MTH 154
Quantitative Reasoning
Course Syllabus

Instructor: James Brandon Wright
Session: Fall 2018 and Spring 2019
Meeting Days: Every other day (W or L day)
Time: Varies
Location: Washington-Lee High School Room 4016
Contact: Brandon.wright@apsva.us

Course Description:
Presents topics in proportional reasoning, modeling, financial literacy and validity studies (logic and set theory). Focuses on the process of taking a real-world situation, identifying the mathematical foundation needed to address the problem, solving the problem and applying what is learned to the original situation.

General Course Purpose:
The Quantitative Reasoning course is organized around big mathematical concepts. The course’s nontraditional treatment of content will help students develop conceptual understanding by supporting them in making connections between concepts and applying previously learned material to new contexts. The course will help to prepare students for success in future courses, gain skills for the workplace, and participate as productive citizens in our society. Encourage students to do mathematics with real data. This includes recognizing the real world often has less than perfect data, ambiguities and multiple possible solutions. It also means equipping students to be intelligent consumers of quantitative data and reports. Encourage students to engage in productive struggle to learn mathematics and make connections to the world in which they live.

Course Prerequisites/Co-Requisites:
Competency in MTE 1-5 as demonstrated through placement or unit completion or equivalent or Corequisite: MCR 4: Learning Support for Quantitative Reasoning

Course Objectives:
• Communication
  • Interpret and communicate quantitative information and mathematical and statistical concepts using language appropriate to the context and intended audience.
    o Use appropriate mathematical language in oral, written and graphical forms.
    o Read and interpret real world advertisements, consumer information, government forms and news articles containing quantitative information.
    o Use quantitative information from multiple sources to make or critique an argument.
• Problem Solving
  • Make sense of problems, develop strategies to find solutions, and persevere in solving them.
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- Develop an answer to an open-ended question requiring analysis and synthesis of multiple calculations, data summaries, and/or models.
- Develop personal problem solving processes and apply them to applications studied over an extended period of time.

- Reasoning
  - Reason, model, and draw conclusions or make decisions with quantitative information.
    - Draw conclusions or make decisions in quantitatively based situations that are dependent upon multiple factors. Students will analyze how different situations would affect the decisions.
    - Present written or verbal justifications of decisions that include appropriate discussion of the mathematics involved.
    - Recognize when additional information is needed or the appropriate times to simplify a problem.

- Evaluation
  - Critique and evaluate quantitative arguments that utilize mathematical, statistical, and quantitative information.
    - Evaluate the validity and possible biases in arguments presented in real world contexts based on multiple sources of quantitative information - for example; advertising, internet postings, consumer information, political arguments.

- Technology
  - Use appropriate technology in a given context.
    - Use a spreadsheet to organize quantitative information and make repeated calculations using simple formulas.
    - Explore internet-based tools appropriate for a given context - for example, an online tool to calculate credit card interest or a scheduling software package.

- Financial Literacy
  - Simple Interest
    - Define interest and understand related terminology.
    - Develop simple interest formula.
    - Use simple interest formulas to analyze financial issues
  - Compound Interest
    - Describe how compound interest differs from simple interest.
    - Explain the mechanics of the compound interest formula addressing items such as why the exponent and \((1+r/n)\) is used.
    - Use compound interest formulas to analyze financial issues
    - Show the difference between compound interest and simple interest using a table or graph.
  - Borrowing
    - Compute payments and charges associated with loans.
    - Identify the true cost of a loan by computing APR
    - Evaluate the costs of buying items on credit
    - Compare loans of varying lengths and interest rates.
  - Investing
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- Calculate the future value of an investment and analyze future value and present value of annuities (Take into consideration possible changes in rate, time, and money.)
- Calculate profit from a sale of an investment
- Compare various investment options and understand when it is appropriate to utilize them

