

MATHEMATICS

Grade: 6

Strand: Number Sense

Academic Standard Indicator: 6.NS.1

Standard Description: Understand that positive and negative numbers are used to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge). Use positive and negative numbers to represent and compare quantities in real-world contexts, explaining the meaning of 0 in each situation.

Suggestion for Integrating International

Content: Have students compare world high and low temperatures above and below zero, in both Fahrenheit and Celsius. Have students examine U.S. and world locations that fall above or below sea level. **Example:** Compare the general height of the Alps to that of the coastal Netherlands, which falls well below sea level.

Grade: 6

Strand: Number Sense

Academic Standard Indicator: 6.NS.3

Standard Description: Compare and order rational numbers and plot them on a number line. Write, interpret, and explain statements of order for rational numbers in real-world contexts.

Suggestion for Integrating International

Content: Have students explore “number sense” in different cultures, such as Mayan mathematics or the Babylonian base 60 system.

Grade: 6

Strand: Number Sense

Academic Standard Indicator: 6.NS.8

Standard Description: Interpret, model, and use ratios to show the relative sizes of two quantities. Describe how a ratio shows the relationship between two quantities. Use the following notations: a/b , a to b , $a:b$.

Suggestion for Integrating International

Content: Have students use ratios to study

ethnic and racial diversity in a variety of international city or country populations in order to understand demographics. **Example:** Have students research statistics of ethnic and racial diversity in South Africa. **Suggested resource:** http://www.southafrica.info/about/people/population.htm#.VXDo_mRVikp.

Grade: 6

Strand: Geometry and Measurement

Academic Standard Indicator: 6.GM.1

Standard Description: Convert between measurement systems (English to metric and metric to English) given conversion factors, and use these conversions in solving real-world problems.

Suggestion for Integrating International

Content: Use an Internet search engine such as Google Images to find photos of road mileage markers from around the globe. Then have students convert kilometers to miles.

Grade: 6

Strand: Geometry and Measurement

Academic Standard Indicator: 6.GM.1

Standard Description: Convert between measurement systems (English to metric and metric to English) given conversion factors, and use these conversions in solving real-world problems.

Suggestion for Integrating International

Content: Have students use today’s weather forecasts around the world and convert temperatures of major world cities.

Grade: 6

Strand: Geometry and Measurement

Academic Standard Indicator: 6.GM.2 & 6.GM.3

Standard Description: 6.GM.2: Know that the sum of the interior angles of any triangle is 180° and that the sum of the interior angles of any quadrilateral is 360° . Use this information to

solve real-world and mathematical problems.
 6.GM.3: Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate; apply these techniques to solve real-world and other mathematical problems.

Suggestion for Integrating International

Content: Have students explore architecture and consider why some cultures build round buildings. **Example:** Have students research why traditional Inuits live in hemisphere-shaped homes (igloos), or ask them to examine the architecture of Russian onion domes. **Suggested resource:**
https://en.wikipedia.org/wiki/Onion_dome.

Grade: 6

Strand: Data Analysis and Statistics

Academic Standard Indicator: 6.DS.3

Standard Description: Formulate statistical questions; collect and organize the data (e.g., using technology); display and interpret the data with graphical representations (e.g., using technology).

Suggestion for Integrating International

Content: Display international demographic or economic data using appropriate bar graphs, frequency tables, time plots, histograms, or circle graphs. **Suggested resource:**
<http://www.nationmaster.com/>.

Grade: 6

Strand: Data Analysis and Statistics

Academic Standard Indicator: 6.DS.4

Standard Description: Summarize numerical data sets in relation to their context in multiple ways, such as: report the number of observations; describe the nature of the attribute under investigation, including how it was measured and its units of measurement; determine quantitative measure of center (mean and/or median) and spread (range and interquartile range), as well as describe any overall pattern and any striking deviation from the overall pattern with reference to the context in which the data were gathered; and relate the choice of measures of center and spread to the

shape of the data distribution and the context in which the data were gathered.

Suggestion for Integrating International

Content: Have students explore mean, median, and mode for data from different countries. **Examples:** Area; population density; per capita income; daily caloric intake; life expectancy; literacy rate. **Suggested resource:** *Material World: A Global Family Portrait* by Peter Menzel (Sierra Club Books, 1995).

Grade: 7

Strand: Number Sense

Academic Standard Indicator: 7.NS.2

Standard Description: Understand the inverse relationship between squaring and finding the square root of a perfect square integer. Find square roots of perfect square integers.

