To support Broward College’s Quality Enhancement Plan (QEP), critical thinking is defined as a process of evaluating information by questioning and testing assumptions, accepting and rejecting arguments and/or perspectives, and applying reasoning to make informed decisions.

1. **Critical Thinking Learning Outcome Statements:**
   *Students will be able to:*
   1.1. Analyze and interpret relevant information
   1.2. Explain questions, problems, and/or issues
   1.3. Evaluate information to determine credibility of reasoning
   1.4. Generate well-reasoned conclusions

2. **Critical Thinking Learning Experiences:**

<table>
<thead>
<tr>
<th>Student Learning Outcome</th>
<th>Teaching &amp; Learning Experiences</th>
<th>Elements of Thought and/or Intellectual Standards</th>
</tr>
</thead>
</table>
| 1. Explain questions, problems, and/or issues | Students are required to:  
1. Read a scientific analysis on Arctic sea ice conditions from the National Snow and Ice Data Center (NSIDC) [http://nsidc.org/arcticseaicenews/](http://nsidc.org/arcticseaicenews/)  
2. View a short video produced by NASA on disappearing Arctic sea ice [http://www.youtube.com/watch?v=UVzCOoQY28Y](http://www.youtube.com/watch?v=UVzCOoQY28Y)  
3. View a short video on the BBC Weather News Channel on Arctic sea ice melting | Students will:  
**Purpose:** Identify the purpose of the video produced by the BBC Weather News and the problem or issue which it addresses.  
**Questions:** Formulate at least three questions which come to mind after viewing the videos and reading the scientific analysis.  
**Information/data:** Describe the trend observed in Arctic sea ice melting and identify the relevant data/statistics from the video and the scientific analysis which support the trend from 1978 to 2014.  
**Implication/consequences:** Students will discuss the possible implications of |
| 2. Analyze and interpret relevant information | To analyze and interpret relevant information, Students will be randomly assigned to a group, consisting of approximately 6 students. Working collaboratively, they will conduct a simple statistical study to answer a research question pertaining to a real life issue or problem.  
In conducting the study, students will:  
1. Identify the population pertaining to the research question and develop a survey for collecting sample data, using a particular sampling strategy.  
2. Collect and tabulate survey data for analysis.  
3. Analyze, and interpret data by:  
   1. Constructing frequency tables, generating graphs and charts, calculating measuring of central tendency, variation and position.  
   2. Estimating population parameters, constructing confidence intervals, calculating sample sizes, and interpreting correlation coefficients. | Students will: Purpose: Identify the purpose of their research project, which is to gain a better understanding of the real life issue or problem which they have identified. Questions: Formulate at least two research questions or hypothesis statements which they will test empirically. Information/data: Engage in a process of data collection, analysis, and interpretation which they will use to address the research questions. Assumptions: Compare original hypotheses with empirical evidence to either support or refute initial beliefs. Assumptions that guided initial beliefs will be questioned and either rejected or confirmed. |
| 3. Evaluate information to determine credibility of reasoning | Using the survey data collected, students will:  
1. Conduct one or more hypothesis tests to answer their research questions identified in 1.2 above  
   i) Identify the null hypothesis and the alternative hypothesis, and express them both in symbolic form  
   ii) Calculate the value of the test statistic.  
   iii) Identify the critical value(s)  
   iv) Determine the p-value  
   v) State the conclusion | Students will: Inference/Conclusions: Determine the appropriate conclusion of the hypothesis test, based on the analysis of sample data. Assumptions: Given the findings from the hypothesis test, students will determine to what extent, assumptions which guided initial beliefs, |
2. Evaluate the findings from the hypothesis tests to determine whether their original claim can be supported or not.

   should be questioned and either be rejected or re-affirmed.

3. Generate well-reasoned conclusions

   **Using the results of the hypothesis tests conducted, students will:**

   1. Present the findings of their research study to the class via a PowerPoint presentation. Were original beliefs supported or not? What conclusions can be drawn from the study?

   2. Discuss the implications of the findings. What factors could have influence the results observed? How can this issue be addressed?

   **Inference/Conclusions:**

   Students will use the data they have collected and analyzed to arrive at logical, well-reasoned and thoughtful conclusions as to the veracity of their hypothesis statements.

