

# HIGH MOUNTAIN INSTITUTE

## Curriculum Guide



**FOUNDED IN 1998, THE HIGH MOUNTAIN INSTITUTE (HMI)** is an independent, coeducational, college preparatory boarding school for forty-two students in their eleventh or twelfth grade year of high school. Situated on a large campus in Leadville, Colorado, the school partners with sending schools across the United States to provide a 17-week academic and experiential education semester. Wilderness expeditions complement the on-campus academic work. The mountains of Colorado and the canyons of Utah serve as classrooms for both scholastic classes and leadership development. Our overarching goal is to prepare students for the widening array of challenges and opportunities available to them at their sending school, in college, and beyond.

## ORGANIZATIONAL STRUCTURE

The High Mountain Institute is an educational organization providing opportunities for leadership growth, intellectual maturation, and self-reliance within a traditional academic and wilderness curriculum.

## MISSION STATEMENT

The High Mountain Institute (HMI) nurtures personal growth through interaction with nature and participation in a strong community. We promote intellectual, physical, and personal development through insistence on academic excellence, our philosophy of mentoring and apprenticing, and rigorous experiential learning. We seek to promote independent thinking and to develop skills of learning and habits of mind that both enhance self-reliance and transfer beyond the boundaries of HMI.

## CORE VALUES

The High Mountain Institute promotes excellence in all levels of school life. Classroom, wilderness, and residential life are fully integrated components of the student experience, and faculty members participate as mentors and guides in all aspects of the semester. This interaction promotes close relationships in the community and leads to greater performance and achievement. Students typically leave the High Mountain Institute invigorated academically, intellectually, and socially and are prepared to lead active, achieving, and curious lives.

### FIVE CORE VALUES GOVERN TEACHING AND LEARNING AT THE HIGH MOUNTAIN INSTITUTE:

- Mentorship in and out of the classroom
- Transference of what students learn beyond the High Mountain Institute
- Place and community based education
- Processed-based learning that teaches students how to think, not what to think, and conveys a passion for learning
- Integration of the natural world, academics, and residential life

# SEMESTER CALENDAR

Each semester is approximately 110 days long. Students spend five weeks in the backcountry of Colorado and Utah and over twelve weeks on the Leadville campus. In both settings, students participate in a rigorous curriculum. Formally structured contact hours for all courses meet or exceed those of sending schools (60 hours/semester).

## CURRICULUM OVERVIEW

The curriculum at the High Mountain Institute includes traditional academic courses in history, foreign languages, literature, mathematics, and science. Students also enroll in a leadership and natural ethics elective. All classes (Algebra II excepted) are taught at the honors or AP-level. Course titles are as follows:

### English

Literature of the Natural World

### Science

Natural Science

### History

United States History: Western Perspectives  
Advanced Placement® United States History

### Mathematics

#### FALL

Algebra II: Algebra and Functions  
Precalculus: Functions  
Precalculus: Trigonometry  
Precalculus: Advanced Functions and Trigonometry  
Advanced Placement® Calculus: A  
Advanced Placement® Calculus: B

#### SPRING

Algebra II: Analysis  
Algebra II: Trigonometry  
Precalculus: Functions and Analysis  
Precalculus: Trigonometry  
Precalculus: Analysis and Limits  
Advanced Placement® Calculus: A  
Advanced Placement® Calculus: B  
Advanced Placement® Calculus: C

### Foreign Language

Intermediate Spanish  
Advanced Spanish

### Required Elective

Practices and Principles: Ethics of the Natural World

Students attend classes six days a week, taking a minimum of five courses. Each class meets for ninety minute sessions four times weekly.

Courses that keep students abreast of classes in progress at sending schools include Algebra II, Precalculus, Calculus, Spanish, and U.S. History (survey and AP). These classes strive to ensure coverage of sending school curricula and promote a productive learning environment for students and teachers. Natural Science, Literature of the Natural World, and Practices and Principles: Ethics of the Natural World stand as self-contained HMI subjects. These courses enjoy more freedom to explore local and regional studies. Although content may differ from sending school courses, grade-appropriate skills are taught in these classes.

## ASSESSMENT

Through the semester, faculty expose students to as many innovative means of evaluation as possible while honoring traditional and widely utilized assessment methods. Practical exams, field studies, and class participation complement quizzes, tests, and research papers in a holistic evaluation of students.

Course work is graded on a traditional letter and percentage grade scale. Our lowest passing grade is 60%, a D-. The following grade scale is used at the High Mountain Institute:

90 – 92%, A-	93 – 97%, A	98 – 100%, A+
80 – 82%, B-	83 – 86%, B	87 – 89%, B+
70 – 72%, C-	73 – 76%, C	77 – 79%, C+
60 – 62%, D-	63 – 66%, D	67 – 69%, D+

## ACCREDITATION

The High Mountain Institute holds dual accreditations. HMI is fully accredited by the Association of Colorado Independent Schools (ACIS), an approved accrediting body of the National Association of Independent Schools (NAIS). HMI is also accredited by the Association of Experiential Education (AEE).

