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. Please note that social distancing is being practiced during this series.
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

Lesson Outcome

- Evaluate a present value of annuity function to model car buying, given a verbal description

Key Vocabulary

- Annuity --> Present Value
- Common Ratio
- Finite Geometric Series
- Initial Value --> Recurring Payment
- Interest

Essential Questions

- What additional costs go into buying and maintaining a car?
- What is the significance of a down payment?
- How might you compare various loan options?
Concept Development

Sum of a finite geometric series ($S_n$)

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

Savings Plan ($A_f$)

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

$F = A_p (1 + i)^n$

Car & House ($A_p$)

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

Revisiting the $y = a \cdot b^x$
Research

- What type of car do I want?
- What is the insurance rate and how does my age, race, and location impact this amount?
- What is the car's fuel efficiency?
- What is the current mileage? Typical lifespan?
- What are the typical maintenance costs? (i.e. Car wash, gas, oil change, general repairs, etc.)
- What is the state’s sales tax?
- What additional fees are required?
- How much did we save? (weeks 1 and 2 savings plan)
- What is 15% of the selling price?
Today’s “Two-Piece”

Did you know that certain factors can impact the car buying experience?

- How have some car dealerships used car sales and financing to treat people of color differently during the car buying experience?

- What role might demographics play when seeking car insurance?
Assume that sales tax is 6% of the selling price and estimated fees are 2% of the selling price. If you put a $1,000 down payment on your car,

How much money do you need to borrow to pay for the car, taxes, and other fees?

Calculate the monthly payment for the different loan options at 2, 3, and 5% interest, with a personal goal not exceeding $500.

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)
Validating the Mathematical Model

- What interest rate gives you an amortization schedule that best fits your needs?
- How might you verify you’ve found an accurate monthly payment?

Amortization schedule allows you to see the pay down of the loan.
- **Loan option 1** at 2% for three years does not fit my schedule because I cannot afford to pay more than $500 per month.
- **Loan option 3** at 5% is for five years. Although it gives me a lower payment now, I’m paying for more in interest. Also, anything can happen in five years.
- **Loan option 2** at 3% for four years allows me to stay within the budget.

The reoccurring payment is similar to the initial deposit from the savings plan, except it’s a withdrawal from the account each month. I can use the present value annuity function with the known $i$, $n$, and identified $R$ to verify the loan amount.
#WeekendChallenge

**Visualize**
- Determine a car you’d like to purchase in the future

(if you do not want to purchase a car, then help someone in your home with this process.)

**Action Research**
- Identify the present cost of the car by interviewing people in your home, calling someone on the phone, looking at a recent magazine, or recording from commercials

**Realize**
- Determine the amount of time your money needs to work in a savings account at a 3, 4, and 5% annual interest rate compounded monthly in order to purchase your car within the next three years, at a 3% interest rate for at least 48 months
Text @wtuhs to (830) 268 – 4310
Shout Out to Suzanne for being Savings Plan SOTW

Tell people to text @wtuhs to the number 81010
They'll receive a welcome text from Remind.
If anyone has trouble with 81010, they can try texting @wtuhs to (830) 268-4310.

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

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
Weekend Challenge

1. Visualize
2. Action Research
3. Realize

- Determine the amount of time your money needs to work at a 3, 4, and 5% annual interest rate compounded monthly in order to make the purchase.
- Determine the present cost by interviewing people in your home, calling someone on the phone, or recording from commercials.
- Determine a major purchase you'd like to make in the future (no time constraint).