

# **Cedar Grove School District**

**Cedar Grove, NJ**

**2016 | CGHS**

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## **Discrete Mathematics**

*Approved by the Cedar Grove Board of Education*

Superintendent of Schools

Mr. Michael J. Fetherman

Board of Education

Mr. Joseph Cicala, President

Mrs. Christine Dye, Vice-President

Mrs. Pam Burke

Mr. Frank Mandala

Mr. Peter Prvulovic

# Discrete Mathematics

## Course Description

This is a senior math course which serves as an opportunity for students to study applications of mathematics involving discrete rather than continuous models. Students will review basic algebra as well as explore the foundations of logic, sets and functions, probability and statistics, and graph theory. The course also includes an introduction to calculus concepts such as limits and derivatives.

**Prerequisite:** Advanced Math or Pre-Calculus Honors

# Discrete Mathematics

## Course Calendar

|  | Sep |   | Oct |   |   | Nov |   |   | Dec |    | Jan |    |    | Feb |    | Mar |    |    | Apr |    |    | May |    | Jun |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |
|--|-----|---|-----|---|---|-----|---|---|-----|----|-----|----|----|-----|----|-----|----|----|-----|----|----|-----|----|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|--|
| Unit:                                  | 1   | 2 | 3   | 4 | 5 | 6   | 7 | 8 | 9   | 10 | 11  | 12 | 13 | 14  | 15 | 16  | 17 | 18 | 19  | 20 | 21 | 22  | 23 | 24  | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |  |  |
| <u>Set Theory</u>                      |     |   |     |   |   |     |   |   |     |    |     |    |    |     |    |     |    |    |     |    |    |     |    |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |
| <u>Functions</u>                       |     |   |     |   |   |     |   |   |     |    |     |    |    |     |    |     |    |    |     |    |    |     |    |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |
| <u>Logic</u>                           |     |   |     |   |   |     |   |   |     |    |     |    |    |     |    |     |    |    |     |    |    |     |    |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |
| <u>Graph Theory</u>                    |     |   |     |   |   |     |   |   |     |    |     |    |    |     |    |     |    |    |     |    |    |     |    |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |
| <u>Data Collection</u>                 |     |   |     |   |   |     |   |   |     |    |     |    |    |     |    |     |    |    |     |    |    |     |    |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |
| <u>Organizing and Summarizing Data</u> |     |   |     |   |   |     |   |   |     |    |     |    |    |     |    |     |    |    |     |    |    |     |    |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |
| <u>Numericaly Summarizing Data</u>     |     |   |     |   |   |     |   |   |     |    |     |    |    |     |    |     |    |    |     |    |    |     |    |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |
| <u>Scatter Plots and Correlation</u>   |     |   |     |   |   |     |   |   |     |    |     |    |    |     |    |     |    |    |     |    |    |     |    |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |
| <u>Probability</u>                     |     |   |     |   |   |     |   |   |     |    |     |    |    |     |    |     |    |    |     |    |    |     |    |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |



# Unit Planner: Set Theory Discrete Mathematics

Tuesday, September 6, 2016, 11:13AM



Cedar Grove High School > 2016-2017 > High School > Mathematics > Discrete Mathematics (D) > Week 1 - Week 6

## Stage 1: Desired Results

NJ Standards

**NJ: 2016 SLS: Mathematics**

**NJ: HS: Stats/Prob**

### Conditional Probability & the Rules of Probability

**HSS-CP.A. Understand independence and conditional probability and use them to interpret data**

HSS-CP.A.1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").

HSS-CP.A.2. Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.

HSS-CP.A.3. Understand the conditional probability of A given B as  $P(A \text{ and } B)/P(B)$ , and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.

### Mathematical Practice

**MP. The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.**

MP.1. Make sense of problems and persevere in solving them.

MP.3. Construct viable arguments and critique the reasoning of others.

MP.5. Use appropriate tools strategically.

MP.6. Attend to precision.

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### Enduring Understandings

Putting elements into sets helps order and arrange the world around us.

Graphical representations and statistical measures influence interpretations and predictions about data.

Relationships can be represented using set theory.

### Essential Questions

- Why is writing sets in set builder notation helpful?
- When would roster form be more helpful than set builder notation?
- How is a proper set different from a subset?
- Why are Venn diagrams helpful when illustrating set operations?
- How are sets and Venn Diagrams related?
- How can understanding set theory help with prior knowledge of numerical sets?
- Where are sets prevalent in society?
- What are infinite sets and why are they important?

