Institute for Humane Education
Grades: 9, 10, 11, 12
States: Common Core State Standards
Subjects: Mathematics

Common Core State Standards

Mathematics

Grade 9 - Adopted 2010

STRAND / DOMAIN	CCSS.Math.Practice	Mathematical Practices
CATEGORY / CLUSTER	CCSS.Math.Practice.MP5	Use appropriate tools strategically. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth **Financial Math: What's the Deal with Debt?** In this lesson plan, students will learn to calculate a loan repayment size and complete an amortization schedule for two different lending scenarios; compare the scales and details of two typical modern-day loan situations; and experience through role-playing some of the pressures and expectations faced by creditors and debtors within contemporary economic systems. **Hear the People** This is a great icebreaker for any activity exploring the challenges and impacts surronding our enormous and growing human population. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
CATEGORY / CLUSTER	CCSS.Math.Practice.MP6	Attend to precision. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth **Financial Math: What's the Deal with Debt?** In this lesson plan, students will learn to calculate a loan repayment size and complete an amortization schedule for two different lending scenarios; compare the scales and details of two typical modern-day loan situations; and experience through role-playing some of the pressures and expectations faced by creditors and debtors within contemporary economic systems. **Hear the People** This is a great icebreaker for any activity exploring the challenges and impacts surronding our enormous and growing human population. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
CATEGORY / CLUSTER	CCSS.Math.Practice.MP8	Look for and express regularity in repeated reasoning. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average

		and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth **Financial Math: What's the Deal with Debt?** In this lesson plan, students will learn to calculate a loan repayment size and complete an amortization schedule for two different lending scenarios; compare the scales and details of two typical modern-day loan situations; and experience through role-playing some of the pressures and expectations faced by creditors and debtors within contemporary economic systems. **Hear the People** This is a great icebreaker for any activity exploring the challenges and impacts surrounding our enormous and growing human population. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
STRAND / DOMAIN	**CCSS.Math.Content.HSA**	Algebra
CATEGORY / CLUSTER	**CCSS.Math.Content.HSA-SSE**	Seeing Structure in Expressions
STANDARD	**CCSS.Math.Content.HSA-SSE.B**	Write expressions in equivalent forms to solve problems.
EXPECTATION	CCSS.Math.Content.HSA-SSE.B.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
GRADE EXPECTATION	**CCSS.Math.Content.HSA-SSE.B.3c**	Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15^t can be rewritten as (1.15^(1/12))^12t ≈ 1.012^12t to reveal the approximate equivalent monthly interest rate if the annual rate is 15%. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSA**	Algebra
CATEGORY / CLUSTER	**CCSS.Math.Content.HSA-CED**	Creating Equations
STANDARD	**CCSS.Math.Content.HSA-CED.A**	Create equations that describe numbers or relationships.
EXPECTATION	**CCSS.Math.Content.HSA-CED.A.2**	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSA**	Algebra
CATEGORY / CLUSTER	**CCSS.Math.Content.HSA-REI**	Reasoning with Equations and Inequalities
STANDARD	**CCSS.Math.Content.HSA-REI.A**	Understand solving equations as a process of reasoning and explain the reasoning.

EXPECTATION	**CCSS.Math.Content.HSA-REI.A.1**	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
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CATEGORY / CLUSTER	**CCSS.Math.Content.HSA-REI**	Reasoning with Equations and Inequalities
STANDARD	**CCSS.Math.Content.HSA-REI.D**	Represent and solve equations and inequalities graphically.
EXPECTATION	**CCSS.Math.Content.HSA-REI.D.10**	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSF**	Functions
CATEGORY / CLUSTER	**CCSS.Math.Content.HSF-IF**	Interpreting Functions
STANDARD	**CCSS.Math.Content.HSF-IF.B**	Interpret functions that arise in applications in terms of the context.
EXPECTATION	**CCSS.Math.Content.HSF-IF.B.4**	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSF**	Functions
CATEGORY / CLUSTER	**CCSS.Math.Content.HSF-IF**	Interpreting Functions
STANDARD	**CCSS.Math.Content.HSF-IF.C**	Analyze functions using different representations.
EXPECTATION	CCSS.Math.Content.HSF-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
GRADE EXPECTATION	**CCSS.Math.Content.HSF-IF.C.7e**	Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. **A Gathering Crowd: Functions & Rates of Change**

