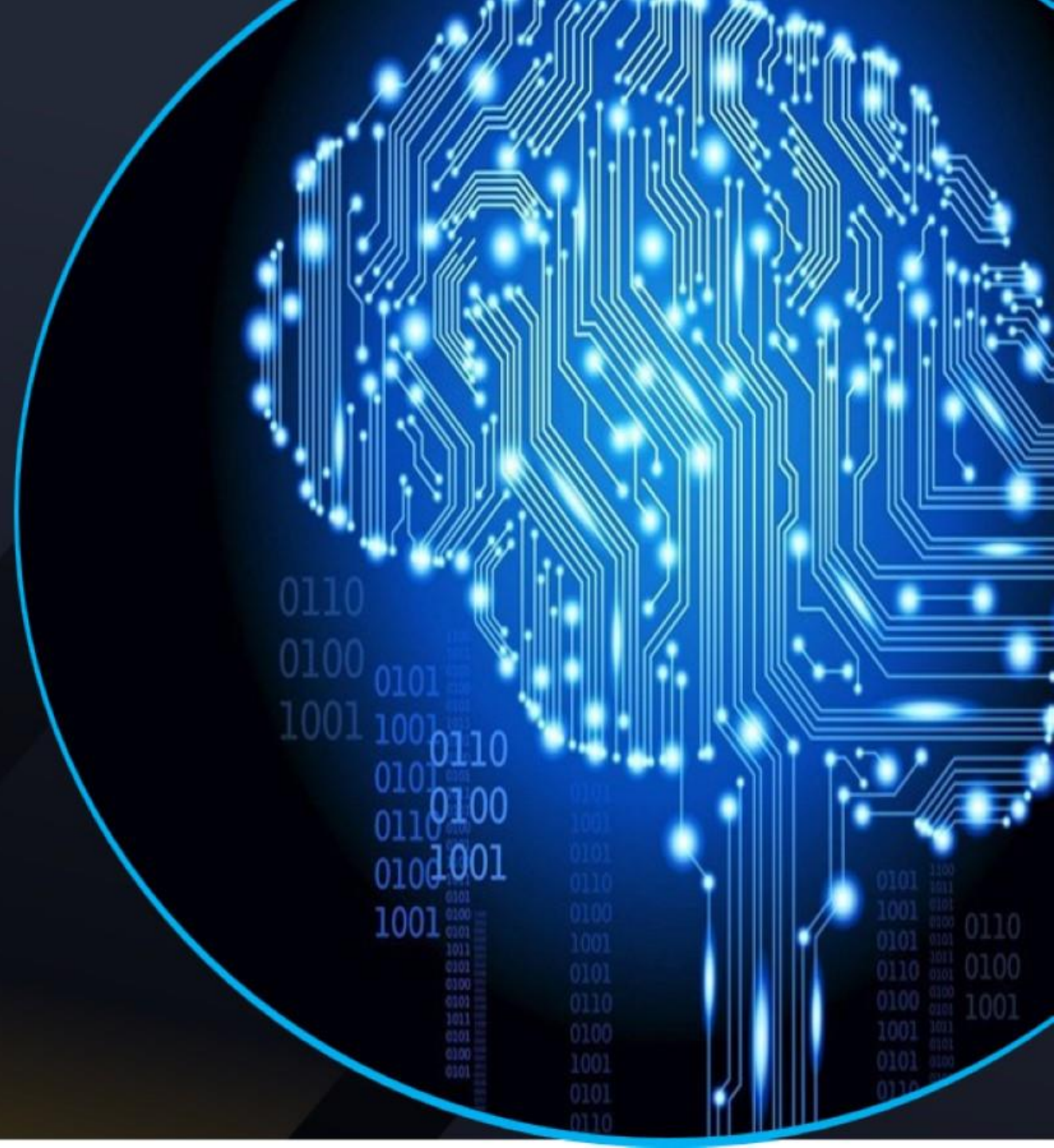


Discrete Mathematics

Dr. Shahira Ahmed

IT241

Orientation Lecture





Discrete Mathematics

IT241

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Reference

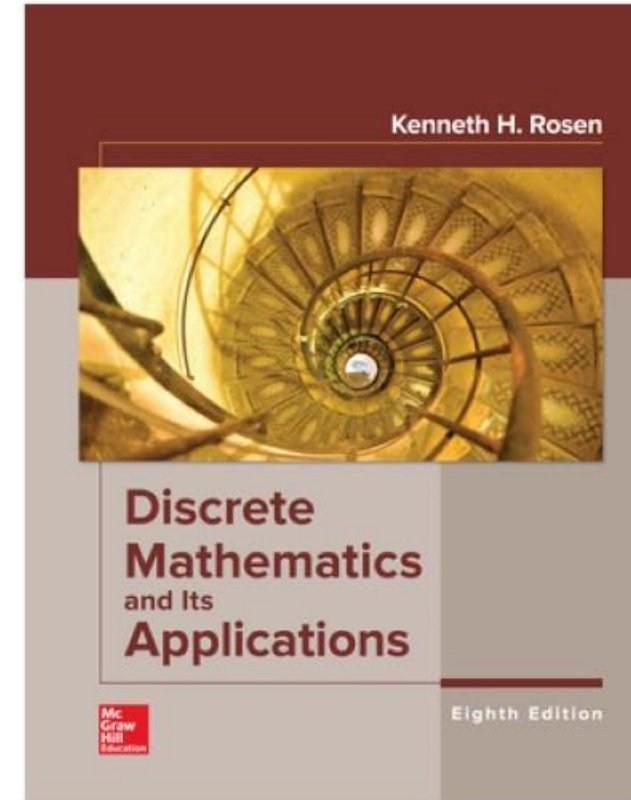
Discrete Mathematics and Its Applications, 8th Edition

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By Kenneth Rosen

