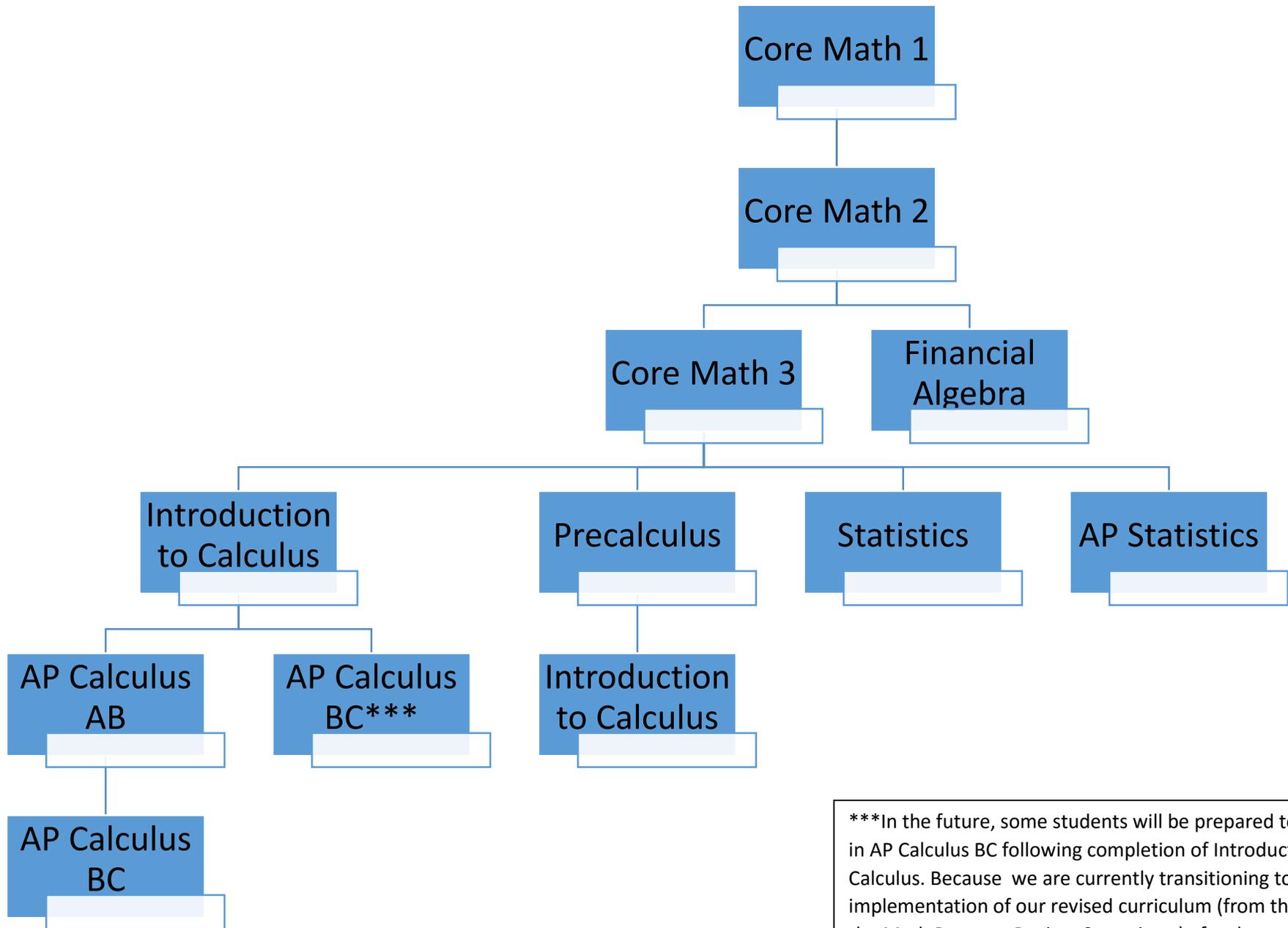


**Souhegan High School Course Offerings in the Program of Studies**



\*\*\*In the future, some students will be prepared to enroll in AP Calculus BC following completion of Introduction to Calculus. Because we are currently transitioning to full implementation of our revised curriculum (from the work of the Math Program Review Committee), for the year 2016-2017 students will be prepared for AP Calculus AB after the completion of Introduction to Calculus, not AP Calculus BC.

