Lesson Plan

Text: Financial Algebra
Volume: 1 Chapter: 4-3
Unit number _____ Title of unit: Loan Calculation
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Short Description (Be sure to include where in your unit this lesson takes place):

Students will be reviewing the monthly payment formula and the loan length formula. Students will also research different online monthly payment calculators that use fewer steps to finding monthly payments.

LESSON PLAN

TEACHER: Teacher Prep/ Lesson Plan

- **Lesson Objectives (Students will be able to:)**
  - Calculate the present value of a single deposit investment
  - Calculate the present value of a periodic deposit investment
  - Read monthly payments from a table
  - Compute monthly payments using a formula
  - Compute finance charges on loans
- **List of prerequisite skills needed:**
  - Basic math skills
  - Have experience using a graphic calculator
- **Vocabulary:**
  - Annual percentage rate
  - Cubic function
  - Cubic regression equation
  - Monthly payment calculator
  - Natural logarithm

- **State Standards addressed:** *(You may use your District's Power Standards if applicable, Highlight "Green" Standards)*
  Math: (Math)
  - Algebra
    - Interpret the structure of expressions, 1b, 2
    - Write expressions in equivalent forms to solve problems, 3c.
  - Functions
    - Analyze functions using different representations 8.b
  - Statistics
    - Summarize, represent, and interpret data on two categorical and quantitative variables

  Reading: (Reading)
  - 1.2.2: Apply strategies to comprehend words and ideas.

- 2.1.4: Apply comprehension monitoring strategies for informational and technical materials, complex narratives, and expositions: use prior knowledge
- 2.1.5: Apply comprehension monitoring strategies for informational and technical materials, complex narratives, and expositions: synthesize ideas from selections to make predictions and inferences.

Writing: (Writing)
- 2.2.1: Demonstrates understanding of different purposes for writing

Leadership:
- 1.4 The student will be involved in activities that require applying theory, problem-solving, and using critical and creative thinking skills while understanding outcomes of related decisions.

- **Teacher Preparation:** *(What materials and set-up are required for this lesson?)*
  - Graphing calculators for each student
  - Computer lab with internet access

- **Content Delivery:** *(How will the lesson be delivered? List any grouping and instructional strategies as well.)*
  For the first part of the lesson, students will receive an equation to solve. The problem will be using the monthly payment formula. Students will all be given graphing calculators and will try and figure the problem out on their own. This is review for most of the students, but there are some very small and easily missed steps in to arriving at the correct answer. After they have had some time with that problem, the instructor ask a student if they got the correct answer and have the student go through the process with the class. The same will be done for the Loan Length formula. The instructor will also be guiding the student along the way and answer any questions.
  Students will then be asked to do some online research for other monthly calculator formulas and solve problems on a worksheet using both the monthly payment formula and the calculators online.

- **Instructional Documents** *(Please attach any Worksheet, Quiz, Reading Guide, etc)*
  - Bell Assignment

- **Assessment Tool used in this Lesson** *(scoring method, guide, or rubric)*
  - Quiz 4-3 Loan Calculations

- **Reinforcement/Intervention/Extension Activities**

- **Career Applications** *(When will this be used in "real life"?)*
  While the monthly payment formula is not an easily memorized formula, it is something that students should know how to compute. Many students will eventually apply for and have credit in some form. Students must be able to calculate the amount of interest they will pay on their loans in order to make responsible financial decisions.

Bell Assignment

Using your graphic calculators, solve the question below. Think about the order of operations as you enter the problem in the calculator.

What is the monthly payment for a loan where the principal is $10,000 an APR of 6% for a period of 5 years?

P= 100,000

R= .07

T= 15

$$M = \frac{P\left(\frac{r}{12}\right)\left(1+\frac{r}{12}\right)\text{^}12(t)}{\left(1+\frac{r}{12}\right)^{12(t)}-1}$$

- Once you find the monthly payment, you can multiply that number by the length of the loan in months
  - 193.33 x 60 = $11,599.80
- The total of the monthly payments is $11,599.80
- To find the interest you will pay for the length of the loan, subtract the total of the monthly payments from the principal
  - 11,599.80 – 10,000 = $1,599.80

Loan Length Formula

$$t = \frac{\text{Ln}(\frac{M}{P}) - (\text{Ln}\left(\frac{M}{P} - \frac{r}{12}\right))}{12\text{Ln}(1 + \frac{r}{12})}$$

Solve using the loan length formula:
Claude wants to borrow $25,000 to purchase a car. All he can afford to pay per month is $300. The bank is offering a 5.9% loan. What would the length of his loan need to be so that he can stay within his budget? Round to the nearest hundredth of a year

M= 300
R= .059
P = 25000

- T is approximately 8.96
- Claude would need to take out a loan for about 9 years

Monthly Payment Formula & Loan Length Worksheet

Student Directions: Solve the problems using a calculator and proper order of operations. Show your work! Check your answers by going online and looking for monthly payment calculators online. Plug in the information from the problems below. Be sure to reference where you found the calculator.

1. Juan purchased a tool set for $\$t$ on the installment plan. He made a 15% down payment and agreed to pay $\$m$ per month for the next y years. Express the finance charge algebraically.

2. What is the total interest on a ten-year 6.1% loan with a principal of $32,000?

3. Hannah is taking out a 4.3% loan to purchase an $18,000 car. The length of the loan is 8 years. How much interest will she pay? (Use an online calculator for this problem)

4. Jennifer wants to borrow $20,000. Her bank offers a 7.1% interest rate. She can afford $500 a month for loan payments. What should be the length of her loan to the nearest tenth of a year?

4-3 Loan Calculations Quiz

1. What is the total interest on a 30-year 5% loan with a principal of $200,000? (Solve using the monthly payment formula)

2. Justin is considering taking out a $10,000 loan. He went to two different banks. Normal Financing offered him an 8-year loan with an interest rate of 8.6%. Second Best Lending offered him a 5-year loan with an interest rate of 10%. Which loan will have the lower interest over the lifetime of the loan?

3. Claude wants to borrow $25,000 to purchase a car. All he can afford to pay per month is $300. The bank is offering a 5.9% loan. What would the length of his loan need to be so that he can stay within his budget? Round to the nearest hundredth of a year.

4. Regarding question 3, what impact would an increase in the monthly payment of $50 have on the length of Claude's loan?