Pmt : $500

m = 12 months/yr

r = 7% compounded monthly

t = 3 yrs.

How much was borrowed?

What's the present value of the annuity described?

Compound Interest

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

$A = P(1+i)^n$

Banker wants this Future Value

Annuity

$FV = R\left(\frac{\left(1+\frac{r}{m}\right)^{mt}-1}{\frac{r}{m}}\right)$

$FV = R\left(\frac{(1+i)^n-1}{i}\right)$

This how he's getting it from you

R = payment

$P(1+i)^n = R\left(\frac{(1+i)^n-1}{i}\right)$

$P\left(1+\frac{.07}{12}\right)^{12(3)} = 500\left(\frac{\left(1+\frac{.07}{12}\right)^{(12)(3)}-1}{\left(\frac{.07}{12}\right)}\right)$

```
1+.07/12
      1.005833333
Ans^(12*3)
      1.232925587
```

$1.232925587\,P \approx 500\left(\frac{.23292558 7}{.0058\overline{3}333}\right)$ (1.23292558 7 − 1)

$\frac{r}{m} \approx .005833333$

$P \approx \frac{500\,(.23292558 7)}{(.0058333333)(1.23292558 7)}$

```
1+.07/12
      1.005833333
Ans^(3*12)
      1.232925587
500*.232925587/.
005833333/Ans
      16193.23312
```

without parens, we divided again, by the 1.232925587.

```
500*.232925587/.
005833333/Ans
      16193.23312
500*.232925587/(
.005833333*1.232
925587)
      16193.23312
```

NOTICE Parens used in denominator we multiplied 1.23... in denom.

$$P(1+i)^n = R\left(\frac{(1+i)^n - 1}{i}\right) = \frac{R}{i}\left((1+i)^n - 1\right)$$

$$P = \frac{R}{i}\left(1 - (1+i)^{-n}\right)$$

$$= \frac{R}{\frac{r}{m}}\left(1 - \left(1+\frac{r}{m}\right)^{-mt}\right)$$

$$(R)\left(\frac{m}{r}\right)\left(1 - \left(1+\frac{r}{m}\right)^{-mt}\right)$$

$$= (500)\left(\frac{12}{.07}\right)\left(1 - \left(1+\frac{.07}{12}\right)^{-3(12)}\right)$$

$$\approx \$16,193.22$$

```
                1.005833333
Ans^(12*3)
                1.232925587
500*12/.07*(1-(1
+.07/12)^-(3*12)
                16193.23223
```