Suggestion for Integrating International

Content: Have students explore different methods for finding the square root of a number. **Example:** Heron's method; Chinese method; observing patterns.

Grade: 7

Strand: Computation

Academic Standard Indicator: 7.C.3 & 7.C.4

Standard Description: 7.C.3: Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers.
 7.C.4: Understand that integers can be divided, provided that the divisor is not zero, and that every quotient of integers (with non-zero divisor) is a rational number. Understand that if p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$.

Suggestion for Integrating International

Content: Have students use math to solve the riddle presented in the traditional Indian folktale, *One Grain of Rice* by Demi (Scholastic Press, 1997). A greedy raja must reward a young village woman for her honesty. Have students determine if her quick-witted mind will turn a single grain of rice into enough to feed all the hungry.

Grade: 7

Strand: Computation

Academic Standard Indicator: 7.C.5

Standard Description: Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.

Suggestion for Integrating International

Content: Have students select international recipes, and double the amount of servings by multiplying the fractions of each ingredient, or halve the recipes using division. **Examples:** Italian cuisine, German strudel, Greek salad, French pastries. **Suggested resource:** <http://allrecipes.com/recipes/world-cuisine/european/>.

Grade: 7

Strand: Algebra and Functions

Academic Standard Indicator: 7.AF.4

Standard Description: Define slope as vertical change for each unit of horizontal change and recognize that a constant rate of change or constant slope describes a linear function. Identify and describe situations with constant or varying rates of change.

Suggestion for Integrating International

Content: Have students use diverse situations from around the world linear relationships. Students can examine online newspapers from around the world to gather their data and analyze if the relationships are linear. **Example:** Using data from biologists studying the Irish Elk, which is an extinct animal, have students explore the changes over time of the length of the skull and the antler.

Grade: 7

Strand: Algebra and Functions

Academic Standard Indicator: 7.AF.4

Standard Description: Define slope as vertical change for each unit of horizontal change and recognize that a constant rate of change or constant slope describes a linear function. Identify and describe situations with constant or varying rates of change.

Suggestion for Integrating International

Content: Have students study plant or crop growth patterns and use data to analyze plant or crop choice versus population needs in the U.S. and a selection of other countries. **Example:** Agricultural information from Hungary.

Suggested resource:

<http://www.fao.org/ag/agp/AGPC/doc/Counprof/Hungary/hungary.htm>.

Grade: 7

Strand: Geometry and Measurement

Academic Standard Indicator: 7.GM.4

Standard Description: Solve real-world and other mathematical problems that involve vertical, adjacent, complementary, and supplementary angles.

Suggestion for Integrating International

Content: Have students observe tessellations found in Greek or Islamic patterned mosaics or Mayan art and then design their own. **Suggested resource:** <http://www.metmuseum.org/learn/for-educators/lesson-plans-and-pre-visit-guides/geometric-design-in-islamic-art>.

Grade: 7

Strand: Geometry and Measurement

Academic Standard Indicator: 7.GM.7

Standard Description: Construct nets for right rectangular prisms and cylinders and use the nets to compute the surface area; apply this technique to solve real-world and other mathematical problems.

Suggestion for Integrating International

Content: Have students study architecture around the world and, working in groups, construct 2D patterns and then fold them to form miniature 3D models of cities or buildings. **Example:** Pyramids in Egypt; cities in Israel, Greece, or Mexico.

Grade: 7

Strand: Data Analysis, Statistics, and Probability

Academic Standard Indicator: 7.DSP.1

Standard Description: Understand that statistics can be used to gain information about a

population by examining a sample of the population and generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

Suggestion for Integrating International

Content: Have students use online magazines and newspapers from around the world to evaluate the reasonableness of claims about depleted natural resources or any aspects of climate change, based on statistical data.

Example: Claims by environmentalists; conservation activists; scientists; marine biologists.

Grade: 7

Strand: Data Analysis, Statistics, and Probability

Academic Standard Indicator: 7.DSP.2

Standard Description: Use data from a random sample to draw inferences about a population. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.

Suggestion for Integrating International

Content: Have students make predictions from statistics about sports popular in non-U.S. countries, such as cricket or rugby. Have students learn the meaning of these statistics, converting the information into appropriate decimals, fractions, and percents.