# COURSES

## Practices and Principles: Ethics of the Natural World

Practices and Principles: Ethics of the Natural World (P&P) is the foundational course of the High Mountain Institute (HMI) semesters. Focusing on both community and individual growth, P&P exemplifies HMI's motto of "where nature and minds meet." The curriculum consists of three parallel progressions: leadership studies, environmental ethics, and expedition skills.

On campus, students read and discuss articles on the theory of environmental ethics and leadership. These discussions provide a foundation for further thought and reflection while out in the field. The course also provides the majority of the curriculum for the wilderness expeditions. In the field, students participate in a variety of classes on leadership, communications, risk management, and technical skills. These discussions complement numerous practical opportunities for students to integrate their learning into life at HMI, both on-campus and during expeditions.

Students are introduced to concepts of philosophical ethics that apply to issues regarding mankind's perception of and dealings with the natural world. The study of both mainstream and alternative philosophical understanding, combined with exploring the world around us, allows students to enhance their own personal relationship with the natural world. Utilizing a "Harkness" discussion format to interpret readings related to wilderness, nature, environmental ethics, sustainability, animal rights, the value of place and leadership, students explore what shapes their own personal worldview. They develop resources and skills with which to formulate their own environmental ethic and to articulate and defend these ideas with clarity, consistency and coherence.

Expedition skills are taught primarily *in situ* during the three expeditions each semester and include both technical wilderness travel skills and leadership/communication skills. During the first expedition, students are introduced to the basic field curriculum: they learn the necessary skills to camp and travel comfortably in the backcountry in order to enhance their ability to develop a personal connection to the natural world. These skills include navigation and map reading, self-care in challenging environments, expedition behavior (teamwork, cooking, etc.). During the second and third expeditions, students are challenged to hone and apply these skills. Once they have demonstrated competency in risk management, travel, and communication skills, students may have the opportunity to travel and camp in small groups without direct instructor supervision, or to partake in more challenging and technical canyoneering routes with instructors.

## ENDURING UNDERSTANDINGS

### PRACTICES AND PRINCIPLES: ETHICS OF THE NATURAL WORLD

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- Every individual has a unique worldview that informs how they perceive and interpret information
- The natural world can be valued in many ways
- Living in and exploring the wilderness provides the opportunity to develop a personal relationship with nature
- Empathy for others' worldviews helps us to make more informed decisions
- Leadership can take many forms
- Developing a connection to a place and a personal relationship with the world around us leads to being more engaged and informed citizens
- Being prepared and having a basic set of skills and knowledge pertaining to back country travel enhances one's ability to develop a unique and meaningful connection to the natural world.

## English: Literature of the Natural World

Literature of The Natural World begins by examining the stereotypical components of the western myth as is created by the eastern elite around heroic cowboys, savage natives, and helpless women. Students begin their interrogation by examining fundamental assumptions nature writers employ in their work. Henry David Thoreau's "Walking" opens this section of the course with a discussion of transcendental ideals. The class studies additional visions presented in texts such as Jack Crawford's "Custer's Death", Sherman Alexie's poetry and *The Absolutely True Diary of a Part-Time Indian*, Malie Meloy's "Ranch Girl," and Mary Austin's "Walking Woman" in an effort to examine how the romantic West is reinvented or subverted by contemporary literature. In addition to reading these texts, this unit focuses on the essential elements of critical analysis, particularly the basic concepts of language theory, Deconstruction, interpretive validity, and critical reading.

The second unit's focus shifts to understanding the elegy of the West through a human desire to mourn and memorialize what has been destroyed and lost. William Kittredge's "The Politics of Storytelling," poetry by William Stafford, Jack Gilbert, and Elizabeth Gilbert, and Norman Maclean's *A River Runs Through It* informs this unit of study. The focus is on examining how and why humans fight to conserve the natural world only after conquering, taming, and destroying the unknown of a frontier. Critical reading and writing skills in this section of the course hone in on producing a close-reading essay based on *A River Runs Through It*.

The next unit addresses literature's power to create change in assumptions about nature and the human relationship with it. Students study texts by contemporary authors such as Edward Abby, Terry Tempest Williams, and others for their capacity to affect change through the power of storytelling. Additionally, the class examines resilience in literature and myth by exploring the concept of the contemporary adventure hero in Jon Krakauer's *Into the Wild* – as a derivative of the pioneer hero.

