Curriculum Sample Template
Max. 8 Pages

Grade Level	12th Grade	**Content Area**	Mathematics
Course Title (grades 9-12 Only)	Trigonometry		
Expected Prior Knowledge *The knowledge/skills mastered earlier in the year foundational to the mastery of the required Standard in the current sample.*	Students are expected to have prior knowledge of and/or skills mastered to: F-BF.5 Solve problems involving exponents and logarithms using their inverse relationship. A-CED.2 Write equations in two or more variables to represent relationships between quantities.		
Alignment to Program of Instruction *Briefly outline methods of instruction found in this sequence of lessons that align to the Program of Instruction described in A.3.*	Mathematics lessons focus on problem solving, critical thinking, and practical applications. Direct Instruction includes lecture (structured overview), small-group (peer partners), and teacher-directed (guided overview) learning activities. Formative assessments include didactic questioning, visual presentation of direct instruction, Cornell Notes and graphic organizers, summaries and reflections, and collaborative activities. Summative assessments designed for student mastery of content.		
Standard Number and Description *List the Number* and the full description for the Required Standard or Science Performance Objective listed in section A.6.*	F-LE.4 For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.		
Materials/Resources Needed	Pencils, Paper, Spiral Notebook (Math Dictionary), Graphing Calculator		

* ***Standard Number****: For English Language Arts (Reading and Writing), use Grade, Strand, Standard (e.g., 3.RI.2). For K-8 Math, use Grade, Domain, Standard (e.g., 6.EE.7). For HS Math, use Conceptual Category-Domain, Standard (e.g., A-REI.6). For Science, use Grade, Strand, Concept, PO (e.g., 4.1.3.1).*

Lesson (add as needed)	**Instructional Strategies**	**Student Activities**
1	**Exponential and Logarithmic Equations** 1. Teacher will review warm-up problems to assess prior knowledge and provide re-teaching assignments as needed. 2. Teacher will introduce key vocabulary: exponential equation, logarithmic equation. 3. Teacher will present structured overview of: (a) the process to solve exponential equations - base 10. 4. Teacher will present guided instruction to: (a) re-write and solve exponential equations with similar powers and (b) re-write and solve exponential equations with different powers using a calculator.	1. Students will access prior knowledge by completing warm-up problems for: (a) simplifying logarithms using a calculator. 2. Students will document key vocabulary and meanings in their Math Dictionary. 3. Students will take Cornell Notes for: (a) the process to solve exponential equations - base 10. 4. Students will work with peer partner to solve problems for each concept, after it is presented in guided instruction. (see Instructional Strategies 4a-b) 5. Students will complete four-six practice problems for each concept presented in the lesson. (see Instructional Strategies 4a-b)
2	**Exponential and Logarithmic Equations** 1. Teacher will present a structured overview of: (a) the properties of logarithms and (b) the process to solve logarithmic equations - base 2, 10. 2. Teacher will present guided instruction to: (a) re-write and solve logarithmic equations and (b) evaluate logarithmic expressions using a calculator.	1. Students will take Cornell Notes for: (a) the properties of logarithms and (b) the process to solve logarithmic equations - base 2, 10. 2. Students will work with peer partner to solve problems for each concept, after it is presented in guided instruction. (see Instructional Strategies 2a-b) 3. Students will complete four-six practice problems for each concept presented in the lesson. (see Instructional Strategies 2a-b)
3	**Exponential and Logarithmic Equations** 1. Teacher will review guided instruction for solving exponential and logarithmic equations.	1. **Summative Assessment:** Students will complete Exponential and Logarithmic Equations Quiz. 2. **Summative Assessment:** Students will complete Exponential and Logarithmic Mathematical Applications.

4	**The Natural Base, e** 1. Teacher will review warm-up problems to assess prior knowledge and provide re-teaching assignments as needed. 2. Teacher will introduce key vocabulary: natural logarithm. 3. Teacher will present structured overview of: (a) the process to solve logarithmic expressions - base e. 4. Teacher will present guided instruction to: (a) re-write logarithmic expressions - base e and (b) re-write and solve mathematical applications for logarithmic expressions - base e using a calculator.	1. Students will access prior knowledge by completing warm-up problems for: (a) simplifying logarithms using a calculator. 2. Students will document key vocabulary and meanings in their Math Dictionary. 3. Students will take Cornell Notes for: (a) the process to solve logarithmic equations -- base e. 4. Students will work with peer partner to solve problems for each concept, after it is presented in guided instruction. (see Instructional Strategies 4a-b) 5. Students will complete four-six practice problems for each concept presented in the lesson. (see Instructional Strategies 4a-b)
5	**Exponential and Logarithmic Equations** 1. Teacher will review guided instruction for solving logarithmic expressions – base e.	1. **Summative Assessment:** Students will complete Natural Logarithms Quiz.