Grade: 7

Strand: Geometry and Measurement

Academic Standard Indicator: 8.GM.1

Standard Description: Identify, define and describe attributes of three-dimensional geometric objects (right rectangular prisms, cylinders, cones, spheres, and pyramids). Explore the effects of slicing these objects using appropriate technology and describe the two-dimensional figure that results.

Suggestion for Integrating International

Content: Have students explore architecture and consider why some cultures build round buildings. **Example:** Traditional Inuits who live in hemisphere-shaped homes (igloos).

Grade: 8

Strand: Geometry and Measurement

Academic Standard Indicator: 8.GM.4

Standard Description: Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. Describe a sequence that exhibits the congruence between two given congruent figures.

Suggestion for Integrating International

Content: Have students use patterned African kente cloth, Eastern European embroidery, or Mexican papel picado as inspiration. Similarly, world landmarks can be viewed for their symmetry. **Examples:** Eiffel Tower; Taj Mahal.

Grade: 8

Strand: Geometry and Measurement

Academic Standard Indicator: 8.GM.8

Standard Description: Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and other mathematical problems in two dimensions.

Suggestion for Integrating International

Content: Have students trace the historical uses and manifestations of the Pythagorean Theorem in early civilizations, including the various proofs that were given. **Suggested resource:** https://en.wikipedia.org/wiki/Pythagorean_theorem.

Grade: 8

Strand: Geometry and Measurement

Academic Standard Indicator: 8.GM.8

Standard Description: Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and other mathematical problems in two dimensions.

Suggestion for Integrating International

Content: Have students use the Pythagorean Theorem to solve problems with international contexts. **Example:** Calculate the height of pyramids in Egypt; Eiffel Tower in France;

pyramid of Kukulcán in Mexico's ancient Mayan city of Chichen Itza.

Suggested resource:

http://en.wikipedia.org/wiki/El_Castillo,_Chichen_Itza.

Subject: Algebra I

Strand: Functions

Academic Standard Indicator: A1.F.2

Standard Description: Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear, has a maximum or minimum value). Sketch a graph that exhibits the qualitative features of a function that has been verbally described. Identify independent and dependent variables and make predictions about the relationship.

Suggestion for Integrating International

Content: Have students look at graphs representing the change in glacial formations around the world over the past few decades. Students could discuss trends in the graph or perhaps write an op-ed piece citing patterns or trends shown by the graph. **Suggested resource:** <http://nsidc.org/>.

Subject: Algebra I

Strand: Function

Academic Standard Indicator: A1.F.2

Standard Description: Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear, has a maximum or minimum value). Sketch a graph that exhibits the qualitative features of a function that has been verbally described. Identify independent and dependent variables and make predictions about the relationship.

Suggestion for Integrating International

Content: Have students use graphs that display greenhouse gas emissions and projections to anchor a discussion of graphic representation. Students can work with various graphs to make interpretations, answer questions related to the graph, and then discuss the implications of future projections. **Suggested resource:** <http://epa.gov/>.

Differentiated Instruction – Highly Able

Accommodations: Have students use tables from various Internet sources to track correlating information. **Example:** Amount of ice that is melting at the polar icecaps. Have students create graphs comparing the two icecaps and draw their own conclusions on the validity of the theory.

Subject: Algebra I

Strand: Linear Equations, Inequalities, and Functions

Academic Standard Indicator: A1.L.4

Standard Description: Represent linear functions as graphs from equations (with and without technology), equations from graphs, and equations from tables and other given information (e.g., from a given point on a line and the slope of the line).

Suggestion for Integrating International

Content: Have students use trend data related to population growth or other indices in various countries to create linear equations to predict future population levels. Then have them graph the equations and make comparisons. **Example:** Have students explore population growth rate by year of a given country. Ask them to explain the associated graphs and predict the next year's population growth rate. **Suggested resource:** <http://www.indexmundi.com/>.

Subject: Algebra I

Strand: Linear Equations, Inequalities, and Functions

Academic Standard Indicator: A1.L.5

Standard Description: Represent real-world problems that can be modeled with a linear function using equations, graphs, and tables; translate fluently among these representations, and interpret the slope and intercepts.

Suggestion for Integrating International

Content: Write the equation of a line that models a data set and uses the equation (or the graph of the equation) to make predictions. Describe the slope of the line in terms of the data, recognizing that the slope is the rate of change.