Throughout the class, students focus on developing their creative and formal writing skills. Each student produces a polished portfolio of his or her best writing with a self-reflective and self-evaluative introduction. Students utilize a variety of essay structures, including critical analysis, informal responses, creative interpretation, and personal poetry and short prose. Assignments include essays based on close textual reading, letter poems, and creative, non-fiction essays. Students revise assignments regularly and receive feedback at every level of the writing process from teachers and peers. Using outlines, peer collaboration and critique, and a grading structure that favors revision, the course promotes analytical, concise, and grammatically-sound writing.

#### ENDURING UNDERSTANDINGS

##### ENGLISH: LITERATURE OF THE NATURAL WORLD

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- The human relationship to the natural world moves in a predictable cycle that is reflected in literature and contemporary rhetoric.
- Improving our writing is a continual, relational process in which we re-view and revise our work. The first draft is not the end.
- Student centered learning encourages the development and clarity of ideas that are supported with evidence.

#### Science: Natural Science

The Natural Science curriculum develops understanding of the natural environment of the American West by bringing together a wide variety of field-based disciplines. Instruction in ecology, geology, and weather principles during classes and weekly lab activities increases students' awareness of the complexities of ecosystems, communities, and populations. On wilderness expeditions, students complete detailed field studies that apply knowledge from class and offer the opportunity to interpret new environments.

The fall semester begins with a look at community ecology in the Rocky Mountains. Students explore adaptations of local flora and fauna and the local climate in an effort to understand how certain species survive in the area. Students are then challenged to look at how ecological systems can become unbalanced. They will examine natural and human caused disturbances as they apply to the Rocky Mountain region. As the onset of winter brings snow

to Colorado's high country, students explore winter ecology and snow science. The spring semester begins at the height of the snow season in January. Students study winter and community ecology by examining winter adaptations of local flora and fauna. As spring returns to Colorado, the course follows local vegetation as it begins a new life cycle. General climatology and community ecology during this season offer a stark contrast to life during the winter. Each semester ends with an examination of local and global environmental issues. Topics include fire ecology, climate change, water rights, organic farming, the Endangered Species Act, sustainable architecture, and more.

Students record all field work in a science journal. Field studies, species accounts, mapping exercises, ecological readings, and field-based lab activities make up the bulk of such assignments. The journals help students improve their observational and reflective skills, and it serves to unite field and classroom exercises.

Students also conduct field studies on each expedition. These studies help students practice and develop methodologies for scientific inquiry. The scientific method is the centerpiece of the approach; students generate pattern-based questions, formulate null and alternative hypotheses, learn and utilize various testing/sampling methods, conduct research, analyze results and form conclusions based on the data, while citing potential areas for further study.

The foundation of the on-campus curriculum is a three-hour weekly lab, which offers students an opportunity to explore, discover, and statistically test hypotheses. Instruction in methodologies of sampling populations helps the class make inferences about the environment and greatly enhances field-study potential on later expeditions.

#### ENDURING UNDERSTANDINGS

##### SCIENCE: NATURAL SCIENCE

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- Scientific study cultivates curiosity and can help us interpret patterns and observations about the world around us using critical and logical reasoning.
- Everything, living and non-living, interacts in dynamic relationships that influence one another.
- Humans are influenced by the environment, and in turn, they play a significant role in affecting the environment.
- Concise communication (both written and oral) is crucial to making scientific inquiry understandable to scientists and non-scientists.
- Learning about a place leads to greater investment in that place.

## United States History: Western Perspectives

The United States History class begins with an exploration of historical meaning and an examination of objectivity in history. Students undertake several exercises designed to underscore the interpretative nature of the subject. Barry Lopez's *Rediscovery of North America* is then used to reinforce productive discussion techniques and introduce students to the impact of European colonization in North America.

The fall semester examines pertinent historical themes while focusing on the time period from American prehistory through the end of Reconstruction. British colonization of the eastern seaboard begins this unit. Students debate the Revolutionary War and independence from Britain from a variety of perspectives. A mock constitutional convention highlights study of early America and covers the major issues dividing the United States. The class then discusses controversies unresolved by the Constitution by researching Hamiltonian (Federalist) and Jeffersonian (Republican) ideals for America. Students place Alexander Hamilton on trial for violating the "Spirit of 1776" as a complement to this section of study. Primary source documents, including *Federalist #10*, John Marshall's opinion in *McCullough v. Maryland*, and portions of Alexis de Tocqueville's *Democracy in America* buttress student understanding of seminal events in early United States history and provoke discussion of ways in which they helped shape modern-day America. Students approach Jacksonian democracy through a series of mini-debates that culminate in a discussion of Andrew Jackson as a unifying force for the fledgling nation. Gore Vidal's *Lincoln* serves as the primary text for understanding the Civil War. Though historical fiction, Vidal's portrait of Abraham Lincoln offers an excellent vehicle for understanding the causes of the Civil War and the consequences of it.