- **Perspective Matters - Number, Ratio, and Proportional Reasoning**
  - Solve real-life problems requiring interpretation and comparison of complex numeric summaries which extend beyond simple measures of center.
  - Solve real-life problems requiring interpretation and comparison of various representations of ratios (i.e., fractions, decimals, rates, and percentages).
  - Distinguish between proportional and non-proportional situations and, when appropriate, apply proportional reasoning. Recognize when proportional techniques do not apply.
  - Solve real-life problems requiring conversion of units using dimensional analysis.
  - Apply scale factors to perform indirect measurements (e.g., maps, blueprints, concentrations, dosages, and densities).
  - Order real-life data written in scientific notation. The data should include different significant digits and different magnitudes.

- **Modeling**
  - **Observation**
    - Through an examination of examples, develop an ability to study physical systems in the real world by using abstract mathematical equations or computer programs.
    - Make measurements of physical systems and relate them to the input values for functions or programs. Examples: measure distance and time for a toy car, length of candle and time as it burns, length of vertical spring under different weights attached (linear); temperature and time for a refrigerated liquid as it warms (nonlinear).
    - Compare the predictions of a mathematical model with actual measurements obtained.
    - Quantitatively compare linear and exponential growth.
    - Explore the mathematical and logical structures that enable familiar models encountered in daily life: Weather models, Financial models, Simple physical models, Normal and Exponential Population Models.
  - **Mathematical Modeling and Analysis**
    - Assemble measurements and data gathered (possibly through surveys, internet, etc.) into tables, displays, charts, and simple graphs.
    - Explore interpolation and extrapolation of linear and non-linear data. Determine the appropriateness of interpolation and/or extrapolation.
    - Identify and distinguish linear and non-linear data sets arrayed in graphs. Identifying when a linear or non-linear model or trend is reasonable for given data or context.
    - Correctly associate a linear equation in two variables with its graph on a numerically accurate set of axes.
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• Numerically distinguish which one of a set of linear equations is modeled by a given set of \((x,y)\) data points
• Identify a mathematical model's boundary values and limitations (and related values and regions where the model is undefined). Identify this as the domain of an algebraic model.
• Using measurements (or other data) gathered, and a computer program (spreadsheet or GDC) to create different regressions (linear and non-linear), determine the best model, and use the model to estimate future values.

• Application
  • Starting with a verbally described requirement, generate an appropriate mathematical approach to creating a useful mathematical model for analysis
  • Explore the graphical solutions to systems of simultaneous linear equations, and their real world applications
  • Numerically analyze and mathematically critique the utility of specific mathematical models: instructor-provided, classmate generated, and self-generated

• Validity Studies
  • Identify logical fallacies in popular culture: political speeches, advertisements, and other attempts to persuade
  • Relate the concept of a "statement" to the notion of Truth Value. Identify statements and non-statements
  • Describe the differences between verbal expression of truth and mathematical expression of truth. Discuss the usefulness of symbolic representation of statements. Discuss the 2-valued nature of mathematical truth value, relate this to real world examples.
  • Determine the logical equivalence between two different verbal statements (simple and compound) in real-world context.
  • Relate the language of conditionals to the language of quantified statements
  • Explore the relationship between quantified statements and conditional statements (e.g., "all scientists are educated" is equivalent to "if she is a scientist then she is educated.")
  • Apply concepts of symbolic logic and set theory to examine compound statements and apply that to decision making of real-world applications.

Major Topics to be Included:
• Financial Literacy (Interest, Borrowing, and Investing)
• Perspective (Complex Numeric Summaries, Ratios, Proportions, Conversions, Scaling, Scientific Notation)
• Modeling (Observation, Mathematical Modeling and Analysis, Application)
• Validity Studies (Statements, Conclusions, Validity, Bias, Logic, Set Theory)
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Required Instructional Materials:
- Course ID for MyMathLab: Access to this MyMathLab course must occur through Blackboard. ([instructorname]####)
- **Calculator:** A scientific calculator is highly recommended; a graphing calculator is optional.
- Regular access to a computer with a working internet connection and Microsoft Excel: If you don’t own a computer or your computer isn’t working, you will need to do your required online work on campus.