   **Implication/consequences:**

   Students will determine and discuss the implications of their findings from their study.

   For example, what does it mean to learn that 80% of Broward College students purchase their textbooks from the college’s bookstore, even though the prices at the bookstore are approximately 30 – 60 percent higher than other vendors such as, Amazon, Chegg, or Half-Price.com?

### 3. Minimum of 2 Critical Thinking Resources/References for Student Self-exploration

**Examples:**

- The Critical Thinking Community: College and University Students


- The Critical Thinking Community: Critical Thinking in Every Day Life: 9 Strategies

### Portfolio:
Journal Writing

Extra Credit Assignment (25 points)

Research Project Reflective Journal

Writing skills are extremely important for college students. It can be the ticket to better college grades and greater academic achievement. One thing is certain, you will be required to write with clarity at some point in the future. This extra credit assignment is an opportunity for you to practice and sharpen your writing skills.

Assignment Instruction
Should you choose to take the extra credit assignment, you will be required to keep a research journal in which you will communicate your experiences, thoughts, ideas, facts, and yes, your frustrations too, pertaining to your research project and the class as a whole. You will write in simple and clear language. To obtain a passing score (15 points) your journal must have a minimum of 8 entries and each entry must have a minimum of 12 complete sentences. Of course you are encouraged to write much more than 12 sentences for each entry. See below for an example of what your reflective journal may look like. I encourage you to share your thoughts, your frustrations, your insights, as well as your good experiences with the research project and the class as a whole. What do you like? What do you dislike? How could it be better? Your journal should be in the form of a word document, double spaced with a font size of 12. Please pay attention to punctuation and good grammar. Also, please note the due dates for your submissions. You are required to write at least one journal entry every 2 weeks. However, you are encouraged to write as much as possible, every week or certainly every other week. The more you write, the more likely you are to get the full 25 points.

Write your reflective journal entries as a word document and then upload the document as an attachment in the extra credit assignment folder in D2L. This folder can be found by clicking on the “Assignments” tab in D2L.

Project-based learning
Collaborative Group Project (100 POINTS)

Objective: Students will conduct a simple statistical study to answer a research question. This is a group research project in which you will apply the methods and concepts learned in this class to real life situations.

Purpose of Project: The purpose of this project is to gain experience in:

- Planning a study
- Gathering data
- Analyzing data
- Drawing conclusions
- Communicating / presenting the results of your study

Student Learning Outcomes:
1. Students will generate a research question and identify the population and sample to which it pertains.
2. Students will design a survey/questionnaire for collecting data. Students will administer the survey and collect data.
3. Students will analyze data, estimate population parameters, construct confidence intervals, calculate sample size, interpret correlation coefficients, conduct hypothesis tests, and present other statistics in their presentation.
4. Students will prepare a PowerPoint presentation or video report which communicates the results of the study.

Step by Step Guide:
As you complete each task below, check it off. Answer all questions in your narrative summary report.

____ Decide on a research question. You can choose one from the list below or generate your own. Identify your population and sample. Decide how you will select your sample and the appropriate sample size.
____ Describe the procedure to collect your data. Prepare your survey or questionnaire.
____ Conduct your survey. Collect your data.
____ Prepare final report / presentation.

Suggested Topics:
1. What are the three most popular TV sitcoms that Broward College students look at? Is there a difference by gender? Age? Ethnicity?
2. What are the three most popular music genres that Broward College students listen to? Is there a difference by gender? age? ethnicity?
3. What proportion of Broward College students has pets? What is the most common pet? Do male students tend to have different pets than female students?
4. What proportion of Broward College students have full-time jobs (40+ hours per week)? Is there a relationship between hours studied and grades earned?

5. Is there a difference in the numbers of credit cards carried by male and female students?

6. Is there a difference in the overall GPA’s of students who work (part / full time jobs) and those who don't work?

7. What proportion of Broward College students drinks coffee? Smoke cigarettes? Is there a difference by age, gender, or ethnicity?

8. Where do Broward college students purchase their textbooks? How much do students spend on textbooks each semester?

9. What proportion of Broward College students at North Campus use social networking sites and how many hours per week do they spend on these sites?

