Time Value of Money Problems

Answers to problems on class overheads

1. $5,000 is placed on deposit for 6 years at 7% (annually compounded) interest. How much will you have at the end? $5,000 → pv 6 → n 7 → i FV → $7,503.65

2. $5,000 is placed on deposit for 6 years. I need $10,000 at the end. What (annually compounded) rate of return do I need? $5,000 → pv 6 → n $10,000 → fv i → 12.25%

3. The average annual return on common stocks was 8.4% over the period from 1802-1997 (assume year-end to year-end). At this rate, what would $1 invested at the end of 1802 grown to by the end of 1997? 1997-1802 = 195 → FV → $6,771,892

4. A bank account has a balance of $20,000. It was set up with a one-time initial deposit ten years ago, and it's been earning interest at 8% (annually compounded). What was the size of the initial deposit? $20,000 → FV 10 → n 8 → i PV → $9,263.87

5. $20,000 is borrowed at 7.5% (compounded annually). It will be paid back in 8 equal annual payments. What is the size of the payment? $20,000 → pv 7.5 → i 8 → n PMT → $3,414.54

6. What's a better investment: 6.60% compounded quarterly or 6.50% compounded monthly?
   - 6.6% compounded quarterly: 4 → p/hr 6.6 → nom% EAR → 6.765% (better)
   - 6.5% compounded monthly: 12 → p/hr 6.5 → non% EAR → 6.697%

Additional problems (not on class handouts)

7. I place $100 on deposit for two years at 5%, followed by two years at 10% How much will I have at the end? $100 × 1.05^2 × 1.10^2 = 133.40

8. I place $100 on deposit 1 year at 10%, followed by one year each at interest rates of (successively) 5%, 10%, and 5%. Now how much will I have at the end? Same as above: the order doesn’t matter.

9. A “zero-coupon” bond can be purchased today for $53.24. When it matures (in 6 years) it will pay the holder $100.00. What is the annual rate of return on this investment? $100 → FV 6 → n $53.24 → PV i → 11.08%

10. A pension fund needs to make a payment of $50,000 in seven years. Assuming that it can achieve a 4.5% annual rate of return on its investments, how much should it set aside today to meet the obligation? $50,000 → FV 7 → n 4.5 → i PV → $36,741.42

11. What is the monthly payment on a 15-year $250,000 mortgage assuming APR of 7% compounded monthly? 12 → p/hr $250,000 → pv 15 × 12 = 180 → n 7 → i PMT → $2,247.07

12. The monthly payments on a 30-year $400,000 mortgage are $2,398.20.
   a. What interest rate (APR compounded monthly) was used to compute the payments? 12 → p/hr $400,000 → pv $2,398.20 → PMT 360 → n i → 6.00%
b. The originator of the mortgage charges a $5,500 "service fee", so the net proceeds of the loan are $394,500. Using this amount as the initial borrowing, and keeping the payments the same, what is the implied rate (again, APR compounded monthly) on the loan? Same data entry as above, except $394,500→pv ... i→6.13%