During the spring term, the class explores American history during the late 19th and 20th centuries through the lens of the American West. After introductory classes on historical methods, the class attempts to define the meaning of the West in American history. The unit culminates in the mock trial of historian Frederick Jackson Turner for the misrepresentation of Western history in his seminal work, *The Significance of the Frontier in American History*. Seeking to understand environmental requirements for significant settlement of the West, students explore the role of water and irrigation in Western development. An examination of western settlement patterns of white, American Indian, and minority settlers, and popular images of them, open a unit on the political and economic history of the West. The class studies the maturation of the region from its populist roots to its modern conservatism in the face of such events as the Great Depression, New Deal, World War II, counter culture, and Regan constructivism.

Students complete both semesters with an independent research project on the American West complemented by an essay and a thorough journey through the writing process. Thesis creation, outlines, and revision offer structure to this section of the course. Throughout the term, current event analysis serves to relate class lessons to modern day problems; all students research and present current event issues of their choosing on a regular basis.

### ENDURING UNDERSTANDINGS

#### UNITED STATES HISTORY: WESTERN PERSPECTIVES

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- American history is a narrative that helps us understand the origins and development of our nation
- The ideals that defined the birth of the United States had a great influence on Americans' social, cultural, and economic actions
- The ideals that defined the birth of the United States were rooted in ideals and philosophies that did not always reflect the reality of a nation defined by conquest and mixing of diverse peoples
- History is an essentially biased and subjective subject. Our job as historians is to use it for a purpose of our choosing.
- It is important to question traditional or predominant narratives and seek out alternative perspectives in order to interpret historical events in a manner that coincides with one's values.
- History is a story, and telling and learning stories is fun!

### Advanced Placement® United States History

In the Advanced Placement (AP) United States History class, students prepare for the May AP Exam. The principle course text is Alan Brinkley's *American History: A Survey*; however, students also encounter a variety of primary and secondary source material designed to emphasize history's strongly interpretative nature.

The fall semester begins with a study of English colonization in North America that focuses on the reasons for developmental differences between the colonies and the ramifications for the future United States. Students conclude the Revolutionary period with a "town meeting" in which they debate the war and independence from Britain from a variety of perspectives. The class then examines the emergence of America as an independent nation through the development of party politics, Jeffersonian democracy, and John Marshall and the Supreme Court. Study of antebellum America follows. This section focuses on the rise of Jacksonian Democracy, tariffs, sectionalism, the Civil War, and Reconstruction.

Students begin the spring semester by reviewing the impact of Reconstruction by reading and discussing Robert Penn Warren's *The Legacy of the Civil War*. The question of the significance of the frontier on American society introduces the Gilded Age; study of industrialization, urbanization, and populism follows. The class then moves into the turn-of-the-century imperialist era. Students analyze similarities and differences between Roosevelt's "big stick" policy, Taft's Dollar Diplomacy, and Wilson's Moral Diplomacy. Examination of progressivism and its impact dominates discussion of domestic issues for this period. The class then moves on to study the connections between World War I, the Roaring Twenties, the Great Depression, and New Deal. Examination of World War II, the postwar boom, the crises of the 1960s and 70s, and the rise of New Conservatism completes the course.

Class discussion serves throughout the term as a major vehicle for understanding seminal events in history, links between issues, and the consequences of them. Assessment includes not only quality and frequency of opinion, but also such areas as listening skills and close textual reading. Throughout the course of the semester, students prepare for the AP exam by completing Document Based Question (DBQ) tests and exercises. Regular quizzes and multiple-choice exercises also ready students for the AP exam. The demanding AP schedule requires of students much self-motivation and discipline. The students bear a considerable reading load in order to prepare for the exam at year's end. They also write a research paper to complement their course readings. Thesis creation, outlines, and revision offer structure to this section of the course.

#### **ENDURING UNDERSTANDINGS**

#### **ADVANCED PLACEMENT® UNITED STATES HISTORY**

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- American history is a narrative that helps us understand the origins and development of our nation
- The Civil War and its aftermath had a profound effect on Americans' social, cultural, and economic actions
- The post Civil War era was defined by economic and geographic expansion; we should question the ways in which these events reflected American ideals and were influenced by a reality of a nation defined by conquest and mixing of diverse peoples.
- History is an essentially biased and subjective subject. Our job as historians is to use it for a purpose of our choosing.
- It is important to question traditional or predominant narratives and seek out alternative perspectives in order to interpret historical events in a manner that coincides with ones values.
- History is a story, and telling and learning stories is fun!

## **FOREIGN LANGUAGE**

The High Mountain Institute foreign language courses are designed to improve overall student communication in Spanish and to allow students to re-enter sending school language programs successfully upon completion of the High Mountain Institute. Building on previously acquired language skills, we strive to practice the major skill areas in Spanish-language learning. Classes emphasize speaking, writing, reading, and listening skills while continuing to teach course-level appropriate grammar.