# Course Descriptions from Program of Studies 2016-2017

## **Core Math 1**

*How are linear and exponential patterns modeled through mathematics?*

Students will study functions, data and geometry through the lens of linear and exponential phenomena. Students will also tie together their knowledge of geometry and algebra through the study of coordinate geometry. This course covers topic traditionally covered in Algebra 1 and Geometry courses and is aligned with the national Common Core State standards, as well as international standards.

## **Core Math 2**

*How can we connect mathematics to the real world?*

Students will explore topics such as variation and modeling, probability, circles, exponential curves, representations of functions and data, and logic. This course covers topics traditionally covered in Algebra 2 , Geometry and Statistics and is aligned with the national Common Core State standards, as well as international standards. Students must have successfully completed Core Math 1.

## **Core Math 3**

*How can we model the world through mathematics?*

Students will explore topics in data analysis, linear programming, functions (which include piecewise, polynomial, radical, rational, exponential, and logarithmic functions), geometry, trigonometry, sequences and series. This course covers topics traditionally covered in Algebra 2, Statistics and Precalculus and is aligned with the national Common Core State Standards, as well as international standards. Students must have successfully completed Core Math 2.

## **Precalculus**

*How can we build our knowledge of functions while establishing a firm foundation for future work in Math courses and in applications students will meet in their lives?*

Students will explore topics in functions, coordinate geometry, trigonometry, complex and polar coordinates, conic sections, and vectors. Students who are not ready for the rigorous pace of Introduction to Calculus should select this course. This course does not fulfill the prerequisite for AP Calculus but does prepare students for Introduction to Calculus. National Common Core State standards and practices are embedded throughout this course. Students must have successfully completed Core Math 3.

## **Introduction to Calculus**

*How can we understand the ideas of Calculus graphically, numerically, symbolically, and verbally?*

Students will complete their study of Precalculus topics during the first trimester and gain an understanding of the basic concepts of differential and integral calculus during the remainder of the year. Practical applications will be emphasized rather than theoretical aspects. Students must have successfully completed Core Math 3 or Precalculus. Students will be prepared for an entry level college calculus course. Students who successfully complete this course may take Statistics, AP Statistics or Advanced Placement Calculus AB. \*\*\*

## **Financial Algebra**

*How can mathematics help me better understand my financial future?*

This algebra-based, applications-oriented, technology dependent course requires Core Math 1 and Core Math 2 as prerequisites. The course addresses college preparatory mathematics topics traditionally covered in Advanced Algebra,

Statistics, Probability, Precalculus, and Calculus under seven financial umbrellas: The Stock Market, Banking, Investing and Modeling a Business, Employment and Income Taxes, Automobile Ownership, Independent Living, and Retirement Planning and Household Budgeting. Students use a variety of problem solving skills and strategies in real-world contexts. Sophomores who enroll in this course must have successfully completed Core Math 2 and must be concurrently enrolled in Core Math 3.

## **Statistics**

*How can we become informed consumers of information?*

This course introduces students to the major concepts and tools for exploring data, planning a study, analyzing patterns, and drawing conclusions from data. Examples from such fields as economics, business, education, psychology, sociology, biology, and medicine will be examined. The course will rely on computer and calculator based processes to analyze data. A graphing calculator is required and will be used extensively as a problem solving tool. This course is open to students who have completed Core Math 3.

## **AP Statistics**

*What is data? How can patterns be observed through data?*

This college-level, non-calculus based course in introductory statistics is an excellent option for any student who has successfully completed Core 3. This course presents strategies for collecting, organizing, analyzing, and drawing conclusions from data. Students will work on projects involving the hands-on gathering and analysis of real world data. They will learn to interpret and judge the statistical information in the world around them. Computers and calculators will allow students to investigate and explore statistical concepts. Effective communication skills will be developed through regular written analysis of real data. Students must have successfully completed Core Math 3 and are expected to take the Advanced Placement exam.