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CATEGORY / CLUSTER	**CCSS.Math.Content.HSF-IF**	Interpreting Functions
STANDARD	**CCSS.Math.Content.HSF-IF.C**	Analyze functions using different representations.
EXPECTATION	CCSS.Math.Content.HSF-IF.C.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
GRADE EXPECTATION	**CCSS.Math.Content.HSF-IF.C.8b**	Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)^t, y = (0.97)^t, y = (1.01)^12t, y = (1.2)^t/10, and classify them as representing exponential growth or decay. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSF**	Functions
CATEGORY / CLUSTER	**CCSS.Math.Content.HSF-BF**	Building Functions
STANDARD	**CCSS.Math.Content.HSF-BF.B**	Build new functions from existing functions.
EXPECTATION	CCSS.Math.Content.HSF-BF.B.4	Find inverse functions.
GRADE EXPECTATION	**CCSS.Math.Content.HSF-BF.B.4a**	Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) =2 x^3 for x > 0 or f(x) = (x+1)/(x-1) for x ≠ 1. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSF**	Functions
CATEGORY / CLUSTER	**CCSS.Math.Content.HSF-LE**	Linear, Quadratic, and Exponential Models
STANDARD	**CCSS.Math.Content.HSF-LE.A**	Construct and compare linear, quadratic, and exponential models and solve problems.
EXPECTATION	CCSS.Math.Content.HSF-LE.A.1	Distinguish between situations that can be modeled with linear functions and with exponential functions.
GRADE EXPECTATION	**CCSS.Math.Content.HSF-LE.A.1a**	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and

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STRAND / DOMAIN	**CCSS.Math.Content.HSS**	Statistics and Probability
CATEGORY / CLUSTER	**CCSS.Math.Content.HSS-CP**	Conditional Probability and the Rules of Probability
STANDARD	**CCSS.Math.Content.HSS-CP.A**	Understand independence and conditional probability and use them to interpret data
EXPECTATION	**CCSS.Math.Content.HSS-CP.A.1**	Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (''or,'' ''and,'' ''not''). **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.A.2**	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. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.A.3**	Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.A.4**	Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.A.5**	Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of

		Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
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CATEGORY / CLUSTER	**CCSS.Math.Content.HSS-CP**	Conditional Probability and the Rules of Probability
STANDARD	**CCSS.Math.Content.HSS-CP.B**	Use the rules of probability to compute probabilities of compound events in a uniform probability model
EXPECTATION	**CCSS.Math.Content.HSS-CP.B.6**	Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A and interpret the answer in terms of the model. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.B.7**	Apply the Addition Rule, P(A or B) = P(A) + P(B) - P(A and B), and interpret the answer in terms of the model. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.B.8**	(+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.B.9**	(+) Use permutations and combinations to compute probabilities of compound events and solve problems. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
STRAND / DOMAIN	**CCSS.Math.Content.HSS**	Statistics and Probability
CATEGORY / CLUSTER	**CCSS.Math.Content.HSS-MD**	Using Probability to Make Decisions
STANDARD	**CCSS.Math.Content.HSS-MD.A**	Calculate expected values and use them to solve problems
EXPECTATION	**CCSS.Math.Content.HSS-MD.A.1**	(+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.

