Deal or No Deal?

LESSON 2 | HSF.LE.A.2 | HSA.CED.A.2 | HSF.BF.A.2

Accommodations & Recommendations:
This lesson is facilitated with pencil, paper and basic scientific calculator. The steps involved can be done by hand or using a basic four-function calculator. Note that a graphing calculator makes this process more efficient, especially in future lessons.

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Mindful Minute

Let's Center Ourselves:

- Look at the visual
- Silently, take 5 seconds to reflect
- For the next 30 seconds, respond by quickly sketching, jotting down, or verbally sharing with someone around you, your reaction to the prompt below:

How might the image relate to the energy or attitude we choose to bring to this experience today?

Today's Lesson

HSF.LE.A.2 | HSA.CED.A.2 | HSF.BF.A.2

Lesson Outcome

- Apply understanding of key features of a geometric series in order to build and evaluate a function representing a savings plan, given a verbal description

Key Vocabulary

- Annuity
- Common Ratio
- Finite Geometric Series
- Initial Value
- Interest
- Multiplier

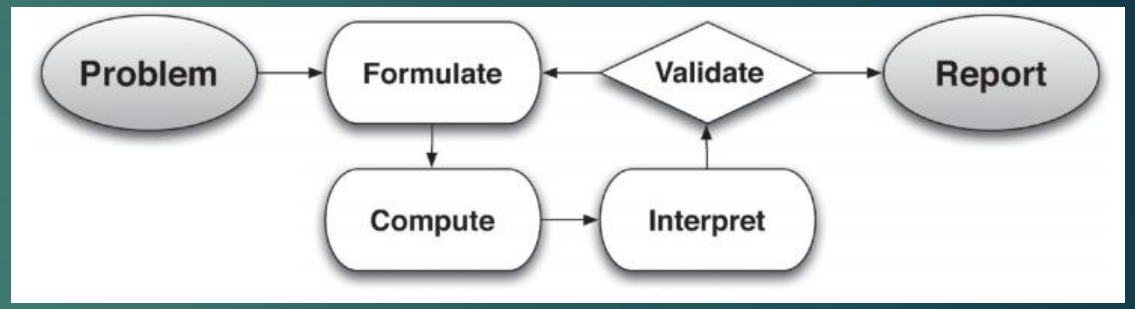
Essential Questions

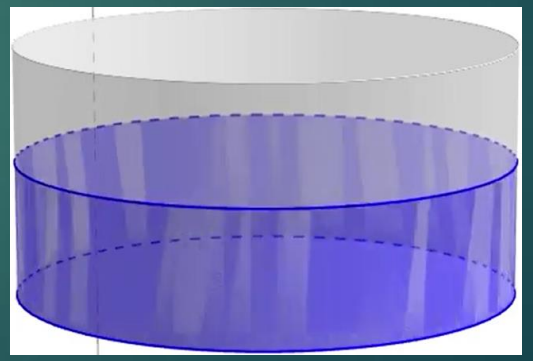
- How many months will it take to reach your savings goal given a set interest rate?
- How much money will you save given a set period and interest rate?
- What interest rate will you need to reach your savings goal within a given period?

Modeling with Mathematics

Background Knowledge

Assume that there is initially 1 inch of water in the tank, and the height of the water doubles every *10* seconds. Build and evaluate a function that could be used to calculate the height *H(t)* of the water in the tank after 1 minute.

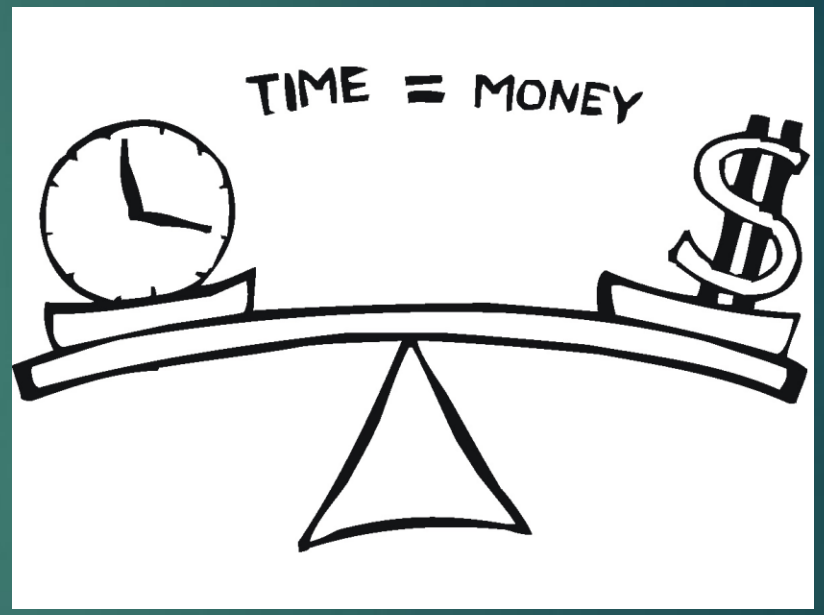




Progress towards Instructional Goal

Revisiting Lesson Outcome

- Apply understanding of key features of a geometric series in order to build and evaluate a function representing a savings plan, given a verbal description