## **Advanced Placement Calculus AB**

*How can we find rates of change at a specific instant and how can we accumulate infinitely small quantities?*

Calculus AB is an intensive college level course dealing with the mathematics of change and motion. Students will explore differential and integral calculus. Differential calculus involves finding the rate at which a variable quantity is changing. Integral calculus involves finding a function when its rate of change is known. Students should have a thorough knowledge of algebra, geometry, trigonometry, and analytic geometry. Students must have successfully completed Introduction to Calculus and are expected to take the Advanced Placement exam.

## **Advanced Placement Calculus BC**

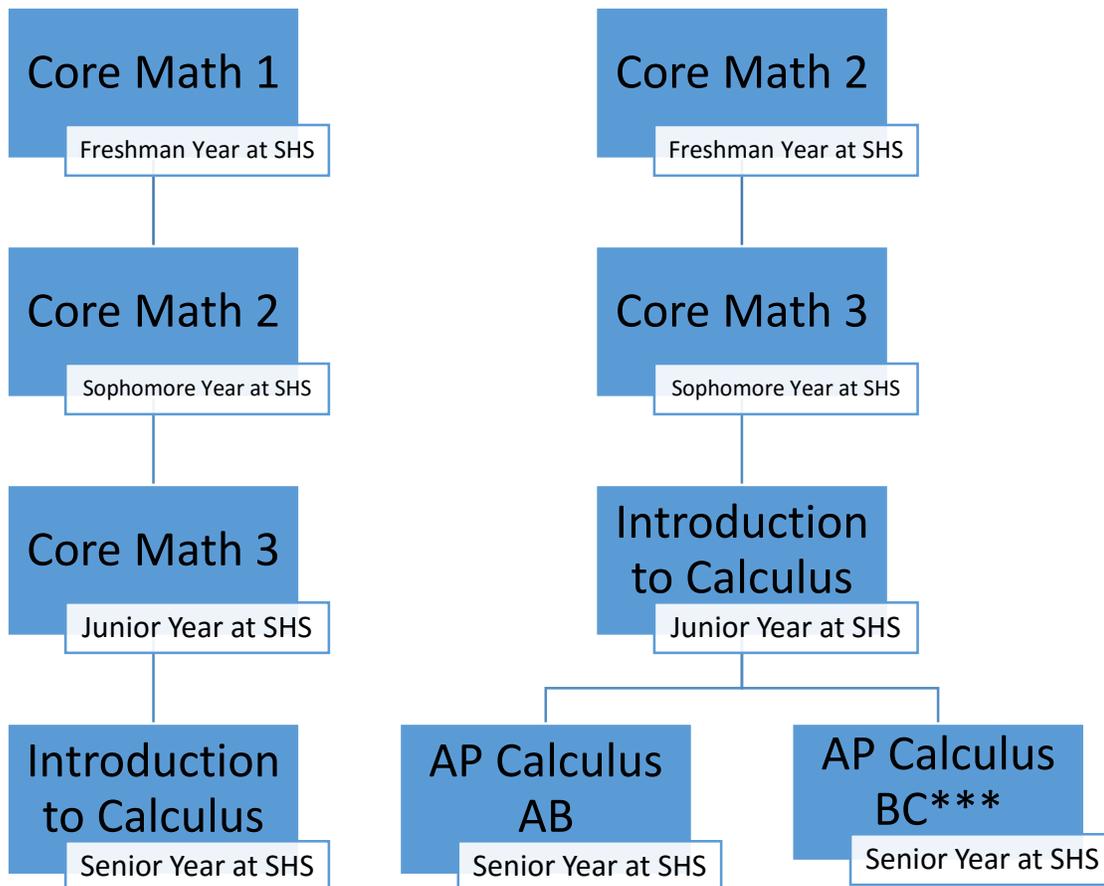
*What is the "power" of Power Series?*

Calculus BC is a second level college course where students gain an understanding of the concepts of calculus and experience its methods and applications. Topics include: parametric, polar, and vector functions; computation and application of derivatives; techniques of antidifferentiation and application of integrals; polynomial approximations and series. Technology is used to reinforce the relationships among the multiple representations of functions, to confirm written work, to implement experimentation, and to assist in interpreting results. Students must have successfully completed Advanced Placement Calculus AB and are expected to take the Advanced Placement exam.

\*\*\*In the future, some students will be prepared to enroll in AP Calculus BC following completion of Introduction to Calculus. Because we are currently transitioning to full implementation of our revised curriculum (from the work of the Math Program Review Committee), for the year 2016-2017 students will be prepared for AP Calculus AB after the completion of Introduction to Calculus, not AP Calculus BC.

## The “Typical Math Experience” for Students at SHS

The vast majority of the students at SHS do NOT choose to engage in the advancement/acceleration process at SHS and experience the following math journeys. The pathway a student takes depends on which course they enter SHS taking. We feel confident that this experience prepared students with a strong foundation on which to build and be successful in a college level calculus class following their time at SHS. With the transition to our newly revised curriculum (based on the work of the Math Program Review Committee), we are now able to offer all students who enter SHS in Core Math 1 a course where half to two thirds of the material is calculus content (our Introduction to Calculus course).



\*\*\*In the future, some students will be prepared to enroll in AP Calculus BC following completion of Introduction to Calculus. Because we are currently transitioning to full implementation of our revised curriculum (from the work of the Math Program Review Committee), for the year 2015-2016 students will be prepared for AP Calculus AB after the completion of Introduction to Calculus, not AP Calculus BC.

# Advancement/Acceleration Opportunities in Mathematics at SHS

In an attempt to meet the needs of all students, Souhegan High School offers students an opportunity to advance/accelerate their mathematical learning and their progression through the core courses offered. The goal of the process is to ensure that students are prepared to be successful in the next course they enroll in here at SHS. The process allows students to prove mastery of the competencies for courses they may not have formally taken in a classroom at SHS and is outlined below:

## Process for Advancement/Acceleration in Mathematics at SHS

**January/February** – Information Night

**January/February** – All students looking to advance/accelerate take a pretest.

This pretest is NOT to determine if students are allowed or ready to accelerate. That determination is made by students, their parents and their teacher. This pretest is given to determine if the student is already competent in any of the material from the course they are looking to advance through. If a student proves competency in a particular unit, they do NOT need to complete the corresponding VLACS unit. MOST students need to complete all of the required VLACS units and do NOT test out of any.

**February** – Students enroll in VLACS to complete units on which they did NOT demonstrate competency.

**February – April** – Students work on VLACS units to complete at least half of the required units.

The expectation from VLACS is that students will be devoting time on a weekly basis to continue to make forward progress on their units.

**April** – Students need to have completed at least half of all their required units before April break.

**May – July** – Students continue to work on VLACS units. All units must be completed before July 15<sup>th</sup>.

A final exam is given around July 15<sup>th</sup> and students must prove competency in all units (including those they may have tested out of on the pretest) to successfully complete the advancement/acceleration process.

## **Frequently Asked Questions**

### **1. Why does this process not begin until January/February?**

Because of the cumulative nature of mathematics, students need to complete a good portion of their current course in order to ensure they will have the skills to be successful in the VLACS units. For instance if a student is advancing through Core Math 3, they would need to be sure they have completed quadratics functions and factoring in Core Math 2 before they would have the skills to complete polynomials on VLACS (a Core Math 3 topic)

### **2. Why can't students have the entire summer to complete their units?**

The number of students accelerating (and thus the resulting schedule changes) could affect the number of sections of courses offered which then affects the entire school schedule. For that reason, we need to know what courses students will be in by mid/late July. The July 15 exam date allows us time to grade the exams and make schedule changes before students and staff begin classes in late August/early September.

**3. When is the best time for a student to accelerate? (What course should a student accelerate through?)**

This is really an individual decision for each student (along with parents and teachers). The reasons that students decide to accelerate vary from “I am looking for more of a challenge in my current math class” to “I want to take AP Calculus BC and I am not currently on track to do so” and everything in between. For that reason, there are many times and courses to choose to advance through. Please see the pros and cons lists below.