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| <p><b>Content</b></p> <ol style="list-style-type: none"> <li>1. Set Builder Notation and Roster Notation</li> <li>2. Commonly used sets and subsets</li> <li>3. Cardinality of a set</li> <li>4. Venn Diagrams</li> <li>5. Intersection and Union of sets</li> </ol> | <p><b>Skills</b></p> <ol style="list-style-type: none"> <li>1. Write sets in set builder notation<br/>Write sets using roster notation</li> <li>2. Natural numbers<br/>Integers<br/>Real Numbers<br/>Complex numbers</li> <li>3. Determining the size of a finite set<br/>Exploring infinite sets</li> <li>4. Two group Venn Diagrams<br/>Three group Venn Diagrams<br/>Sets using Venn Diagrams<br/>Shading Venn Diagrams</li> <li>5. Intersection using sets<br/>Intersection using Venn Diagrams<br/>Union using sets<br/>Union using Venn Diagrams</li> </ol> |
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### Stage 2: Assessment Evidence

#### Assessments

- Set Theory Test**
- Summative: Written Test**
- Quizzes**
- Summative: Written Test**
- Class Discussion**
- Formative: Other oral assessments**
- Homework**
- Summative: Other written assessments**
- Project**
- Personal Project**

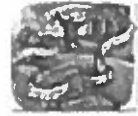
### Stage 3: Learning Plan

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| <p><b>Learning Activities</b></p> <ul style="list-style-type: none"> <li>• Lecture</li> <li>• Class Discussions</li> <li>• Cooperative Learning Activities</li> <li>• Guided Practice</li> <li>• Performance Assessments</li> <li>• Projects</li> <li>• Infusion of technology</li> <li>• Homework Review</li> <li>• Test Review</li> <li>• Research</li> </ul> | <p><b>Resources</b></p> <p><b>§ Textbook:</b><br/>Angel, Allen, et al. <i>A Survey of Mathematics: with Applications</i>. New York: Pearson. 2013. Print.</p> <p><b>§ Supplementary Materials</b></p> <p><b>§ Websites</b></p> <p><b>§ Calculators</b><br/>Graphing calculator (TI-83 Plus, or TI-84)</p> <p><b>§ Technology</b><br/>Power Points, Excel</p> |
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# Unit Planner: Functions Discrete Mathematics

Tuesday, September 6, 2016, 11:13AM



Cedar Grove High School > 2016-2017 > High School > Mathematics > Discrete Mathematics (D) > Week 7 - Week 13

## Stage 1: Desired Results

NJ Standards

**NJ: 2016 SLS: Mathematics**

**NJ: HS: Functions**

### Interpreting Functions

**HSF-IF.A. Understand the concept of a function and use function notation.**

HSF-IF.A.1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If  $f$  is a function and  $x$  is an element of its domain, then  $f(x)$  denotes the output of  $f$  corresponding to the input  $x$ . The graph of  $f$  is the graph of the equation  $y = f(x)$ .

HSF-IF.A.2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

**HSF-IF.B. Interpret functions that arise in applications in terms of the context.**

HSF-IF.B.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.

**HSF-IF.C. Analyze functions using different representations.**

HSF-IF.C.7a. Graph linear and quadratic functions and show intercepts, maxima, and minima.

### Linear, Quadratic, and Exponential Models

**HSF-LE.A. Construct and compare linear and exponential models and solve problems.**

HSF-LE.A.1b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

### Mathematical Practice

**MP. The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.**

MP.1. Make sense of problems and persevere in solving them.

MP.4. Model with mathematics.

MP.5. Use appropriate tools strategically.

MP.6. Attend to precision.

MP.7. Look for and make use of structure.

### Enduring Understandings

Ratios can be used to show a relationship between changing quantities, such as vertical and horizontal change.  
A line on a graph can be represented by a linear equation. The relationship between two lines can be determined by comparing their slopes and y-intercepts. A function describes the mechanism whereby elements of the range correspond to single results in the domain. The graph of a function on the Cartesian grid shows the set of points where the x-coordinates and y-coordinates satisfy its defining function  $y = f(x)$ . A function needs solution space with one more dimension than the number of its defining variables.

### Essential Questions

What does the slope of a line indicate about the line?  
What information does the equation of a line give you?  
How are equations and graphs related? How do linear equations, slopes, intercepts, and points on a line help us solve relevant problems and make predictions?