Suggestion for Integrating International

Content: Have students use trend data related to population growth or other indices in various

countries to create linear equations to predict future population levels. **Example:** Ask students to research the birthrate of Iraqi immigrants in Sweden compared to the birthrate of native Swedes and see which year they intersect.

Suggested resource:

<http://www.migrationpolicy.org/article/assessing-immigrant-integration-sweden-after-may-2013-riots>.

Subject: Algebra I

Strand: Quadratics and Exponential Equations and Functions

Academic Standard Indicator: A1.QE.3

Standard Description: Graph exponential and quadratic equations in two variables with and without technology.

Suggestion for Integrating International

Content: Have students use actual data from a variety of arched (parabolic) bridges in various countries to match or create quadratic equations that describe their structures.

Subject: Geometry

Strand: Triangles

Academic Standard Indicator: G.T.5

Standard Description: Use properties of congruent and similar triangles to solve real-world and mathematical problems involving sides, perimeters, and areas of triangles.

Suggestion for Integrating International

Content: Have students use notable triangular architecture from a variety of cultures to examine relationships and measures.

Subject: Geometry

Strand: Quadrilaterals and Other Polygons

Academic Standard Indicator: G.QP.3

Standard Description: Find measures of interior and exterior angles of polygons. Explain and justify the method used.

Suggestion for Integrating International

Content: Have students find the sum of measures of interior and exterior angles of convex polygons and deduce formulas by using examples from Islamic, Greek, or Mayan art.

Subject: Geometry

Strand: Quadrilaterals and Other Polygons

Academic Standard Indicator: G.QP.4

Standard Description: Identify types of symmetry of polygons, including line, point, rotational, and self-congruencies.

Suggestion for Integrating International

Content: Have students look at national flags from a variety of countries to discuss geometric transformations and symmetries that exist.

Example: Ask students to explore geometric patterns in art from different countries, regions, and cultures. **Suggested resource:**

http://www.metmuseum.org/toah/hd/geom/hd_geom.htm.

Subject: Geometry

Strand: Quadrilaterals and Other Polygons

Academic Standard Indicator: G.QP.4

Standard Description: Identify types of symmetry of polygons, including line, point, rotational, and self-congruencies.

Suggestion for Integrating International

Content: Have students study rotational symmetry by looking at Tibetan mandalas and Native American images.

Subject: Geometry

Strand: Circles

Academic Standard Indicator: G.CI.1

Standard Description: Define, identify and use relationships among the following: radius, diameter, arc, measure of an arc, chord, secant, tangent, and congruent concentric circles.

Suggestion for Integrating International

Content: Have students imagine that they are transmitting a signal to a country on the other side of the world, either assigned by the teacher or chosen by students. Have them use their knowledge of tangents to properly place satellites for successful transmission.

Subject: Geometry

Strand: Circles

Academic Standard Indicator: G.CI.1

Standard Description: Define, identify and use relationships among the following: radius, diameter, arc, measure of an arc, chord, secant, tangent, and congruent concentric circles.

Suggestion for Integrating International

Content: Have students analyze the configurations that exist at Stonehenge, both within the structure itself as well as in relation to astronomical phenomena.

Subject: Geometry

Strand: Circles

Academic Standard Indicator: G.CI.4

Standard Description: Solve real-world and other mathematical problems that involve finding measures of circumference, areas of circles and sectors, and arc lengths and related angles (central, inscribes, and intersections of secants and tangents).

Suggestion for Integrating International

Content: Have students use the locations of various major cities around the world, as given by longitude and latitude, to determine the distance between cities.

Subject: Geometry

Strand: Three-Dimensional Solids

Academic Standard Indicator: G.TS.1

Standard Description: Describe relationships between the faces, edges, and vertices of three-dimensional solids. Create a net for given three-dimensional solids. Describe the three-dimensional solid that can be made from a given net (or pattern).

Suggestion for Integrating International

Content: Have students research the Konigsberg (located in present day Kaliningrad, Russia) Bridge problem as elucidated by German mathematician, Leonhard Euler, in 1735.

Subject: Geometry

Strand: Three-Dimensional Solids

Academic Standard Indicator: G.TS.2

Standard Description: Describe symmetries of three-dimensional solids.

Suggestion for Integrating International

Content: Have students look at major architecture from early civilizations, such as Egyptian pyramids or Mayan temples, to determine and compare the various symmetries within these structures.