**4. Why does my student have to wait until they reach SHS to start this process?**

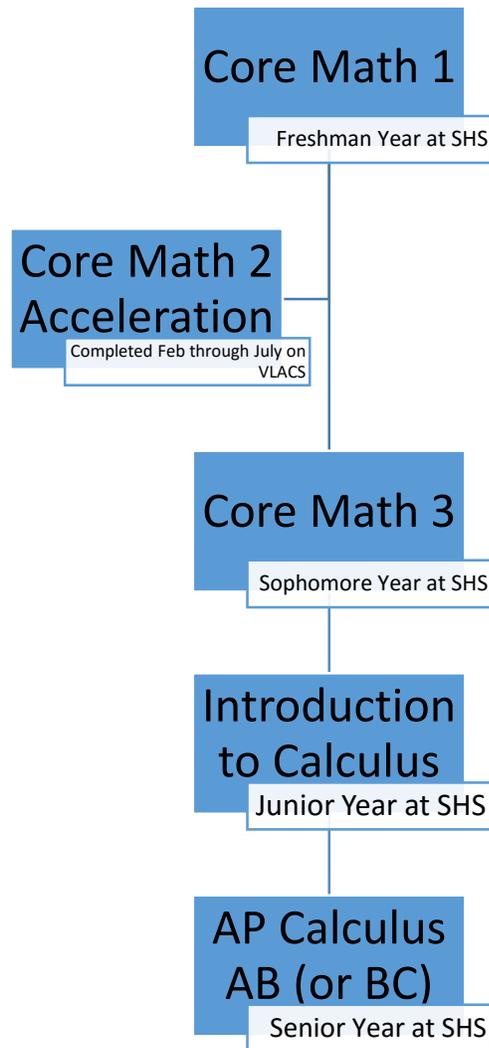
It is important that students have time at the start of 9<sup>th</sup> grade to transition to the many changes involved in going from middle school to high school. We feel we are best able to support students with those transitions if they take the next consecutive math course following their 8<sup>th</sup> grade experience. If a student were to attempt to advance/accelerate between 8<sup>th</sup> and 9<sup>th</sup> grade, then not only are they adjusting to all the new structures in the high school, but they are also trying to adjust to a new math class at the same time. Past experiences have also shown us that most middle school students are not developmentally ready for the online learning environment and we do not want to set students up for failure. We are looking to ensure that students are ready to be successful in the math class they enroll in.

**5. Why do students need to complete the units on VLACS? Why can't they just take a test?**

Our main goal is that students are completely prepared for the course they are about to enroll in at SHS. We have found that in the past, when students just needed to “pass a test”, they were able to study/learn the material long enough to pass the test but they were not able to retain the material. By cramming the material for the test (as opposed to interacting with the material on a regular basis), students were not learning the material in a way that prepared them to be successful in their next SHS math class.