10. What proportion of Broward College students at North Campus believe that marijuana should be legalized? Is there a difference by age, gender, or ethnicity?

11. Political party affiliations of Broward College Students: What percentage of Broward College students are Democrats / Republicans / Independents?

12. Voting behavior of Broward College students: What percentage of Broward College students are registered voters? What percentage plan to vote in the next presidential election?

**Assignment:** Conduct a survey, study, or experiment. Present your findings to the class and submit a written report.

**STEP 1:** Decide what you are going to investigate. Identify your research question. Identify your population and your sample.

**STEP 2:** Decide what kind of sampling you will use to collect your data? Prepare survey or questionnaire. Identify your sample. Conduct survey.

**STEP 3:** Collect and analyze your data. Show frequency tables, box plots, histograms, calculate probabilities using data collected, construct confidence intervals. Conduct Hypothesis Tests. Decide on the statistics that you will? For example, mean, mode, median, or percentages? Calculate standard deviations. Estimate sample sizes.

**STEP 4:** Class presentation – PowerPoint. Tell us about your project and provide visuals, handouts, posters, etc.

**GRADE:** Your grade will be based on your design, analysis, conclusions, presentation, report, and self-evaluation, as well as accuracy, clarity, and your proper use of statistical techniques and vocabulary.

STA2023
# TIME-LINE FOR GROUP RESEARCH PROJECT

<table>
<thead>
<tr>
<th>DUE DATE</th>
<th>LEARNING OUTCOMES - CONTENT / ACTIVITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEEK 3 01/20/14</td>
<td>What is your research question? Describe what you are going to investigate. Identify the population for your study. Identify the sample for your study. Describe how you will collect your data. Create survey to collect data.</td>
</tr>
<tr>
<td>WEEK 6 02/10/14</td>
<td>Data collection and Analysis. You should have collected or be in the process of collecting your data. Combine the data collected by all group members into a single Excel file. Begin summarizing the data by creating frequency tables, histograms, and bar-graphs. Calculate measures of center, variation, and dispersion. Compute z-scores, percentiles, and quartiles. Identify variables with normal distributions and those that are positively or negatively skewed.</td>
</tr>
<tr>
<td>WEEK 13 03/31/14</td>
<td>Prepare powerpoint presentation showing work completed. Prepare for group presentation. Each member of the group must present. State your conclusions regarding the original research question. What did you discover? Were there any surprises? If you had to redo this project, would you do it differently? What suggestions for improvement would you recommend?</td>
</tr>
<tr>
<td>WEEK 15 04/21/14</td>
<td>Group presentation in Class. Your final grade will be based on: (1) extent to which you have attempted to address the instructions/questions above; (2) the quality of the group’s powerpoint presentation; (3) the quality of teamwork demonstrated; and (4) accuracy, clarity, and proper use of statistical analyses and vocabulary. See grading rubric for research project that is posted on D2L.</td>
</tr>
</tbody>
</table>

STA 2023: STATISTICS
Course Objectives:  This course will introduce you to the fundamentals of descriptive and inferential statistics. It will help you understand the value of statistics in acquiring knowledge and making decisions in today’s society. It will also help you become a critical and thoughtful consumer of information.

Course Student Learning Outcomes:

Upon the successful completion of this course you will be able to:

1. Identify and apply various data collection and sampling methods. Distinguish between population parameters and sample statistics. Identify data at each of the four levels of measurement.
2. Organize, summarize, and illustrate data in tables and graphs. Construct and interpret frequency, relative and cumulative frequency distribution tables. Construct and interpret histograms.
3. Calculate and interpret measures of central tendency, variation, and position.
4. Develop an understanding of the concept of probability by applying the definition and rules of probability to solve problems involving discrete variables. Calculate probabilities of simple, compound, and conditional events.
5. Determine the probability distribution for a given experiment and random variable and calculate its mean and standard deviation.
6. Compute probabilities for random variables having a normal distribution and solve problems using the normal distribution. Apply the central limit theorem for sample means.
7. Determine point and interval estimates for population parameters.
8. Construct confidence intervals for population proportions and means. Calculate appropriate sample sizes used for the estimation of a population proportion and population mean with known standard deviation.
9. Demonstrate an understanding of the concept and process of hypothesis testing by performing hypothesis tests using the p-value and traditional methods.
10. Develop an understanding of the concept of linear correlation and regression by constructing and interpreting a scatter plot, by computing and interpreting a linear correlation coefficient, and by determining the simple linear regression equation and using it to make predictions.

