central Time) after a homework paper is posted.

Only the first student to correct mistakes and errors of a problem (not the entire assignment) will earn one point. Correspondingly, the owner of the posted paper with mistakes and errors will lose one point until losing additional three points for the entire assignment. Thus, a posted homework paper could earn -3 if too many mistake and errors are found.

The instructor determines if a mistake or error would cause one point deduction, and hence the student would earn one point for fixing the mistake and error. If no one discovers mistakes and errors after 72 hours, the instructor may go over it to find mistakes and errors, and the owner of the posted paper will lose one point for each problem until the owner loses all extra points, that is, the posted homework may get 0 but not negative points. It must be your own work for extra credit. One can earn a maximum point of 30.

Tests: There will be 3 tests. Each test is worth of 100 points. Please see Appendix B for exam coverage descriptions.

The tests must be proctored. If you cannot take a test on the Commerce campus, you need to let your instructor know the location where you want to take a test one week before the first test. A location usually is a testing center at a college or university near you. Some college and universities may charge you a fee for using the testing center. Once an agreement with the testing center is made, you will be notified. If you have questions, discuss it with your instructor immediately.

Project: You will do a course project, worth of 100 points. Please see details in Appendix C. The deadline for submitting your project is 11:59PM, Monday, Dec. 8, 2014. Submit your project to the Dropbox at eCollege.

GRADING

The maximum possible points available in this course are:

Glossary	40 points
Homework	120 points
Tests	300 points
Projects	100 points
Total	560 points

Your course grade will be based on the percentage of the points you make to the total points available in the course:

A >= 90%, B >= 80%, C >= 70% D >= 60% F < 60%.

TECHNOLOGY REQUIREMENTS

COURSE SPECIFIC

- TI-83/84 or other calculators with similar capability is highly recommended.
- Printer to print homework, quizzes and tests.
- Scanner/digital camera/cell phone that you can take pictures of your work and submit them to the Dropbox at the eCollege.
- eCollege: As a student enrolled at Texas A&M University-Commerce, you have access to eCollege. You will obtain course materials through eCollege. The course materials are only for this course. You cannot distribute the course materials without permission of the instructor. You also have an email account via myLeo - all my emails sent from eCollege (and all other university emails) will go to this account, so please be sure to check it regularly.

GENERAL eCOLLEGE REQUIREMENTS

- You will need regular access to a computer with a broadband Internet connection. The minimum computer requirements for the Epic Web Client are:
  - Any current Flash-compliant browser (e.g., Internet Explorer 7 or Firefox 3.0)
  - 512 MB of RAM, 1 GB or more preferred
  - Broadband connection required courses are heavily video intensive
  - Video display capable of high-color 16-bit display 1024 x 768 or higher resolution
- A sound card and speakers or headphones
- Current anti-virus software must be installed and kept up to date
- Some classes may have specific class requirements for additional software. These requirements will be listed on the course offerings page. Most home computers purchased within the last 3-4 years meet or surpass these requirements.
- You will need some additional free software for enhanced web browsing. Ensure that you download the free versions of the following software:
  - Adobe Reader
  - Adobe Flash Player
- At a minimum, you must have Microsoft Office 2003, XP, 2007 or Open Office. Microsoft Office is the standard office productivity software utilized by faculty, students, and staff. Microsoft Word is the standard word processing software, Microsoft Excel is the standard spreadsheet software, and Microsoft PowerPoint is the standard presentation software. Copying and pasting, along with attaching/uploading documents for assignment submission, will also be required. If you do not have Microsoft Office, you can check with the bookstore to see if they have any student copies.

TECHNICAL SUPPORT FOR eCOLLEGE

The following eCollege support options are available 24 hours a day / 7 days a week:

Help: Click on the 'Help' button on the toolbar for information regarding working with eCollege (i.e. How to submit to Dropbox, How to post to discussions etc…)

Chat Support: Click on 'Live Support' on the tool bar within your course to chat with an eCollege Representative.

Phone: 1-866-656-5511 (Toll Free) to speak with eCollege Technical Support Representative.

Email: helpdesk@online.tamuc.org to initiate a support request with eCollege Technical Support Representative.

For Specific Course Content Questions: Contact Your Instructor. Please contact your instructor via email or through the "Virtual Office."

myLeo Support

Your myLeo email address is required to send and receive all student correspondence. Please email helpdesk@tamuc.edu or call us at 903-468-6000 with any questions about setting up your myLeo email account. You may also access information at https://leo.tamuc.edu.

