M110 SECTION 11.5 AMORTIZATION DAY 1

So you found your dream home. Terrific! Only 30 years of payments and it will be all yours! You took out a loan from the bank and now you must repay that loan, plus the accumulated interest, in monthly payments. The process of paying off a loan (plus interest) by making a series of regular, equal payments is called ***amortization***.

EXAMPLE You have purchased a new boat for $15,000. You make a $5,000 down payment and borrow the rest of the money from the bank. You agree to pay back the loan *plus interest* in 4 years at 18% annual interest.

The banker's point of view

He uses the compound interest formula to calculate the future value of the loan.

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

Your point of view

You are thinking this is like a sinking fund -- that is, making a series of regular payments to "save" for the loan plus interest.

$$A = R \cdot \left[\left(1+\frac{r}{n}\right)^{nt} - 1\right] \div \left(\frac{r}{n}\right)$$

Since both the above equations are equal to **A**, we can set them equal to each other:

$$P\left(1+\frac{r}{n}\right)^{nt} = R \cdot \left[\left(1+\frac{r}{n}\right)^{nt} - 1\right] \div \left(\frac{r}{n}\right)$$

FORMULA FOR R, THE REGULAR MONTHLY PAYMENT

We will use this formula to find **R**, the regular monthly payment, to pay off the loan amount ($10,000) plus interest over the next 4 years at 18% annual interest. Find the payment for the above example.

$$P\left(1 + \frac{r}{n}\right)^{nt} = R \cdot \left[\left(1 + \frac{r}{n}\right)^{nt} - 1\right] \div \left(\frac{r}{n}\right)$$

(ALWAYS ROUND THE PAYMENT UP TO NEXT HIGHER CENT!)

R = ?
P = _____
r = _____
n = _____
t = _____

Now, let us look at the first few months of payments. There are a few things to keep in mind:

1. Your payment is paying off BOTH the loan amount **AND THE INTEREST**
2. You are borrowing A LOT of money ($10,000), so at the start of repaying the loan you owe interest on the full amount.
3. As the principal is reduced each payments pays more toward principal and less toward interest.

This list showing payment-by-payment how much is going to principal and interest is called an ***amortization schedule or table.***

Payment Number	Amount of Payment	Interest	Applied toward reducing the Principal (Balance)	Balance
				$ 10,000
1	$293.75			
2	$293.75			
3	$293.75			
4	$293.75			
5	$293.75			
6	$293.75			

EXAMPLE To expand your business, you need a loan of $5,000. Your bank loans you the money at 12% annual interest rate, which you agree to pay back in 3 equal monthly installments. Find the monthly payment and construct an amortization schedule for the entire loan.

$$P\left(1+\frac{r}{n}\right)^{nt} = R\cdot\left[\left(1+\frac{r}{n}\right)^{nt}-1\right]\div\left(\frac{r}{n}\right)$$

Payment Number	Amount of Payment	Interest	Applied toward reducing the Principal (Balance)	Balance
1				
2				
3				

EXAMPLE You have purchased a new home for $145,000. You make a $25,000 down payment and borrow the rest of the money from the bank. The bank offers you a 30-year mortgage at an annual interest rate of 7%. Find the monthly payment and construct an amortization schedule for the first 3 payments.

$$P\left(1+\frac{r}{n}\right)^{nt} = R\cdot\left[\left(1+\frac{r}{n}\right)^{nt}-1\right]\div\left(\frac{r}{n}\right)$$

Payment Number	Amount of Payment	Interest	Applied toward reducing the Principal (Balance)	Balance
				$ 120,000
1				
2				
3				

EXAMPLE You buy a home for $297, 000. You put 25% down and secure a loan for the remainder for 25 years at an annual interest rate of 7%.

a. What is the amount of your mortgage?

b. What is your monthly mortgage payment?

c. What is the total of the payments over the life of the loan?

d. How much interest did you pay over the 25 years? (Shocking, isn't it?)

e. In the end, how much did you pay for the home?