Colorado State University GLOBAL CAMPUS

MTH350: DISCRETE MATHEMATICS

Credit Hours: 3

Contact Hours: This is a 3-credit course, offered in accelerated format. This means that 16 weeks of material is covered in 8 weeks. The exact number of hours per week that you can expect to spend on each course will vary based upon the weekly coursework, as well as your study style and preferences. You should plan to spend 14-20 hours per week in each course reading material, interacting on the discussion boards, writing papers, completing projects, and doing research.

Faculty Information: Faculty contact information and office hours can be found on the faculty profile page.

COURSE DESCRIPTION AND OUTCOMES

Course Description:

This online course provides an introduction to discrete math with a personalized learning approach designed for an Information Technology specialization. The main areas of study include combinatorics, sequences, logic and proofs, and graph theory. Assessments for this course will include discussions, mastery exercises, and critical thinking assignments with several IT-related applications. This course fulfills a general education mathematics requirement.

Course Overview:

This is an introductory course on discrete mathematics, which is the study of discrete structures rather than continuous structures such as those covered in calculus courses. Discrete mathematics topics included in this course are combinatorics, sequences, logic and proofs, and graph theory. This course is designed for an Information Technology specialization, and thus will include a variety of readings about IT-related applications of discrete mathematics from sources outside the course textbook.

Each week, an adaptive lecture will present the material with a variety of modes that include videos and interactive activities. Check Your Understanding exercises at the end of each initial page will personalize the learning experience by allowing students to learn more about select topics.

During weeks 3 and 6, a Live Classroom will be held where students will be encouraged to attend an optional 1-hour synchronous session with their instructor. This will be an opportunity for students to ask questions and see select problems worked out.

The four Critical Thinking assignments for this course will explore some of the ways discrete mathematics concepts can be applied to solve real-world problems. For each assignment, one of the options will always be IT-related.

Weekly Discussion Board forums will provide opportunities to reflect on the material and write in response to open-ended prompts about it. This will also be a chance to engage with peers and contrast each other's understandings.

Additional course assessments will include **opening exercises** (which are not graded), **mastery exercises** for each module, a **midterm exam**, and a **cumulative final exam**.

Course Learning Outcomes:

1. Formulate distinct representations of sets and apply various set operations.
2. Apply appropriate counting techniques to application problems.
3. Analyze sequences given as a closed formula or recursively defined.
4. Evaluate sums of arithmetic and geometric sequences.
5. Utilize the principle of mathematical induction to prove whether or not a given statement is true.
6. Construct truth tables to perform logic operations on formal statements.
7. Develop proofs of mathematical statements.
8. Apply principles of graph theory to real-world contexts.

Participation & Attendance

Prompt and consistent attendance in your online courses is essential for your success at CSU-Global Campus. Failure to verify your attendance within the first 7 days of this course may result in your withdrawal. If for some reason you would like to drop a course, please contact your advisor.

Online classes have deadlines, assignments, and participation requirements just like on-campus classes. Budget your time carefully and keep an open line of communication with your instructor. If you are having technical problems, problems with your assignments, or other problems that are impeding your progress, let your instructor know as soon as possible.

Course Materials

Required:
Levin, O. (2017). *Discrete mathematics: An open introduction*. Retrieved from http://discrete.openmathbooks.org/dmoi/dmoi.html (CC BY-SA 4.0)

NOTE: *All non-textbook required readings and materials necessary to complete assignments, discussions, and/or supplemental or required exercises are provided within the course itself. Please read through each course module carefully.*

Course Schedule

Due Dates
The Academic Week at CSU-Global begins on Monday and ends the following Sunday.

- **Discussion Boards:** The original post must be completed by Thursday at 11:59 p.m. MT and Peer Responses posted by Sunday 11:59 p.m. MT. Late posts may not be awarded points.
- **Opening Exercises:** Take the opening exercise before reading each week's content to see which areas you will need to focus on. You may take these exercises as many times as you need. The opening exercises will not affect your final grade.
- **Mastery Exercises:** Students may access and retake mastery exercises three times with the highest score counting. The Mastery Exercises are held to the same late policy as the Critical Thinking assignments in the course.
- **Exams:** Students take a midterm and final exam in this course. The midterm and final exams will be taken in the LMS. Students will have 1 attempt on the midterm exam and one attempt on the final exam. The exams are due at the end of the week of the midterm and the final.
- **Critical Thinking:** Assignments are due Sunday at 11:59 p.m. MT.

- **Live Classroom:** Although participation is not required, Live Classroom sessions are held during Weeks 3 and 6.