### Content

1. Order of Operations
2. Solving Linear equations
3. Literals
4. Solve Linear Inequalities
5. Graph Linear Equations
6. Graph Linear Inequalities
7. Solving quadratic Equations
8. Composition of functions

### Skills

1. Simplify expressions  
Evaluate functions  
Word problems with formulas
2. One step equations  
Multiple step equations  
Equations with no solutions or infinite solutions  
Solving proportions
3. Solving for a variable in an equation
4. Graphing linear inequalities  
Multiplying/dividing by a negative number  
Solving linear inequalities  
Integer only solutions  
Compound inequalities
5. Graphing by using intercepts  
Graphing by using slope-intercept form  
Horizontal and Vertical lines
6. Graphing an inequality
7. Multiplying a binomial  
Factoring a trinomial  
Solving by factoring  
Solving by using the quadratic formula
8. Composition of linear function  
Composition involving powers

## Stage 2: Assessment Evidence

### Assessments

- Chapter Test
- Written Test
- Project
- Personal Project
- Homework
- Other written assessments

**Class Discussion**  
**Other oral assessments**  
**Quizzes**  
**Other written assessments**

### **Stage 3: Learning Plan**

#### **Learning Activities**

- Lecture
- Class Discussions
- Cooperative Learning Activities
- Guided Practice
- Performance Assessments
- Projects
- Infusion of technology
- Homework Review
- Test Review
- Research

#### **Resources**

**§ Textbook:**  
Angel, Allen, et al. *A Survey of Mathematics: with Applications*. New York: Pearson. 2013. Print.

#### **§ Supplementary Materials**

#### **§ Websites**

**§ Calculators**  
Graphing calculator (TI-83 Plus, or TI-84)

**§ Technology**  
Power Points, Excel





**Unit Planner: Logic  
Discrete Mathematics**

Tuesday, September 6, 2016, 11:13AM



Cedar Grove High School > 2016-2017 > High School > Mathematics > Discrete Mathematics (D) > Week 14 - Week 18

**Stage 1: Desired Results**

**NJ Standards**

**NJ: 2016 SLS: Mathematics**

**NJ: HS: Modeling**

**Mathematical Practice**

**MP.**The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

MP.1. Make sense of problems and persevere in solving them.

MP.3. Construct viable arguments and critique the reasoning of others.

MP.6. Attend to precision.

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**Enduring Understandings**

Use inductive and deductive reasoning to reach conclusions, identifies conjectures and counterexamples, and describes the nature of a deductive mathematical system. Recognizes valid deductive reasoning; constructs and uses if-then, converse, inverse, and contrapositive statement. Uses formal and/or informal logical reasoning processes.

**Essential Questions**

How is a truth table constructed and used for? When is a statement true or false and how can you determine it? When is an argument deemed valid and under what conditions is this true? How can you tell if two statements are logically equivalent?

**Content**

1. Statements and Logic Connectives
2. Truth Tables for negation, Conjunction, Disjunction
3. Truth Tables for the Conditional and Biconditional
4. Equivalent Statements
5. Symbolic Arguments

**Skills**

1.
  - Write Negations
  - Write conjunctions
  - Write disjunctions
  - Understand grouped statements
  - Change symbols into words
  - Write conditional statements
  - Write biconditional statements
2.
  - Construct a truth table
  - Construct a truth table with a negation
  - Construct a truth table with eight cases
  - Determining truth values without using a table
3.
  - Truth tables with conditionals
  - Truth tables with biconditionals
  - Determine truth values of a compound statement
  - Self-Contradiction/Tautology
4.
  - Determine whether two statements are logically

equivalent  
 DeMorgan's Law  
 Conditionals written as disjunctions  
 Negations written as conjunctions  
 Converse, Inverse, Contrapositive  
 5.  
 Valid/Invalid arguments  
 Determining Validity without a truth table  
 Determining validity with a truth table  
 Identifying common fallacies

### Stage 2: Assessment Evidence

#### Assessments

**Written Test**  
**Q&A in class discussions**  
**Other oral assessments**  
**Personal Project**  
**Homework**  
**Other written assessments**  
**Lecture/seminar**

### Stage 3: Learning Plan

#### Learning Activities

- Lecture
- Class Discussions
- Cooperative Learning Activities
- Guided Practice
- Performance Assessments
- Projects
- Infusion of technology
- Homework Review
- Test Review
- Research