Subject: Geometry

Strand: Three-Dimensional Solids

Academic Standard Indicator: G.TS.5

Standard Description: Solve real-world and other mathematical problems involving volume and surface area of prisms, cylinders, cones, spheres, and pyramids, including problems that involve algebraic expressions.

Suggestion for Integrating International

Content: Have students consider the story of the golden crown and Archimedes' principle to explore the volume of solids. Then have them use this method to verify the accuracy of various regular solids, using international examples.

Subject: Geometry

Strand: Three-Dimensional Solids

Academic Standard Indicator: G.TS.5

Standard Description: Solve real-world and other mathematical problems involving volume and surface area of prisms, cylinders, cones, spheres, and pyramids, including problems that involve algebraic expressions.

Suggestion for Integrating International

Content: Have students use historical data relating to the thickness and area of glaciers around the world to determine their volume at various points in time.

Subject: Algebra II

Strand: Systems of Equations

Academic Standard Indicator: A2.SE.3

Standard Description: Represent real-world problems using a system of linear equations in three variables and solve such problems with and without technology. Interpret the solution and determine whether it is reasonable.

Suggestion for Integrating International

Content: Using "distance to horizon" equations,

have students determine the largest possible distance that could be viewed from the highest point on each continent.

Subject: Algebra II

Strand: Quadratic Equations and Functions

Academic Standard Indicator: A2.Q.1

Standard Description: Represent real-world problems that can be modeled with quadratic functions using tables, graphs, and equations; translate fluently among these representations. Solve such problems with and without technology. Interpret the solutions and determine whether they are reasonable.

Suggestion for Integrating International

Content: Have students compare the monetary values of currencies of other countries to the U.S. dollar. Then have them graph and model the relations with a linear equation to determine the exchange rate. **Suggested resource:** <http://www.oanda.com/currency/converter>.

Subject: Algebra II

Strand: Polynomial, Rational, and Other Equations and Functions

Academic Standard Indicator: A2.PR.2

Standard Description: Graph relations and functions including polynomial, square root, and piecewise-defined functions (including step functions and absolute value functions) with and without technology. Identify and describe features, such as intercepts, zeros, domain and range, end behavior, and lines of symmetry.

Suggestion for Integrating International

Content: Have students explore whether the global climate is warming by collecting and graphing average annual temperature data from countries around the world over a period of time. Then have them look for a possible pattern and determine if the relation can be modeled by a function. **Example:** Why is it so dry in the Middle East? **Suggested resource:** <http://www.science.co.il/Weather/Middle-East-Climate/>.

Subject: Algebra II

Strand: Polynomial, Rational, and Other Equations and Functions

Academic Standard Indicator: A2.PR.2

Standard Description: Graph relations and functions including polynomial, square root, and piecewise-defined functions (including step functions and absolute value functions) with and without technology. Identify and describe features, such as intercepts, zeros, domain and range, end behavior, and lines of symmetry.

Suggestion for Integrating International

Content: Have students determine the highway speeding fines in different countries. Then have them graph and write the piecewise functions associated with each fine increase due to higher speeds.

Subject: Algebra II

Strand: Exponential and Logarithmic Equations and Functions

Academic Standard Indicator: A2.EL.3

Standard Description: Identify the percent rate of change in exponential functions written as equations, such as $y = 1.02^t$, $y = (0.97)^t$, $y = (1.01)12^t$, $y = (1.2)^t/10$, and classify them as representing exponential growth or decay.

Suggestion for Integrating International

Content: Have examine the spread of international diseases such as HIV-AIDS or Ebola over time, either in selected countries or across the world as a whole. Then have them determine a growth or decay model for the relationship between number of victims and time.

Subject: Algebra II

Strand: Polynomial, Rational, and Other Equations and Functions

Academic Standard Indicator: A2.EL.6

Standard Description: Use the laws of exponents to derive the laws of logarithms. Use the laws of logarithms and the inverse relationship between exponential functions and logarithms to evaluate expressions and solve equations in one variable.

Suggestion for Integrating International

Content: Have students analyze the change in

population of different countries around the world over time to determine whether their growth has been exponential. If so, have students graph the model the populations over time.

Subject: Algebra II

Strand: Complex Numbers and Expressions

Academic Standard Indicator: A2.CNE.6

Standard Description: Find partial sums of arithmetic and geometric series and represent them using sigma notation.