WEEKLY READING AND ASSIGNMENT DETAILS

Module 1

Readings

- Chapter 0, Sections 0.1, 0.2, 0.3, & 0.4 in *Discrete Mathematics: An Open Introduction*
- Mathieu, J., & Théo, L. (2014). Teaching formal methods and discrete mathematics. *Electronic Proceedings in Theoretical Computer Science, 149*, 30-43. Retrieved from https://arxiv.org/pdf/1404.6604v1.pdf
- Vandrunen, T. (2017). Functional programming as a discrete mathematics topic. *ACM Inroads,8*(2), 51-58.

Opening Exercise (0 points)

Discussion (25 points)

Mastery Exercise (15 points)

Module 2

Readings

- Chapter 1, Sections 1.1, 1.2, & 1.3 in *Discrete Mathematics: An Open Introduction*
- Banderier, C., & Wallner, M. (2017). Lattice paths with catastrophes. *Electronic Notes in Discrete Mathematics*, 59, 131-146.
- Yang, X. (2017). Chapter 3 - binomial theorem and expansions. In *Engineering Mathematics with Examples and Applications* (pp. 31-35). Boston, MA: Academic Press.

Opening Exercise (0 points)

Discussion (25 points)

Mastery Exercise (15 points)

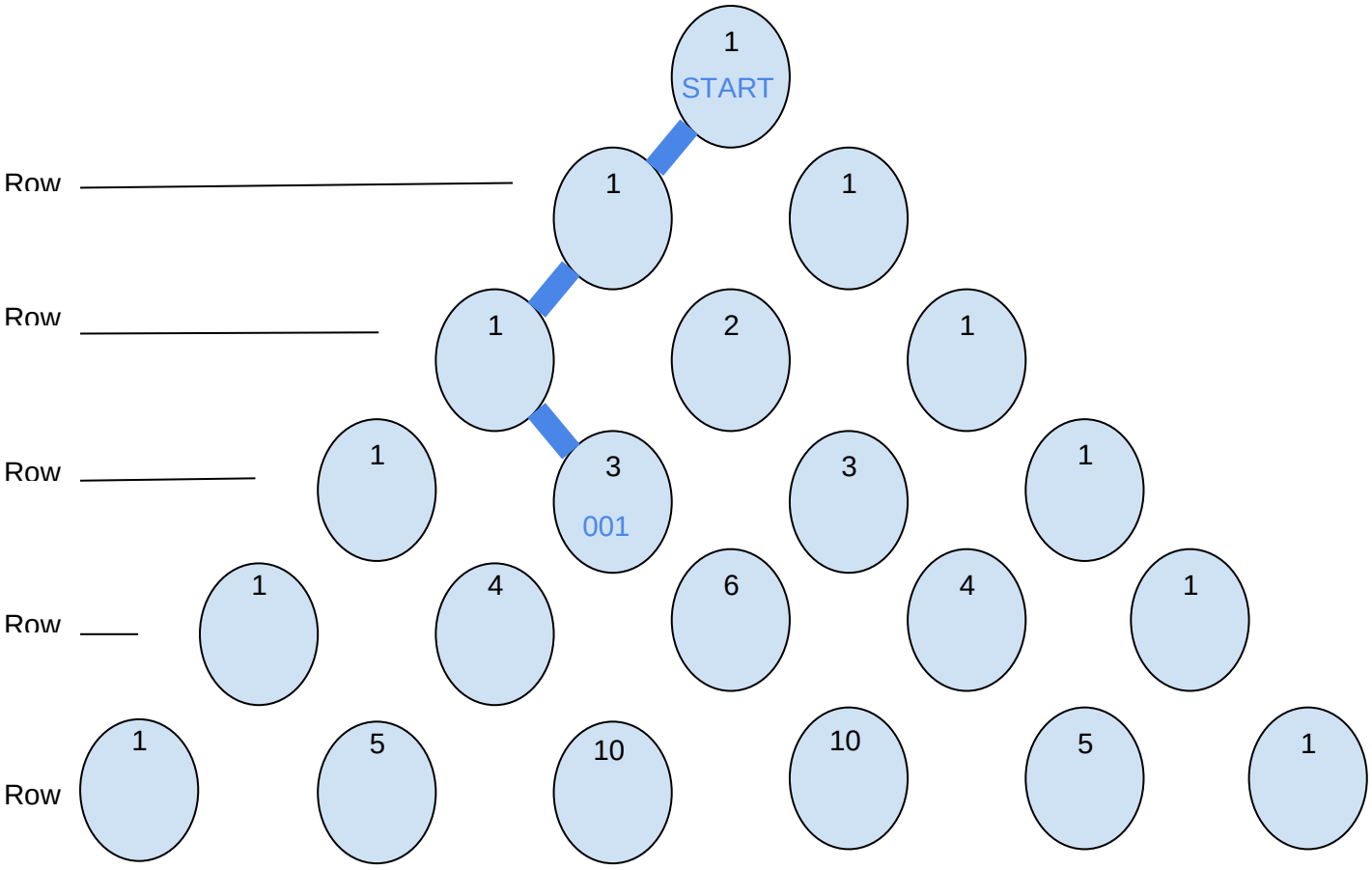
Critical Thinking (75 points)

Choose one of the following two assignments to complete this week. Do not do both assignments. Identify your assignment choice in the title of your submission.

