Dear students,

Please solve the following problems by writing your full calculations on a sheet of paper, and check which answer of the multiple choices is the correct one according to your calculations. Then compare your calculation to the way of calculations mentioned in the key of these problems. In the individual test and final exam, you will be requested to write the full answer including the dollar or percentage signs.

1. How much is the present value of a 5-year annuity deposits of $1,000 per year, with the first payment 1 year from today, at an interest rate of 12%?

   $PV = \$1{,}000\{(1 / 0.12) - [1 / 0.12(1.12^5)]\}$

   $PV = \$3{,}604.78$

2. The salesperson offers, "Buy this new car for $25,000 cash or, with an appropriate down payment, pay $500 per month for 48 months at 8% interest." Assuming that the salesperson does not offer a free lunch, calculate the "appropriate" down payment.

   $PV = \$500 \times \{[1 / (0.08 / 12)] - [1/(0.08 / 12)(1 + (0.08 / 12)^{48})]\}$

   $PV = \$20{,}480.96$

   Down payment = $25,000 − 20,480.96 = $4,519.04

3. Someone offers to buy your car for four, equal annual payments, beginning 1 year from today. If you think that the present value of your car is $9,000 and the interest rate is 10%, what is the minimum annual payment that you would accept?

   $PV = C\{(1 / 0.1) - [1 / (0.1 \times 1.1^4)]\} = \$9{,}000$

   $A = \$2839.24$

4. How much more is a perpetuity of $1,000 worth than an annuity of the same amount for 20 years? Assume an interest rate of 10% and cash flows at the end of each period.

   $PV_{Perpetuity} = \$1{,}000 / 0.10 = \$10{,}000$

   $PV_{Annuity} = \$1{,}000[1 / 0.10 - 1 / 0.10(1.10)^{20}]$

   $PV_{Annuity} = \$8{,}513.56$

   Difference = $10,000 − 8,513.56 = $1,486.4

5. What is the present value of a four-year annuity of $100 per year that makes its first payment 2 years from today if the discount rate is 9%?

   This problem to be solves in two steps: first to calculate the PV annuity of the four payments. As the first payment is made in the second year; it means that the PV annuity is located on year 1 on the time line. The second step is to calculate the PV of the answer we had in step 1, using the normal PV formula (NOT the annuity formula):

PV (annuity)= {$100[(1 / 0.09) − 1 / 0.09(1.09)^{4}]} = $323.96

PV= 323.96 / 1.09 = $297.22

6. If $120,000 is borrowed for a home mortgage, to be repaid at 9% interest over 30 years with annual payments of $11,680.36, how much interest (as opposed to return of capital) is paid in the last year of the loan?

Value of loan at start of last year = $11,680.36 / 1.09 = $10,715.93

Interest on loan in last year = 0.09 × $10,715.93 = $964.43

7. $50,000 is borrowed, to be repaid in three equal, annual payments with 10% interest. Approximately how much principal is amortized with the first payment?

Payment = $50,000 / [1 / 0.1 − 1 / 0.1(1.1)^{3}]

Payment = $20,105.74

Principal payment = $20,105.74 − ($50,000 × 0.1)

Principal payment = $15,105.74

8. You're ready to make the last of four equal, annual payments on a $1,000 loan with a 10% interest rate. If the amount of the payment is $315.47, how much of that payment is interest?
$315.47 − ($315.47 / 1.1) = $28.68

9. What will be the monthly payment on a $75,000 30-year home mortgage at 12% APR?

Payment = $75,000 / [(1 / 0.01) − 1 / 0.01(1.01)^{360}]

Payment = $771.46

10. Your real estate agent mentions that homes in your price range require a payment of $1,200 per month for 30 years at 0.75% interest per month. What is the size of the mortgage with these terms?

PV = $1,200[(1 / 0.0075) − 1 / 0.0075(1.0075)^{360}]

PV = $149,138.24

11. How much do you need when you retire to provide a $2,500 monthly check that will last for 25 years? Assume that your savings can earn 0.5% a month.

Monthly interest rate = 0.06 / 12 = 0.005

PV = $2,500 {(1 / 0.005) − [1 / 0.005(1.005)$^{12 \times 25}$]}

PV = $388,017.16