Grade 10 - Adopted 2010

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CATEGORY / CLUSTER	CCSS.Math.Practice.MP5	Use appropriate tools strategically. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth **Financial Math: What's the Deal with Debt?** In this lesson plan, students will learn to calculate a loan repayment size and complete an amortization schedule for two different lending scenarios; compare the scales and details of two typical modern-day loan situations; and experience through role-playing some of the pressures and expectations faced by creditors and debtors within contemporary economic systems. **Hear the People** This is a great icebreaker for any activity exploring the challenges and impacts surronding our enormous and growing human population. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
CATEGORY / CLUSTER	CCSS.Math.Practice.MP6	Attend to precision. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth **Financial Math: What's the Deal with Debt?** In this lesson plan, students will learn to calculate a loan repayment size and complete an amortization schedule for two different lending scenarios; compare the scales and details of two typical modern-day loan situations; and experience through role-playing some of the pressures and expectations faced by creditors and debtors within contemporary economic systems. **Hear the People** This is a great icebreaker for any activity exploring the challenges and impacts surronding our enormous and growing human population. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
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STRAND / DOMAIN	**CCSS.Math.Content.HSA**	Algebra
CATEGORY / CLUSTER	**CCSS.Math.Content.HSA-SSE**	Seeing Structure in Expressions
STANDARD	**CCSS.Math.Content.HSA-SSE.B**	Write expressions in equivalent forms to solve problems.
EXPECTATION	CCSS.Math.Content.HSA-SSE.B.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
GRADE EXPECTATION	**CCSS.Math.Content.HSA-SSE.B.3c**	Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15^t can be rewritten as (1.15^(1/12))^12t ≈ 1.012^12t to reveal the approximate equivalent monthly interest rate if the annual rate is 15%. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
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CATEGORY / CLUSTER	**CCSS.Math.Content.HSA-CED**	Creating Equations
STANDARD	**CCSS.Math.Content.HSA-CED.A**	Create equations that describe numbers or relationships.
EXPECTATION	**CCSS.Math.Content.HSA-CED.A.2**	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSA**	Algebra
CATEGORY / CLUSTER	**CCSS.Math.Content.HSA-REI**	Reasoning with Equations and Inequalities
STANDARD	**CCSS.Math.Content.HSA-REI.A**	Understand solving equations as a process of reasoning and explain the reasoning.
EXPECTATION	**CCSS.Math.Content.HSA-REI.A.1**	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential

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CATEGORY / CLUSTER	**CCSS.Math.Content.HSA-REI**	Reasoning with Equations and Inequalities
STANDARD	**CCSS.Math.Content.HSA-REI.D**	Represent and solve equations and inequalities graphically.
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STRAND / DOMAIN	**CCSS.Math.Content.HSF**	Functions
CATEGORY / CLUSTER	**CCSS.Math.Content.HSF-IF**	Interpreting Functions
STANDARD	**CCSS.Math.Content.HSF-IF.B**	Interpret functions that arise in applications in terms of the context.
EXPECTATION	**CCSS.Math.Content.HSF-IF.B.4**	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
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CATEGORY / CLUSTER	**CCSS.Math.Content.HSF-IF**	Interpreting Functions
STANDARD	**CCSS.Math.Content.HSF-IF.C**	Analyze functions using different representations.
EXPECTATION	CCSS.Math.Content.HSF-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
GRADE EXPECTATION	**CCSS.Math.Content.HSF-IF.C.7e**	Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth

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STANDARD	**CCSS.Math.Content.HSF-IF.C**	Analyze functions using different representations.
EXPECTATION	CCSS.Math.Content.HSF-IF.C.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
GRADE EXPECTATION	**CCSS.Math.Content.HSF-IF.C.8b**	Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)^t, y = (0.97)^t, y = (1.01)^12t, y = (1.2)^t/10, and classify them as representing exponential growth or decay. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
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STANDARD	**CCSS.Math.Content.HSF-BF.B**	Build new functions from existing functions.
EXPECTATION	CCSS.Math.Content.HSF-BF.B.4	Find inverse functions.
GRADE EXPECTATION	**CCSS.Math.Content.HSF-BF.B.4a**	Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) =2 x^3 for x > 0 or f(x) = (x+1)/(x-1) for x ≠ 1. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSF**	Functions
CATEGORY / CLUSTER	**CCSS.Math.Content.HSF-LE**	Linear, Quadratic, and Exponential Models
STANDARD	**CCSS.Math.Content.HSF-LE.A**	Construct and compare linear and exponential models and solve problems.
EXPECTATION	CCSS.Math.Content.HSF-LE.A.1	Distinguish between situations that can be modeled with linear functions and with exponential functions.
GRADE EXPECTATION	**CCSS.Math.Content.HSF-LE.A.1a**	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSS**	Statistics and Probability
CATEGORY /	**CCSS.Math.Content.HSS-**	Conditional Probability and the Rules of Probability

CLUSTER	**CP**	
STANDARD	**CCSS.Math.Content.HSS-CP.A**	Understand independence and conditional probability and use them to interpret data
EXPECTATION	**CCSS.Math.Content.HSS-CP.A.1**	Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (''or,'' ''and,'' ''not''). **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.A.2**	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. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.A.3**	Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.A.4**	Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.A.5**	Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
STRAND / DOMAIN	**CCSS.Math.Content.HSS**	Statistics and Probability
CATEGORY / CLUSTER	**CCSS.Math.Content.HSS-CP**	Conditional Probability and the Rules of Probability
STANDARD	**CCSS.Math.Content.HSS-**	Use the rules of probability to compute probabilities of compound

