The following are what you can expect a typical Xth grader to have learned in Massachusetts public schools. Many of ESP's students will be more advanced than their grade level (sometimes way more advanced), so you can definitely teach classes with higher prerequisites, but if you do this, you should think carefully through the prerequisites and describe them for students in reasonable detail when you register your class. The source for most of the below information is the Massachusetts Public Schools Curriculum Benchmarks, which can be found online by Googling "Massachusetts Public Schools Curriculum Benchmarks".

When starting 7th grade

	What students typically *do* know	What you should *not* expect them to know
Mathematics	* Adding and subtracting negative numbers * Ratios, fractions * Prime factorization; greatest common factor, least common multiple * Algebraic expressions (for example, x+1, 2x) * Solving one-variable equations and inequalities * Graphing points in the coordinate plane * Exponents (that are numbers) * Areas, surface areas, and volumes (including circles -- they know what pi is) * Statistical distributions (dot plots, histograms, box plots; median and mean)	* Concept of a function, what f(x) means * Writing equations of lines, graphing lines * Quadratic functions, parabolas * What Σ means * Why you can't take a square root of a negative number * Raising a number to a variable power (e.g. what 3^x means) * What e is * Logarithms * Right-angle trigonometry (or any other trigonometry) * Vectors and matrices Things they will learn *during* grade 7: * Manipulating tax, interest, and percents in problems * Unit conversions * Geometric constructions * Manipulating probabilities * Volumes of cones, prisms, and spheres
Physical sciences	* Atoms are made of protons, neutrons and electrons * Seasons are caused by Earth being tilted on its axis * Rocks can be classified as igneous, metamorphic and sedimentary; there is a rock	* Kinetic molecular theory of gases, ideal gas equations * Introductory physics concepts like force, momentum, and energy * Wavelength and frequency * The difference between mass and weight

	cycle. * What erosion and weathering are * Processes in the water cycle * Structure of the solar system	* Acids, bases, pH * Formulas of chemical compounds, except water and table salt (for example, they won't necessarily know that the nitrogen we breathe is N_2). * How to balance chemical equations * How to calculate percent error; common prefixes for units (e.g. milli-)
Life sciences	* Classifying living things by characteristics * Basic plant anatomy and development * Basic concepts of systems of the body (e.g. the heart is part of the circulatory system, the stomach is part of the digestive system) * Life cycles and metamorphosis * Inherited characteristics, and how living things' traits are adapted to their environment * Concept of an ecosystem * Food chains	* Structures of small molecules like carbon dioxide or methane * Lipids, proteins, nucleic acids, and carbohydrates: what they are chemically, what they do biologically * DNA → RNA → protein * Punnett squares * Formal classification of living things

When starting 8th grade

	What students typically *do* know	What you should *not* expect them to know
Mathematics	* Manipulating tax, interest, and percents in problems * Unit conversion (such as…) * Geometric constructions (such as…) * Manipulating and interpreting probabilities (such as…) * What random sampling is * Volumes of prisms and spheres	* Quadratic functions, parabolas * What Σ means, what f(x) means * Raising a number to a variable power (e.g. what 3^x means) * What e is * Logarithms * Right-angle trigonometry (or any other trigonometry) * Vectors and matrices Things they will learn *during* grade 8: * Concept of a function

		* Writing equations of lines, graphing lines
Physical sciences	* Earth's surface is divided into tectonic plates which interact at their boundaries * Air is a mixture of gases	* Kinetic molecular theory of gases, ideal gas equations * Introductory physics concepts like force, momentum, and energy * Wavelength and frequency * The difference between mass and weight * How to balance chemical equations
Life sciences	* Acids are things that taste sour and bases are things that feel soapy * Basic functions of eukaryotic cell organelles (DNA is in the nucleus, lysozomes digest waste, plant cells have chloroplasts where photosynthesis happens, etc.)	* What acids and bases are chemically, pH * Structures of small molecules like carbon dioxide or methane * Lipids, proteins, nucleic acids, and carbohydrates: what they are chemically, what they do biologically * DNA → RNA → protein * Punnett squares