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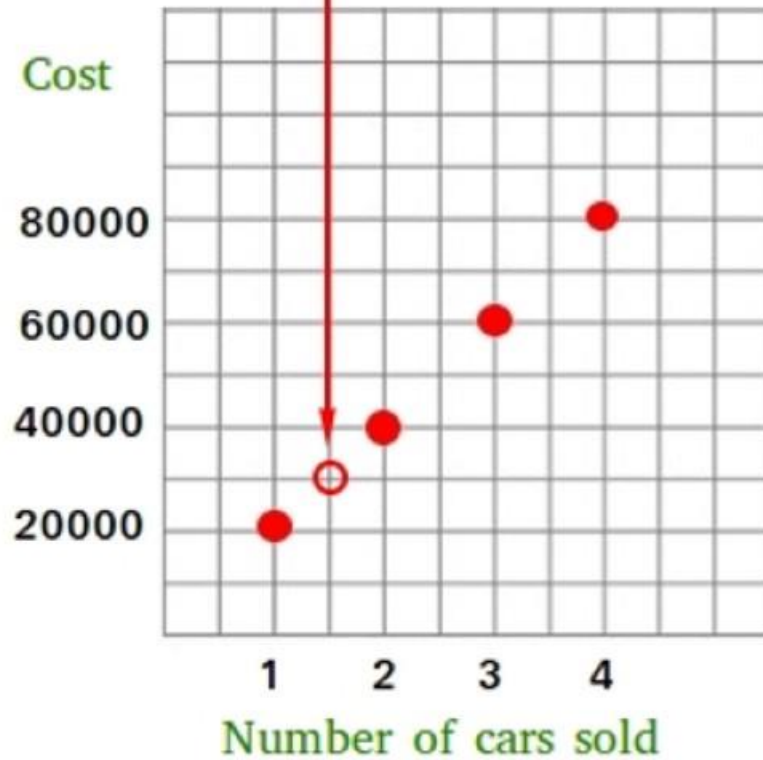
What is Discrete?

- Discrete means “separate” or “distinct”.
 - The number of tickets sold in a day.
 - The number of students in your class.
 - The number of employees in a company.
 - The number of computers in each department.
 - The number of customers who bought different items.
 - The number of items you buy at the grocery store each week.