ACCESS AND NAVIGATION

eCollege Access and Log in Information

This course will be facilitated using eCollege, the Learning Management System used by Texas A&M University-Commerce. To get started with the course, go to: http://www.tamuc.edu/myleo.aspx.

You will need your CWID and password to log in to the course. If you do not know your CWID or have forgotten your password, contact Technology Services at 903.468.6000 or helpdesk@tamu-commerce.edu**.**

It is strongly recommended that you perform a "Browser Test" prior to the start of your course. To launch a browser test, login to eCollege, click on the 'myCourses' tab, and then select the "Browser Test" link under Support Services.

Course Navigation

Course readings, assignments and discussions will be completed /turned in through eCollege. Your grades will be available in eCollege. The course materials are only for this course. You cannot distribute the course materials without permission of the instructor

This course is presented using weekly units. Each unit contains video lectures, a discussion area, assignments, a quiz and an exam.

You should begin by reading the course syllabus, paying particular attention to the assignments and Suggested Day-by-Day Schedule, and then complete the Start Here unit.

COMMUNICATION AND SUPPORT

Interaction with Instructor: You may email and telephone your instructor. You visit your instructor at the Virtual office at eCollege. I will try to respond your email within 24 hours, Monday through Thursday.

Virtual Office: This space is set aside for students to ask course related questions. Place any questions or concerns about the course here and they will answered within 24 hours on weekdays. (It is possible that I will answer all threads during my office hours as posted on the syllabus.)

Please feel free to answer one another's questions. I will check answers (as well as questions) for correctness, but do not hesitate to respond to a posting if you feel you can answer the question thoroughly and directly.

Student Lounge: This space is for students to communicate with each other. I may visit Student Lounge and join your discussion.

Discussion Areas in Weekly Units: This space is for student questions related to the week's content.

Doc Sharing

This space is used for earning extra credit. Please see the Course Requirements section and Extra Credit heading of the course syllabus for more details. To enhance communication and study, you are encouraged to post your correct homework solutions on Doc Sharing at eCollege.

When you post your paper for a homework assignment on Doc Sharing for extra credit, please use a description like, Assignment 1 on Pages 8-9, #3, 4, 9.

When you correct mistakes and errors, use a description like, "Correction on #3 of Assignment N (or Page #), posted by XYZ (name of the student)."

Student Academic Resources

Math Lab: Free tutoring service offered by the Mathematics department (Binnion Hall Room 328). Please visit the web site for the hours of operation and more details.
http://www.tamuc.edu/academics/colleges/scienceEngineeringAgriculture/departments/mathematics/students/default.aspx

The TAMUC One Stop Shop- provides as many student resources as possible in one location.
http://www.tamuc.edu/admissions/oneStopShop/

The TAMUC Academic Success Center provides academic resources to help you achieve academic success. http://www.tamuc.edu/CampusLife/CampusServices/AcademicSuccessCenter/default.aspx

COURSE AND UNIVERSITY POLICIES AND PROCEDURES

Course Specific Policies and Procedures

Policy for Reporting Problems with eCollege

If students encounter eCollege-based problems while submitting assignments and assessments, the following procedures MUST be followed.

1. Students must report the problem to the help desk. You may reach the helpdesk at helpdesk@online.tamuc.org or 1-866-656-5511

2. Students MUST file their problem with the helpdesk and obtain a helpdesk ticket number

3. Once a helpdesk ticket number is in your possession, students should email me to advise me of the problem and to provide me with the helpdesk ticket number

4. At that time I will call the helpdesk to confirm your problem and follow up with you.

PLEASE NOTE: Your personal computer/access problems are not a legitimate excuse for filing a ticket with the help desk. You are strongly encouraged to check for compatibility of your browser BEFORE the course begins and to take the eCollege tutorial offered for students who may require some extra assistance in navigating the eCollege platform. ONLY eCollege-based problems are legitimate.

Drop Course Policy

Students are responsible for dropping themselves from the course according to University policy should this become necessary.