Suggestion for Integrating International

Content: Have students research the work of 16th-century Indian mathematician and astronomer Nilakantha Somayaji and use his geometric model for the sum of an arithmetic series to add $2+4+6+10$.

Subject: Algebra II

Strand: Data Analysis, Statistics, and Probability

Academic Standard Indicator: A2.DSP.5

Standard Description: Understand dependent and independent events, and conditional probability; apply these concepts to calculate probabilities.

Suggestion for Integrating International

Content: Have students explore probability by considering if a random person is chosen from a country (assigned by a teacher), what the probability is that the person is a doctor. Then have students assess if the person from the student's assigned country is a millionaire, what the probability is that s/he is a government official.

Subject: Algebra II

Strand: Data Analysis, Statistics, and Probability

Academic Standard Indicator: A2.DSP.6

Standard Description: Understand the multiplication counting principle, permutations, and combinations; apply these concepts to calculate probabilities.

Suggestion for Integrating International

Content: For each of the continents except

Antarctica, have students determine the number of ways to arrange its countries from first to last.

Subject: Algebra II

Strand: Data Analysis, Statistics, and Probability

Academic Standard Indicator: A2.DSP.6

Standard Description: Understand the multiplication counting principle, permutations, and combinations; apply these concepts to calculate probabilities.

Suggestion for Integrating International

Content: Indian mathematics is credited with early interest in combinations. Research the Bhagabati Sutra, an Indian mathematical text dating about 300 BC, which provides a variety of formulas. **Example:** To calculate the number of groups that can be formed from the five senses.

Subject: Pre-Calculus

Strand: Exponential and Logarithmic Functions and Equations

Academic Standard Indicator: PC.EL.3

Standard Description: Graph and solve real-world and other mathematical problems that can be modeled using exponential and logarithmic equations and inequalities; interpret the solution and determine whether it is reasonable.

Suggestion for Integrating International

Content: Have students research the origin of the number e^{π} , which is sometimes known as Gelfond's number. Aleksander Gelfond was a 20th-century Russian mathematician.

Subject: Pre-Calculus

Strand: Exponential and Logarithmic Functions and Equations

Academic Standard Indicator: PC.EL.3

Standard Description: Graph and solve real-world and other mathematical problems that can be modeled using exponential and logarithmic equations and inequalities; interpret the solution and determine whether it is reasonable.

Suggestion for Integrating International

Content: Have students examine exponential

and logistic growth in the context of world populations and the spread of disease.

Subject: Pre-Calculus

Strand: Exponential and Logarithmic Functions and Equations

Academic Standard Indicator: PC.EL.3

Standard Description: Graph and solve real-world and other mathematical problems that can be modeled using exponential and logarithmic equations and inequalities; interpret the solution and determine whether it is reasonable.

Suggestion for Integrating International

Content: Have students explore how we measure the magnitude of an earthquake and how this measure relates to an earthquake's intensity. Then have students research and compare recent earthquake magnitude measures in Chile, Haiti, and Japan. **Extension:** Challenge students to use this measure to help non-mathematicians understand the percent difference in intensity level.

Subject: Pre-Calculus

Strand: Exponential and Logarithmic Functions and Equations

Academic Standard Indicator: PC.EL.4

Standard Description: Use technology to find a quadratic, exponential, logarithmic, or power function that models a relationship for a bivariate data set to make predictions; compute (using technology) and interpret the correlation coefficient.

Suggestion for Integrating International

Content: Have students research an average Body Mass Index (BMI) set of data for U.S. women or men and develop a model that describes the data. Then have them research BMI data for a comparable demographic from another country and adjust their model to fit the new data set. Students should comment on the change in parameters and provide an analysis of the difference in the two models.

Subject: Pre-Calculus

Strand: Exponential and Logarithmic Functions and Equations

Academic Standard Indicator: PC.EL.4

Standard Description: Use technology to find a quadratic, exponential, logarithmic, or power function that models a relationship for a bivariate data set to make predictions; compute (using technology) and interpret the correlation coefficient.

Suggestion for Integrating International

Content: Have students draw a scatterplot and calculate the correlation coefficient for data sets by continent. **Examples:** Carbon dioxide production vs. Number of species extinctions over time; cost of health care vs. Life expectancy; percent desert vs. percent malnourished population. Then have students interpret the coefficient of determination (r^2) in the context of the data set.