Option #1: Pascal's Triangle: Paths and Binary Strings

Suppose you want to create a path between each number on Pascal's Triangle. For this exercise, suppose the only moves allowed are to go down one row either to the left or to the right.

We will code the path by using bit strings. In particular, a 0 will be used for each move downward to the left, and a 1 for each move downward to the right. So, for example, consider the first five rows of Pascal's Triangle shown in the assignment (visit the Critical Thinking Assignment in the Module 2 folder), and the path shown between the top number 1 (labelled START) and the left-most 3.



This path involves starting at the top 1 labelled START and first going down and to the left (code with a 0), then down to the left again (code with another 0), and finally down to the right (code with a 1). Hence, this path would be coded with binary string 001. This code is then recorded at the *ending* location on the triangle.

For Option #1, complete the following tasks based on the coding scheme described above:

a. Determine if there are additional paths between the START (number 1 at the top) and end point (leftmost 3). If so, describe them in words, by tracing the path on the triangle, and as binary strings. Then record all such binary strings at the ending location.
b. Find and record at least 5 paths using binary strings between the START location and numbers in rows 4 and 5. Compare the binary strings for each number and discuss why those similarities and differences might exist. Also, explain any connections you notice between the number of possible paths ending at each location and the corresponding entry of Pascal's Triangle.
c. Discuss what information about an endpoint and the paths leading to it can be gathered from the length of its binary strings and the number of 1s in them.
d. Explain the addition rule of Pascal's Triangle in your own words in terms of the path coding scheme you worked with in this assignment.
e. Note the type of symmetry that Pascal's Triangle has and explain it in terms of the paths.

Additional Requirements:

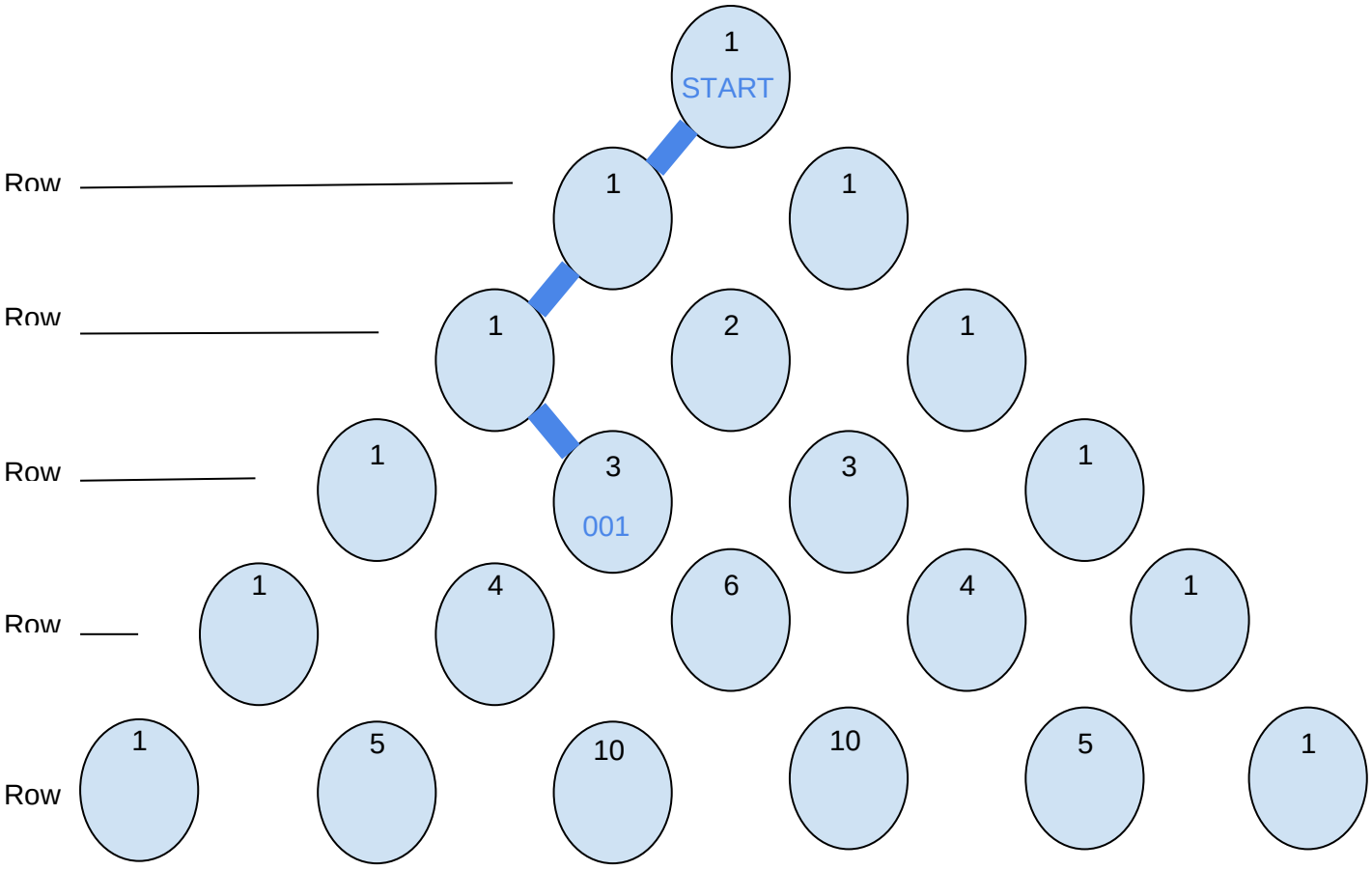
1. Paper must be written in third person.