University Specific Policies and Procedures

ADA Statement : Students with Disabilities

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

Office of Student Disability Resources and Services
Texas A&M University-Commerce
Gee Library- Room 132
Phone (903) 886-5150 or (903) 886-5835 Fax (903) 468-8148
Email: StudentDisabilityServices@tamuc.edu

Student Conduct

Basic Tenets of Common Decency

"All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment." (Student's Guide Handbook, Policies and Procedures, Conduct.) This means that rude and/or disruptive behavior will not be tolerated.

Academic Integrity

Academic Misconduct: **http://student-rules.tamu.edu/rule20**

Aggie Honor System Rules
http://aggiehonor.tamu.edu/RulesAndProcedures/HonorSystemRules.aspx#definitions

- Misconduct in research or scholarship includes fabrication, falsification, or plagiarism in proposing, performing, reviewing, or reporting research. It does not include honest error or honest differences in interpretations or judgments of data.

  Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one's work, should the instructor request it, is sufficient grounds to initiate an academic dishonesty case.

  Academic dishonesty includes the commission of any of the following acts. This listing is not, however, exclusive of any other acts that may reasonably be called academic dishonesty. Clarification is provided for each definition by listing some prohibited behaviors.

  - **20.1.2.3.1 Cheating:**

Intentionally using or attempting to use unauthorized materials, information, notes, study aids or other devices or materials in any academic exercise. Unauthorized materials may include anything or anyone that gives a student assistance and has not been specifically approved in advance by the instructor.

Examples:

a. During an examination, looking at another student's examination or using external aids (for example, books, notes, calculators, conversation with others, or electronic devices) unless specifically allowed in advance by the instructor.
b. Having others conduct research or prepare work without advance authorization from the instructor.
c. Acquiring answers for any assigned work or examination from any unauthorized source. This includes, but is not limited to, using the services of commercial term paper companies, purchasing answer sets to homework from tutoring companies, and obtaining information from students who have previously taken the examination.
d. Collaborating with other students in the completion of assigned work, unless specifically authorized by the instructor teaching the course. It is safe to assume that all assignments are to be completed individually unless the instructor indicates otherwise; however, students who are unsure should seek clarification from their instructors.
e. Other similar acts.

Appendix A: Homework Assignments

Tip: Each homework assignment corresponds to a video lecture although a few video lectures do not have a homework assignment. After watching each video lecture, do the corresponding homework. Then watch two video lectures before doing the homework, like Assignment 1/2, 14/15, and 22/23.

Assignment and Lecture #	Problems	Due by 11:59PM of the following dates
Chapter One		
1/2	Page 7-8, #3, 4, 9	Aug. 31
3	Pages 18-20. #2, 3, 4, 10	Aug. 31
4	Pages 19-20, #6	Aug. 31
5	Use Venn diagrams to show that (1) $A\cap(B\cup C)$ (2) DeMorgan's Law: $(A\cap B)^c = A^c \cup B^c$	Sept. 7
6	Pages 20, #12, 13, 14, 16	Sept. 7
7	Pages 23, Justify your answers, #2, 4, 7(a, b, c)	Sept. 7
8/9	Pages 32-34, #1, 2, 3, 5	Sept. 14
10	Pages 33-34, 6, 7, 8, 9, 13	Sept. 14
11	Pages 38-39, #1, 2, 3	Sept. 14
12	Pages 47, #7, 10,(iv, v, vii), 11(a, c)	Sept. 14
13	Pages 46-47, 1, 2, 5, 6(b, c, d, g), 8(a)	Sept. 14
Chapter Two		
14/15	Prove that (1) The sum of any two odd integers is an even integer (2) The sum of an even integer and an odd integer is an odd integer (3) The product of an even integer and an odd integer is an even integer (4) The product of two even integers is an even integer	Sept. 14
16	Page 59, #8, and (1) Prove that |xy|=|x||y|	Sept. 21
17	Prove or disprove (1) $(x+1)^3 \geq x^3, \forall x \in R$ (2) If p is a prime number, so is p^2.	Sept. 21
18	Pages 59, #13, 14, 16, and (1) Prove that if x^2 is irrational, so is x. (2) Prove that the product of a rational number and an irrational number is an irrational number.	Sept. 21
19	Page 60, #20, 22, 23	Sept. 21
20	Page 59, #6, 9, 10, 11, 29	Sept. 21
21	Page 68, 2(b, d), 9, 11	Sept. 21
22/23	Page 75-76, 1, 2, 3, 4, 6, 8	Sept. 25
24	Page 75-76, 7, 9, 10, 11	Sept. 25