Subject: Trigonometry

Strand: Periodic Functions

Academic Standard Indicator: TR.PF.2

Standard Description: Graph trigonometric functions with and without technology. Use the graphs to model and analyze periodic phenomena, stating amplitude, period, frequency, phase shift, and midline (vertical shift).

Suggestion for Integrating International

Content: Have students use tide tables to plot, model, and compare the behavior of tides. **Examples:** Bay of Fundy in Nova Scotia; Caribbean; Atlantic.

Subject: Trigonometry

Strand: Periodic Functions

Academic Standard Indicator: TR.PF.3

Standard Description: Construct the inverse trigonometric functions of sine, cosine, and tangent by restricting the domain.

Suggestion for Integrating International

Content: Have students explore how trigonometry stems from the Indo-Arab exchange of cultures and ideas. India is considered to have introduced the sine function to the Arab world through the famous Indian astronomical text *Surya Siddhanta* in which are located sine tables. Have students research the etymology of the word *sine*, as well as the origin of the tangent and cotangent functions.

Subject: Trigonometry

Strand: Periodic Functions

Academic Standard Indicator: TR.PF.3

Standard Description: Graph conic sections. Identify and describe features like center, vertex or vertices, focus or foci, directrix, axis of symmetry, major axis, minor axis, and eccentricity.

Suggestion for Integrating International

Content: Have students research and model Ibrahim Ibn Sina's construction of a parabola, ellipse, and hyperbola.

Subject: Trigonometry

Strand: Coordinates

Academic Standard Indicator: TR.PC.1

Standard Description: Define polar coordinates and relate polar coordinates to Cartesian coordinates.

Suggestion for Integrating International

Content: A slight variation on polar coordinates is used to form the coordinate system for modern air navigation. Have students use this coordinate system to chart a course for a pilot flying from Indianapolis, IN, to international cities of their choice.

Subject: Finite Math

Strand: Probability

Academic Standard Indicator: FM.P.1

Standard Description: Use Markov chains to solve problems.

Suggestion for Integrating International

Content: Have students research the life and work of Andrey Markov, a 19th-century Russian mathematician.

Subject: Finite Math

Strand: Networks

Academic Standard Indicator: FM.N.5

Standard Description: Use graph-coloring techniques to solve problems.

Suggestion for Integrating International

Content: Have students determine how to color a map of the world using the minimum number of colors needed so that no adjacent states or countries are the same color. **Suggested resource:**

<https://serendip.brynmawr.edu/playground/fourcolor/> - scroll down until you see the applet for running the 4-color map problem on maps of your own creation.

Subject: Finite Math

Strand: Probability

Academic Standard Indicator: FM.P.3

Standard Description: Understand and use the multiplication rule to calculate probabilities for independent and dependent events. Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.

Suggestion for Integrating International

Content: Have students calculate the probability that it will rain for three days in a row for each individual month in a given year for the U.S. and selected other countries of their choice.

Grade: Probability and Statistics

Strand: Experimental Design

Academic Standard Indicator: PS.ED.6

Standard Description: Model and solve real-world problems involving patterns using recursion and iteration, growth and decay, and compound interest.

Suggestion for Integrating International

Content: Have students visit various online newspapers from around the world to investigate bank interest rates and mortgage rates. **Example:** They can use these rates to calculate the amount of interest that would be paid, in different international locations, on a \$10,000 loan.

Extension: They can also explore the average cost of buying a vacation home in various countries, using the classified ads from the online newspapers, and make a case for their choice of house. **Suggested resource:**

<http://www.oanda.com/currency/converter/>.

Subject: Probability and Statistics
Strand: Experimental Design
Academic Standard Indicator: PS.DA.1

Standard Description: Create, compare, and evaluate different graphic displays of the same data, using histograms, frequency polygons, cumulative frequency distribution functions, pie charts, scatterplots, stem-and-leaf plots, and box-and-whisker plots. Draw these with and without technology.

Suggestion for Integrating International Content: Have students conduct a survey (census, if possible), to determine what percent of the students in each class of the high school, freshman to seniors, can name the seven continents. Then have them graft the resulting data in numerous ways to compare the results by class, such as pie charts and side-by-side bar graph.

Subject: Probability and Statistics
Strand: Experimental Design
Academic Standard Indicator: PS.DA.2

Standard Description: Compute and use mean, median, mode, weighted mean, geometric mean, harmonic mean, range, quartiles, variance, and standard deviation. Use tables and technology to estimate areas under the normal curve. Fit a data set to a normal distribution and estimate population percentages. Recognize that there are data sets not normally distributed for which such procedures are inappropriate.

