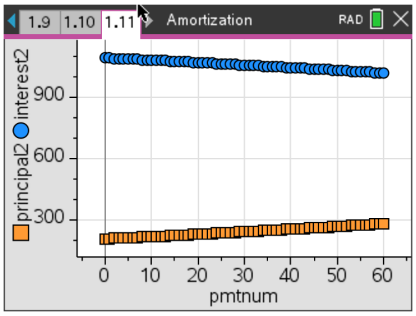
Amortization

Student Activity

Name _____

Class _____

The goal of this activity is to use Amortization tables to help you understand depreciation and the paying back of loans. You will get a comprehensive picture of your loan beyond your monthly payment. You will be able to track exactly how much of your payments are going toward your principal versus interest and how much you'll be paying for interest in total.



Before this activity is started, some background knowledge must be given on amortization tables. Amortization tables are quite useful when discussing the payback of loans. They are used as ways of calculating the value for business assets over time. We are going to use them to give you a little taste of what it would cost to purchase a car or a home and how to compare options. Sometime should be spent practicing how to enter values using both the Finance Solver (menu, 8 Finance, 1 Finance Solver) and Amortization Table (menu, 8 Finance, 3 Amortization, 1 Amortization Table) commands.

Some formulas you will need to be up to date on for this topic are:

Periodic Payment amount (A): $A = PV \cdot \frac{r \cdot (1+r)^n}{(1+r)^n - 1}$ (rate is divided by 12)

Monthly principal: $Total\ Monthly\ Payment - \left(Outstanding\ Loan\ Balance \cdot \frac{r}{12}\right)$

Compound Interest: $FV = PV\left(1 + \frac{r}{100k}\right)^{kn}$

Depreciation: $FV = PV\left(1 + \frac{r}{100}\right)^{n}$

Problem 1

Daisy and Peter want to purchase a new home and need a loan for $130,000 from the local bank. The loan is for 30 years and the annual interest rate is 4.2%, compounded monthly. They will pay the loan off in fixed monthly installments at the end of each month.

In this problem, we will be answering each part several ways to practice the different capabilities on the TI-Nspire CX II handheld.

(a) Find the amount that Daisy and Peter will be paying back each month by:

(i.) using the Finance Solver on your handheld (show your inputs below).

N	
I(%)	
PV	
Pmt	
FV	
PpY	
CpY	

(ii.) using the Amortization Table on your handheld. Discuss with a classmate what you have created and fill in the four headings of the table and the first 4 rows of values created on your handheld.

Explain how you can use the table values to find the monthly payment.

(b) Find the amount that Daisy and Peter will still owe after 10 years by using:

(i.) the Finance Solver.

N	
I(%)	
PV	
Pmt	
FV	
PpY	
CpY	

(ii.) the Amortization Table.

(c) Using your work from parts (a) and (b), find the total amount of interest Daisy and Peter will be paying for the first 10 years.

Reflection

Discuss with a classmate how your TI-Nspire technology has helped through the process of answering **Problem 1**. Also discuss the benefits of both processes that were asked of you in **Problem 1**. Share your results with the class.

Problem 2

For problem 2, you will be using the *Amortization.tns* file on your handheld that was downloaded by your teacher. Please open it now.

In this problem, you will use an amortization table to aid in the answering of several loan style questions. Move to page 1.2.

Page 1.2:
On page 1.3 (Calculator page), create the table with the given information below. On pages 1.4 and 1.5 you will see this same data in a spreadsheet and on a data and statistics graph. Answer the questions that follow on pages 1.6 - 1.8 .

Christine secures a new 5 year car loan for $21,500 at an annual rate of 6.1%, compounded monthly. She will be making her payments at the end of each month.

Page 1.6:
(i) Find the total interest paid at the end of the five year loan.

(ii) Find the total amount paid to the bank at the end of the five year loan.

Page 1.7:
(iii) With a classmate, discuss what you notice about the graph on page 1.5. Discuss your results with the class.

Page 1.8:
(iv) Discuss with a classmate what would happen to the table and graph of data if the amount of the loan increased to $215,000 with the same rate but over 30 years. Share your results with the class.

Further IB Applications

Problem 1:

Emily wants to retire at age 65. She wants to contribute to an annuity fund, which will pay her a monthly allowance of $3000 during her retirement. She wants to save enough money so that the payments last for 20 years. An advisory has told her that she can expect to earn 4.5% interest on her funds, compounded annually.

(a) Calculate the amount Emily would need to have saved in the fund to meet her retirement goal.

(b) Emily just turned 32. She currently has no retirement savings. Her plan is to save a portion of her salary each month into the fund. Calculate the amount Emily needs to save each month to meet her retirement goal.

Problem 2:

In this question, give all answers to two decimal places.

Robert is in the market to purchase a new boat. The price of the boat he is currently looking at is $15,000, but he cannot afford that amount currently. The boat dealership offers two options to finance a loan.

Finance option A:

A 7 year loan at a nominal annual interest rate of 12% **compounded quarterly**. No deposit required and the repayments are made each quarter.

Finance option B:

A 7 year loan at a nominal annual interest rate of *r* % **compounded monthly**. Terms of the loan require a 10% deposit and monthly repayments of $225

(a) For option A:

i. Find the repayment made each quarter.

ii. Find the total amount paid for the boat.

iii. Find the interest paid on this loan.

(b) For option B:

i. Find the amount to be borrowed for this option.

ii. Find the annual interest rate, *r*.

(c) State the option Robert should choose. Justify your answer.

(d) Robert's boat depreciates at an annual rate of 20% per year. Find the value of Robert's boat 5 years after it is purchased.