Chapter Three		
25	a. Get answers for Fact 2 and Fact 3. b. How many integers are there such that (i) $-12 \le i \le 36$ (ii) $-33 \le i \le -14$ (iii) Between -10^{30} and 10^{30}	Oct. 5
26	a. Find the values of each of the following (i) $\left\lfloor \frac{16}{47} \right\rfloor$ (ii) $\lfloor -167 \rfloor$ (iii) $\lfloor 278 \rfloor$ (iv) $\lfloor -7.32 \rfloor$ (v) $\lfloor -0.5 \rfloor$ b. Find the values of each of the following (i) $\left\lceil \frac{16}{47} \right\rceil$ (ii) $\lceil -167 \rceil$ (iii) $\lceil 278 \rceil$ (iv) $\lceil -7.32 \rceil$ (v) $\lceil -0.5 \rceil$ c. How many odd integers are there between (i) 1 and 30 (ii) 41 and 120 (iii) 31 and 97 (iv) 100 and 10000 d. How many multiples of 6 are there between (i) 0 and 120 (ii) 9 and 77 (iii) -8 and 34 (iv) -300 and 4300	Oct. 5
27	Page 86, 2, 3, 4, 5	Oct. 5
28	Page 87, 9, 17(b, c), 19, 20, 21 Hint for #19, 20, 21: proof by mathematical induction, or by cases. See Lectures 16 and 21.	Oct. 5
29	Page 86, 7(a, b, c, d), 13, 10	Oct. 5
30	Page 87, 15 (Find $\gcd(m,n)$ by two methods)	Oct. 5
31	Page 94, 1(b, d), 4, 7, 9 A. There are three methods to find $\gcd(m,n)$. Which one do you like better? Please explain	Oct. 12
32	Page 100, 1(b, d), 5, 6, 13	Oct. 12
33	Page 108, 6(a, Hint: by mathematical induction), 14(b)	Oct. 12
Chapter Four: We rearrange the topics in Sections 4.1, 4.2 and 4.3 in terms of the order of concept development. Watch video lectures first, then read the textbook for related topics as indicated in the following assignments.		
34	Read: Pages 132-136 (stop at Example 4.2.4. Do not read 4.2.4) HW, Pages 139-140, 1, 7, 8(a)	Oct. 12
35	Read: Pages 136 (Example 4.2.7)-139. Homework assignments: a. Find P(24, 3), P(14, 7), P(8, 7) b. In how many ways, can a 12-member committee choose a chairperson, vice-chairperson and a secretary? c. How many permutations can we get with digits 1, 2, 3? List all of them. d. How many permutations can we get with A, B, C, D?	Oct. 12
36	Read: a. Pages 136-137 in the order, Example 4.2.6, 4.2.5, then 4.2.4. b. Read Page 128 Definition 4.1.7, then Page 142 Theorem 4.3.2. c. Read Examples 4.1.3, 4.1.4, 4.1.5, 4.1.6 and the following paragraph. HW, Page 131, #1, 2, 3, 4, 5; Page 145, #1(a, c, d, h), 2	Oct. 12

