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.   What is the future value of $10,000 on deposit for 2 years at 6% simple interest?

        $FV = \$10,000 + (2 \times 0.06 \times 10,000) = \$11,200$

2.   How much interest is earned in just the third year on a $1,000 deposit that earns 7% interest compounded annually?

        $\$1000.00 \times (1.07)^2 = \$1,144.90$ after 2 years

        $\$1,144.90 \times 0.07 = \$80.14$

3.   How much will be accumulated in a bank account paying 12% interest compounded annually if $100 was just credited to the account?

        $\$100 \times 1.12 = \$112$

4.   Assume the total expense for your current year in college equals $20,000. How much would your parents have needed to invest 21 years ago in an account paying 8% compounded annually to cover this amount?

        $PV = \$20,000 / (1.08)^{21}$

        $PV = \$3,973.11$

5.   An investment of $100 pays interest of 2.5% per quarter. What will be the value of this investment at the end of 3 years?

        $FV = PV(1 + r)^t = 100 \times 1.025^{12} = \$134.49$

6.   A car's price is currently $20,000 and is expected to rise by 4% a year. If the interest rate is 6%, how much do you need to put aside today to buy the car one year from now?

        Future price of car = $(\$20,000 \times 1.04) = \$20,800$

        $PV = \$ 20,800 / (1.06) = \$19,623$

7.   What will be the approximate population of the United States, if its current population of 300 million grows at a compound rate of 2% annually for 25 years?

        $FV = PV(1 + r)^t$

        $FV = 300$ million $\times (1.02)^{25}$

        $FV = 492.2$ million ≈ 492 million

8.   A furniture store is offering free credit on purchases over $1,000. You observe that a big-screen television can be purchased $4,000 due in one year. The store next door offers an identical television for $3,650 but does not offer credit terms. Is the first option really a "free" credit or not? Please explain your answer by calculations.

$$FV = PV(1 + r)^t$$

$$\$4,000 = \$3,650(1 + r)$$

$$r = 0.0959, \text{ or } 9.59\%$$

9.   What is the present value of the following payment stream, discounted at 8% annually: $1,000 at the end of year 1, $2,000 at the end of year 2, and $3,000 at the end of year 3?

$$PV = \$1,000 / 1.08 + \$2,000 / 1.08^2 + \$3,000 / 1.08^3$$

$$PV = \$5,022.10$$

10.   You invested $1,200 three years ago. During the three years, you earned annual rates of return of 4.8%, 9.2%, and 11.6%. What is the value of this investment today?

$$FV = PV(1 + r)^t$$

$$FV = PV(1 + r)^t (1 + r)^t (1 + r)^t$$

$$FV = \$1,200(1.048)^1 (1.092)^1 (1.116)^1$$

$$FV = \$1,532.60$$

11.   You will be receiving cash flows of: $1,000 today, $2,000 at end of year 1, $4,000 at end of year 3, and $6,000 at end of year 5. What is the present value of these cash flows at an interest rate of 7%?

$$PV = FV / (1 + r)^t$$

$$PV = \$1,000 + \$2,000 / 1.07^1 + \$4,000 / 1.07^3 + \$6,000 / 1.07^5$$

$$PV = \$10,412.27$$

12.   The sum of $3,000 is deposited into an account paying 10% annually. If $1,206 is withdrawn at the end of years 1 and 2, how much then remains in the account?"

$$FV_{Year\ 1} = PV(1 + r) - \text{Withdrawal}$$

$$FV_{Year\ 1} = \$3,000(1.1) - \$1,206$$

$$FV_{Year\ 1} = \$2,094$$

$$FV_{Year\ 2} = FV_{Year\ 1}\ (1 + r) - \text{Withdrawal}$$

$$FV_{Year\ 2} = \$2,094(1.1) - \$1,206\ FV_{Year\ 2} = \$1,097.40$$

13. What is the expected real rate of interest for an account that offers a 12% nominal rate of return when the rate of inflation is 6% annually?