	CP.B	events in a uniform probability model
EXPECTATION	**CCSS.Math.Content.HSS-CP.B.6**	Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A and interpret the answer in terms of the model. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.B.7**	Apply the Addition Rule, P(A or B) = P(A) + P(B) - P(A and B), and interpret the answer in terms of the model. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.B.8**	(+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.B.9**	(+) Use permutations and combinations to compute probabilities of compound events and solve problems. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
STRAND / DOMAIN	**CCSS.Math.Content.HSS**	Statistics and Probability
CATEGORY / CLUSTER	**CCSS.Math.Content.HSS-MD**	Using Probability to Make Decisions
STANDARD	**CCSS.Math.Content.HSS-MD.A**	Calculate expected values and use them to solve problems
EXPECTATION	**CCSS.Math.Content.HSS-MD.A.1**	(+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.

Common Core State Standards

Mathematics

Grade 11 - Adopted 2010

STRAND / DOMAIN	**CCSS.Math.Practice**	Mathematical Practices
CATEGORY / CLUSTER	**CCSS.Math.Practice.MP5**	Use appropriate tools strategically. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human

		population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth **Financial Math: What's the Deal with Debt?** In this lesson plan, students will learn to calculate a loan repayment size and complete an amortization schedule for two different lending scenarios; compare the scales and details of two typical modern-day loan situations; and experience through role-playing some of the pressures and expectations faced by creditors and debtors within contemporary economic systems. **Hear the People** This is a great icebreaker for any activity exploring the challenges and impacts surronding our enormous and growing human population. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
CATEGORY / CLUSTER	**CCSS.Math.Practice.MP6**	Attend to precision. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth **Financial Math: What's the Deal with Debt?** In this lesson plan, students will learn to calculate a loan repayment size and complete an amortization schedule for two different lending scenarios; compare the scales and details of two typical modern-day loan situations; and experience through role-playing some of the pressures and expectations faced by creditors and debtors within contemporary economic systems. **Hear the People** This is a great icebreaker for any activity exploring the challenges and impacts surronding our enormous and growing human population. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
CATEGORY / CLUSTER	**CCSS.Math.Practice.MP8**	Look for and express regularity in repeated reasoning. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth **Financial Math: What's the Deal with Debt?** In this lesson plan, students will learn to calculate a loan repayment size and complete an amortization schedule for two different lending scenarios; compare the scales and details of two typical modern-day loan situations; and experience through role-playing some of the pressures and expectations faced by creditors and debtors within contemporary economic systems. **Hear the People** This is a great icebreaker for any activity exploring the challenges and impacts surronding our enormous and growing human population. **Risky Business: Exploring Probability Theory**

		Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
STRAND / DOMAIN	**CCSS.Math.Content.HSA**	Algebra
CATEGORY / CLUSTER	**CCSS.Math.Content.HSA-SSE**	Seeing Structure in Expressions
STANDARD	**CCSS.Math.Content.HSA-SSE.B**	Write expressions in equivalent forms to solve problems.
EXPECTATION	CCSS.Math.Content.HSA-SSE.B.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
GRADE EXPECTATION	**CCSS.Math.Content.HSA-SSE.B.3c**	Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15^t can be rewritten as (1.15^(1/12))^12t ≈ 1.012^12t to reveal the approximate equivalent monthly interest rate if the annual rate is 15%. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSA**	Algebra
CATEGORY / CLUSTER	**CCSS.Math.Content.HSA-CED**	Creating Equations
STANDARD	**CCSS.Math.Content.HSA-CED.A**	Create equations that describe numbers or relationships.
EXPECTATION	**CCSS.Math.Content.HSA-CED.A.2**	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSA**	Algebra
CATEGORY / CLUSTER	**CCSS.Math.Content.HSA-REI**	Reasoning with Equations and Inequalities
STANDARD	**CCSS.Math.Content.HSA-REI.A**	Understand solving equations as a process of reasoning and explain the reasoning.
EXPECTATION	**CCSS.Math.Content.HSA-REI.A.1**	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSA**	Algebra