#### **ENDURING UNDERSTANDINGS**

#### **FOREIGN LANGUAGE**

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- The building blocks (grammar, vocabulary, tone, phrasing, syntax) of a language are important to conveying meaning and determine the efficacy with which you communicate.
- Learning a language opens opportunities, enhances experiences in other cultures, and allows us to be more open to differences in communication and culture.
- Studying current issues and events allows one to empathize with cultural differences.
- Studying another language enables you to connect to a diverse population thereby broadening your awareness of other cultures and ways of viewing the world.

#### **CHOOSING THE CORRECT LANGUAGE COURSE**

The High Mountain Institute caters to the needs of Spanish students who are enrolled in level III, IV, V and AP language classes at their sending schools. At the beginning of the semester, students take a placement test to determine whether they should enroll in the Intermediate or Advanced language class. Individual student needs play a predominant role in determining placement. Intermediate language classes are typically equivalent to level III or III-Honors courses, while advanced language classes are typically equivalent to level IV, V or AP language courses.

Students interested in completing a language course not offered at the High Mountain Institute should contact their sending school and the High Mountain Institute in order to determine the feasibility of an independent study through the student's sending school.

#### **DETAILED CLASS DESCRIPTIONS**

##### **Intermediate Spanish**

Intermediate Spanish is a challenging course in Spanish language and Hispanic culture that corresponds roughly to an honors-level, third-year high school class or a second-year college course. Students work to improve their written and spoken Spanish, and develop their listening and reading comprehension

skills. In all grammar and skills work, students are encouraged to see their language study as a gateway to learning about and understanding different cultures.

The fall semester begins with a review of fundamental grammar topics including the present tense, the differences between the verbs *ser* and *estar*, reflexive and pseudo-impersonal verb constructions, and progressive tenses. Students fine-tune their understanding of these concepts through conversational practice, writing assignments, and formal grammar assessments. As the semester progresses, students study more complex topics, such as the preterit and imperfect tenses in narration and conversation, the use of object pronouns, interrogative constructions, comparatives and superlatives, perfect tenses, the future and conditional tenses, and the differences between *por* and *para*.

The spring semester is dedicated primarily to reviewing the indicative tenses and to introducing the command forms.; the passive voice; idiomatic expressions; and other selected grammar topics. Given the varied backgrounds of students who enroll in the course, the grammar topics and focus of instruction change each semester; similarly, the pace and progression of the course are highly dependent on the level of language mastery with which students enter the course.

In-class activities and homework are dedicated to developing the four major linguistic skills: reading comprehension, listening comprehension, speaking, and writing.

Cultural studies focus on immigration to the United States from Latin America and the impact Hispanic communities and peoples have had on the culture of the American Southwest. Students first examine the motivations that bring immigrants to the United States from Central and South America. They then examine the cultures of countries from which many people are immigrating including: Mexico, Cuba, El Salvador, and the Dominican Republic. The course concludes with an investigation of the influences of Hispanic culture in the American Southwest, through food, art, and music.

### **Advanced Spanish**

Advanced Spanish is a challenging course in Spanish language and Hispanic culture that corresponds roughly to level 4/5 high school course or an advanced conversation and stylistics college course. Students work to improve their written and spoken Spanish and are encouraged to see their language study as a gateway to learning about and understanding other cultures.

Throughout our grammar studies, students focus on honing their basic grammar skills while learning about Spanish language stylistics—particularly lexical traps common to English speakers. Several vocabulary units are devoted to these linguistic pitfalls and include topics like false cognates, words with changing meanings, idiomatic expressions, and lexical constructions

common in Spanish that do not exist in English. The course is conducted entirely in Spanish.

The fall semester begins with a review of fundamental grammar topics including the present tense, reflexive and pseudo-impersonal verb constructions, and pronoun use. As the semester progresses, students move rapidly through the other indicative tenses, interrogative constructions, passive constructions, other pronouns, and the differences between *por* and *para*. The semester finishes with a comprehensive, multi-week study of the subjunctive mood. The spring semester is dedicated to reviewing all verb tenses, with a special emphasis on the subjunctive and command forms. Students also study relative pronouns, the uses of the gerund and infinitive, preposition use, adjective constructions, impersonal expressions, and indirect speech. Given the varied backgrounds of students who enroll in the course, the grammar topics and focus of instruction change slightly each semester; similarly, the pace and progression of the course are highly dependent on the level of language mastery with which students enter the course.

Exercises vary from day to day and include practice with writing, reading, speaking, and listening. Students frequently work in small groups in order to maximize speaking practice. Writing activities include structured essays that require students to incorporate recently-studied grammar and vocabulary; reading comprehension exercises draw on fiction and non-fiction texts and also include brief current events presentations on a regular basis. Listening exercises include completing or correcting the lyrics of popular Spanish-language songs, watching Spanish-language films, or listening to AP-style dialogues, interviews, and narrations.