2. Your paper should be 3-4 pages in length (counting the title page and references page) and cite and integrate at least one credible outside source. The CSU-Global Library is a great place to find resources. Your textbook is a credible resource.
3. Include a title page, introduction, body, conclusion, and a reference page.
4. The introduction should describe or summarize the topic or problem. It might discuss the importance of the topic or how it affects you or society as a whole, or it might discuss or describe the unique terminology associated with the topic.
5. The body of your paper should answer the questions posed in the problem. Explain how you approached and answered the question or solved the problem, and, for each question, show all steps involved. Be sure this is in paragraph format, not numbered answers like a homework assignment.
6. The conclusion should summarize your thoughts about what you have determined from the data and your analysis, often with a broader personal or societal perspective in mind. Nothing new should be introduced in the conclusion that was not previously discussed in the body paragraphs.
7. Include any tables of data or calculations, calculated values, and/or graphs associated with this problem in the body of your assignment.
8. Document formatting, citations, and style should conform to the CSU-Global Library's CSU-Global Guide to Writing & APA: Introduction. A short summary containing much that you need to know about paper formatting, citations, and references is contained in the New Sample APA Paper. In addition, information in the CSU-Global Library under the Writing Center/APA Resources tab has many helpful areas (Writing Center, Writing Tips, Template & Examples/Papers & Essays, and others).

Option #2: Pascal's Triangle and Binomial Coefficients

Suppose you want to create a path between each number on Pascal's Triangle. For this exercise, suppose the only moves allowed are to go down one row either to the left or to the right.

We will code the path by using bit strings. In particular, a 0 will be used for each move downward to the left, and a 1 for each move downward to the right. So, for example, consider the first five rows of Pascal's Triangle in the Critical Thinking Assignment (found in the Module 2 folder), and the path shown between the top number 1 (labelled START) and the left-most 3.



This path involves starting at the top 1 labelled START and first going down and to the left (code with a 0), then down to the left again (code with another 0), and finally down to the right (code with a 1). Hence, this path would be coded with binary string 001. This code is then recorded at the *ending* location on the triangle.

For Option #2, you will explore Pascal's Triangle and its connections to binomial coefficients, C(n,k).

Complete the following tasks:

a. Determine if there are additional paths between the START (number 1 at the top) and end point (leftmost 3). If so, describe them in words, by tracing the path on the triangle, and as binary strings. Then record all such binary strings at the ending location.
b. Label each location of Pascal's Triangle with C(n,k) where n is the row number and k is its place from the left starting at 0. (ex: The number 6 in row 4 is labeled C(4,2) since it is in row 4 and 2 places from the left edge of the triangle.)
c. Discuss how each C(n,k) is related to the paths and corresponding binary strings that lead to its location. In particular, notice how n and k are related to the binary string lengths and the number of 1s in them.
d. Notice that C(n,k) = C(k,n-k) for all n and k. Explain why this is so in your own words. Also, discuss this finding in terms of the paths, binary strings, and entry of Pascal's Triangle.
e. Discuss how this labeling of Pascal's Triangle is related to combinations and how it can be used to solve real-world applications.