#### Resources

**§ Textbook:**  
 Angel, Allen, et al. *A Survey of Mathematics: with Applications*. New York: Pearson. 2013. Print.

**§ Supplementary Materials**

**§ Websites**

**§ Calculators**  
 Graphing calculator (TI-83 Plus, or TI-84)

**§ Technology**  
 Power Points, Excel



# Unit Planner: Graph Theory Discrete Mathematics

Tuesday, September 6, 2016, 11:13AM



Cedar Grove High School > 2016-2017 > High School > Mathematics > Discrete Mathematics (D) > Week 19 - Week 20

## Stage 1: Desired Results

NJ Standards

**NJ: 2016 SLS: Mathematics**

**NJ: HS: Modeling**

### Mathematical Practice

**MP.**The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

MP.1. Make sense of problems and persevere in solving them.

MP.2. Reason abstractly and quantitatively.

MP.4. Model with mathematics.

MP.6. Attend to precision.

MP.7. Look for and make use of structure.

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### Enduring Understandings

Graph theory is a useful tool for solving real world problems.  
There are several aspects of graph theory that can help find paths and circuits that would otherwise take an extended period of time to find.

### Essential Questions

What is graph theory and how is it applicable to real world situations? What are the different types of situations that can be simulated and solved with graph theory?

### Content

1. Graphs, Paths, Circuits
2. Euler Paths and Circuits
3. Hamilton Paths and Circuits

### Skills

1.
  - Konigsberg bridge problem
  - Representing floor plans
  - Representing maps
  - Finding a path
  - Finding a circuit
  - Finding a bridge
2.
  - Euler paths and circuits
  - Using Euler's theorem
  - Determining Euler paths and circuits
3.
  - Finding Hamilton Circuits
  - Number of Hamilton Circuits

Traveling Salesman (Time permitting)  
Nearest neighbor (Time permitting)

### Stage 2: Assessment Evidence

#### Assessments

Chapter Quiz  
Written Test  
Personal Project  
Homework  
Other written assessments  
Lecture/seminar  
Q&A in class  
Other oral assessments

### Stage 3: Learning Plan

#### Learning Activities

- Lecture
- Class Discussions
- Cooperative Learning Activities
- Guided Practice
- Performance Assessments
- Projects
- Infusion of technology
- Homework Review
- Test Review
- Research

#### Resources

§ **Textbook:**  
Angel, Allen, et al. *A Survey of Mathematics: with Applications*. New York: Pearson. 2013. Print.  
§ **Supplementary Materials**

#### § **Websites**

§ **Calculators**  
Graphing calculator (TI-83 Plus, or TI-84)

§ **Technology**  
Power Points, Excel



# Unit Planner: Data Collection Discrete Mathematics

Tuesday, September 6, 2016, 11:13AM



Cedar Grove High School > 2016-2017 > High School > Mathematics > Discrete Mathematics (D) > Week 21 - Week 24

Lauritano, Heather

## Stage 1: Desired Results

NJ Standards

**NJ: 2016 SLS: Mathematics**

**NJ: HS: Stats/Prob**

### Making Inferences & Justifying Conclusions

**HSS-IC.A. Understand and evaluate random processes underlying statistical experiments**

HSS-IC.A.1. Understand that statistics is a process for making inferences about population parameters based on a random sample from that population.

**HSS-IC.B. Make inferences and justify conclusions from sample surveys, experiments and observational studies**

HSS-IC.B.6. Evaluate reports based on data.

### Mathematical Practice

**MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.**

MP.1. Make sense of problems and persevere in solving them.

MP.2. Reason abstractly and quantitatively.

MP.3. Construct viable arguments and critique the reasoning of others.

MP.4. Model with mathematics.

MP.5. Use appropriate tools strategically.

MP.6. Attend to precision.

MP.7. Look for and make use of structure.

MP.8. Look for and express regularity in repeated reasoning.

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Enduring Understandings

Careful planning is essential to obtaining valid data.