CATEGORY / CLUSTER	**CCSS.Math.Content.HSA-REI**	Reasoning with Equations and Inequalities
STANDARD	**CCSS.Math.Content.HSA-REI.D**	Represent and solve equations and inequalities graphically.
EXPECTATION	**CCSS.Math.Content.HSA-REI.D.10**	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSF**	Functions
CATEGORY / CLUSTER	**CCSS.Math.Content.HSF-IF**	Interpreting Functions
STANDARD	**CCSS.Math.Content.HSF-IF.B**	Interpret functions that arise in applications in terms of the context.
EXPECTATION	**CCSS.Math.Content.HSF-IF.B.4**	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSF**	Functions
CATEGORY / CLUSTER	**CCSS.Math.Content.HSF-IF**	Interpreting Functions
STANDARD	**CCSS.Math.Content.HSF-IF.C**	Analyze functions using different representations.
EXPECTATION	CCSS.Math.Content.HSF-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
GRADE EXPECTATION	**CCSS.Math.Content.HSF-IF.C.7e**	Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSF**	Functions
CATEGORY / CLUSTER	**CCSS.Math.Content.HSF-IF**	Interpreting Functions
STANDARD	**CCSS.Math.Content.HSF-IF.C**	Analyze functions using different representations.

EXPECTATION	CCSS.Math.Content.HSF-IF.C.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
GRADE EXPECTATION	**CCSS.Math.Content.HSF-IF.C.8b**	Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)^t, y = (0.97)^t, y = (1.01)^12t, y = (1.2)^t/10, and classify them as representing exponential growth or decay. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSF**	Functions
CATEGORY / CLUSTER	**CCSS.Math.Content.HSF-BF**	Building Functions
STANDARD	**CCSS.Math.Content.HSF-BF.B**	Build new functions from existing functions.
EXPECTATION	CCSS.Math.Content.HSF-BF.B.4	Find inverse functions.
GRADE EXPECTATION	**CCSS.Math.Content.HSF-BF.B.4a**	Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) =2 x^3 for x > 0 or f(x) = (x+1)/(x-1) for x ≠ 1. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSF**	Functions
CATEGORY / CLUSTER	**CCSS.Math.Content.HSF-LE**	Linear, Quadratic, and Exponential Models
STANDARD	**CCSS.Math.Content.HSF-LE.A**	Construct and compare linear and exponential models and solve problems.
EXPECTATION	CCSS.Math.Content.HSF-LE.A.1	Distinguish between situations that can be modeled with linear functions and with exponential functions.
GRADE EXPECTATION	**CCSS.Math.Content.HSF-LE.A.1a**	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSS**	Statistics and Probability
CATEGORY / CLUSTER	**CCSS.Math.Content.HSS-CP**	Conditional Probability and the Rules of Probability
STANDARD	**CCSS.Math.Content.HSS-CP.A**	Understand independence and conditional probability and use them to interpret data
EXPECTATION	**CCSS.Math.Content.HSS-CP.A.1**	Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (''or,'' ''and,'' ''not'').

		Risky Business: Exploring Probability Theory Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.A.2**	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. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.A.3**	Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.A.4**	Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.A.5**	Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
STRAND / DOMAIN	**CCSS.Math.Content.HSS**	Statistics and Probability
CATEGORY / CLUSTER	**CCSS.Math.Content.HSS-CP**	Conditional Probability and the Rules of Probability
STANDARD	**CCSS.Math.Content.HSS-CP.B**	Use the rules of probability to compute probabilities of compound events in a uniform probability model
EXPECTATION	**CCSS.Math.Content.HSS-CP.B.6**	Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A and interpret the answer in terms of the model. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic

		probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.B.7**	Apply the Addition Rule, P(A or B) = P(A) + P(B) - P(A and B), and interpret the answer in terms of the model. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.B.8**	(+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.B.9**	(+) Use permutations and combinations to compute probabilities of compound events and solve problems. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
STRAND / DOMAIN	**CCSS.Math.Content.HSS**	Statistics and Probability
CATEGORY / CLUSTER	**CCSS.Math.Content.HSS-MD**	Using Probability to Make Decisions
STANDARD	**CCSS.Math.Content.HSS-MD.A**	Calculate expected values and use them to solve problems
EXPECTATION	**CCSS.Math.Content.HSS-MD.A.1**	(+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.