Summative Assessment Items: *Attach here.* For each summative assessment item, include an answer key or scoring rubric describing how points are to be awarded.

1. **Exponential and Logarithmic Equations Quiz:** Assessment is scored on a 45 point scale, each question is worth 5 points and partial credit may be given. Students will score 36 out of 40 points (80%) to demonstrate mastery.
2. **Exponential and Logarithmic Equations Mathematical Applications:** Assessment is scored on a 40 point scale, each question is worth 5 points and partial credit may be given. Students will score 36 out of 40 points (80%) to demonstrate mastery.*
3. **Natural Logarithms Quiz:** Assessment is scored on a 20 point scale, each question is worth 5 points and partial credit may be given. Students will score 16 out of 20 points (80%) to demonstrate mastery.

*assessment independent from instruction

For each summative assessment item, partial credit will be awarded as follows:

5 points for correct answer and writing of ALL mathematical calculations required to solve item.
4 points for correct answer and writing of SOME but not ALL mathematical calculations required to solve item.
3 points for correct answer and no writing of mathematical calculations required to solve item.
2 points for incorrect answer and writing of ALL mathematical calculations required to solve item.
1 point for incorrect answer and writing of SOME but not ALL mathematical calculations required to solve item.
0 points for incorrect answer and no writing of mathematical calculations required to solve item.

Exponential and Logarithmic Equations Quiz

Score: _____

Solve each exponential equation.

1. $5^{2x} = 20$ **2.** $12^{2x-8} = 15$ **3.** $16^{5x} = 64^{x+7}$ **4.** $25^{x} = 125^{x-2}$

_____ _____ _____ _____

Solve each logarithmic equation.

5. $\log_2 x^7 = 21$ 6. $\log_2 (7x + 1) = \log_2 (2 - x)$ 7. $\log (x + 6) = \log (5x - 2)$

_____ _____ _____

Use a table and a graph to solve each equation.

8. $2^{x-5} < 64$ 9. $\log x^3 = 12$

_____ _____

Exponential and Logarithmic Mathematical Applications

Score: _____

1. Suppose a bacteria culture doubles in size every hour. How many hours will it take for the number of bacteria to exceed 1,000,000?
   a. Write the number in scientific notation. _____
   b. Write the inequality to for the problem. _____
   c. Re-write the inequality into a logarithmic equation. _____
   d. Solve the logarithmic equation (round to nearest hour). _____
2. You receive one penny on the first day, and then triple that (3 cents) on the second day, and so on for a month. On what day would you receive at least a million dollars.
   a. Write the number in scientific notation. _____
   b. Write the inequality to for the problem. _____
   c. Re-write the inequality into a logarithmic equation. _____
   d. Solve the logarithmic equation (round to nearest hour). _____

Natural Logarithms Quiz

Score: _____

1. What is the total amount for an investment of $500 invested at 5.25% for 40 years and compounded continuously? (Use formula $A = Pe^{rt}$)
   a. Write the formula for the problem. _____
   b. Solve the formula for the natural logarithm (round to nearest cent). _____
2. Determine how long it will take for 650 mg of a sample of chromium-51 which has a half-life of about 28 days to decay to 200 mg. (Use formula $N(t) = N_0e^{-kt}$)
   a. Write the formula for the problem. _____
   b. Solve the formula for the natural logarithm. _____

Exponential and Logarithmic Equations Quiz Answer Key

1. $\boldsymbol{x} \approx 0.9307$
2. $\boldsymbol{x} \approx 4.5449$
3. $\boldsymbol{x} \approx -6.67$
4. $\boldsymbol{x} = 6$
5. $\boldsymbol{x} = 8$
6. $\boldsymbol{x} = 1/8$
7. $\boldsymbol{x} = 2$
8. $\boldsymbol{x} < 11$
9. $\boldsymbol{x} = 10{,}000$

Exponential and Logarithmic Mathematical Applications Answer Key

1a. 10^6
1b. $2^n > 10^6$
1c. $\log 2^n > \log 10^6$
1d. 19.94 = 20 hours

2a. 10^8
2b. $3^{n-1} > 1 \times 10^8$
2c. $\log 3^{n-1} > \log 10^8$
2d. 17.8 or 18 days

Natural Logarithms Quiz Answer Key

1a. $A = 100e^{0.035(8)}$
1b. $A \approx \$132.31$

2a. $½ = 1e^{-k(28)}$
2b. $k \approx 0.0247$