Essential Questions

How do we obtain data? To what extent is all data

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| <p>Clarifying the question leads to appropriate methodology. The analysis is only as good as the data. Students will understand how to deconstruct statistical information in an effort to evaluate its validity and assess the aims of the authors in presenting the information.</p>   | <p>biased? To what extent does data collection methodology affect results? How can variable be eliminated through randomization? How does one decide between an observational study, an experiment, and a simulation? To what extent can data be purposefully biased?</p>  |
| <p><b>Content</b></p> <ol style="list-style-type: none"> <li>1. Introduction to the practice of statistics</li> <li>2. Observational studies vs Designed experiments</li> <li>3. Simple Random Sampling</li> <li>4. Other effective sampling methods</li> <li>5. Bias in sampling</li> <li>6. The design of experiments</li> </ol> | <p><b>Skills</b></p> <ol style="list-style-type: none"> <li>1. <ul style="list-style-type: none"> <li>Define statistics and statistical thinking</li> <li>Explain the process of statistics</li> <li>Distinguish between qualitative and quantitative variables</li> <li>Distinguish between discrete and continuous variables</li> </ul> </li> <li>2. <ul style="list-style-type: none"> <li>Distinguish between an observational study and an experiment</li> <li>Explain the various types of observational studies</li> </ul> </li> <li>3. <ul style="list-style-type: none"> <li>Obtain a Simple Random Sample</li> </ul> </li> <li>4. <ul style="list-style-type: none"> <li>Obtain a Stratified Sample</li> <li>Obtain a Systematic Sample</li> <li>Obtain a Cluster Sample</li> </ul> </li> <li>5. <ul style="list-style-type: none"> <li>Explain the Sources of Bias in Sampling</li> </ul> </li> <li>6. <ul style="list-style-type: none"> <li>Describe the Characteristics of an Experiment</li> <li>Explain the Steps in Designing an Experiment</li> <li>Explain the Completely Randomized Design</li> <li>Explain the Matched-Pairs Design</li> <li>Explain the Randomized Block Design</li> </ul> </li> </ol> |

### Stage 2: Assessment Evidence

- Assessments**
- Chapter Test**
  - Written Test**
  - Homework Check**
  - Other written assessments**
  - Q&A in class**
  - Other oral assessments**
  - Lecture/seminar**

### Stage 3: Learning Plan

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| <p><b>Learning Activities</b></p> <ul style="list-style-type: none"> <li>· Lecture</li> <li>· Class discussions</li> <li>· Multiple Intelligences Activities</li> <li>· Cooperative Learning Structures</li> <li>· Guided Practice</li> <li>· Performance Assessments</li> <li>· Projects</li> <li>· Simulation activities</li> <li>· Technology infusion</li> <li>· Differentiated Instruction</li> </ul> | <p><b>Resources</b></p> <p>§ <b>Textbook:</b> <i>Statistics: Making Informed Decisions</i><br/>Sullivan<br/>Pearson, 2013</p> <p>§ <b>Supplementary Materials</b></p> <p>§ <b>Websites</b></p> <p>§ <b>Calculators</b><br/>Graphing calculator (TI-83 Plus, or TI-84)</p> |
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- Homework review
- Test review

**§ Technology**  
Power Points, Excel



# Unit Planner: Organizing and Summarizing Data Discrete Mathematics

Tuesday, September 6, 2016, 11:13AM



Cedar Grove High School > 2016-2017 > High School > Mathematics > Discrete Mathematics (D) > Week 25 - Week 28

Lauritano, Heather

## Stage 1: Desired Results

NJ Standards

**NJ: 2016 SLS: Mathematics**

**NJ: HS: Stats/Prob**

### Interpreting Categorical & Quantitative Data

**HSS-ID.A. Summarize, represent, and interpret data on a single count or measurement variable**

HSS-ID.A.1. Represent data with plots on the real number line (dot plots, histograms, and box plots).

**HSS-ID.B. Summarize, represent, and interpret data on two categorical and quantitative variables**

HSS-ID.B.5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal and conditional relative frequencies). Recognize possible associations and trends in the data.

### Mathematical Practice

**MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.**

MP.1. Make sense of problems and persevere in solving them.

MP.2. Reason abstractly and quantitatively.

MP.3. Construct viable arguments and critique the reasoning of others.

MP.4. Model with mathematics.

MP.5. Use appropriate tools strategically.

MP.6. Attend to precision.

MP.7. Look for and make use of structure.

MP.8. Look for and express regularity in repeated reasoning.

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#### Enduring Understandings

Graphical representations are the most common way that statistical information is represented. One must be

#### Essential Questions

What is the best way to organize qualitative or quantitative data?