Cultural studies focus on immigration to the United States from Latin America and the impact Hispanic communities and peoples have had on the culture of the American Southwest. Students first examine the motivations that brought Hispanic Immigrants to the U.S. historically. They then examine modern-day drivers of immigration to the United States from Central and South America. Next students examine the “immigrant experience” with a focus on U.S. border and immigration politics. The course concludes with an investigation of the influences of Hispanic culture in the American Southwest, through food, art, and music.

Approximately 4-5 times during the semester, the Advanced Spanish class has the privilege of meeting with native Spanish speakers as part of a partnership with a local Leadville women’s empowerment group. This exchange provides opportunities for students to learn about the immigrant experience first-hand, practice authentic speaking and listening in Spanish, and share cultures. It is also an opportunity to help the women become more comfortable interacting with non-Hispanic populations and with speaking English.

## Accelerated Advanced Spanish

Depending on student numbers and skill levels, Accelerated Advanced Spanish is offered. The Accelerated course roughly corresponds to an AP-level class, with a heavy focus on developing the four major language skills: reading, writing, listening, and speaking. Similar topics are reviewed as in the Advanced course, but the course moves at a faster pace. Skill-based evaluations are emphasized, with students regularly practicing AP-style speaking exercises, listening and reading comprehension exercises, and writing activities.

## MATHEMATICS

The goal of each math course is to continue to build on skills the student has gained in previous math courses and to teach students to consider mathematical problems critically, to use logical reasoning to approach problems, and to use these skills to make sense of the world through mathematics. HMI Semester math courses emphasize a desire to teach how to think about a math problem, not simply the formulaic algorithm for solving them. We encourage students to ask questions about a problem, to engage in estimating its solution, to determine what information is needed to solve it, and finally to determine an appropriate method for solving the problem. Not all problems have solutions that are exact or correct, and students are engaged in thinking about why answers may be incorrect or even impossible to verify. We ask students to communicate solutions both orally and in writing. Our courses use technology when appropriate and help students to make conscious decisions about when technology will aid them in their endeavors and when it may be a hindrance.

Students leave the courses recognizing mathematics as an omnipresent language that they will be able to use for the rest of their lives. They recognize patterns in the world around them, generalize from these patterns, define models for systems, recognize errors and limitations in these systems, and demonstrate perseverance and creativity in attempting to solve the questions that they themselves ask. We also teach students to see mathematics as a study unto itself; while math has many applications, it can also exist as a logical study on its own.

### ENDURING UNDERSTANDINGS MATHEMATICS

- Mathematics provides a schema for numerical and logical reasoning and critical thinking, along with being a realm of inquiry
- Most math problems have many ways they can be solved; selecting the right method or tool can often aid in efficiency and accuracy
- Mathematics can help make sense of patterns, relationships, and the world in general; it sometimes

requires making assumptions and accepting error

- Formulating and solving math questions in the real world takes creativity, perseverance, and discipline
- Mathematics can be expressed and understood algebraically, graphically, numerically, and in writing

### CHOOSING THE APPROPRIATE COURSE

The High Mountain Institute strives to place students in courses that will allow them to re-enter their sending school's math programs successfully: however, not all classes will align perfectly. The High Mountain Institute believes that continuing the study of mathematical logic and concepts outweighs any specific topic in mathematics. We strive to have students return to their sending schools with a stronger understanding of the underpinnings of mathematics and on-track to continue with their math progression.

Students interested in completing a course primarily focused on an area we do not cover (such as geometry, statistics, or a significant amount of discrete mathematics) should work with their sending school and the High Mountain Institute to determine the feasibility of an independent study through the student's sending school.

Graphing calculators (TI-83/84/89 types or equivalents) are used in all courses.

### DETAILED CLASS DESCRIPTIONS

#### Algebra II: Algebra and Functions (Fall)

This course is for students who have studied a full year of Algebra I and are beginning their study of Algebra II. The focus is on improving the student's ability to manipulate complex algebraic expressions and understanding functions.

Algebra II: Algebra and Functions begins with a review of the real number system, fractions, and the properties of basic algebra. Students then study exponents, rational exponents, and the laws of radicals, including rationalizing denominators. The class practices simplifying polynomials and rational expressions in  $X$  by using the properties of addition, subtraction, multiplication, and factoring. The students also focus on solving linear, absolute value, and quadratic equations. The class is introduced to the basic concepts of functions, including evaluation, mapping, and graphing. The graphs of functions are analyzed by investigating intercepts, domain, range, discontinuity, and symmetry. Next, the students learn how to solve quadratic equations by factoring, using the quadratic formula, extracting square roots, and completing the square. The students study parabolas by defining quadratics using standard form to determine intercepts, the axis of symmetry, the vertex, and position. The class also studies imaginary and complex numbers. The final unit in the course is a study of multivariable linear systems, and the students learn to solve these using substitution, graphing, and Gaussian elimination.