# Acceleration Opportunities: Pros and Cons

## Option 1: Accelerating through Math 2



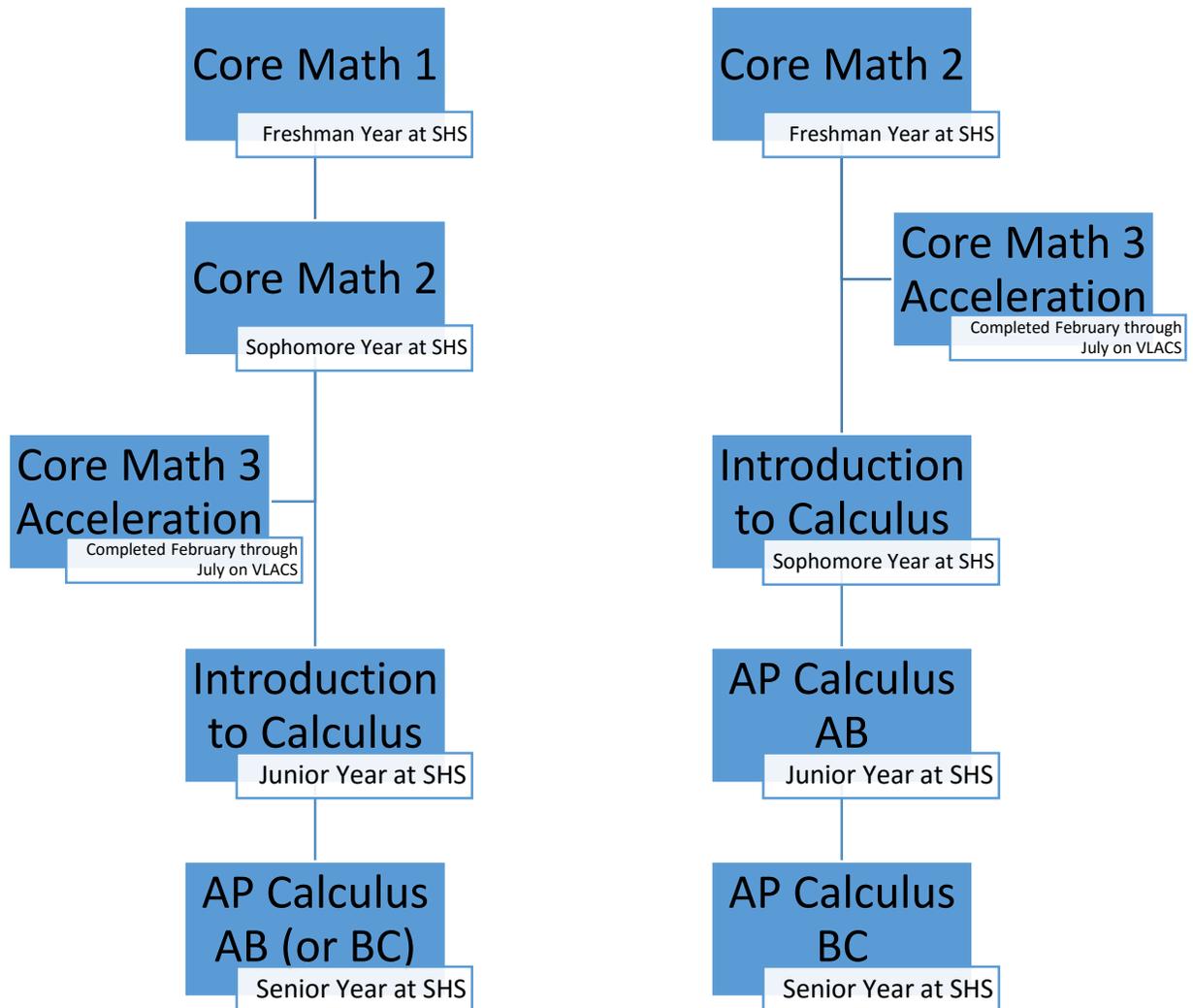
### Pros

- A student may not be feeling challenged in their current class Math 1 (and is continually exceeding expectations) and this allows a student to take a class which will be more challenging during their sophomore year.
- Students would complete Introduction to Calculus before AP Calculus, which would allow them to build a foundation in calculus before taking a college level calculus course (AP Calculus).

### Cons

- Students have 6-10 competencies to cover on VLACS which is a substantial time commitment in addition to their current workload.
- The online experience is not a complete substitute for the classroom experience and students may have a weaker foundation on which to build during subsequent classes.