Common Core State Standards

Mathematics

Grade 12 - Adopted 2010

STRAND / DOMAIN	**CCSS.Math.Practice**	Mathematical Practices
CATEGORY / CLUSTER	**CCSS.Math.Practice.MP5**	Use appropriate tools strategically. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth **Financial Math: What's the Deal with Debt?**

		In this lesson plan, students will learn to calculate a loan repayment size and complete an amortization schedule for two different lending scenarios; compare the scales and details of two typical modern-day loan situations; and experience through role-playing some of the pressures and expectations faced by creditors and debtors within contemporary economic systems. **Hear the People** This is a great icebreaker for any activity exploring the challenges and impacts surronding our enormous and growing human population. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
CATEGORY / CLUSTER	**CCSS.Math.Practice.MP6**	Attend to precision. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth **Financial Math: What's the Deal with Debt?** In this lesson plan, students will learn to calculate a loan repayment size and complete an amortization schedule for two different lending scenarios; compare the scales and details of two typical modern-day loan situations; and experience through role-playing some of the pressures and expectations faced by creditors and debtors within contemporary economic systems. **Hear the People** This is a great icebreaker for any activity exploring the challenges and impacts surronding our enormous and growing human population. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
CATEGORY / CLUSTER	**CCSS.Math.Practice.MP8**	Look for and express regularity in repeated reasoning. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth **Financial Math: What's the Deal with Debt?** In this lesson plan, students will learn to calculate a loan repayment size and complete an amortization schedule for two different lending scenarios; compare the scales and details of two typical modern-day loan situations; and experience through role-playing some of the pressures and expectations faced by creditors and debtors within contemporary economic systems. **Hear the People** This is a great icebreaker for any activity exploring the challenges and impacts surronding our enormous and growing human population. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
STRAND /	**CCSS.Math.Content.HSA**	Algebra

DOMAIN		
CATEGORY / CLUSTER	**CCSS.Math.Content.HSA-SSE**	Seeing Structure in Expressions
STANDARD	**CCSS.Math.Content.HSA-SSE.B**	Write expressions in equivalent forms to solve problems.
EXPECTATION	CCSS.Math.Content.HSA-SSE.B.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
GRADE EXPECTATION	**CCSS.Math.Content.HSA-SSE.B.3c**	Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15^t can be rewritten as (1.15^(1/12))^12t ≈ 1.012^12t to reveal the approximate equivalent monthly interest rate if the annual rate is 15%. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSA**	Algebra
CATEGORY / CLUSTER	**CCSS.Math.Content.HSA-CED**	Creating Equations
STANDARD	**CCSS.Math.Content.HSA-CED.A**	Create equations that describe numbers or relationships.
EXPECTATION	**CCSS.Math.Content.HSA-CED.A.2**	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSA**	Algebra
CATEGORY / CLUSTER	**CCSS.Math.Content.HSA-REI**	Reasoning with Equations and Inequalities
STANDARD	**CCSS.Math.Content.HSA-REI.A**	Understand solving equations as a process of reasoning and explain the reasoning.
EXPECTATION	**CCSS.Math.Content.HSA-REI.A.1**	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSA**	Algebra
CATEGORY / CLUSTER	**CCSS.Math.Content.HSA-REI**	Reasoning with Equations and Inequalities
STANDARD	**CCSS.Math.Content.HSA-REI.D**	Represent and solve equations and inequalities graphically.
EXPECTATION	**CCSS.Math.Content.HSA-**	Understand that the graph of an equation in two variables is the set

	REI.D.10	of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSF**	Functions
CATEGORY / CLUSTER	**CCSS.Math.Content.HSF-IF**	Interpreting Functions
STANDARD	**CCSS.Math.Content.HSF-IF.B**	Interpret functions that arise in applications in terms of the context.
EXPECTATION	**CCSS.Math.Content.HSF-IF.B.4**	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSF**	Functions
CATEGORY / CLUSTER	**CCSS.Math.Content.HSF-IF**	Interpreting Functions
STANDARD	**CCSS.Math.Content.HSF-IF.C**	Analyze functions using different representations.
EXPECTATION	CCSS.Math.Content.HSF-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
GRADE EXPECTATION	**CCSS.Math.Content.HSF-IF.C.7e**	Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSF**	Functions
CATEGORY / CLUSTER	**CCSS.Math.Content.HSF-IF**	Interpreting Functions
STANDARD	**CCSS.Math.Content.HSF-IF.C**	Analyze functions using different representations.
EXPECTATION	CCSS.Math.Content.HSF-IF.C.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
GRADE EXPECTATION	**CCSS.Math.Content.HSF-IF.C.8b**	Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)^t, y = (0.97)^t, y = (1.01)^12t, y = (1.2)^t/10, and classify them as representing exponential growth or decay.