## **Algebra II: Analysis (Spring)**

Algebra II: Analysis is a continuation of Algebra II concepts. Students in this course should be comfortable with all basic algebra skills and will apply these skills to understanding a variety of functions that model the world. Successful completion of this course will allow students to enter a Precalculus or Statistics class their senior year.

Algebra II: Analysis begins a review of the basic concepts of functions, including evaluation, mapping, and graphing. The graphs of functions are analyzed by investigating intercepts, domain, range, discontinuity, and symmetry. Next, students study quadratic functions and parabolas using standard form to determine intercepts, the axis of symmetry, the vertex, and position. Students analyze the graphs of quadratic and rational functions by investigating shifting, reflecting, stretching, intercepts, domains, discontinuity, and asymptotes. Students also learn interval notation during this section. Defining, manipulating, and solving exponential and logarithmic functions are studied next along with graphing, modeling data, and application problems that involved banking, compound interest, growth, and decay. Also, the class works with the family of conic shapes: circles, ellipses, hyperbolas, and parabolas. Students examine the standard equations for these curves and practice graphing these functions. The final topic is a survey of arithmetic and geometric sequences and series, which includes the factorial function, an introduction to sigma notation, and sometimes an introduction to mathematical induction.

## **Precalculus: Functions (Fall)**

This Precalculus class focuses on manipulating and understanding a variety of functions. It is taught at a higher level and faster pace than Algebra II classes that cover similar material, and incorporates as much first year calculus theory as possible. This class may be the best fit for some advanced Algebra II students.

Precalculus: Functions begins with a review of exponents, rational exponents, the laws of radicals, and simplifying polynomials and rational expressions. The class moves into a study of the basic properties of functions. Next, the class focuses on the graphs of these functions by investigating shifting, reflecting, stretching, intercepts, maxima, minima, domain, range, continuity, and asymptotes. The class studies composite and inverse functions before completing a detailed study of quadratic functions. The class also spends time solving linear, quadratic, and rational inequalities. Defining, manipulating, and solving exponential and logarithmic functions are studied next along with graphing, modeling data, and application problems that involved banking, compound interest, growth, and decay. Whenever possible, first year calculus theory is integrated into this course as it relates to each section.

## **Precalculus: Functions and Trigonometry (Fall)**

This course is for advanced students, whose Precalculus class at their sending school begins with a review of functions, including exponents and logarithms. The second half of the course assumes some previous knowledge of trigonometry from a Geometry or Algebra II course and focuses on further exploring this subject. Students who successfully complete this course will be ready to continue Precalculus or begin Calculus, depending on their previous courses.

Precalculus: Functions and Trigonometry begins with a reintroduction to functions, their properties, and how to evaluate them. Next, the class focuses on the graphs of basic functions by investigating shifting, reflecting, stretching, intercepts, maxima, minima, domain, and range. The class works with composite and inverse functions and graphs of polynomial and rational functions. The class also studies synthetic and polynomial division and the process of splitting rational functions through partial fractions as a way to understand and manipulate rational functions. The course includes a quick review of how to manipulate exponential and logarithmic functions and equations. After reintroducing the six trigonometric functions, the course focuses on the study of inverse trigonometric functions and the ability to solve a variety of real-world problems. Next, the class works on analytic trigonometry, including simplifying and manipulating functions algebraically, verifying trigonometric identities, and solving trigonometric equations. The students also study the Law of Sines and the Law of Cosines in terms of their application to engineering problems involving oblique triangles. Generally, the trigonometry unit ends with an introduction to polar and parametric coordinates and equations.

## **Precalculus: Trigonometry (Fall and Spring)**

This course is for students whose Precalculus class focuses primarily on trigonometry. Students who successfully complete this course will be ready to continue a study in Precalculus or begin Calculus depending on their previous courses.

Precalculus: Trigonometry is a survey of trigonometry and its applications to the real world. The course begins with an introduction to both degree and radian units of measure. The class then studies the six basic trigonometric functions by defining them both from the unit circle and from right triangles. This is followed by the examination and manipulation of graphs of the sine and cosine functions. This includes analyzing amplitude, period, vertical shift, horizontal phase shift, and the five key points. After becoming familiar with the trigonometric functions and a few applications, the course focuses on the study of inverse trigonometric functions and the ability to solve a variety of engineering and physics problems. Students also study the Law of Sines and the Law of Cosines. The course combines students' knowledge of algebra with trigonometry by proving trigonometric

identities and solving trigonometric functions. This includes the study and use of sum, difference, multiple-angle, and half-angle formulas. The trigonometry unit ends with an introduction to polar coordinates and equations.