When starting 9th grade

	What students typically *do* know	What you should *not* expect them to know
Mathematics	* Irrational numbers and approximating them with fractions * Square roots and other roots, and exponents * Writing equations of lines (e.g. y = mx + b), graphing lines, solving linear equations, * Functions (notation they know is likely y = …, not f(x) = …) * Geometric congruence and similarity * The Pythagorean Theorem * Two-variable statistical data, scatter-plots, and (conceptually) best fit lines * Rotation, reflection, and	* What Σ means, what f(x) means * Raising a number to a variable power (e.g. what 3^x means) * What e is * Logarithms * Right-angle trigonometry (or any other trigonometry) * Vectors and matrices Things they will learn *during* grade 9: * Concept of a function * Quadratic functions, parabolas

	translation of shapes	
Physical sciences	* Small-numbered elements on the periodic table	* Kinetic molecular theory of gases, ideal gas equations * Introductory physics concepts like force, momentum, and energy * Wavelength and frequency * The difference between mass and weight * How to balance chemical equations * How to calculate percent error; common prefixes for units (e.g. milli-)
Life sciences	* The role of genes and chromosomes * The major systems of the human body * Cells, tissues, organs, and organ systems * Principles of evolution, and evidence for evolution * Symbiosis	

When starting 10th grade

	What students typically *do* know	What you should *not* expect them to know
Mathematics	Algebra I For many, Geometry For a few, Algebra II and Trigonometry	Algebra II and Trigonometry (many are taking this now) Precalculus (a few are taking this now)
Physical sciences		* Kinetic molecular theory of gases, ideal gas equations * Introductory physics concepts like force, momentum, and energy * Wavelength and frequency

When starting 11th grade

	What students typically *do*	What you should *not* expect them to

	know	know
Mathematics	Geometry For many, Algebra II and Trigonometry For a few, Precalculus	Precalculus (many are taking this now) Calculus (a few are taking this now)
Physical sciences	* Kinetic molecular theory of gases, ideal gas equations * Wavelength and frequency * How to go between chemical formulas and names (e.g. sodium bicarbonate = $NaHCO_3$) * Acids and bases, pH * Activation energy * How to balance chemical equations	* Introductory physics concepts like force, momentum, and energy

When starting 12th grade

	What students typically *do* know	What you should *not* expect them to know
Mathematics	Algebra II and Trigonometry For many, Precalculus For a few, Calculus	Calculus (many are taking this right now)
Physical sciences	* Introductory physics concepts like force, momentum, and energy	

Students who have had AP Physics B

What students typically *do* know	What you should *not* expect them to know
* Potential vs. kinetic energy	* Concept of derivative and integral

<u>Concepts these students have likely been taught, but not fully understood:</u> Entropy, angular momentum, the wave nature of light...

Students who have had AP calculus and/or Physics C Mechanics

What students typically *do* know	What you should *not* expect them to know
* Concept of derivative and integral * Acceleration is the time derivative of velocity which is the time derivative of position * Potential vs. kinetic energy * Concept of a vector field as a vector associated with each point in space * Integrating force to get work * What Taylor series are	* Partial derivatives, multiple integrals, line, surface, and volume integrals * Concept of flux * Notation from vector calculus, such as the del operator * What Taylor series are *for*, and why they *work*

Students who have had AP Chemistry

What students typically *do* know	What you should *not* expect them to know
* Potential vs. kinetic energy	* Concept of derivative and integral

Students who have had AP Biology

What students typically *do* know	What you should *not* expect them to know
* Potential vs. kinetic energy	* Concept of derivative and integral

Additional notes:

- Newtonian physics can take a long time to sink in; many students who feel familiar with Newton's laws still have trouble applying them correctly
- Most students who have seen trigonometry, exponents, complex numbers and e still don't know why DeMoivre's theorem is true, or that e^i*pi = -1
- Students who have taken Algebra II and Precalculus have seen complex numbers, but many still feel wary of / uncomfortable with them years later