College Mathematics

loans

The amount of a <u>loan</u> is the *single amount* that would have the same future value as the entire series of payments. This is called the *present value* of the annuity.

<u>Example 1</u> (solving for the payment):

Suppose you have been approved for a $9000 car loan with an interest rate of 7.5%, compounded monthly. If you want to make equal payments at the *end* of every month to pay off the loan in 4 years, what must be the monthly payment?

Solution:

The future value of the entire series of payments is

= PMT [(1.00625^48 - 1) / (1.00625 - 1)]

The future value of the loan amount is $9000(1.00625)^48.

This must be equal to the future value of all the payments:

$9000(1.00625)^48 = PMT [(1.00625^48 - 1) / (1.00625 - 1)]

PMT = $9000(1.00625)^48 / [(1.00625^48 - 1) / 0.00625]
= $217.61

Your monthly payment will be $217.61

<u>Example 2</u> (solving for the loan amount):

Suppose you can afford to make $500 payments at the *end* of every month toward a house loan. If the annual interest rate is 6%, compounded monthly, and you plan on taking 30 years to pay off the loan, how big a loan can you afford?

Solution:

The future value of the entire series of payments is

$500 [(1.005)^359 + ... + (1.005)^2 + (1.005)^1 + 1]
= $500 [((1.005)^360 - 1) / (1.005 - 1)]
= $502,257.52

The future value of the loan amount is PV(1.005)^360.

This must be equal to the future value of all the payments:

PV(1.005)^360 = $502,257.52

PV = $502,257.52 / (1.005)^360
= $83,395.81

You can afford a mortgage loan of $83,395.81