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| <p>skeptical when looking at a graph or chart. There is a proper way to create a chart or graph so that it is not misleading.</p>   | <p>How can a graph be misleading? What should be kept in mind to not create a graph that is misleading?</p>   |
| <p><b>Content</b></p> <ol style="list-style-type: none"> <li>1. Organizing qualitative data</li> <li>2. Organizing quantitative data</li> <li>3. Additional displays of quantitative data</li> <li>4. Graphical misrepresentations of data</li> </ol> | <p><b>Skills</b></p> <ol style="list-style-type: none"> <li>1. <ul style="list-style-type: none"> <li>Organize Qualitative Data in Tables</li> <li>Construct Bar Graphs</li> <li>Construct Pie Charts</li> </ul> </li> <li>2. <ul style="list-style-type: none"> <li>Organize discrete data in tables</li> <li>Construct histograms of discrete data</li> <li>Organize continuous data in tables</li> <li>Construct histograms of continuous data</li> <li>Draw stem-and-leaf plots</li> <li>Draw dot plots</li> <li>Identify the shape of a distribution</li> </ul> </li> <li>3. <ul style="list-style-type: none"> <li>Construct frequency polygons</li> <li>Create cumulative frequency and relative frequency tables</li> <li>Construct frequency and relative frequency ogives</li> <li>Draw time-series graphs</li> </ul> </li> <li>4. <ul style="list-style-type: none"> <li>Describe what can make a graph misleading or deceptive</li> </ul> </li> </ol> |

### Stage 2: Assessment Evidence

#### Assessments

- Lecture/seminar**
- Q&A in class**
- Other oral assessments**
- Homework**
- Other written assessments**
- Survey**
- Personal Project**
- Written Test**

### Stage 3: Learning Plan

#### Learning Activities

- Lecture
- Class discussions
- Multiple Intelligences Activities
- Cooperative Learning Structures
- Guided Practice
- Performance Assessments
- Projects
- Simulation activities
- Technology infusion
- Differentiated Instruction
- Homework review
- Test review

#### Resources

- § **Textbook:** *Statistics: Making Informed Decisions*  
Sullivan  
Pearson, 2013
- § **Supplementary Materials**
- § **Websites**
- § **Calculators**  
Graphing calculator (TI-83 Plus, or TI-84)
- § **Technology**  
Power Points, Excel



# Unit Planner: Numerically Summarizing Data Discrete Mathematics

Tuesday, September 6, 2016, 11:13AM



Cedar Grove High School > 2016-2017 > High School > Mathematics > Discrete Mathematics (D) > Week 29 - Week 33

Lauritano, Heather

## Stage 1: Desired Results

### NJ Standards

#### **NJ: 2016 SLS: Mathematics**

#### **NJ: HS: Stats/Prob**

#### **Interpreting Categorical & Quantitative Data**

##### **HSS-ID.A. Summarize, represent, and interpret data on a single count or measurement variable**

HSS-ID.A.2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

HSS-ID.A.3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

HSS-ID.A.4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets and tables to estimate areas under the normal curve.

#### **Making Inferences & Justifying Conclusions**

##### **HSS-IC.B. Make inferences and justify conclusions from sample surveys, experiments and observational studies**

HSS-IC.B.3. Recognize the purposes of and differences among sample surveys, experiments and observational studies; explain how randomization relates to each.

HSS-IC.B.4. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.

HSS-IC.B.5. Use data from a randomized experiment to compare two treatments; justify significant differences between parameters through the use of simulation models for random assignment.

HSS-IC.B.6. Evaluate reports based on data.

#### **Mathematical Practice**

**MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.**

MP.1. Make sense of problems and persevere in solving them.

MP.2. Reason abstractly and quantitatively.

MP.3. Construct viable arguments and critique the reasoning of others.

MP.4. Model with mathematics.

MP.5. Use appropriate tools strategically.

MP.6. Attend to precision.

MP.7. Look for and make use of structure.

MP.8. Look for and express regularity in repeated reasoning.

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### Enduring Understandings

Even though a piece of data may not seem like it is an outlier, it very well may be. Know what the different measurements mean so when they are used, you know if the author used it to mislead data or was being truthful. Know what standard deviation means and how it is used.

### Essential Questions

What is the best measure of central tendency given a set of data? How can the measure of spread be determined so that someone can tell how spread out data is? How can the mean and standard deviation be calculated from grouped data (continuous quantitative)? How can a boxplot mimic the shape of a distribution?

