The amount of a loan 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.

Example 1 (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
$$\text{PV} = \text{PMT} \left[ \frac{ ( 1.00625^{-48} - 1 ) }{ ( 1.00625 - 1 ) } \right]$$

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

This must be equal to the future value of all the payments:
$$9000(1.00625)^{48} = \text{PMT} \left[ \frac{ ( 1.00625^{-48} - 1 ) }{ ( 1.00625 - 1 ) } \right]$$

$$\text{PMT} = \frac{9000(1.00625)^{48}}{ ( 1.00625^{-48} - 1 ) / 0.00625 }$$

$$\text{PMT} = 217.61$$

Your monthly payment will be $217.61

Example 2 (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
$$\text{PV} = 500 \left[ ( 1.005)^{359} + \ldots + (1.005)^{2} + (1.005)^{1} + 1 \right]$$

$$\text{PV} = 500 \left[ \frac{ ( (1.005)^{360} - 1 ) }{ (1.005 - 1) } \right]$$

$$\text{PV} = 502,257.52$$

The future value of the loan amount is $\text{PV}(1.005)^{360}$.

This must be equal to the future value of all the payments:
$$\text{PV}(1.005)^{360} = 502,257.52$$

$$\text{PV} = \frac{502,257.52}{(1.005)^{360}}$$

$$\text{PV} = 83,395.81$$

You can afford a mortgage loan of $83,395.81