Course Credit:
3 credit hours and 1 high school credit for completion of the course.

Policies:
1. **Grading Policies**
   a. Grading Scale
      - A = 100 - 90  B = 89 - 80  C = 79 - 70  D = 69 - 60  F = 59 and below
   b. In cases where district grading policies conflict with college grading policies, the high school and college grades may differ; this may include assignment/test retakes, extended assignment due dates, capped minimum grade allowed, among other such district policies.
   c. It is important that students check their final NOVA grades in Blackboard as soon as the course(s) completed.

<table>
<thead>
<tr>
<th>Grade Breakdown</th>
<th>Arlington Grading Scale:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tests/Quizzes</td>
<td>90-100 A 70-76 C</td>
</tr>
<tr>
<td>Homework/Classwork</td>
<td>87-89 B+ 67-69 D+</td>
</tr>
<tr>
<td>Excel Files</td>
<td>80-86 B 60-66 D</td>
</tr>
<tr>
<td>Projects</td>
<td>77-79 C+ 0-59 E</td>
</tr>
<tr>
<td>Midterm/Final</td>
<td>20%</td>
</tr>
</tbody>
</table>

The Midterm will occur in late December or early January. The Final Exam will occur before senior experience. There are NO EXEMPTIONS for the Final.

In order to simulate the experience of a college-level semester course, grades for MTH 154 will carry over all the quarters. This means that grades earned in the 1st quarter will be seen through all the quarters of the year. No grades will be counted twice, but a student will be able to see a running record of his/her grades throughout the entire semester.

All assessments may contain any previously taught material. Student grades reflect student achievement and not student behavior.
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Homework:
You will have three things to complete on a consistent basis outside of class time.

1. Section organizer – where you read the upcoming section filling in key terms, questions, and Excel information.
2. MyMathLab Homework – This is homework can be accessed online.
3. Excel File – You will complete the indicated Excel sheet and write a reflection about something you learned or your thoughts about the information in the sheet.

The section organizers will be checked randomly throughout the year for completion. MyMathLab homework will be graded automatically after you submit your questions. Some homework may allow a retry option until the turn-in deadline. Excel files will be submitted through Canvas. All Files should be named in the format “LastName – chapter.section” (Example Wright – 1.1)

Tests:
For the most part, we will have chapter tests. I will announce the date of the test at least a week in advance. If you know ahead of time that you are going to be absent, for any excused reason, you must tell me before the day of the test to schedule a time to take the test BEFORE it is given in class. If you neglect to do so, you will not be given the opportunity to retake the test. Please avoid making doctor's appointments during our class times.

You will be asked to make up any previously scheduled missed test within one week of the last day of your absence. You must take the responsibility to schedule a make-up time. *Credit will not be given if you have an unverified absence on the day of a test or quiz.*

Projects: Will be given throughout the year.

II. Course Policies
   a. Academic Integrity
      i. The College does not tolerate academic dishonesty. Students who are not honest in their academic work will face disciplinary action along with any grade penalty the instructor imposes. Procedures for disciplinary measures and appeals are outlined in the Student Handbook (http://www.nvcc.edu/students/handbook/). In extreme cases, academic dishonesty may result in dismissal from the College.
      ii. Plagiarism: is the act of appropriating passages from the work of another individual, either word for word or in substance, and representing them as one’s own work. This includes any submission of written work other than one’s own. In short, plagiarism means using the exact words, opinions, or factual information from another person without giving that person credit. Students who are not honest in their academic work will face disciplinary action along with any grade penalty the instructor imposes. For more information about student academic integrity: https://www.nvcc.edu/curcatalog/policies/integrity.html
      iii. Students are both part of Arlington Public Schools (APS) and NVCC, and they are accountable for both academic honor codes:
         a. APS (page 8-9 of Washington-Lee High School student handbook)
There is one fundamental principle: all work submitted must be the student's own. For homework and class work, students may ask for assistance from other classmates or faculty, but each student's work should be unique. During exams, help is not to be given or accepted. Using another student's work or answers, and claiming them as your own is a violation. Violations will result in an automatic zero on the assignment or exam. In addition, parents and the administration will be contacted.