Course Description:  This is a first course in statistical methods, addressing such topics as: collecting, grouping, and presenting data; measures of central tendency; variation and position; theoretical distributions; probability; estimation of parameters; tests of hypotheses, correlation and regression. The complete outline for this course is provided on the web at: http://www.broward.edu/outlines/STA2023.pdf
Time:

Location:

Prerequisite: Intermediate Algebra (MAT 1033) with a grade of “C” or higher, or recommendation of the Mathematics Department (via equivalent course or placement test score).

Text/Supplies: Elementary Statistics; Mario F. Triola; (11th edition); Addison Wesley; 2009. You must also acquire a TI-84 scientific calculator. The T1-83 model is also an acceptable model.

Attendance Policy

You are expected to attend all class meetings. Attendance is taken at the beginning of each class. No absences, whether approved by the college for participation in college-sponsored activities or necessitated by sickness or other personal emergency, are "excused" in the sense of relieving you of the responsibility for work assigned or carried on in class during your absence.

Your absence will be excused if due to a major religious holiday in your own faith, your own serious illness, a death in your immediate family (mother, father, spouse, child, brother, sister, grandparent, or grandchild), or attendance to a statutory government obligation, but you **MUST** provide supporting documentation. **Three or more unexcused absences will result in a grade of F.** If you stop submitting assignments or fail to take tests prior to the withdrawal date, you will be administratively withdrawn from class and receive a **W** or, if it is your third attempt, an **F**.

If you stop participating after the withdrawal date, you will receive a **WF** that will then be computed as an **F** in your **GPA**. To avoid this situation, you should remain an active learner in this class and always communicate extenuating circumstances to me. Ongoing communication with the instructor is critical to your course success. I will use completion of tests, quizzes, and other class assignments as indicators of your participation in order to satisfy this reporting requirement.

Grading Policy:

Your final grade in this course will be based on:

1. **Three (3) Exams:** There will be 3 exams, each worth 125 points. Exam 1 will be on chapters 1-3. Exam 2 will be on chapter 4, 5, and 6, and exam 3 will be on chapters 7, 8 and 10. The dates of the exams are
listed in the course schedule but are subject to change. You will be notified at least 1 week in advance before an exam is given. A makeup exam will be given only if verifiable documentation can be provided showing your illness or emergency. The day of the makeup exam will be decided by the instructor on an individual basis and will take place in my office under my supervision.

(2) **Chapter Quizzes:** There will be a total of 9 take-home chapter quizzes, each of which is worth 15 points. The lowest quiz score will be removed and the remaining 8 quiz scores will be used to compute your overall quiz score. Quizzes are due before the start of class. **No late quizzes will be accepted.**

(3) **Group Project:** You will be assigned to a group and your group will conduct a simple statistical study to answer a research question. You will apply the methods and concepts learned in this class to real life situations. You will work cooperatively with your group members to produce a PowerPoint presentation showing the method and results of your study. See handout on group project for more details. **Please be aware that all Group presentations are video-recorded.** These video recording are used only for teaching and learning purposes and will be kept confidential.

Computation of the final grade will be as follows:

<table>
<thead>
<tr>
<th></th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXAM 1</td>
<td>125</td>
</tr>
<tr>
<td>EXAM 2</td>
<td>125</td>
</tr>
<tr>
<td>EXAM 3</td>
<td>125</td>
</tr>
<tr>
<td>8 TAKE-HOME QUIZZES</td>
<td>120</td>
</tr>
<tr>
<td>GROUP RESEARCH PROJECT</td>
<td>100</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>595</strong></td>
</tr>
</tbody>
</table>

**Grade of A:** 535 points and above

**Grade of B:** 476 points and above

**Grade of C:** 416 points and above

**Grade of D:** 357 points and above

**Grade of F:** This grade will be awarded to those who: (1) fail to acquire a course average of at least 60%; (2) commit an act of cheating/plagiarism; and/or (3) stop attending the course without officially withdrawing.