37	Read: Page 129, from Theorem 4.1.8 to (including) Figure 4.7. Then 4.1.9. If you like you may read Pages 123-127. HW, Page 132, #7, Page 145, #3(a, b, c), 4	Oct. 19
38	Read: Section 3. HW, Page 140, #5, 8(b, 8a was assigned in Assignment 34), Page 146 #8 a. Five cards are selected from a standard deck of 52 cards. In how many ways can you get four-of-a-kind? Four-of-a-kind consists of four cards of the same denomination and one other card. For example, A-A-A-A-8 and 7-7-7-7-K are hands of four-of-a-kind.	Oct. 19
39	Read: pages 147-149 up to Example 4.4.4 (inclusive) HW, Page153, #1(b, d, f), 3, 5, 8	Oct. 19
40	Read: Pages 149-152, up to Example 4.4.9 (inclusive) HW, Page 154, #7, 11, 13, 15	Oct. 19
41	Read Section 4.5 a. Find the sample space, S, and |S| (i) Two card are selected from the red cards of a standard deck of 52 cards (ii) A student must answer three questions from a set of four questions	Oct. 19
42	Read Section 4.5 Pages 160-161, #2, 4, 6(a, c) a. The employees of a company are in the following departments: 31 in Sales, 54 in Research, 42 in Marketing, 20 in Engineering, 47 in Finance, and 58 in Production. If an employee's paycheck is lost, what is the probability that the employee is in the Research Department? b. A shipment of 12 microwave ovens contains three defective units. A vending company has ordered four of these units, and since each is identically packed, the selection will be at random. What is the probability that (i) all four units are good, (ii) exactly two units are good, and (iii) at least two units are good?	Oct. 19
43	Read Pages 163-165 Page 168, #1, 2, 8(a)	Oct. 26
44	Read Pages 166-168 Pages 168-170, #5(b, d), 6(a, d), 7, 8(b), 9	Oct. 26
45	1. Let S be a set of marbles with different colors and sizes. Define a relation between marbles by $s \sim t$ if s and t have the same size. Is $\sim$ an equivalence relation? Please explain. Let [s]={t| $t \in S$, $t \sim s$ }. What does [s] look like? 2. Let A={1, 2, 3, 4, 5, 6}. Define a relation on A by $m \sim n$ if $m-n$ is an even integer. Is $\sim$ an equivalence relation? Please explain. Let [m]={t| $t \in A$, $t \sim m$}. Find all [m]. 3. Let $A = \{n \in \mathbb{N} : n^2 < 36\}$ and R be a relation on A defined by $$R = \{(m,n) : m \equiv n \pmod 3\}$$ a. List all numbers in A. b. List all points in R. c. Specify which of the properties (R), (T), (S), (AS), and (AR) the relation	Nov. 2

<table>
<tr><td></td><td>satisfies. Is R an equivalence relation? If yes, let [m]={t| $t \in A$, $t \sim m$}, and find all [m].
4. Let $S=\{1,2,3,4\}$ and R be a relation from S to S defined by $R=\{(m,n): m+n \in S\}$. Do the same problems listed in #3.</td><td></td></tr>
<tr><td>46</td><td>Read Pages 174-175 (before 5.2.7), or read it after Lecture 48.
Page 177, #3(a, b)
1. Let $f(n)=\cos\frac{n\pi}{2}, n \in \mathbb{N}$. A relation on $\mathbb{N}$ is defined as $m \sim n$ if and only if $f(m)=f(n), \forall m,n \in \mathbb{N}$ .Prove that $\sim$ is an equivalence relation. Then find all equivalence classes.</td><td>Nov. 2</td></tr>
<tr><td>47</td><td>Read Pages 171-173
1. It is 2:00 PM now. Use congruence modulo 12 to determine what time it is after a. 9 hours; b. 17 hours; c. 28 hours; d. 17 hours.
2. Given a positive integer, p, prove that $m \equiv n$ (mod p) is an equivalence relation.
3. Find all congruence classes modulo 6, $[n]_6$.</td><td>Nov. 2</td></tr>
<tr><td>48</td><td>Read Pages 174-175 (before 5.2.7)
Page 177, #5, 6</td><td>Nov. 2</td></tr>
<tr><td>49</td><td>List numbers in $Z(6)$ and $[n]_6, n \in \mathbb{Z}$. Complete the $+_6$ and $*_6$ tables in $Z(6)$:
<table>
<tr><td>$+_6$</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>0</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
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1. Find the additive identity and multiplicative identity of $Z(6)$.
2. Find the additive inverse of each element of $Z(6)$.
3. Find the multiplicative inverse of each element of $Z(6)$.
4. Find a. $2+_6 5$; b. $2*_6 5$
5. Find x in $Z(6)$:a. $2+_6 x=0$; b. $2+_6 x=3$; c. $3+_6 x=2$
6. Find x in $Z(6)$:a. $2*_6 x=0$</td><td>Nov. 2</td></tr>
<tr><td>50</td><td>Read Pages 188-190 (before Quasiorder).
1. It is September now. What is the month after 40 months? Use the modular arithmetic notation to show your work.
2. It is Thursday now. What is the day after 136 days? Use the modular arithmetic notation to show your work.
3. Let $m,m',n,n' \in \mathbb{Z}$, and p a positive integer. Prove that if $m' \equiv m(\mathrm{mod}\ p)$ and $n' \equiv n(\mathrm{mod}\ p)$, then $m' \cdot n' \equiv m \cdot n(\mathrm{mod}\ p)$.
Page 195, #7</td><td>Nov. 2</td></tr>
<tr><td></td><td>More exercises will be added later.</td><td></td></tr>
</table>

Appendix B: Suggested Day-by-Day Schedule

This schedule gives you an idea how much you need to learn each day. You may study ahead of this schedule, but do not fall behind because it will be difficult to catch up once you get behind. We may modify this Schedule if necessary.