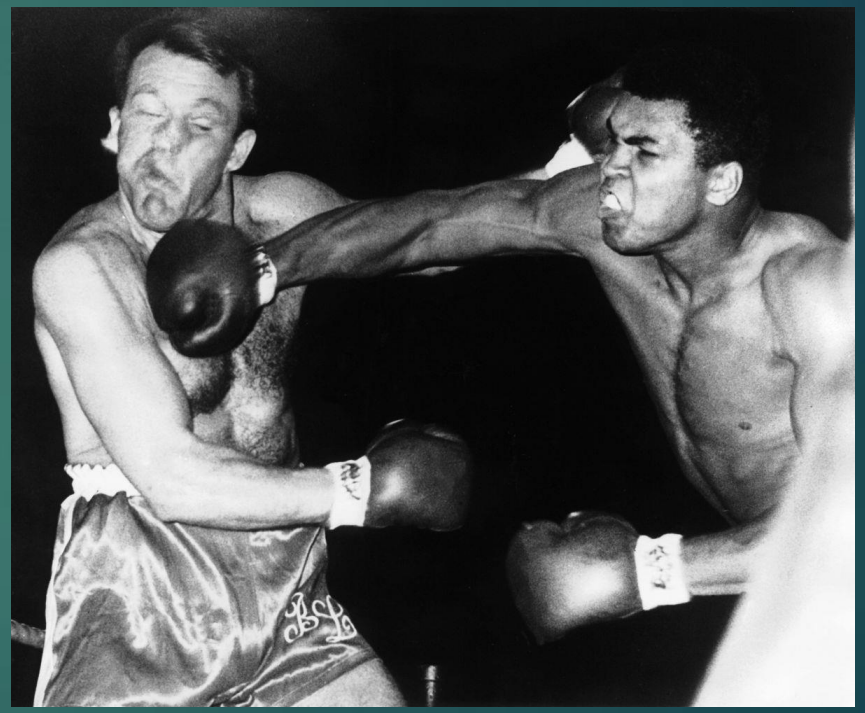


Note:
Real world data is often messy, resulting in models that may not be amenable to paper and pencil techniques. Spreadsheets, graphing utilities, and other tools assist with devising appropriate models and data displays that may be useful in analyzing a situation. (NCTM)

Today's "Two-Piece"

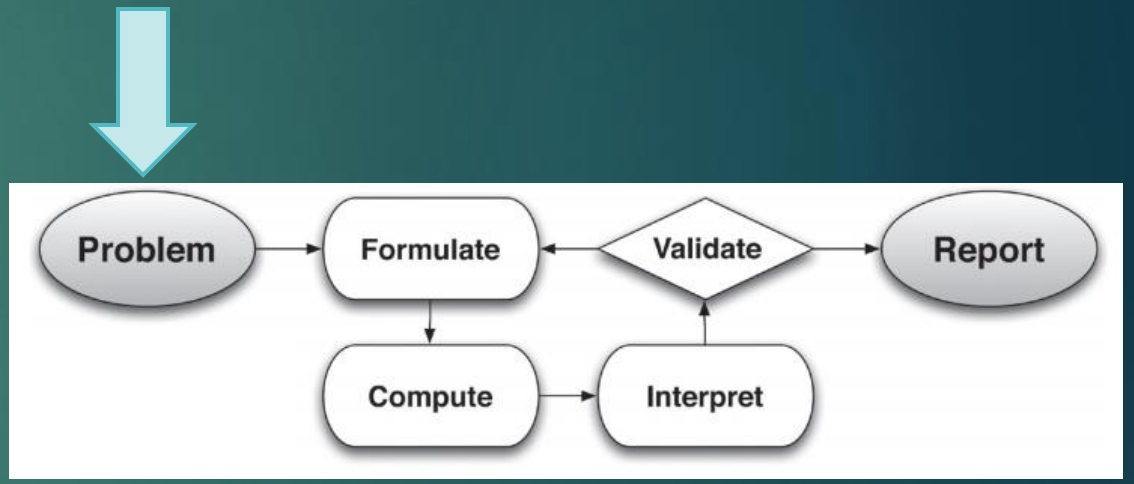
Did you know that certain factors impact the amount of money that you can save?

- What circumstances might prevent someone from ensuring their money reaches its maximum potential?
- How might someone safeguard themselves against savings account discrimination?