Suggestion for Integrating International Content: Have students calculate the five-number summary, plus mean and standard deviation, of the data by continent. **Examples:** Oil production and oil consumption; rainfall and water consumption; rice production and rice consumption. Then have them write a paragraph comparing and contrasting each data pair.

Subject: Probability and Statistics
Strand: Data Analysis
Academic Standard Indicator: PS.DA.2

Standard Description: Compute and use mean, median, mode, weighted mean, geometric mean, harmonic mean, range, quartiles, variance, and standard deviation. Use tables and technology to estimate areas under the normal curve. Fit a data

set to a normal distribution and estimate population percentages. Recognize that there are data sets not normally distributed for which such procedures are inappropriate.

Suggestion for Integrating International Content: Have students research and gather data from various countries to determine if the data are normally distributed. Then have them locate the 1-2-3 standard deviation points from the mean. **Examples:** Water consumption; oil consumption; percent wetland; percent desert; rice production; life expectancy; active military personnel.

Subject: Probability and Statistics
Strand: Data Analysis
Academic Standard Indicator: PS.DA.4

Standard Description: Understand hypothesis test of means and differences between means and use them to reach conclusions. Compute and use confidence intervals to make estimates. Construct and interpret margin of error and confidence intervals for population proportions.

Suggestion for Integrating International Content: Have students research upcoming government elections throughout the globe. Have them find recent poll results and create a 95% confidence interval for the percentage of expected votes for a specific candidate. Have students conduct follow up research at a later date to see who won the election.

Subject: Probability and Statistics
Strand: Data Analysis
Academic Standard Indicator: PS.DA.11

Standard Description: Find linear models by using median fit and least squares regression methods to make predictions. Decide which among several linear models gives a better fit. Interpret the slope and intercept in terms of the original context. Informally assess the fit of a function by plotting and analyzing residuals.

Suggestion for Integrating International Content: Have students draw a scatterplot of the data pairs by continent. Then have them determine the line of best fit to predict the next explanatory variable. **Examples:** Carbon dioxide production vs. number of species extinctions over time; cost of health care vs. life

expectancy; percent desert vs. percent malnourished population.

Subject: Probability and Statistics

Strand: Probability

Academic Standard Indicator: PS.P.3

Standard Description: Understand the multiplication counting principle, permutations, and combinations; use them to solve real-world problems. Use simulations with and without technology to solve counting and probability problems.

Suggestion for Integrating International

Content: Calculate the number of ways (combinations) by which a given country can choose two trading partners from adjacent first tier and second tier (two away) countries.

Subject: Probability and Statistics

Strand: Experimental Design

Academic Standard Indicator: PS.ED.7

Standard Description: Understand and apply basic ideas related to the design, analysis, and interpretation of surveys and sampling, such as background information, random sampling, causality, and bias.

Suggestion for Integrating International

Content: Have students use online magazines and newspapers from around the world to evaluate the reasonableness of claims about depleted natural resources or any aspects of climate change, based on statistical data.

Example: Claims by environmentalists; conservation activists; scientists; marine biologists.

Subject: Calculus and Calculus AB. Advanced Placement

Strand: Integrals

Academic Standard Indicator: C.I.3

Standard Description: Interpret a definite integral as a limit of Riemann Sums.

Suggestion for Integrating International

Content: Have students use the (Greek) Archimedes' Method of Exhaustion to find an estimate for pi. Then have students consider how this method is similar to the finding limits of the (German) Riemann Sums.

Subject: Calculus and Calculus AB. Advanced Placement

Strand: Integrals

Academic Standard Indicator: C.AI.3

Standard Description: Solve differential equations of the form $y' = ky$ as applied to growth and decay problems.

Suggestion for Integrating International

Content: Have students find census data from two countries of their choice dating back to, for example, 1920 and 1930. Then have them solve the exponential growth differential equation and use the data to solve for the constant of integration, as well as the growth rate. Students can then determine how predictive their model for the current population of the two countries is and comment on improvements they could make to their models.

MATHEMATICS

Create Your Own Suggestions for Integrating International Content

Grade/Subject:

Strand:

Academic Standard Indicator:

Standard Description:

Suggestion for Integrating International Content:

Grade/Subject:

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Suggestion for Integrating International Content:
