

**Mathematics Standards**

**Junior/Senior Math**

**Course Overview:** This course is intended for students who have struggled in their study of Algebra and/or Geometry, but know that it is in their best interest to continue their study of mathematics. This course is designed to help the students to understand a variety of ways that they will use mathematics in their daily lives outside of the classroom and to tie mathematics to ideas from other areas of study. The scope and sequence of the topics included in this course will vary depending on the mathematical backgrounds and needs of the particular students. The topics will be drawn from the following: map math, financial math, informal geometry, programming on the graphing calculator, and important ideas from algebra and statistics.

**Bold standards are essential standards that all students will learn as they complete the course.**

**Unit 1 – Map Math (approximately 10 days)**

**Description:** In this unit, students will discover how math pops up in places they may never have considered. They will begin by looking at a map of the United States as they explore patterns in the numbers use in naming the Interstate Highways. They will then consider the underlying coordinate systems used within cities (and sometimes entire counties) to number the streets and to assign street addresses. They will use maps of several individual states to explore patterns in the mile markers and the exit numbers and use these numbers and other methods to calculate distances.

**Standards**

1. **Students will investigate a real-life rectangular coordinate system as they investigate the underlying structure of street addresses.** (6-NS.8)

2. Students will explore patterns in the numbering of the Interstate Highways. (6-NS.8)

3. Students will consider other coordinate systems such as GPS coordinates and the system used in the Index of Cities on a map. (6-NS.8)

4. Students will investigate the structure that was used in setting up mile markers and exit numbers and use exit number/mile marker information and other methods to calculate distances on a map. (7-NS.3)

**Unit 2 – Financial Math (approximately 50 days)**

**Description:** In this unit, students will learn how mathematics can help them to make better financial decisions. The two biggest ideas will be the mathematics of borrowing money and investing money for retirement. Students will learn what to consider when deciding between a longer or shorter term loans and see that there is considerable difference in the interest they will pay, especially on a home loan. When investing for retirement, they will use the mathematics to discover the beauty of compound interest and see the importance of investing early in their working life rather than waiting until later. Other topics will include using tax rate schedule to better understand how federal income tax works and figuring out the doubling time for an investment. In addition to their calculator, students will make extensive use of Microsoft Excel and/or Google Sheets whenever it makes sense to assist in the calculations.

**Standards**

1. **Students will solve a variety of problems that involve a percent increase in a given quantity.** (F-LE.1)

2. Students will learn a shortcut for computing a percent increase that will be important when they get to more advanced computations. (F-LE.1)

3. Students will use federal income tax rate schedules to compute the amount of tax owed given the taxable income and filing status. (F-BF.1)

4. Students will gain an understanding graduated nature of the federal income tax table, i.e. higher portions of income are taxed at a higher rate than lower portions of income. (F-BF.1)

5. Students will compare mathematically the taxation of those filing as “single” vs. those filing as “married filing jointly”. (F-BF.1)

6. Students will compute the interest paid in paying off a car loan. (F-BF.1)

7. Students will compute the future value of a lump sum investment over time based on a constant annual interest rate. (F-LE.1)

8. Students will compute the interest paid in paying off a home loan. (F-BF.1)

9. **Students will analyze amount of interest paid when choosing between shorter or longer term loans.** (F-BF.1)

10. Students will compute the future value of lump sum investments for which the interest is compounded semi-annually, quarterly, monthly, and daily. F-LE.1)

11. Students will compare investment options with different interest rates and compounding frequencies in order to choose the best option. (F-LE.1)

12. Students will find the future value of investments for which contributions are made at regular intervals. They will do the computations one interest period at a time. (F-BF.1)

13. **Students will use Microsoft Excel or Google Sheets to assist with investment computations.** (F-BF.1, B&IT.IT1.c)

14. Students will use a table to calculate approximate monthly loan payments. (F-BF.1)

15. Students will use the payment formula to improve the accuracy of their monthly loan payment calculations. (F-BF.1)

16. Students will use the built-in PMT function in Microsoft Excel or Google Sheets to more efficiently calculate monthly loan payments. (F-BF.1, B&IT.IT1.c)

17. **Students will consider the first few payments on a home loan to determine how much of the payment pays the interest for the month and how much will be left to pay down the loan.** (7-EE.3)

18. Students will compare the amount of interest paid with the first payment of a 30-year home loan with that of shorter term home loans. (7-EE.3)

19. Students will use a guess-and-check process to compute the doubling time for various investments based on the annual rate of growth. (F-LE.1)

20. Students will compute the payment on loans where there is sales tax and a down payment involved. (F-BF.1)

21. Students will create the first few months of an amortization table doing the computations on their calculator. (F-BF.1)

22. Students will use Microsoft Excel or Google Sheets to create amortization tables for 3- and 5-year car loans and 15- and 30-year home loans. (F-BF.1, B&IT.IT1.c)

23. Students will use a formula to find the future value of investments for which the investor makes monthly contributions. (F-BF.1)

24. **Students will use a formula to calculate the monthly contribution required to meet an investment goal.** (F-BF.1)

25. Students will compute the total of all contributions and then the total amount of interest earned for various periodic investment situations. (F-BF.1)

26. Students will compute the total monthly payment required for a home loan including property taxes and homeowners insurance. (F-BF.1)

27. Students will use an amortization table to learn how they can reduce the amount of interest paid on a loan by paying extra principal whenever possible. (7-NS.3)

28. **Students will compare home loan scenarios from different banks to see where they can get the best deal.** (7-EE.3)

29. Students will discover the “Rule of 72” as a shortcut for computing the doubling time of an investment given the annual rate of return. (F-LE.1)

30. Students will find the future value for some complicated investment strategies involving combinations periodic contributions with lump sum investments. (F-BF.1)

31. Students will use a formula to compute the maximum loan they should consider, given the maximum monthly payment they can afford. (F-BF.1)

32. Students will calculate the lump sum investment necessary to achieve a future value goal. (F-LE.1)

33. Students will compare tax rate schedules to see mathematically how they have changed over the years. (F-BF.1)

34. **Students will explore various online financial calculators and write about the ones they found that they now understand and can use because of what they have learned in this unit.** (CC-SMP.5, B&IT.IT1.f)

**Unit 3 – Informal Geometry** **(approximately 50 days)**

**Description:** In this unit, students will take an informal look at Geometry. The focus will not be on formal geometric proof, but rather on practical applications of geometry. Topics will include geometric drawings, the vocabulary of geometry, angle relationships, properties of polygons, perimeter, area, surface area, volume, the Pythagorean Theorem, and right and oblique triangle trigonometry.

**Standards**

1. Students will draw rectangular prisms using oblique and isometric projection. (Art & Design-E.12.4)
2. Students will draw rectangular prisms using one- and two-point perspective. (Art & Design-E.12.4)
3. Students will use their oblique, isometric, and perspective techniques to create drawings of other 3-dimensional objects. (Art & Design-E.12.4)
4. **Students will explore number patterns and observe structure to make conjectures.** (CC-SMP.7)
5. Students will review the vocabulary of geometry. (CC-SMP.6)
6. Students will explore the prefixes that indicate number and see how these prefixes are important in many other areas in addition to mathematics. (CC-SMP.6)
7. Students will solve some application problems for which it is important that they draw a diagram. (7-G.2)
8. Students will investigate and solve problems involving vertical angles and linear pairs. (G-CO.9)
9. **Students will investigate the sum of the interior angles in a triangle and solve related problems.** (G-CO.10)
10. Students will investigate the interior angle sum for polygons with more than 3 sides and solve related problems. (G-GMD.1)
11. Students will compute the measure of the interior angles for an equiangular polygon, given the number of sides. (G-GMD.1)
12. Students will investigate the sum of the measures of one set of exterior angles for polygons with various numbers of sides. (G-GMD.1)
13. Students will investigate the triangle inequality properties and make important observations. (G-CO.10)
14. Students will investigate the properties of isosceles triangles and solve related problems. (G-CO.10)
15. Students will use coordinate geometry to find slopes and midpoints. (G-GPE.5)
16. Students will investigate the slopes of parallel and perpendicular lines. (G-GPE.5)
17. **Students will use the formula for circumference of a circle to solve problems.** (G-MG.1)
18. Students will solve problems using the area formulas for rectangles, parallelograms, triangles, trapezoids. (G-MG.1)
19. **Students will use their area formulas to solve real-world problems involving floor tiling, carpet, paint, etc.** (G-MG.1)
20. **Students will use the formula for the area of a circle to solve problems.** (G-MG.1)
21. Students will solve complicated problems that involve combinations of the area formulas. (G-MG.1)
22. Students will use the area formulas to find the number of acres in an irregularly shaped field. (G-MG.1)
23. Students will compute the total surface area for various 3-dimensional objects and use surface area computations to solve real-world problems. (G-MG.1)
24. Students will simplify expressions involving square roots. (N-RN.2)
25. Students will use the Pythagorean Theorem to solve problems. (G-SRT.8)
26. Students will learn how concrete workers can use Pythagorean triples to check that their forms will result in a square corner for a slab of concrete. (G-SRT.8)
27. **Students will complete some real-world application problems using the Pythagorean Theorem.** (G-SRT.8)
28. Students will investigate two special right triangles (45-45-90 and 30-60-90). (G-CO.10, G-SRT.8)
29. Students will use the Pythagorean Theorem to discover and use the distance formula in coordinate geometry. (G-SRT.8, G-GPE.7)
30. Students will review the vocabulary of prisms, pyramids, cylinders, and cones. (8-G.9)
31. Students will compute the volume for prisms and cylinders. (G-GMD.3)
32. Students will compute the volume for pyramids and cones. (G-GMD.3)
33. **Students will use these volume formulas to solve real-world problems, e.g. finding the how much concrete to order given the dimensions of the desired slab.** (G-GMD.3)
34. Students will compute the volume of a sphere. (G-GMD.3)
35. Students will solve problems involving similar triangles. (G-SRT.5)
36. Students will solve problems using the three trig ratios – sine, cosine, and tangent. (G-SRT.8)
37. Students will solve problems using the Law of Sines and the Law of Cosines. (G-SRT.11)
38. Students will go outside and use trigonometry to find the measure of inaccessible distances. (G-SRT.8)

**Unit 4 – Programming on the Graphing Calculator** **(approximately 15 days)**

**Description:** In this unit, students will learn some of the basics of writing code to execute programs. They will begin with simple input/output programs and then move on to branching, loops, and a Menu command. They will also investigate how these ideas of programming can be used in Excel.

**Standards**

1. **Students will learn create, edit, and execute programs on the graphing calculator.** (B&IT.PR1.a)
2. Students will write simple input/output programs. (B&IT.PR1.a)

3. Students will write programs with branching using if-then-else statements. (B&IT.PR1.a)

4. Students will write programs with loops using GoTo, For, While, and Repeat. (B&IT.PR1.a)

5. Students will write programs using the Menu command. (B&IT.PR1.a)

6. Students will investigate the if-then-else function in Microsoft Excel. (B&IT.PR1.a)

**Unit 5 – Important Ideas from Algebra** **(approximately 20 days)**

**Description:** In this unit, students will review some of the most important and practical algebra concepts that they may need to know for further education beyond high school. The focus will be on clearing up some of the misconceptions from some of the areas the students may have had difficulty with in the past.

**Standards**

1. Students will review the order of operations. (A-SSE.3)
2. **Students will solve linear equations in one variable.** (A-REI.3)
3. Students will graph linear equations. (A-REI.10)
4. Students will solve problems involving linear functions. (A-CED.1)
5. Students will solve systems of equations. (A-REI.6)
6. **Students will solve problems using the properties of exponents.** (A-SSE.3, N-RN.2)
7. Students will multiply polynomials. (A-APR.1)
8. Students will factor polynomials. (A-APR.1)
9. Students will solve quadratic equations. (A-SSE.3a, A-REI.4b)
10. Students will simplify radical expressions. (N-RN.2)
11. **Students will solve real-life application problems.** (A-CED.1, A-CED.2)

**Unit 6 – A short Course in Statistics (approximately 20 days)**

**Description:** In this unit, students will explore some of the basic ideas of statistics that they may need to know for further education beyond high school and to become better informed consumers and citizens. The focus will be on measures of center and spread, organizing and displaying data, using z-scores to understand standardized tests, probability, and counting.

**Standards**

1. **Students will develop methods to find measures of central tendency, including mean, median, and mode.** (S-ID.2)

2. **Students will explore ways to organize and display data, including dot plots, stem-and-leaf plots, box plots, bar graphs, and histograms.** (S-ID.1)

3. Students will develop methods to find measures of spread, including range, interquartile range, mean absolute deviation, and standard deviation. (S-ID.2)

4. Students will identify outliers in sets of data. (S-ID.3)

5. Students will learn how they can compare apple to oranges – by using z-scores. (S-ID.4)

6. Students will calculate theoretical probabilities for a variety of events using organized lists, tree diagrams, and area models. (S-CP.1)

7. Students will find the expected value for games of chance. (S-MD.2)

8. Students will develop the concept of a fair game. (S-MD.5)

9. **Students will solve some introductory counting problems.** (S-MD.9)