- Turn in your homework for each week by 11:59 PM, each Sunday, and
- Turn in your Glossary for each week by 11:59 PM, each Sunday, as well.

Week of	Monday	Tuesday	Wednesday	Thursday	Friday
Aug. 25 Week 1	• Read Syllabus • Be familiar with eCollege • Get the course materials		Section 1.1 1. Sets 2. Venn Diagrams		Section 1.2 3. Set operations 4. Laws of algebra of sets
Sept. 1 Week 2	Happy Labor Day ☺		Section 1.2 5. Proofs involving sets 6. Tree diagrams and Cartesian coordinates		Section 1.3 7. Partitions Section 1.4 8. Introduction to logic
Sept. 8 Week 3	Section 1.4 9. Logic operations 10. Tautology		Section 1.5 11. Quantifiers Section 1.6 12. Implications1 13. Implications2		Section 2.1 14. Prf techniques 1 15. Prf techniques 2
Sept. 15 Week 4	Section 2.1 16. Prf techniques 3 17. Prf techniques 4 18. Prf techniques 5		Section 2.1 19. Prf techniques 6 20. Prf techniques 7		Section 2.2 21. Math Induction
Sept. 22 Week 5	Section 2.3 22. Pigeonhole principle 1 23. Pigeonhole principle 2		Section 2.4 24. Pigeonhole principle 3 Review for Test 1		Test 1: covers Ch. 1, 2
Sept. 29 Week 6	Section 3.1 25. Number Theory: Intro. 26. Number theory: floor and ceiling functions		Section 3.1 27. Divisibility (1) 28. Divisibility (2)		Section 3.1 29. Prime numbers 30. Relative primes
Oct. 6 Week 7	Section 3.2 31. Euclidean Algorithm Section 3.3 32. Least Common Multiple		Section 3.4 33. Divisibility tests Section 4.2/4.4 34. Fundamental principle of counting		Section 3.4 35. Permutations Section 4.1/4.3 36. Combination 1
Oct. 13 Week 8	Section 4.1/4.3 37. Combination 2 38. Combination 3		Section 4.4 39. Combinatorics 1 40. Combinatorics 2		Section 4.5 41. Probability 1 42. Probability 2
Oct. 20 Week 9	Catch up Review for Test 2		Test 2 covers Ch. 3, 4		Section 5.1 43. Relations (1) 44. Relations (2)

Oct. 27 Week 10	Section 5.2 45. Equivalence relations 46. Equivalence Classes		Section 5.2 47. Congruence Modulo p (1) 48. Congruence Modulo p (2)		Section 5.4 49. Modular Arithmetic (1) 50. Modular Arithmetic (2)
Nov. 3 Week 11	Section 6.1		Section 6.1/6.2		Section 6.2
Nov. 10 Week 12	Section 7.1		Section 7.1/7.2		Section 7.2
Nov. 17 Week 13	Catch up Review for Test 3		Test 3: covers the rest we learn.		Project
Nov. 24 Week 14	Project		Project	Thanksgiving Holiday	
Dec. 1 Week 15	Project		Project		Project Last Day of Classes
Dec. 8 Week 16	Project due by 11:59pm, Dec. 8				

Appendix C

A Project of Discrete Mathematics

You will need to do a project on discrete mathematics. Start your project as soon as possible. Your project must be submitted electronically in the Microsoft Word file by 11:59PM, Monday, Dec. 8, 2014 to Drobox at eCollege. Your project will be evaluated based the following rubrics.

1. (5 points) Professional appearance and format of your paper: Your paper must have at least 10 pages with double line space, in addition to the title page and references. The margins are not more than 1" from each side; the font size should not be larger than 12; and the font can be Calibri, or Times New Roman. The paper must be numbered. The sizes of tables and pictures need to be reasonable. Your paper should be organized in the following format:
    a. Project title, names of authors, emails and affiliations (optional)
    b. Project summary, abstract, and/or objectives
    c. Project Body (you may use sections, bullets tables, pictures)
    d. Acknowledgement (if applicable)
    e. References: If you obtained any information from the Internet, include the URL. You may use the MLA (Modern Language Association) citation style, or the Chicago citation style, or the style of a reputable mathematical journal, for example, the Journal of Mathematical Analysis and Applications (http://www.elsevier.com/wps/find/journaldescription.cws_home/622886?generatepdf=true)

    Your paper must be presentable, or the entire project will receive 0 points.