Additional Requirements:

1. Paper must be written in third person.
2. Your paper should be 3-4 pages in length (counting the title page and references page) and cite and integrate at least one credible outside source. The CSU-Global Library is a great place to find resources. Your textbook is a credible resource.
3. Include a title page, introduction, body, conclusion, and a reference page.
4. The introduction should describe or summarize the topic or problem. It might discuss the importance of the topic or how it affects you or society as a whole, or it might discuss or describe the unique terminology associated with the topic.
5. The body of your paper should answer the questions posed in the problem. Explain how you approached and answered the question or solved the problem, and, for each question, show all steps involved. Be sure this is in paragraph format, not numbered answers like a homework assignment.
6. The conclusion should summarize your thoughts about what you have determined from the data and your analysis, often with a broader personal or societal perspective in mind. Nothing new should be introduced in the conclusion that was not previously discussed in the body paragraphs.
7. Include any tables of data or calculations, calculated values, and/or graphs associated with this problem in the body of your assignment.
8. Document formatting, citations, and style should conform to the CSU-Global Library's CSU-Global Guide to Writing & APA: Introduction. A short summary containing much that you need to know about paper formatting, citations, and references is contained in the New Sample APA Paper. In addition, information in the CSU-Global Library under the Writing Center/APA Resources tab has many helpful areas (Writing Center, Writing Tips, Template & Examples/Papers & Essays, and others).

Module 3

Readings

- Chapter 2, Sections 2.1-2.2 in *Discrete Mathematics: An Open Introduction*
- Huang, Y., & Wen, Z. (2015). The sequence of return words of the Fibonacci sequence. *Theoretical Computer Science, 593*, 106-116.
- Mneimneh, S. (2015). Fibonacci in the curriculum: Not just a bad recurrence. *Proceedings of the 46th ACM Technical Symposium on Computer Science Education - SIGCSE 15*. Hunter College and the Graduate Center of the City University of New York (CUNY). New York, NY: ACM.

Opening Exercise (0 points)

Discussion (25 points)

Live Classroom (0 points)

Mastery Exercise (15 points)

Critical Thinking (85 points)

Choose one of the following two assignments to complete this week. Do not do both assignments. Identify your assignment choice in the title of your submission.

Option #1: Fibonacci Sequence Through Programming

For Option #1, you will be exploring the Fibonacci sequence through programming. Complete the following tasks:

a. Research and take note of the recursive formula F(n) that can be used to define the Fibonacci sequence.
b. Design a simple program, using pseudocode, to implement the recursive formula you found in part (a) to compute numbers in the Fibonacci sequence. Describe in detail how your program

implements the recursive formula. You may find it useful to discuss how it through a concrete example such as F(8) = 21.

c. Determine the number of times your program computes F(1) for each time F(5) is computed.
d. Discuss any issues you find with your program and what reasoning there may be.

Additional Requirements:

1. Paper must be written in third person.
2. Your paper should be 3-4 pages in length (counting the title page and references page) and cite and integrate at least one credible outside source. The CSU-Global Library is a great place to find resources. Your textbook is a credible resource.
3. Include a title page, introduction, body, conclusion, and a reference page.
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6. The conclusion should summarize your thoughts about what you have determined from the data and your analysis, often with a broader personal or societal perspective in mind. Nothing new should be introduced in the conclusion that was not previously discussed in the body paragraphs.
7. Include any tables of data or calculations, calculated values, and/or graphs associated with this problem in the body of your assignment.
8. Document formatting, citations, and style should conform to the CSU-Global Library's CSU-Global Guide to Writing & APA: Introduction. A short summary containing much that you need to know about paper formatting, citations, and references is contained in the New Sample APA Paper. In addition, information in the CSU-Global Library under the Writing Center/APA Resources tab has many helpful areas (Writing Center, Writing Tips, Template & Examples/Papers & Essays, and others).

Option #2: Characteristics of the Fibonacci Sequence

For Option #2, you will discuss the mathematics behind various characteristics of the Fibonacci sequence. In particular, you will research and write about the following aspects of the Fibonacci sequence in your own words:

a. Relation to Pascal's Triangle.
b. The Golden Ratio.
c. Partial sums of the Fibonacci sequence.
d. Negative numbers in the Fibonacci sequence.