**Option 2: Accelerating through Math 3 (which pathway depends on what class a student enters SHS in)**



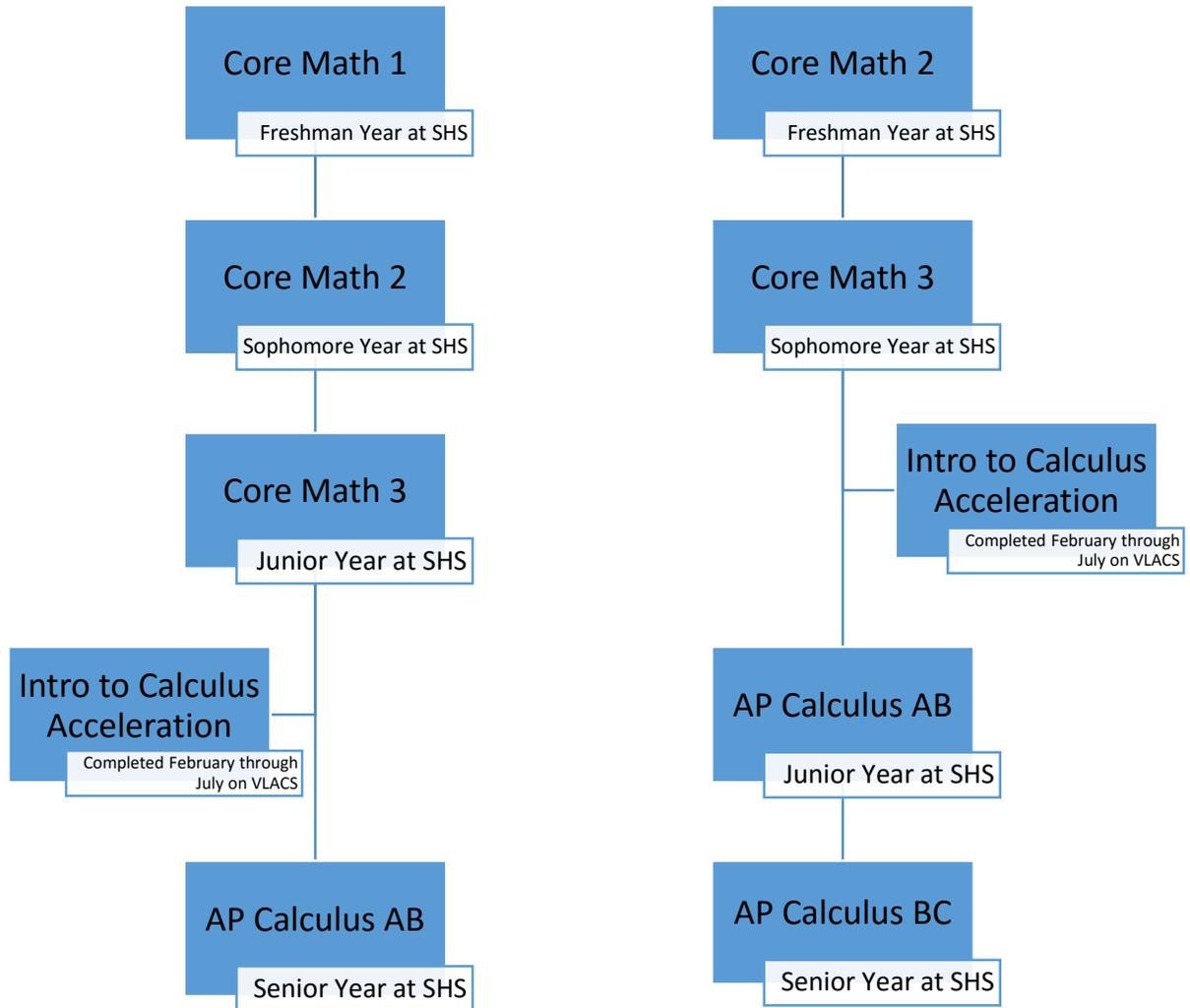
**Pros**

- A student may not be feeling challenged in their current class Math 2 (and is continually exceeding expectations) and this allows a student to take a class which will be more challenging during their sophomore or junior year.
- Students would complete Introduction to Calculus before AP Calculus, which would allow them to build a foundation in calculus before taking a college level calculus course (AP Calculus).
- The pace of the AP classes is much faster than that of our core curriculum (because they are college level classes). By completing Introduction to Calculus before AP Calculus, a student has a foundation in calculus to build upon while adjusting to the faster pace of AP Calculus as opposed to trying to adjust to a faster pace as well as new material (if they accelerated through Intro to Calc).

**Cons**

- Students have 6-10 competencies to cover on VLACS which is a substantial time commitment in addition to their current workload.
- The online experience is not a complete substitute for the classroom experience and students may have a weaker foundation on which to build during subsequent classes.