Modeling with Mathematics

A $\$100$ deposit is made at the end of every month for 12 months in an account that earns interest at an annual interest rate of 3% compounded monthly. Build and evaluate a function that could be used to calculate the amount of money in the account immediately after the last payment.



Validating the Mathematical Model

- How might you verify that the function models the given savings plan?
- What representation would better allow you to calculate the amount of money in the account at any time?

We can derive the function that represents the sequence where S_n is the sum of the series, a is the monthly deposit, and r is the common ratio.

$$S_n = a + a(r)^1 + a(r)^2 + a(r)^3 + \cdots, + a(r)^{10} + a(r)^{11}$$

Finding the difference between the sum of the sequence, S_n , and the common ratio times S_n, or $r * S_n$ accounts for the multiplier as the compounding factor of the monthly deposit.

Therefore, function includes the exact summation of all values in the table and can be used to find values not included in the table via evaluation.

$$S_n = a\left(\frac{1 - r^n}{1 - r}\right)$$

#WeekendChallenge

Present Value of Annuity Formula

$$A_p = R\left(\frac{1-(1+i)^{-n}}{i}\right)$$

Problem Sneak Peak

A student wants to buy a car and can afford to pay $200 per month. If they plan to take out a loan at 6% interest per year with a recurring payment of $200 for four years, what price car can she buy?

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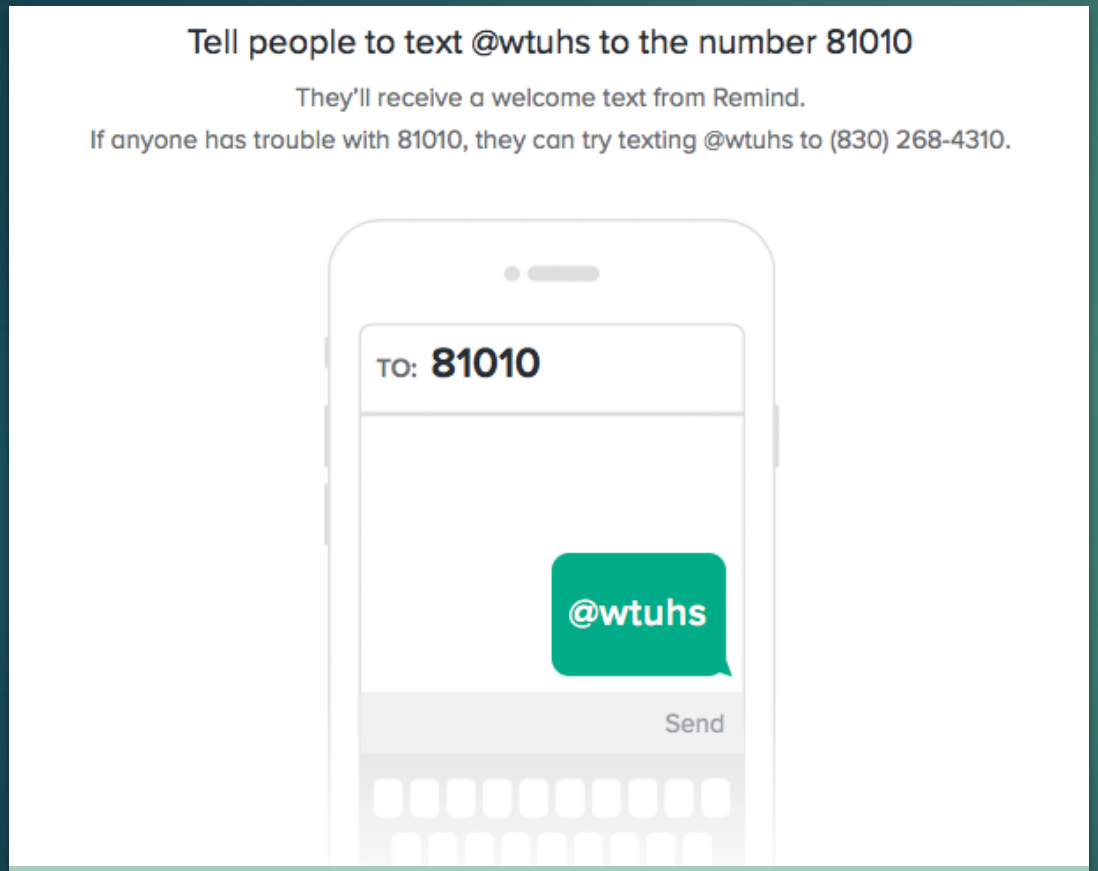

Copies of this lesson plan will be translated to Spanish and put on WTU website if you do have someone who can print, courtesy of Kathrine Avila at CHEC and Veronica Torres at Truesdell EC

- Text the number to:
  - Request additional problems and the answer key
  - Share your mindful minute response picture or journal entry
  - Be considered for the "Student of the Week" Shout Out in next week's lesson