		A Gathering Crowd: Functions & Rates of Change In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSF**	Functions
CATEGORY / CLUSTER	**CCSS.Math.Content.HSF-BF**	Building Functions
STANDARD	**CCSS.Math.Content.HSF-BF.B**	Build new functions from existing functions.
EXPECTATION	CCSS.Math.Content.HSF-BF.B.4	Find inverse functions.
GRADE EXPECTATION	**CCSS.Math.Content.HSF-BF.B.4a**	Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) =2 x^3 for x > 0 or f(x) = (x+1)/(x-1) for x ≠ 1. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSF**	Functions
CATEGORY / CLUSTER	**CCSS.Math.Content.HSF-LE**	Linear, Quadratic, and Exponential Models
STANDARD	**CCSS.Math.Content.HSF-LE.A**	Construct and compare linear and exponential models and solve problems.
EXPECTATION	CCSS.Math.Content.HSF-LE.A.1	Distinguish between situations that can be modeled with linear functions and with exponential functions.
GRADE EXPECTATION	**CCSS.Math.Content.HSF-LE.A.1a**	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. **A Gathering Crowd: Functions & Rates of Change** In this activity, students will be able to: describe and model human population growth during the past 600 years with an exponential function, considering both the total amount of growth and average and/or instantaneous rates of increase: explain the strengths and limitations of modeling human population growth with an exponential function;explore and discuss some of the environmental, cultural, and economic impacts of human population growth
STRAND / DOMAIN	**CCSS.Math.Content.HSS**	Statistics and Probability
CATEGORY / CLUSTER	**CCSS.Math.Content.HSS-CP**	Conditional Probability and the Rules of Probability
STANDARD	**CCSS.Math.Content.HSS-CP.A**	Understand independence and conditional probability and use them to interpret data
EXPECTATION	**CCSS.Math.Content.HSS-CP.A.1**	Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (''or,'' ''and,'' ''not''). **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.

EXPECTATION	CCSS.Math.Content.HSS-CP.A.2	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. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	CCSS.Math.Content.HSS-CP.A.3	Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	CCSS.Math.Content.HSS-CP.A.4	Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	CCSS.Math.Content.HSS-CP.A.5	Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
STRAND / DOMAIN	CCSS.Math.Content.HSS	Statistics and Probability
CATEGORY / CLUSTER	CCSS.Math.Content.HSS-CP	Conditional Probability and the Rules of Probability
STANDARD	CCSS.Math.Content.HSS-CP.B	Use the rules of probability to compute probabilities of compound events in a uniform probability model
EXPECTATION	CCSS.Math.Content.HSS-CP.B.6	Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A and interpret the answer in terms of the model. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	CCSS.Math.Content.HSS-CP.B.7	Apply the Addition Rule, P(A or B) = P(A) + P(B) - P(A and B), and interpret the answer in terms of the model.

		Risky Business: Exploring Probability Theory Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.B.8**	(+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
EXPECTATION	**CCSS.Math.Content.HSS-CP.B.9**	(+) Use permutations and combinations to compute probabilities of compound events and solve problems. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.
STRAND / DOMAIN	**CCSS.Math.Content.HSS**	Statistics and Probability
CATEGORY / CLUSTER	**CCSS.Math.Content.HSS-MD**	Using Probability to Make Decisions
STANDARD	**CCSS.Math.Content.HSS-MD.A**	Calculate expected values and use them to solve problems
EXPECTATION	**CCSS.Math.Content.HSS-MD.A.1**	(+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions. **Risky Business: Exploring Probability Theory** Using a realistic scenario, students will be able to calculate basic probabilities pertinent to ecological and human-health concerns of industrial oil sands development in Canada; engage in active research of statistical data concerning the industrial development of Canadian oil sands; andproduce a risk assessment and action plan presentation based on that research.