### Content

1. Measures of central tendency
2. Measures of dispersion
3. Measures of central tendency and dispersion from grouped data
4. Measures of position and outliers
5. The five-number summary and boxplots

### Skills

1. Determine the arithmetic mean of a variable from raw data  
Determine the median of a variable from raw data  
Explain what it means for a statistic to be resistant  
Determine the mode of a variable from raw data
2. Determine the range of a variable from raw data  
Determine the standard deviation of a variable from raw data  
Determine the variance of a variable from raw data  
Use the Empirical Rule to describe data that are bell shaped
3. Approximate the mean of a variable from grouped data  
Compute the weighted mean  
Approximate the standard deviation of a variable from grouped data
4. Determine and interpret z-scores  
Interpret percentiles  
Determine and interpret quartiles  
Determine and interpret the interquartile range  
Check a set of data for outliers
5. Compute the five-number summary  
Draw and interpret boxplots

## Stage 2: Assessment Evidence

### Assessments

Lecture/seminar

Homework

Other written assessments

Q&A in class

Other oral assessments

Written Test

Use of Calculator to display boxplots

## Other Visual Assessments

### Stage 3: Learning Plan

#### Learning Activities

- Lecture
- Class discussions
- Multiple Intelligences Activities
- Cooperative Learning Structures
- Guided Practice
- Performance Assessments
- Projects
- Simulation activities
- Technology infusion
- Differentiated Instruction
- Homework review
- Test review

#### Resources

§ **Textbook:** *Statistics: Making Informed Decisions*  
Sullivan  
Pearson, 2013

#### § **Supplementary Materials**

#### § **Websites**

#### § **Calculators**

Graphing calculator (TI-83 Plus, or TI-84)

#### § **Technology**

Power Points, Excel



# Unit Planner: Scatter Plots and Correlation Discrete Mathematics

Tuesday, September 6, 2016, 11:18AM



Cedar Grove High School > 2016-2017 > High School > Mathematics > Discrete Mathematics (D) > Week 34 - Week 36

Lauritano, Heather

## Stage 1: Desired Results

### NJ Standards

#### **NJ: 2016 SLS: Mathematics**

#### **NJ: HS: Stats/Prob**

#### **Interpreting Categorical & Quantitative Data**

##### **HSS-ID.A. Summarize, represent, and interpret data on a single count or measurement variable**

HSS-ID.A.1. Represent data with plots on the real number line (dot plots, histograms, and box plots).

##### **HSS-ID.C. Interpret linear models**

HSS-ID.C.7. Interpret the slope (rate of change) and the intercept (constant term) of a linear fit in the context of the data.

HSS-ID.C.8. Compute (using technology) and interpret the correlation coefficient of a linear fit.

HSS-ID.C.9. Distinguish between correlation and causation.

#### **Conditional Probability & the Rules of Probability**

##### **HSS-CP.A. Understand independence and conditional probability and use them to interpret data**

HSS-CP.A.4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.

#### **Mathematical Practice**

**MP.** The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

MP.1. Make sense of problems and persevere in solving them.

MP.2. Reason abstractly and quantitatively.

MP.3. Construct viable arguments and critique the reasoning of others.

MP.4. Model with mathematics.

MP.5. Use appropriate tools strategically.

MP.6. Attend to precision.

MP.7. Look for and make use of structure.

MP.8. Look for and express regularity in repeated reasoning.

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| <p><b>Enduring Understandings</b></p> <p>Regression is an effective model for prediction. There is a difference between causation and correlation.</p> | <p><b>Essential Questions</b></p> <p>Is a regression model an effective model for prediction? Is there a difference between causation and correlation? Can causation be determined from correlation?</p>   |
| <p><b>Content</b></p> <ol style="list-style-type: none"> <li>Scatter diagrams and correlation</li> <li>Least-squares regression</li> </ol>             | <p><b>Skills</b></p> <ol style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>Draw and interpret scatter diagrams</li> <li>Describe the properties of the linear correlation coefficient</li> <li>Compute and interpret the linear correlation coefficient</li> <li>Determine whether a linear relation exists between two variables</li> <li>Explain the difference between correlation and causation</li> </ul> </li> <li> <ul style="list-style-type: none"> <li>Find the least-squares regression line and use the line to make predictions</li> <li>Interpret the slope and the y-intercept of the least-squares regression line</li> <li>Compute the sum of squared residuals</li> </ul> </li> </ol> |