### **Precalculus: Analysis and Limits (Spring)**

This course is designed to be a second or third semester of Precalculus. Most students who take this course will be entering a Calculus class the following semester.

Precalculus: Analysis and Limits often begins with a unit on exponential and logarithmic functions. This includes how to manipulate exponential and logarithmic functions and equations, graphing and solving application problems that involved banking, compound interest, growth, and decay, and developing and manipulating models for all of these functions. Next, the class studies the family of conic shapes: ellipses, hyperbolas, and parabolas. Students examine the standard equations for these curves and practiced graphing and manipulating these functions. The class then shifts focus to study sequences and series, which includes a review of the factorial function and an introduction to sigma notation. Other topics covered include geometric sequences and series, infinite series, and the ideas of convergence and divergence. The students learn the binomial theorem and are introduced to mathematical induction as a powerful tool for proving theorems. Next, the students explore counting principles and their applications to probability. Another unit is a quick survey of graphing equations in both the polar and parametric planes. Sometimes, the class also includes a unit on matrices and their applications. In the final few weeks, the course ends with an introduction to limits and continuity. The students study how to calculate limits graphically and algebraically and are introduced to the idea of the derivative.

### **Advanced Placement® Calculus: A (Fall and Spring)**

Calculus A is a first semester Calculus class that focuses on limits, derivatives, and their applications. Students who take this class in the fall will be prepared to take the Advanced Placement® AB Calculus exam in the spring. Students who take this class in the spring will be prepared to take a BC Calculus class the following year.

Advanced Placement® (AP) Calculus A focuses on preparing students for the AP AB Calculus exam in May. The course begins with a quick review of functions and graphing. The class then moves into a study of limits and continuity, focusing both on the definition of a limit and how to calculate limits. This leads directly into the definition of a derivative, differentiability, and the rules for finding derivatives of common functions. This includes a study of the power rule, product rule, quotient rule, chain rule, and implicit differentiation. After becoming comfortable with derivatives, the class focuses on the applications of the derivative. This

includes a study of problems utilizing either the physics concepts of position, velocity, and acceleration, the technique of related rates, or optimizing systems. The class also applies derivatives to the study of the shapes of graphs, concavity, and relative and absolute extrema. The course includes a quick review of exponential, logarithmic, and inverse trigonometric functions before students learned to compute the derivatives of these functions. The class often moves into integral calculus at the end by studying antiderivatives and the problem of how to find the area under a curve. These two ideas, antiderivatives and the area under a curve, are combined in the study of the Fundamental Theorem of Calculus. The last part of the course sometimes focuses on computing integrals through integration by substitution and numerical approximation of definite integrals through the Trapezoidal Rule.

### **Advanced Placement® Calculus: B (Fall and Spring)**

Calculus B is the second semester of calculus and is designed for students who have taken one semester of Calculus at their sending schools. Students who complete this class will be prepared to take the Advanced Placement® AB Calculus exam or to continue their study of calculus at their sending school to take the BC Calculus exam.

Advanced Placement® (AP) Calculus B focuses on preparing students for the AP AB or BC Calculus exam in May. The course begins with a study of integral calculus through both computing antiderivatives and calculating the area under a curve. These two ideas, antiderivatives and the area under a curve, are combined by the Fundamental Theorem of Calculus. The next part of the course focuses on computing integrals through integration by substitution and numerical approximation of definite integrals through the Trapezoidal Rule. The study of integration continues by studying how to integrate the natural logarithmic, common logarithmic, exponential, and inverse trigonometric functions. After becoming familiar with a variety of integrals, the class applies the techniques of integration to find the area between two curves or to calculate the volumes of rotated solids. Arc length of planar curves and the physics concept of work are two common applications that are also studied. The final unit focuses on differential equations. Students study graphical representations of basic equations using slope fields, solve both first order linear and autonomous differential equations, and approximate solutions using Euler's method.

### **Advanced Placement® Calculus: C (Spring)**

Calculus C is a third semester calculus class. Students taking this course should have completed both Calculus A and B at their sending schools and will be prepared to take the Advanced Placement® BC Calculus exam.

**Advanced Placement® (AP) Calculus C focuses on preparing** students for the AP BC Calculus exam in May. First, the class studies advanced integration techniques. This includes integration by parts, partial fractions, trigonometric integrals, trigonometric substitution, and improper integrals. The following unit focuses on differential equations. Students study graphical representations of basic equations using slope fields, solve both first order linear and autonomous differential equations, and approximate solutions using Euler’s method. The course continues with an overview of differentiation and integration and their applications in polar and parametric systems. Next, the class moves into a detailed study of sequences and series. This includes computing the convergence of series using the integral, comparison, ratio, root, and alternating series tests. Finally, the class studies power series and their applications, including both Taylor and Maclaurin series and polynomials.