Additional Requirements:

1. Paper must be written in third person.
2. Your paper should be 3-4 pages in length (counting the title page and references page) and cite and integrate at least one credible outside source. The CSU-Global Library is a great place to find resources. Your textbook is a credible resource.
3. Include a title page, introduction, body, conclusion, and a reference page.
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Module 4

Readings

- Chapter 2, Section 2.5 in *Discrete Mathematics: An Open Introduction*
- García-Martínez, I., & Parraguez, M. (2017). The basis step in the construction of the principle of mathematical induction based on APOS theory. *The Journal of Mathematical Behavior, 46*, 128-143.
- Stylianides, G. J., Sandefur, J., & Watson, A. (2016). Conditions for proving by mathematical induction to be explanatory. *The Journal of Mathematical Behavior, 43*, 20-34.

Opening Exercise (0 points)

Discussion (25 points)

Mastery Exercise (15 points)

Midterm Exam (150 points)

This course requires that you complete a Midterm Exam that covers the material represented in the first four modules of the course. You can access the Midterm Exam in the Module 4 folder. Complete the exam this week before moving on with Module 5.

Module 5

Readings

- Chapter 4, Sections 4.1 & 4.2 in *Discrete Mathematics: An Open Introduction*
- Gutierrez, J. M., Jensen, M., & Riaz, T. (2016). Applied graph theory to real smart city logistic problems. *Procedia Computer Science*, 95, 40-47.
- Song, C., Goswami, K., Park, Y., Chang, S., & Choo, E. (2017). Graphic model analysis of frauds in online consumer reviews. *Proceedings of the Second International Conference on Internet of things and Cloud Computing* - ICC 17.

Opening Exercise (0 points)

Discussion (25 points)

Mastery Exercise (15 points)

Critical Thinking (85 points)

Choose one of the following two assignments to complete this week. Do not do both assignments. Identify your assignment choice in the title of your submission.

Option #1: Applications of Graph Theory Concepts: Computer Science

For Option #1, you will explore applications of graph theory concepts in the context of computer science. Complete the following tasks:

a. Research the topic of binary search trees. Write a brief summary of your understanding of this.
b. Design a simple program, using pseudocode, that performs a binary search.
c. In your own words, explain how a binary search tree works using graph theory terminology.
d. Construct a binary search tree for any alphabetically ordered list of five words. Represent it visually as a graph.
e. Discuss any characteristics you note about the graph you created in part (d). In your discussion, make sure to address the following:
    i. What are the degrees of each vertex?
    ii. Is it a complete graph?
    iii. Is the graph planar?

Additional Requirements:

1. Paper must be written in third person.
2. Your paper should be 3-4 pages in length (counting the title page and references page) and cite and integrate at least one credible outside source. The CSU-Global Library is a great place to find resources. Your textbook is a credible resource.
3. Include a title page, introduction, body, conclusion, and a reference page.
4. The introduction should describe or summarize the topic or problem. It might discuss the importance of the topic or how it affects you or society as a whole, or it might discuss or describe the unique terminology associated with the topic.
5. The body of your paper should answer the questions posed in the problem. Explain how you approached and answered the question or solved the problem, and, for each question, show all steps involved. Be sure this is in paragraph format, not numbered answers like a homework assignment.
6. The conclusion should summarize your thoughts about what you have determined from the data and your analysis, often with a broader personal or societal perspective in mind. Nothing new should be introduced in the conclusion that was not previously discussed in the body paragraphs.
7. Include any tables of data or calculations, calculated values, and/or graphs associated with this problem in the body of your assignment.
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Option #2: Applications of Graph Theory Concepts: Social Networks

For Option #2, you will be applying graph theory concepts to the context of social networks. Complete the following tasks:

a. Create a graph with 10 vertices where each vertex is labeled with the name of a person in your social network. Include yourself as one of those vertices.
b. State what the edges of your graph represent in this context.
c. Discuss any characteristics you note about the graph you created in part (b). In your discussion, make sure to address the following:

- What are the degrees of each vertex?
- Is it a complete graph?
- Is the graph planar?

d. We refer to the number of steps between two people as the *degree of separation* between them.
   - What is the largest degree of separation from you to any other person in your social network graph?
   - What is the largest degree of separation between any two people in your social network graph?

e. Research about the maximum degrees of separation that has been hypothesized between any two people around the world. Discuss in your own words how graph theory concepts are involved in this research.