b. **Attendance Policy for Make-up Work**

1. Tests/quizzes: You will be asked to make up any previously scheduled missed test or quiz within one week of the last day of your absence. You must take the responsibility to schedule a make-up time. Credit will not be given if you have an unverified absence on the day of a test or quiz.

2. Homework: Will be due on the day on which the student returns to school from an excused absence. No credit will be given for homework assignments missed due to an unverified absence. Students will be able to turn in four homework assignments late each quarter for full credit, but the assignments must be submitted before the unit test.

3. Projects: Will be due on the day on which the student returns to school. A project will be considered late if a student has an unverified absence on the day it is due.

4. The teacher and student will determine a calendar for make-up work that results from an extended absence.

5. Getting notes and worksheets from the day of an absence is the responsibility of the student. Visit Mr. Wright's website for any posted notes.

c. **Disabilities**

i. Students with disabilities are required to contact NOVA’s Office of Disability Support Services (DSS) to discuss possible accommodations. All information is kept confidential and may increase your chances of success in the academic setting. If accommodations are agreed upon, student will receive a Memorandum of Accommodation (MOA) by DSS. For more information about NOVA’s DSS office: [https://www.nvcc.edu/disability-services](https://www.nvcc.edu/disability-services).

d. **Self-Advocacy**

i. Students are expected to reach out to their instructor if they do not understand content or expectations.

ii. College instructors and other college personnel will not talk with a parent without the permission of and presence of the student. The conversation is between the administrator/faculty member and the student. The parent's role is to listen, give moral support, and summarize information and agreements if needed.

iii. Dual enrolled students have access to full NOVA campus services to include tutoring, library, and counseling services; student resources are found here: [http://www.nvcc.edu/students/index.html](http://www.nvcc.edu/students/index.html)
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III. Additional Course Information

DE students are expected to engage in college level course contents and discussions appropriate for adult learners. Mature topics may be discussed.

This is a college course. My expectations for you are high. Students must take the responsibility for understanding the material by:

- Be present for all class meetings.
- Using time management skills to ensure keeping up with the class.
- Completing homework and other assignments - including online assignments.
- Turning in things on time - no late work accepted.
- Not expecting credit for work that does not deserve any. Grades are based on quality.
- It is expected that all students understand what constitutes appropriate behavior. You can refer to your student handbook regarding particular policies. Remember beyond the 2nd unexcused tardy in a quarter a detention will be assigned to the student.
- Please note that electronic devices (cell phones, ipods, mp3 players, smartwatches, etc.) should be turned off at all times in my class. See the full math department electronic device policy below.

Electronic Devices Policy

In order to help maintain a classroom environment centered on learning, the math department has adopted a cell phone policy in all math classrooms.

Students will not have cell phones (or other electronic devices) on their person, their desk, or visible in any way. Cell phones (or other electronic devices) must be silenced and out of sight at all times unless specifically permitted for instructional purposes.

- Upon the first offense the student will hand over their device until the end of class. If a student refuses, administration will be notified.
- Upon the second offense the device will be turned over to the main office for the student to collect at the end of the day.
- Any offense beyond that will require a parent or legal guardian to come to Washington-Lee to collect the device from the student’s administrator.

Drop/Withdrawal Information:

Dropped classes will not appear on the student’s transcripts while a withdrawal will appear on the transcripts as a “W”. If you choose to exercise either of these options, please speak with me as I need to send information to NVCC.

