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1) Lafayette Savings Bank offers an account that pays a nominal rate of i% per year, compounded daily. A deposit of $1,000 made on January 1, 2008 had grown to $1,127.49 on January 1, 2013. Find i.

B=1127.49/1000
(1+i/365)^(5*365)=B
1+i/365=(B/1000)^1/(5*365)

\> $B := \frac{1127.49}{1000}; i := 365 \cdot \left(B^{\frac{1}{5 \cdot 365}} - 1\right)$

$$B := 1.127490000$$
$$i := 0.0239995 \quad (1)$$

2) The value of the Purdue P&C Insurance Company's reserve account was $850,000 on January 1, 2010. They paid claims of $400,000 on December 31, 2010, $300,000 on December 31, 2011, and $150,000 on December 31, 2012 from the reserve account. Assuming that the reserve account earned 4% interest and they paid all of the claims from this account, what was the value of this account on January 1, 2013?

\> $i := .04; FV := 850000 \cdot (1+i)^3 - 400000 \cdot (1+i)^2 - 300000 \cdot (1+i) - 150000$

$$i := 0.04$$
$$FV := 61494.4000 \quad (2)$$

3)I just won a prize that promised to pay $10,000 at the end of the year for n years, with the first payment made at the end of the current year. I computed that at 4% interest, my prize is worth $186, 646.17 today. Find n.

((1+i)^n-1)/i)*10000=186646.17(1+i)^n

Let x=(1+i)^n.

$$\frac{(x-1)}{i} = \frac{186646.17}{10000} \cdot x$$

Also ln(x)=n*ln(1+i)

\> $i := .04; a := solve\left(x - 1 = i \cdot \left(\frac{186646.17}{10000}\right) \cdot x, x\right); n := \frac{\ln(a)}{\ln(1+i)};$

$$i := 0.04$$
$$a := 3.946091341$$
$$n := 35.00001516 \quad (3)$$

4)\From January 1, 2006 to December 31, 2008, First Bank paid 4% interest, compounded monthly. On January 1, 2009, they lowered their rate to 2% interest, compounded monthly. I deposited $100 at the end of each month beginning in January, 2006. How much did I have in my account on January 1, 2013?

\> $i := \frac{.04}{12}; j := \frac{.02}{12};$

$$i := 0.003333333333$$

$$j := 0.001666666667 \quad (4)$$

> $B1 := \frac{\left((1+i)^{3 \cdot 12} - 1\right)}{i} \cdot 100$

$$B1 := 3818.155830 \quad (5)$$

> $B := \frac{\left((1+j)^{4 \cdot 12} - 1\right)}{j} \cdot 100 + (1+j)^{4 \cdot 12} \cdot B1$

$$B := 9128.780348 \quad (6)$$

5)Over a 7 year period, an account earned 7% annual effective interest for the first two years, 7% annual effective force of interest for years 3 through 5, and 7 % annual effective discount during the 6th and 7th years. Find the annual effective rate of return on this account.

> $i := .07; j := \exp(.07) - 1; d := .07; ii := \frac{d}{1-d};$

$$i := 0.07$$
$$j := 0.072508181$$
$$d := 0.07$$
$$ii := 0.07526881720 \quad (7)$$

> $k := \left((1+i)^2 \cdot (j+1)^3 \cdot (1+ii)^2\right)^{\frac{1}{7}} - 1$

$$k := 0.072578461 \quad (8)$$

7)You borrow $1,000,000 to buy a house which you finance with a 30 year loan at 5% interest, compounded monthly, on which you pay $5368.22 at the end of each month. How much do you owe at the end of the tenth year—i.e. immediately after the 120th payment?

> $i := \frac{.05}{12}; n := 10 \cdot 12; M := 5368.22; B := (1+i)^n \cdot 1000000 - \frac{\left((1+i)^n - 1\right)}{i} \cdot M;$

$$i := 0.004166666667$$
$$n := 120$$
$$M := 5368.22$$
$$B := 8.134200408\ 10^5 \quad (9)$$

8)In problem 7, immediately after the 120th payment, you refinance the loan at 4% interest, compounded monthly. Assuming that the answer to Problem 7 is $800,000 (which is not correct), find the new monthly payment.

> $i := \frac{.04}{12}; n := 20 \cdot 12; \mathrm{M} := solve\left(\frac{\left((1+i)^n - 1\right)}{i} \cdot P = (1+i)^n \cdot 800000, P\right)$

$$i := 0.003333333333$$
$$n := 240$$
$$M := 4847.842950 \quad (10)$$

9)At the end of year 1 I deposit $1000 into an account that is earning 4% interest compounded annually. At the end of each subsequent year I deposit 3 % less than I did the previous year. Find the final accumulation in the account at the end of year 30.

j=1.04;k=.97

A=1000(j^29+k*j^28+j^28*k^2+...+1*k^29)=1000*j^29(1+(k/j)^28+(k/j)^27+...+1)

=1000j^29((k/j)^30-1)/(k/j-1) or

A=1000(j^29+k*j^28+j^28*k^2+...+1*k^29)=1000*k^29((j/k)^29+(j/k)^28+..+1)

=1000k^29((j/k)^30-1)/(j/k-1)

> $j := 1.04;\ k := .97;\ \dfrac{1000 \cdot k^{29} \cdot \left(\left(\frac{j}{k} \right)^{30} - 1 \right)}{\frac{j}{k} - 1};\ \dfrac{1000 \cdot j^{29} \cdot \left(\left(\frac{k}{j} \right)^{30} - 1 \right)}{\frac{k}{j} - 1};$

$$j := 1.04$$
$$k := 0.97$$
$$40605.57799$$
$$40605.57774 \qquad \textbf{(11)}$$

10)What price should you pay for a 15 year bond having a \$5,000 redemption value which has \$200 coupons, paid 4 times a year, assuming that you want a 5% yield, compounded 4 times a year? Note: The 5% is a nominal rate, not an annual effective rate.

> $i := \dfrac{.05}{4};\ C := 200;\ n := 15;$

$$i := 0.01250000000$$
$$C := 200$$
$$n := 15 \qquad \textbf{(12)}$$

> $FV := \dfrac{\left((1+i)^{n \cdot 4} - 1 \right)}{i} \cdot 200 + 5000;\ PV := (1+i)^{-n \cdot 4} \cdot FV;$

$$FV := 22714.90155$$
$$PV := 10779.75637 \qquad \textbf{(13)}$$

11)The bond in the previous question is sold after 5 years, immediately after the payment of the coupon, to an investor wanting a 7% yield, compounded 4 times a year?? What should the selling price of the bond be?

> $i := \dfrac{.07}{4};\ C := 200;\ n := 10;$

$$i := 0.01750000000$$
$$C := 200$$
$$n := 10 \qquad \textbf{(14)}$$

> $FV := \dfrac{\left((1+i)^{n \cdot 4} - 1 \right)}{i} \cdot 200 + 5000;\ PV := (1+i)^{-n \cdot 4} \cdot FV;$

$$FV := 16446.82678$$
$$PV := 8216.850825 \qquad \textbf{(15)}$$

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