Additional Requirements:

1. Paper must be written in third person.
2. Your paper should be 3-4 pages in length (counting the title page and references page) and cite and integrate at least one credible outside source. The CSU-Global Library is a great place to find resources. Your textbook is a credible resource.
3. Include a title page, introduction, body, conclusion, and a reference page.
4. The introduction should describe or summarize the topic or problem. It might discuss the importance of the topic or how it affects you or society as a whole, or it might discuss or describe the unique terminology associated with the topic.
5. The body of your paper should answer the questions posed in the problem. Explain how you approached and answered the question or solved the problem, and, for each question, show all steps involved. Be sure this is in paragraph format, not numbered answers like a homework assignment.
6. The conclusion should summarize your thoughts about what you have determined from the data and your analysis, often with a broader personal or societal perspective in mind. Nothing new should be introduced in the conclusion that was not previously discussed in the body paragraphs.
7. Include any tables of data or calculations, calculated values, and/or graphs associated with this problem in the body of your assignment.
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Module 6

Readings

- Chapter 4, Sections 4.3 & 4.4 in *Discrete Mathematics: An Open Introduction*
- Bensouyad, M., Guidoum, N., & Saidouni, D. E. (2015). Strict strong graph coloring. *Proceedings of the International Conference on Engineering & MIS 2015 - ICEMIS*.
- Sungu, G., & Boz, B. (2015). An evolutionary algorithm for weighted graph coloring problem. *Proceedings of the Companion Publication of the 2015 on Genetic and Evolutionary Computation Conference - GECCO Companion 15*.

Opening Exercise (0 points)

Discussion (25 points)

Live Classroom (0 points)

Mastery Exercise (15 points)

Critical Thinking (85 points)

Choose one of the following two assignments to complete this week. Do not do both assignments. Identify your assignment choice in the title of your submission.

Option #1: Graph Coloring Concepts and Wi-Fi

For Option #1, you will explore how graph coloring concepts can be applied to the real-world problem of installing Wi-Fi stations in an office. Suppose that an office is installing four Wi-Fi stations throughout the building, and that any stations within 150 feet of each other must transmit on different channels.

Complete the following tasks:

a. Create your own office configuration and fill in the table with the distances between each pair of Wi-Fi stations in your office. (Note: The maximum distance possible between any two Wi-Fi stations is 200 ft.)

	Station #1	**Station #2**	**Station #3**	**Station #4**
Station #1				
Station #2				
Station #3				
Station #4				

b. Suppose the engineers want to minimize the number of channels. Draw a graph that would be useful to solve this problem. (Hint: Edges should connect two stations when the distance is less than 150 feet.)
c. Discuss how this problem can be solved using graph coloring concepts.
d. Solve the problem.
e. Explain what the chromatic number of the graph you created in part (b) would tell the engineers installing the Wi-Fi stations.

Additional Requirements:

1. Paper must be written in third person.
2. Your paper should be 3-4 pages in length (counting the title page and references page) and cite and integrate at least one credible outside source. The CSU-Global Library is a great place to find resources. Your textbook is a credible resource.
3. Include a title page, introduction, body, conclusion, and a reference page.
4. The introduction should describe or summarize the topic or problem. It might discuss the importance of the topic or how it affects you or society as a whole, or it might discuss or describe the unique terminology associated with the topic.
5. The body of your paper should answer the questions posed in the problem. Explain how you approached and answered the question or solved the problem, and, for each question, show all steps involved. Be sure this is in paragraph format, not numbered answers like a homework assignment.
6. The conclusion should summarize your thoughts about what you have determined from the data and your analysis, often with a broader personal or societal perspective in mind. Nothing

new should be introduced in the conclusion that was not previously discussed in the body paragraphs.
7. Include any tables of data or calculations, calculated values, and/or graphs associated with this problem in the body of your assignment.
8. Document formatting, citations, and style should conform to the CSU-Global Library's CSU-Global Guide to Writing & APA: Introduction. A short summary containing much that you need to know about paper formatting, citations, and references is contained in the New Sample APA Paper. In addition, information in the CSU-Global Library under the Writing Center/APA Resources tab has many helpful areas (Writing Center, Writing Tips, Template & Examples/Papers & Essays, and others).

Option #2: Represent a Map by Graph with Coloring

For Option #2, you will be representing a map by a graph and finding the coloring of the graph that uses the fewest number of colors. Complete the following tasks:

Part 1:

a. Find the county map of New Hampshire, and create a graph that represents it. Counties should be represented as the vertices and the edges should be drawn between them when two counties share a border.
b. Determine if your graph is 2-colorable, 3-colorable, or 4-colorable.
c. Discuss how you found your answer to part (b) and what real-world applications there might be for your findings.

Part 2:

a. Draw a map of a fictional state consisting of four counties that is 3-colorable.
b. Discuss your method for creating the map in part (a). Be sure to explain how you verified that your map is indeed 3-colorable.