Drop date – October 5th       Withdrawal Date – December 4th
Where To Find Extra Help:
At some point during this course it is not unusual to find you need extra help. Below are several resources at your disposal and pertinent information about them:

- **Zero Period – Room 4016**
  - 7:20-8:10 daily
- **Generals period**
  - Must get a pass from Mr. Wright to attend.
- **Lunch – Room 4017**
  - A teacher will be present during each lunch to help.
- **After School**
  - Mr. Wright’s Room (room 4016)
    - Most days (Wednesday is usually a meeting day for the school)
    - 3:01-4:00 ish
    - Let me know if you plan to come after school, as I will leave if no one is in my room by 3:20

**NOVA Student resources**

In addition to all the benefits that a student has at Washington-Lee, dual enrollment students also benefit from NVCC resources such as tutoring, library, advising/counseling, and several more. Information about each resource can be found below.

- **Advising and Counseling**
  - Students can receive advising relating to academic goals, career planning, college transferring, disability services or retention. Please visit the Advising and Counseling website: [http://www.nvcc.edu/advising/](http://www.nvcc.edu/advising/)
- **Library resources**
  - As a NOVA dual enrollment student, you can use the NOVA library system. This includes each of the campus libraries but also the online resources associated with the library system. For more information, see the library website: [http://libguides.nvcc.edu/dual-enrollment](http://libguides.nvcc.edu/dual-enrollment)
- **Tutoring**
  - Dual enrollment students also have access to free tutoring services for their NOVA classes on each campus. Please see the tutoring website for hours and policies for each campus. [http://www.nvcc.edu/tutoring/](http://www.nvcc.edu/tutoring/)
- **Student Life**
  - Dual enrollment students can take part in many of the programs, clubs and activities that Student Life provides. Please see the Student Life website for more information: [http://www.nvcc.edu/students/](http://www.nvcc.edu/students/)
- **NOVA Card**
  - NOVACard is the official identification card of Northern Virginia Community College. All NOVA students are encouraged to get a free NOVACard in order to access these benefits and services: [http://nvcc.edu/novacard/index.html](http://nvcc.edu/novacard/index.html)
### IV. Course Schedule

#### a. Critical Course Dates

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Start Date</td>
<td>Monday, September 17, 2018</td>
</tr>
<tr>
<td>Course Drop Date</td>
<td>Friday, October 5, 2018</td>
</tr>
<tr>
<td>Course Withdraw Date</td>
<td>Tuesday, December 4, 2018</td>
</tr>
<tr>
<td>Final Exam Date</td>
<td>May 21st, 2019</td>
</tr>
<tr>
<td>Course End Date</td>
<td>Friday, January 25, 2019</td>
</tr>
</tbody>
</table>

#### b. Course Schedule

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Month</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>September</td>
<td>Homework assigned on Mymath Lab</td>
</tr>
<tr>
<td>2</td>
<td>October</td>
<td>Homework assigned on Mymath Lab</td>
</tr>
<tr>
<td>3</td>
<td>November</td>
<td>Homework assigned on Mymath Lab</td>
</tr>
<tr>
<td>4</td>
<td>December</td>
<td>Homework assigned on Mymath Lab</td>
</tr>
<tr>
<td>5</td>
<td>January</td>
<td>Homework assigned on Mymath Lab</td>
</tr>
<tr>
<td>6</td>
<td>February</td>
<td>Homework assigned on Mymath Lab</td>
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<tr>
<td>7</td>
<td>March</td>
<td>Homework assigned on Mymath Lab</td>
</tr>
<tr>
<td>8</td>
<td>April</td>
<td>Homework assigned on Mymath Lab</td>
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<tr>
<td>9</td>
<td>May</td>
<td>Homework assigned on Mymath Lab</td>
</tr>
<tr>
<td>10</td>
<td>May</td>
<td>Homework assigned on Mymath Lab</td>
</tr>
</tbody>
</table>

#### c. Final Exam Date

**There will be a final exam. There are no exemptions.**