1) At the end of year 1 I deposit $1,000 into an account that is earning 4% interest compounded annually. At the end of each subsequent year I deposit 2 % less than I did the previous year. Thus, for example, at the end of year 2 I deposit $980 and at the end of year 3 I deposit $960.40. How much do I have after the 40th deposit?

> j := 1.04; jj := .98; P := 1000

$$j := 1.04$$
$$jj := 0.98$$
$$P := 1000 \qquad (1)$$

> $A = P \cdot j^{39} + jj \cdot P \cdot j^{38} + jj^2 \cdot P \cdot j^{37} + ... + jj^{39} \cdot P$

Error, invalid sum/difference

$$A = P \cdot j^{39} + jj \cdot P \cdot j^{38} + jj^2 \cdot P \cdot j^{37} + ... + jj^{39} \cdot P$$

> $= jj^{39} \cdot P \cdot \left(\left(\frac{j}{jj} \right)^{39} + \left(\frac{j}{jj} \right)^{38} + ... + 1 \right)$

Error, invalid sum/difference

$$= jj^{39} \cdot P \cdot \left(\left(\frac{j}{jj} \right)^{39} + \left(\frac{j}{jj} \right)^{38} + ... + 1 \right)$$

> $Ans := \dfrac{jj^{39} \cdot P \cdot \left(\left(\frac{j}{jj} \right)^{40} - 1 \right)}{\frac{j}{jj} - 1}$

$$Ans := 72588.67017 \qquad (2)$$

>

2) On Jan . 1, 2009, I won an award that pays $10,000 dollars every year for n years with the first payment immediately. Find n, given that at 3% annual interest, the present value of my award on Jan . 1, 2009 was approximately $ 300,000.

> $i := .03; j := 1 + i;$

$$i := 0.03$$
$$j := 1.03 \qquad (3)$$

FV(award)=FV(payments)

> $300000\, j^n = \dfrac{10000 \cdot (j^n - 1)}{i} j$

$$300000\, 1.03^n = 3.433333333\, 10^5\, 1.03^n - 3.433333333\, 10^5 \qquad (4)$$

> $\dfrac{i \cdot 300000}{j \cdot 10000} j^n = j^n - 1$

> $q := \dfrac{i \cdot 300000}{\mathrm{j} \cdot 10000}$

$$q := 0.8737864077 \qquad (5)$$

> $jTOn := solve(q \cdot x = x - 1, x)$

$$jTOn := 7.923076919 \qquad (6)$$

> $n := \dfrac{\ln(jTOn)}{\ln(j)}$

$$n := 70.02244588 \qquad (7)$$

>

3) I take out a \$400, 000, 20 year loan at 6 % interest compounded monthly.
a.Find my monthly payment (paid at the end of each month).

> $i := \frac{.06}{12}; j := 1 + i; n := 12 \cdot 20;$

$$i := 0.005000000000$$
$$j := 1.005000000$$
$$n := 240 \quad \textbf{(8)}$$

> $P := solve\left(400000 \cdot j^n = \frac{(j^n - 1)}{i} \cdot X, X\right)$

$$P := 2865.724233 \quad \textbf{(9)}$$

b. How much do I owe after the 10th payment?

> $Owe := 150000 \cdot j^{10} - \frac{\mathrm{P} \cdot (j^{10} - 1)}{i}$

$$Owe := 1.283603167\ 10^5 \quad \textbf{(10)}$$

11) Paul has a \$200,000 fully insured house with a disappearing deductible. For losses of \$200 or less, the insurance company pays nothing while for losses \$2,200 or more they pay everything. What value X of loss would cause Paul to have to pay \$150?

From the formula in the file "Some Formulas" on the web the deductible is

> $Ded := \frac{(2200 - X)}{2200 - 200} \cdot 200.0$

We solve for X:

$$Ded := 220.0000000 - 0.1000000000\ X \quad \textbf{(11)}$$

> $solve(Ded = 150, X)$

$$700. \quad \textbf{(12)}$$

10) Mary's house is insured for \$300,000, with no deductible. Her insurance company requires 80% coinsurance. Mary had \$12,000 water damage for which the insurance company paid \$9, 000. What, according to the insurance company, is the current value of Mary's house?

Fraction paid was

> $f := \frac{9000}{12000}$

$$f := \frac{3}{4} \quad \textbf{(13)}$$

Hence, to find the value X of the house we do

> $solve\left(\frac{300000}{.8 \cdot X} = \frac{3}{4}, X\right)$

$$5.00000\ 10^5 \quad \textbf{(14)}$$

>