Discrete vs Continuous

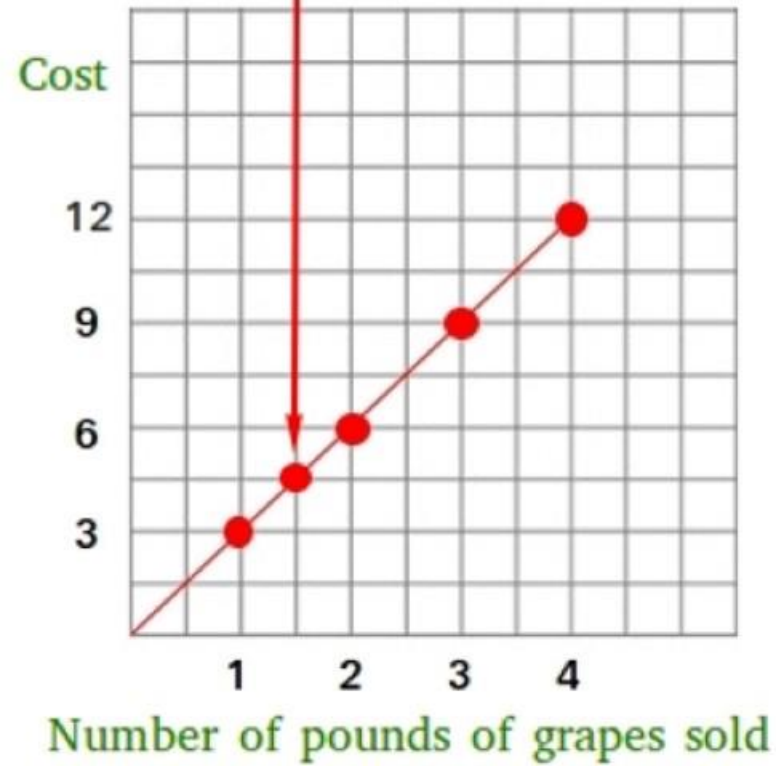
Discrete data

Selling 1.5 cars makes no sense



Continuous data

Selling 1.5 pounds makes sense



What is Discrete Mathematics?

- Discrete mathematics is the part of mathematics devoted to the study of discrete (as opposed to continuous) objects.
- Calculus deals with continuous objects and is not part of discrete mathematics.
- A course in discrete mathematics provides the mathematical background needed for all subsequent courses in computer science and information Technology.

- How many ways can a password be chosen following specific rules?
- How many unique Internet addresses using ip v4?
ipv6 offers 40,282,366,920,938,463,463,374,607,431,768,211,456
ip v4 offers 4.3 billion
- What is the probability of winning a particular lottery?
- Is there a link between two computers in a network?
- How can I identify spam email messages?

- What is the shortest path between two cities using a transportation system?
- How can I encrypt a message so that no unintended recipient can read it?
- Find the shortest tour that visits each of a group of cities only once and then ends in the starting city.
- How can we represent English sentences so that a computer can reason with them?

- **Mathematical Reasoning:** Ability to read, understand, and construct mathematical arguments and proofs.
- **Combinatorial Analysis:** Techniques for counting objects of different kinds.
- **Discrete Structures:** Abstract mathematical structures that represent objects and the relationships between them. Examples are sets, permutations, relations, graphs, trees, and finite state machines.

- **Algorithmic Thinking:** One way to solve many problems is to specify an algorithm. An algorithm is a sequence of steps that can be followed to solve any instance of a particular problem. Algorithmic thinking involves specifying algorithms, analyzing the memory and time required by an execution of the algorithm, and verifying that the algorithm will produce the correct answer.

Discrete Mathematics is a Gateway Course

- Topics in discrete mathematics will be important in many courses that you will take in the future:
 - **Computer Science:** Computer Architecture, Data Structures, Algorithms, Programming Languages, Compilers, Computer Security, Databases, Artificial Intelligence, Networking, Graphics, Game Design, Theory of Computation,
 - **Mathematics:** Logic, Set Theory, Probability, Number Theory, Abstract Algebra, Combinatorics, Graph Theory, Game Theory, Network Optimization, ...
 - **Other Disciplines:** You may find concepts learned here useful in courses in philosophy, economics, linguistics, and other departments.



Thank You