

PreCalculus PreAP  
Six Weeks Project / Culminating Semester Project

The objective of this project is to use properties of geometric sequences and exponential functions to model and predict future values of increase or decrease scenarios using Microsoft PowerPoint or Prezi.

1. City Population - Choose any city in the world that you would like to live in.

- Part I (10 points): Create a collage slide of 1 to 3 pictures that best models the city of your choice.
  - Your slide must contain the following information – State or country and three facts about the city. **Appropriate citation is required based on the source of your information.**
  - Give the current city population of the city you chose and the rate at which the population increases or decreases every year as a percent. **Appropriate citation is required based on the source of your information.**
- Part II (15 points): Formulate a geometric sequence  $p_n$  that will predict the population at any time  $n$  years after 2018.
  - You must find and interpret  $p_{11}$  in a complete sentence.
- Part III (15 points): Formulate an exponential function  $P(t)$  that will predict the population at any time  $t$  years after 2018.
  - You must find and interpret  $P(10)$  in a complete sentence.
- Part IV (10 points): Predict the amount of time, in years, to the nearest tenth the population of your city will increase by **50%** using the exponential function and algebraic methods.
  - You must mathematically show how you arrived at the answer.
  - You must interpret the answer in a complete sentence.
- Part V (50 points): Your presentation must include the following information.
  - Slide 1: Title Slide - Name (first and last), Period/Day
  - Slide 2: City Collage of Selected City
  - Slide 3: Geometric sequence with the computed value and the interpretation
  - Slide 4: Exponential function with the computed value and the interpretation
  - Slide 5: Predicted value of when the population of the city will increase by **50%** with interpretation.

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Six Weeks Project / Culminating Semester Project

2. Vehicle Investment - Choose any vehicle that you would like to own. **Assume that you purchased the vehicle today.**

- Part I (10 points): Create a collage slide of 1 to 3 pictures that best models the vehicle of your choice.
  - Your slide must contain the following information - Make, model, year, and specifications. **Appropriate citation is required based on the source of your information.**
  - Give the price of the vehicle in US dollars and the rate at which the vehicle depreciates every year as a percent. **Appropriate citation is required based on the source of your information.**
- Part II (15 points): Formulate a geometric sequence  $c_n$  that will predict the cost of the vehicle at any time  $n$  years after it is purchased.
  - You must find and interpret  $c_6$  in a complete sentence.
- Part III (15 points): Formulate an exponential function  $C(t)$  that will predict the cost of the car at any time  $t$  years after it is purchased.
  - You must find and interpret  $C(5)$  in a complete sentence.
- Part IV (10 points): Predict the amount of time, in years, to the nearest tenth that the value of your vehicle will decrease **50%** in value using the exponential function and algebraic methods.
  - You must mathematically show how you arrived at the answer.
  - You must interpret the answer in a complete sentence.
- Part V (50 points): Your presentation must include the following information.
  - Slide 2: Vehicle Collage of Selected Vehicle
  - Slide 3: Geometric sequence with the computed value and the interpretation
  - Slide 4: Exponential function with the computed value and the interpretation
  - Slide 5: Predicted value of when the value of the vehicle will decrease by **50%** with interpretation.

PreCalculus PreAP  
Six Weeks Project / Culminating Semester Project

3. Savings Account - Choose any bank that you would like to open a savings account with. Assume that you open the account with the bank of your choice today.

- Part I (10 points): Create a collage slide of 1 to 3 pictures that best models the bank of your choice.
  - Your slide must include the following information - Name of the Bank, year it was first established, and the services it offers, and the minimum amount required to open any checking or savings account. ***Appropriate citation is required based on the source of your information.***
- Part II (10 points): Create a slide of that contains the following information.
  - The amount you will initially deposit in your savings account is your birthyear in US dollars. (For example, if you were born in 1981, then your initial deposit will be \$1,981.)
  - The interest rate is based on the day you were born on and will be compounded monthly. Use the following statements below to determine your annual percentage rate (APR), as a percent.
    - If you were born on any day from the 1<sup>st</sup> – 9<sup>th</sup>, then you will use the following formula:  $1 + \frac{day}{10} \%$ . (For example: if you were born on the 7<sup>th</sup> day of the month, then your APR would be 1.7% compounded monthly.)
    - If you were born on any day from the 10<sup>th</sup> – 19<sup>th</sup>, then you will use the following formula.  $\frac{.5+day}{10} \%$ . (For example: if you were born on the 13<sup>th</sup> day of the month, then your APR would be 1.35% compounded monthly.)
    - If you were born on any day from the 20<sup>th</sup> – 29<sup>th</sup>, then you will use the following formula.  $\frac{.25+day}{10} \%$ . (For example: if you were born on the 28<sup>th</sup> day of the month, then your APR would be 2.825% compounded monthly.)
    - If you were born on the 30<sup>th</sup> or 31<sup>st</sup>, then you will use the following formula.  $\frac{day}{10} \%$ . (For example: if you were born on the 30<sup>th</sup> day of the month, then your APR would be 3.0% compounded monthly.)

PreCalculus PreAP  
Six Weeks Project / Culminating Semester Project

- Part III (15 points): Formulate a geometric sequence  $a_n$  that will predict the amount in the account at any time  $n$  years after today. Assume no deposits or withdrawals are made with this account.
  - Use the geometric sequence to predict the amount in the savings account by computing the first 10 terms of the sequence.
  - You must find and interpret  $a_{11}$  in a complete sentence.
- Part III (15 points): Formulate an exponential function  $A(t)$  that will predict the amount in the savings account  $t$  years after today.
  - You must find and interpret  $A(10)$  in a complete sentence.
- Part IV (10 points): Predict the amount of time, in years, to the nearest tenth the initial amount you deposited will have increased by **50%** using algebraic methods.
  - You must mathematically show how you arrived at the answer.
  - You must interpret the answer in a complete sentence.
- Part V (50 points): Your presentation must include the following information.
  - Slide 6: Bank Collage of Selected Bank
  - Slide 7: Geometric sequence with the computed value and the interpretation
  - Slide 8: Exponential function with the computed value and the interpretation
  - Slide 9: Predicted value of when the amount in the account will increase by **50%** with interpretation.

PreCalculus PreAP  
Six Weeks Project / Culminating Semester Project

4. Career Choice - Choose any career field you like to go into. **Assume that you started the job today and you receive a 5% raise each year.**
- Part I (10 points): Create a collage slide of 1 to 3 pictures that best models your career choice.
    - Your slide must include the following information – Name of your career, name of your corporation or business you would like to work for, and reasons for your career choice.
    - Give the current annual salary of your career or job choice in US dollars.  
**Appropriate citation is required based on the source of your information.**
  - Part II (15 points): Formulate a geometric sequence  $m_n$  that will predict the amount of your salary  $n$  years after today.
    - You must find and interpret  $m_6$  in a complete sentence.
  - Part III (15 points): Formulate an exponential function  $M(t)$  that will predict the amount of your annual salary  $t$  years after today.
    - You must find and interpret  $M(5)$  in a complete sentence.
  - Part IV (10 points): Predict the amount of time, in years, to the nearest tenth the amount of time your salary will increase by **50%** using algebraic methods.
    - You must mathematically show how you arrived at the answer.
    - You must interpret the answer in a complete sentence.
  - Part V (50 points): Your presentation must include the following information.
    - Slide 10: Career Collage of Selected Career
    - Slide 11: Geometric sequence with the computed value and the interpretation
    - Slide 12: Exponential function with the computed value and the interpretation
    - Slide 13: Predicted value of when your salary will increase by **50%** with interpretation.