**Course Policy:** By registering for this course as a student, you agree to the following statement:

I have read the syllabus for STA2023 and the course policy. I understand that I must demonstrate my learning of statistical concepts/methods
through quizzes, exams, and a research project, to be successful in this class. **I will study and keep up to date with all course material on a daily basis.** I also realize the need to be polite and respectful to other students and the instructor, to stay for the full allotted class time, and to ask questions and seek out additional help when needed. If you find, later in the semester, that you no longer want to learn the material in this course, you’re expected to withdraw, if possible.

Whining or complaining about the amount of work or the difficulty of the material will be counterproductive. **Your behavior must be respectful.** If your comments or actions in class adversely affect other students or the functioning of the class, it will be considered disruptive. Also considered disruptive are: (1) conversations among students while information is being presented, (2) rude comments or remarks directed toward other students or the instructor, (3) raised voices or confrontational comments, (4) failure to follow instructions given by the instructor. Disruptive behavior may result in you being asked to leave the class.

You are expected to be in class (on time) and to stay for the entire class period. On the dates where tests are given. You’ll have the entire class period to complete the test. During testing, all materials and personal items must be placed under your chair or remain closed on your desk. All tests are to be exclusively your own work. Cheating in any way will result in disciplinary action and a grade of “F” for the course.

**Academic Honesty:** Broward College expects its students to be honest in all of their course work and activities. Breaches of academic honesty include cheating, plagiarism, misrepresentation, bribery, and the unauthorized possession of examinations, papers, or other class materials that have not been formally released by instructor. A student’s academic work must be the result of his or her own thought, research, or self-expression. Cheating includes, but is not limited to, looking at the text notes or another person’s paper during an examination. Cheating also includes the giving of work or information to another student to be copied and/or used as his or her own. This also includes giving someone answers to examination questions either when an examination is being given or after having taken an examination. Students found violating this academic honesty policy in class, during quizzes or exams, or on assignments will automatically receive a “0” for the quiz, exam and/or assignment. The student will then be referred to the Dean of Student Affairs for disciplinary action.

**Disability Statement:** A student must satisfy the definition of a disability as established by the Americans with Disabilities Act of 1990 and Section 504 of the Rehabilitation Act of 1973. Section 504 defines a disability as a condition which substantially limits one or more major life activities such as learning, walking, seeing, hearing, breathing, caring for oneself, and
working. To be eligible for accommodations, a student must provide appropriate documentation of each disability that demonstrates an accompanying substantial limitation to one or more major life activities. Students who have special needs as defined by the Americans with Disabilities Act should:

Notify the Broward College of Disability Services as early in the term as possible. It is the student’s responsibility to contact the Office of Disability Services to document disability prior to receiving services. Notify the instructor after contracting the Office of Disability Services so that the instructor can consult with the Office of Disability Services to discuss which accommodations are appropriate for the situation.

**COURSE SCHEDULE**

What follows is a section-by-section breakdown of the estimated manner in which this course will be organized. I reserve the right to make adjustments to the syllabus, course calendar, and other attending documents during the semester in the event of extenuating circumstances and to supplement the existing textbook sections with other written materials.