    1 + real interest rate = (1 + nominal interest rate) / (1 + inflation)

    1 + real interest rate = 1.12 / 1.06

    Real interest rate = 5.66%

14. What is the minimum nominal rate of return that you should accept if you require a 4% real rate of return and the rate of inflation is expected to average 3.5% during the investment period?

    1 + nominal rate = (1 + real rate)(1 + inflation rate)

    Nominal rate = (1.04 × 1.035) − 1

    Nominal rate = 7.64%

15. What is the APR on a loan that charges interest at the rate of 1.4% per month?

    APR = 1.4% × 12 = 16.80%

16. Would a depositor prefer an APR of 8% with monthly compounding or an APR of 8.5% with semiannual compounding?

    $$EAR = [1 + (0.08\ /\ 12)]^{12} - 1 = 8.30\%$$

    $$EAR = [1 + (0.085\ /\ 2)]^{2} - 1 = 8.68\%$$

    The depositor will prefer the option with the higher EAR (effective annual rate)

17. What is the annually compounded rate of interest on an account with an APR of 10% and monthly compounding?

    $$EAR = [1 + (0.10\ /\ 12)]^{12} - 1 = 0.1047,\ \text{or}\ 10.47\%$$

18. What is the APR on a loan with an effective annual rate of 15.26% and weekly compounding of interest?

    $$APR = [(1.1526)^{1/52} - 1] \times 52 = 0.1422,\ \text{or}\ 14.22\%$$

19. What is the effective annual interest rate on a 9% APR automobile loan that has monthly payments?

    $$EAR = [1 + (0.09\ /\ 12)]^{12} - 1 = 0.0938,\ \text{or}\ 9.38\%$$

20. What is the present value of your trust fund if you have projected that it will provide you with $50,000 , 7 years from today and it earns 10% compounded annually?

$PV = FV / (1 + r)^t$

$PV = \$50,000 / 1.10^7$

$PV = \$25,657.91$

21. What is the discount factor for $1 to be received in 5 years at a discount rate of 8%?

$PV = FV / (1 + r)^t$

$PV = 1 / 1.08^5$

$PV = 0.6806$

22. A credit card account that charges interest at the rate of 1.25% per month would have an annually compounded rate of _____ and an APR of _____.

$EAR = (1 + 0.0125)^{12} - 1 = 0.1608$, or 16.08%

$APR = 1.25\% \times 12 = 15.00\%$

23. Eighteen years from now, 4 years of college are expected to cost $150,000. How much more must be deposited into an account today to fund this expense if you can earn only 8% on your savings rather than the 11% you hope to earn?

Additional deposit = $\$150,000 / 1.08^{18} - \$150,000 / 1.11^{18}$

Additional deposit = $14,614.03

24. Would you prefer a savings account that paid 7% interest compounded quarterly, 6.8% compounded monthly, 7.2% compounded weekly, or an account that paid 7.5% with annual compounding?

$EAR = [1 + (0.07 / 4)]^4 - 1 = 0.0719$, or 7.19%

$EAR = [1 + (0.068 / 12)]^{12} - 1 = 0.0702$, or 7.02%

$EAR = [1 + (0.072 / 52)]^{52} - 1 = 0.0746$, or 7.46%

$EAR = APR = 7.5\%$

25. After reading the fine print in your credit card agreement, you find that the "low" interest rate is actually an 18% APR, or 1.5% per month. What is the effective annual rate?
$EAR = 1.015^{12} - 1 = 0.1956$, or 19.56%

26. Lester's just signed a contract that will provide the firm with annual cash inflows of $28,000, $35,000, and $42,000 over the next three years with the first payment of $28,000 occurring one year from today. What is this contract worth today at a discount rate of 7.25%?

$PV = \$28{,}000 / 1.0725 + \$35{,}000 / 1.0725^2 + \$42{,}000 / 1.0725^3$

$PV = \$90{,}580.55$

27.   Miller's Hardware plans on saving \$42,000, \$54,000, and \$58,000 at the end of each year for the next three years, respectively. How much will the firm have saved at the end of the three years if it can earn 4.5% on its savings?
$FV = (\$42{,}000 \times 1.045)^2 + (\$54{,}000 \times 1.045) + \$58{,}000 = \$160{,}295.05$