Additional Requirements:

1. Paper must be written in third person.
2. Your paper should be 3-4 pages in length (counting the title page and references page) and cite and integrate at least one credible outside source. The CSU-Global Library is a great place to find resources. Your textbook is a credible resource.
3. Include a title page, introduction, body, conclusion, and a reference page.
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5. The body of your paper should answer the questions posed in the problem. Explain how you approached and answered the question or solved the problem, and, for each question, show all steps involved. Be sure this is in paragraph format, not numbered answers like a homework assignment.
6. The conclusion should summarize your thoughts about what you have determined from the data and your analysis, often with a broader personal or societal perspective in mind. Nothing new should be introduced in the conclusion that was not previously discussed in the body paragraphs.
7. Include any tables of data or calculations, calculated values, and/or graphs associated with this problem in the body of your assignment.
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Module 7

Readings

- Chapter 3, Section 3.1 in *Discrete Mathematics: An Open Introduction*
- Blass, A. (2016). Symbioses between mathematical logic and computer science. *Annals of Pure and Applied Logic*, 167(10), 868-878.
- Cruz Quiroga, L., & Moreno, W. (2016). Chapter 15 – classic formal logic and nonclassical logics: Basis of research on neural networks. In *Artificial Neural Network for Drug Design, Delivery and Disposition* (pp. 297-317). Boston, MA: Academic Press.

Opening Exercise (0 points)

Discussion (25 points)

Mastery Exercise (15 points)

Module 8

Readings

- Chapter 3, Section 3.2 in *Discrete Mathematics: An Open Introduction*
- Brown, S. A. (2018). Are indirect proofs less convincing? A study of students' comparative assessments. *The Journal of Mathematical Behavior, 49*, 1-23.
- McCartin-Lim, M., Woolf, B., & McGregor, A. (2018). Connect the dots to prove it. *Proceedings of the 49th ACM Technical Symposium on Computer Science Education - SIGCSE 18*.

Opening Exercise (0 points)

Discussion (25 points)

Mastery Exercise (15 points)

Final Exam (200 points)

This course requires that you complete a Final Exam that covers the material represented in the entire course. You can access the Final Exam in the Module 8 folder. Complete the exam this week by the 11:59pm MT of the last day of the course.

COURSE POLICIES

Grading Scale	
A	95.0 – 100
A-	90.0 – 94.9
B+	86.7 – 89.9
B	83.3 – 86.6
B-	80.0 – 83.2
C+	75.0 – 79.9
C	70.0 – 74.9
D	60.0 – 69.9
F	59.9 or below

Course Grading

20% Discussion Participation
0% Opening Exercises
0% Live Classroom
12% Mastery Exercises
33% Critical Thinking Assignments
15% Midterm Exam
20% Final Exam

IN-CLASSROOM POLICIES

For information on late work and incomplete grade policies, please refer to our **In-Classroom Student Policies and Guidelines** or the Academic Catalog for comprehensive documentation of CSU-Global institutional policies.

Academic Integrity
Students must assume responsibility for maintaining honesty in all work submitted for credit and in any other work designated by the instructor of the course. Academic dishonesty includes cheating, fabrication, facilitating academic dishonesty, plagiarism, reusing /re-purposing your own work (see *CSU-Global Guide to Writing and APA Requirements* for percentage of repurposed work that can be used in an assignment), unauthorized possession of academic materials, and unauthorized collaboration. The CSU-Global Library provides information on how students can avoid plagiarism by understanding what it is and how to use the Library and Internet resources.

Citing Sources with APA Style
All students are expected to follow the CSU-Global Guide to Writing & APA when citing in APA (based on the most recent APA style manual) for all assignments. A link to this guide should also be provided within most assignment descriptions in your course.

Disability Services Statement
CSU–Global is committed to providing reasonable accommodations for all persons with disabilities. Any student with a documented disability requesting academic accommodations should contact the Disability Resource Coordinator at 720-279-0650 and/or email ada@CSUGlobal.edu for additional information to coordinate reasonable accommodations for students with documented disabilities.

Netiquette
Respect the diversity of opinions among the instructor and classmates and engage with them in a courteous, respectful, and professional manner. All posts and classroom communication must be conducted in accordance with the student code of conduct. Think before you push the Send button. Did you say just what you meant? How will the person on the other end read the words?

Maintain an environment free of harassment, stalking, threats, abuse, insults or humiliation toward the instructor and classmates. This includes, but is not limited to, demeaning written or oral comments of an ethnic, religious, age, disability, sexist (or sexual orientation), or racist nature; and the unwanted sexual advances or intimidations by email, or on discussion boards and other postings within or connected to the online classroom. If you have concerns about something that has been said, please let your instructor know.