**Option 3: Accelerating through Intro to Calculus to AP Calculus AB(which pathway depends on what class a student enters SHS in)**



**Pros**

- Student have only 4 – 6 competencies to cover on VLACS which is fewer than accelerating through Math 2 or Math 3. The curriculum in Intro to Calculus covers the remaining 4 – 6 precalculus competencies and then covers calculus competencies. Student are only responsible for 4 – 6 Precalculus competencies and do NOT need to complete the Calculus competencies to accelerate through Intro to Calculus.
- Students have a strong foundation of Core 1 – Core 3 topics having taken all of them in a traditional classroom setting.

**Cons**

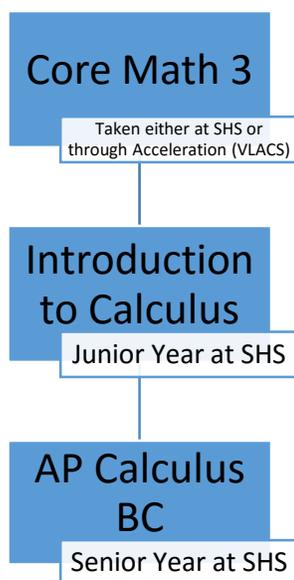
- Students do NOT have any exposure to formal calculus concepts before entering AP Calculus AB.
- Students are in a class where the majority of students have already been exposed to calculus through Intro to Calculus.
- The pace of AP Calculus AB is much faster than that of our core curriculum. Students who advance/accelerate through Intro to Calc into AP Calculus AB are adjusting to not only new curriculum but also a much faster pace.
- The online experience is not a complete substitute for the classroom experience and students may have a weaker foundation on which to build.

## Pathways to AP Calculus BC :

### Pros and Cons

In order to complete AP Calculus BC during their career at SHS, students have two different paths they can follow if they complete Core Math 3 BEFORE their junior year.

#### Pathway 1: Core Math 3, Introduction to Calculus, AP Calculus BC (Students do NOT complete AP Calculus AB)



#### Pros:

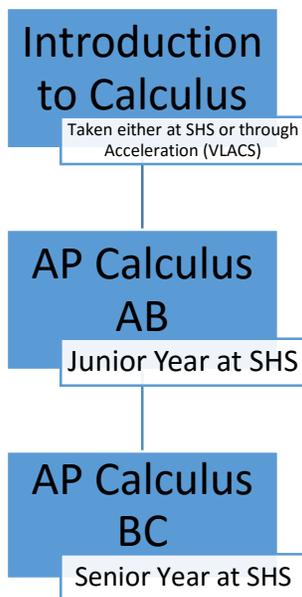
- This pathway allows a student to complete AP Calculus BC during their senior year without engaging in the advancement/acceleration process at SHS, *if they come into SHS taking Math 2 as a freshman.*
- Students gain a foundational understanding of calculus through the Introduction to Calculus course so when they enter AP Calculus BC, they are mainly focusing on the increased pace as opposed to all new material AND the increased pace.
- Student receive both an AB score and a BC score from the AP Exam at the end of AP Calculus BC. This offers students an opportunity to earn either credit from their college of choice if they score a qualifying grade on the AP exam.

#### Cons:

- Students has only one AP math class listed on their transcript (although they do receive both an AB score and a BC score when they take the AP Calculus BC exam at the end of the year).
- Students will be in a class where some of the other students may already have completed a full year of college calculus (AP Calculus AB).
- Students need to be highly motivated and driven. The pace of AP Calculus BC is much faster than that of our core curriculum and students will be adjusting to not only new curriculum but also a much faster pace. Some of their classmates may have already taken AP Calculus AB and will be adjusted to the pace already

## Pathways to AP Calculus BC:

### Pathway 2: Introduction to Calculus, AP Calculus AB, AP Calculus BC



#### Pros:

- Students have two AP courses on their transcript.
- Students have two opportunities to interact with the AP Calculus AB material since AP Calculus BC is comprised of 60% AB topics and 40% BC topics.

#### Cons:

- Students must complete a course through VLACS in order to advance/accelerate. The online environment is not ideal for all students and often times leads to some weaknesses in some skills.