2. (5 points) Summary or abstract of your project. You may include objective statements.

3. (15 points) Difficulty and complexity: There are four options for your project (see the next page). For Project Option 1 and 2, the difficulty refers to the level of school mathematics from the lowest, arithmetic, to the highest, calculus II. For Project Option 3, your project needs to be at least at the level you taught, teach, or will teach. The appropriate length of the project is also a consideration of difficulty, though the minimum length is 10 pages with double space. An unnecessarily lengthy paper will not be considered more difficult. Difficulty may mean complexity. Use and inclusion of definitions, theorems and proofs will reflect difficulty and complexity. The more difficult the mathematics is, the more points you may earn.

4. (15 points) Originality or creativity: The first meaning of originality is that your paper must be your own work. Plagiarism is prohibited, and hence will result in 0 for the entire project. Any materials taken from the Internet, publications and other people's work must be well cited. The second meaning of originality is that your work has not been seen on the Internet and in publications. Originality may also mean creativity. The more original work your project has, the more points you may earn.

5. (60 points) Readability and Communication: clear and correct calculation, derivation, proofs, applications and explanation; sufficient and appropriate examples; real world examples, particularly related to your students, school and community (this also contributes to originality); smooth connection and transition among concepts, definitions, theorems, examples, and explanations; use of pictures, diagrams, and tables; easiness for understanding; appropriate citation; completeness of the project; fun to read.

6. Correctness: mathematically your project must be correct. Errors and mistakes in mathematics will be subject to deduction of points you earn. Errors and mistakes in other areas (English, Education, Science…) may or may not cause a deduction, depending on the nature and significance of the errors and mistakes.

7. The instructor retains the final interpretation of the grading rubrics.

You can choose one of the following topics for your project:

Option 1, False Proofs: There are many false proofs. For example, the following article is an MIT student project:

- Xing Yuan, Mathematical Fallacy Proofs, http://ocw.mit.edu/courses/mathematics/18-304-undergraduate-seminar-in-discrete-mathematics-spring-2006/projects/fallacy_yuan.pdf

You also see two other examples in our lecture, Proof Techniques (1), Introduction.

For this project, you need to search the Internet for more new false proofs. Then for each false proof, you explain what lead to the false proof, and how the false proof helps students learn and understand.

Option 2, Analysis and Classification of Student Mistakes: Students often make mistakes in arithmetic, algebra, trigonometry, and calculus. Why? What kind of mistakes do they make? How would you help avoid and correct the mistakes? You may read the following article for this topic:

- Keith Hirst, CLASSIFYING STUDENTS' MISTAKES IN CALCULUS http://www.math.uoc.gr/~ictm2/Proceedings/pap31.pdf

If you have taught or tutored before, you may collect the mistakes that your students made, then classify and analyze them. You may also develop a plan how you would apply your findings in your classroom.

Option 3, Discrete Mathematics in Your Classroom. If you are a pre-service or in-service teacher, you may choose to read the three articles in Section 4 (Pages 187-202, Pages 203-222, and Pages 223-236) and the four in Section 5 (pages 239-254, Pages 255-264, Pages 295-300, and Pages 301-307) in the following book,

- *Discrete Mathematics in the Schools*, edited by J. Rosenstein, D. Franzblau, and F. Roberts , published by the American Mathematical Society, ISBN-13: 978-0821804483, http://www.ams.org/bookstore?fn=20&arg1=mathcomb&ikey=DIMACS-36-S

You may also read other articles in the book if you like. After your reading, develop a teaching plan how you can include some topics of discrete mathematics in your classroom.

Or, you may pick a section (or a topic) in the textbook. Develop a lecture note how you would teach it. Your lecture note should include introduction (your understanding of the section(s)), definitions, theorems, examples, and your explanation of the definitions, theorems, applications if there are applications, and homework assignments.

Option 4: Any other topics of discrete mathematics that you would like to investigate further. Discuss this with your instructor before you work on it.