<table>
<thead>
<tr>
<th>WEEK 1 01/07</th>
<th><strong>CHAPTER 1: REVIEW OF SYLLABUS:</strong> GROUP ASSIGNMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Introduction to Statistics. Statistical thinking: Context / Source of data; Sampling Method; Conclusions; Practical implications. <strong>Required Reading:</strong> Chapter 1. Pages 4-34</td>
</tr>
<tr>
<td></td>
<td>Homework: Pg 9, EX 1-2, Questions 1-18; Pg 16, EX 1-3, Questions 5-32; Pg 35, EX 1-5, Questions 9-20.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WEEK 2 01/14</th>
<th><strong>CHAPTER 1:</strong> Nature of data; Collecting sample data; Levels of Measurement. Uses and Abuses of Statistics. Design of Experiments. Sampling Designs. <strong>Required Reading:</strong> Chapter 1. Pages 4-34</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Homework: Pg 9, EX 1-2, Questions 1-18; Pg 16, EX 1-3, Questions 5-32; Pg 35, EX 1-5, Questions 9-20.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Homework: Pg 53; EX 2-2, Questions 5-16. Page 76, Questions 1-10.</td>
</tr>
</tbody>
</table>
Homework: Page 94-95, EX 3-2, Questions 5-12. Pg 96, Questions 21 and 22, Pg 110, EX 3-3, Questions 5-10 and Page 127, EX 3-4, Questions 5-22. |
| WEEK 5 02/04 | **EXAM 1** |
Homework: Pg 148-149, EX 4-2. Questions 5-32; Pg. 157-158, EX 4-3 Questions 17-32. Pg 168-170, EX 4-4, Questions 5-27. Pg 175-176, EX 4-5, Questions 5-15. |
| WEEK 8 02/25 | **CHAPTER 6:** Normal Probability Distributions. Finding Probabilities when given Z-Scores. Finding Z-Scores from known areas. Applications of the Normal Distribution. Finding values from known areas. Sampling Distributions and Estimators. The Central Limit Theorem – Definition and Applications. Interpreting Results and the Rare Event Rule. **Required Reading:** Section 6.1 – 6.3 and Section 6-5. Pages 249-270 |
| WEEK 9 03/04 | SPRING BREAK |
| WEEK 10 03/11 | EXAM 2 |
**Required Reading:** Section 7.1 – 7.3. Pages 327-338 and 346-351  
Homework: Pg. 340, EX 7-2, Questions 5-28; Pg 343 EX 7-3, Questions 41-42, Page 352, EX 7-3, Questions 5-14. |
| WEEK 12 03/25 | **CHAPTER 8:** Basics of Hypothesis Testing. Components of a Formal Hypothesis Test. Identifying the Null and Alternative Hypotheses.  
Converting sample data to a test statistic. Tools for assessing the Test Statistic: Critical Region, Significance Level, Critical Value, Two-Tailed, Left-Tailed, and Right-Tailed tests, and procedure for finding P-Value.  
**Required Reading:** Section 8.1 – 8.3 Pages 391-403  
Homework: Pg. 409-410, EX 8-2, Questions 5-24. |
| WEEK 13 04/01 | **CHAPTER 8:** Hypothesis Testing.  
Determine the rejection region(s) and construct sketch of the region.  
Determine p-value for a hypothesis test. Calculate sample z or t test. Significance Level, Critical Value, and P-Value. Decisions and Conclusions: Wording of the final conclusion. Testing a claim about a proportion – P-Value method versus Traditional method. Testing a claim about a Mean with known Standard Deviation. Perform a hypothesis test relating to the difference of two means when given two independent samples.  
**Required Reading:** Section 8.3 – 8.4 Pages 412-415, and pages 425-428  
Homework: Pg. 410-411, EX 8-2, Questions 25-40; EX 8-3, Questions 9, 10, and 13, and EX 8-4, Questions 10 and 14. |
| WEEK 14 04/08 | **CHAPTER 10:** Correlation and Regression. Basic concepts of correlation. Construct and interpret scatter diagrams. The Linear Correlation Coefficient. Calculating the correlation coefficient - r. Interpretation of the linear correlation coefficient - r. Explained |
variation. Testing for significant linear correlation between two variables. P-value Method for a hypothesis test for correlation.

**Required Reading:** Section 10.1 – 10.3 Pages 517-529

Homework: Pg 530-531, EX 10-2, Questions 2-6; and 9-10.

| WEEK 14 04/15 | **CHAPTER 10**: Correlation and Regression. Basic concepts of regression. Determining the equation for a regression line. Determining best predicted values of variable Y using the regression equation.
| **Required Reading:** Section 10.1 – 10.3 Pages 517-529
| Homework: Pg 530-531, EX 10-2, Questions 2-6; and 9-10. |

| WEEK 15 04/22 | **GROUP PRESENTATIONS** |

| WEEK 16 04/29 - 01 | **EXAM 3** |