**Stage 2: Assessment Evidence**

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| <p><b>Assessments</b></p> <ul style="list-style-type: none"> <li>Lecture/seminar</li> <li>Q&amp;A in class</li> <li>Other oral assessments</li> <li>Homework</li> <li>Other written assessments</li> <li>Written Test</li> </ul> |
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**Stage 3: Learning Plan**

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| <p><b>Learning Activities</b></p> <ul style="list-style-type: none"> <li>Lecture</li> <li>Class discussions</li> <li>Multiple Intelligences Activities</li> <li>Cooperative Learning Structures</li> <li>Guided Practice</li> <li>Performance Assessments</li> <li>Projects</li> <li>Simulation activities</li> <li>Technology infusion</li> <li>Differentiated Instruction</li> <li>Homework review</li> <li>Test review</li> </ul> | <p><b>Resources</b></p> <ul style="list-style-type: none"> <li>§ <b>Textbook:</b> <i>Statistics: Making Informed Decisions</i><br/>Sullivan<br/>Pearson, 2013</li> <li>§ <b>Supplementary Materials</b></li> <li>§ <b>Websites</b></li> <li>§ <b>Calculators</b><br/>Graphing calculator (TI-83 Plus, or TI-84)</li> <li>§ <b>Technology</b><br/>Power Points, Excel</li> </ul> |
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# Unit Planner: Probability Discrete Mathematics

Tuesday, September 6, 2016, 11:23AM



Cedar Grove High School > 2016-2017 > High School > Mathematics > Discrete Mathematics (D) > Week 37 - Week 40

Lauritano, Heather

## Stage 1: Desired Results

### NJ Standards

#### NJ: 2016 SLS: Mathematics

#### NJ: HS: Stats/Prob

#### Using Probability to Make Decisions

##### HSS-MD.A. Calculate expected values and use them to solve problems

HSS-MD.A.1. (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.

HSS-MD.A.2. (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.

HSS-MD.A.3. (+) Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value.

HSS-MD.A.4. (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.

##### HSS-MD.B. Use probability to evaluate outcomes of decisions

HSS-MD.B.5a. Find the expected payoff for a game of chance.

HSS-MD.B.5b. Evaluate and compare strategies on the basis of expected values.

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#### Enduring Understandings

Probability is a tool for measuring long-term behavior. Probability is used to make inferences and predictions. Use permutations and combinations to solve real life situations.

#### Essential Questions

What is probability? How can probability be simulated? What is a probability distribution? How does one determine probability for a given event? How are probabilities computed? Why is the computation of probabilities useful? How can permutations and combinations be used to calculate probabilities?

#### Content

1. Probability Rules
2. The addition rule and compliments
3. Independence and the multiplication rule
4. Conditional probability and the general multiplication rule
5. Counting techniques
6. Which method do I use?

#### Skills

1. Apply the rules of probabilities  
Compute and interpret probabilities using the empirical method  
Compute and interpret probabilities using the classical method  
Use simulation to obtain data based on probabilities  
Recognize and interpret subjective probabilities

2. Use the Addition Rule for Disjoint Events  
Use the General Addition Rule  
Compute the probability of an event using the Complement Rule
3. Identify independent events  
Use the Multiplication Rule for Independent Events  
Compute at-least probabilities
4. Compute conditional probabilities  
Compute probabilities using the General Multiplication Rule
5. Solve counting problems using the Multiplication rule  
Solve counting problems using permutations  
Solve counting problems using combinations  
Solve counting problems involving permutations with nondistinct items  
Compute probabilities involving permutations and combinations
6. Determine the appropriate probability rule to use  
Determine the appropriate counting technique to use

### Stage 2: Assessment Evidence

#### Assessments

**Lecture/seminar**  
**Q&A in class**  
**Other oral assessments**  
**Homework**  
**Other written assessments**  
**Baseball**  
**Personal Project**  
**M&M's**  
**Personal Project**  
**Written Test**

### Stage 3: Learning Plan

#### Learning Activities

- Lecture
- Class discussions
- Multiple Intelligences Activities
- Cooperative Learning Structures
- Guided Practice
- Performance Assessments
- Projects
- Simulation activities
- Technology infusion
- Differentiated Instruction
- Homework review
- Test review

#### Resources

- § Textbook: *Statistics: Making Informed Decisions***  
 Sullivan  
 Pearson, 2013  
**§ Supplementary Materials**
- § Websites**
- § Calculators**  
 Graphing calculator (TI-83 Plus, or TI-84)
- § Technology**  
 Power Points, Excel