Finance Practice Problems

Ordinary Annuity (Sinking Fund)

Payment at the end of each period

\[ F = R \left[ \frac{(1 + \frac{r}{n})^{nt} - 1}{\frac{r}{n}} \right] \]

Example: Joe deposits $22,000 at the end of each year for 7 years, in an account paying 6% compounded annually, how much will he have on deposit after 7 years? \textbf{Ans:} $184,664.43

Practice 1: Mina deposits $500 at the end of each month for 10 years, in an account paying 5% compounded monthly, how much will she have on deposit after 10 years?

Practice 2: Napoleon deposits $1,200 at the end of each quarter for 10 years, in an account paying 8% compounded quarterly, how much will he have on deposit after 10 years? \textbf{Ans:} $72,482.38

Practice 3-a: Jose wants to retire in twenty years and for this purpose he is depositing $200 at the end of each month in a sinking fund that pays 7.2% compounded monthly. If he will be doing this for twenty years, then how much money will be there for him when he retires? \textbf{Ans:} $106,752.47

Practice 3-b: If Joe wants to accumulate $130,000 in the twenty years period, and then what interest rate would provide that amount? \textbf{Ans:} 8.79%

Practice 4: Find the amount of payment to be Joe needs to make into a sinking fund every quarter to accumulate $62,000 after 6 years: Knowing that money earns 8% compounded quarterly. \textbf{Ans:} $2,038.01

Practice 5: Find the amount of payment to be made into a sinking fund to accumulate $75,000 for 4 and half year: money earns 6% compounded semiannually. \textbf{Ans:} $7,382.54
Annuity Due

\[
F = R \left[ \frac{\left(1 + \frac{r}{n}\right)^{nt} - 1}{\frac{r}{n}} \right] - R
\]

Payment at the beginning of each period

Example: Joe deposits $500 at the beginning of each quarter end for 7 years, in an account paying 12 % compounded quarterly, how much will he have on deposit after 7 years? \textbf{Ans:} $22,109.43

Example: Joe deposits $500 at the end of each quarter for 7 years, in an account paying 12 % compounded quarterly, how much will he have on deposit after 7 years? \textbf{Ans:} $21,465.46

Practice 1: Cesar deposits $16,000 at the beginning of each year for 8 years, in an account paying 4.7 % compounded annually, how much will he have on deposit after 8 years? \textbf{Ans:} $158,260.36

Practice 2: Cesar deposits $100 at the beginning of each quarter for 30 years, in an account paying 4 % compounded annually, how much will he have on deposit after 8 years? \textbf{Ans:}

Practice 3: Find the amount of payment to be Joe needs to make into an annuity fund every quarter to accumulate $62,000 after 6 years: Knowing that money earns 8 % compounded quarterly. \textbf{Ans:}

Practice 4: Find the amount of payment to be made into an annuity fund to accumulate $75,000 for 4 and half year: money earns 6% compounded semiannually. \textbf{Ans:}

\[
Amortization \quad R = P \left[ \frac{\frac{r}{n}}{1 - \left(1 + \frac{r}{n}\right)^{-nt}} \right]
\]

\[P = \text{Loan Amount} \quad R = \text{Periodic Payment} \quad r = \text{Interest Rate}\]

\[n = \text{Compounding Period} \quad t = \text{Time}\]

Example (4-year payment): A car costs $22,000. After a down payment of $4,000, the balance will be paid off in 48 equal monthly payments with the interest of 12 % per year on the unpaid balance. Find the amount of each payment. \textbf{Ans:} $474.01
Practice 1 (5-year term): A car costs $22,000. After a down payment of $4,000, the balance will be paid off in 60 equal monthly payments with the interest of 12% per year on the unpaid balance. Find the amount of each payment. Ans:

Practice 2 (6-year term): A car costs $22,000. After a down payment of $4,000, the balance will be paid off in 72 equal monthly payments with the interest of 12% per year on the unpaid balance. Find the amount of each payment. Ans:

Practice 3 (Bad credit): A car costs $22,000. After a down payment of $4,000, the balance will be paid off in 48 equal monthly payments with the interest of 18% per year on the unpaid balance. Find the amount of each payment. Ans:

Practice 4 (Good Credit and 4-year term): A car costs $22,000. After a down payment of $4,000, the balance will be paid off in 48 equal monthly payments with the interest of 6% per year on the unpaid balance. Find the amount of each payment. Ans:

Practice 5 (Bad Credit and 5-year term): A car costs $22,000. After a down payment of $4,000, the balance will be paid off in 60 equal monthly payments with the interest of 18% per year on the unpaid balance. Find the amount of each payment. Ans:

Practice 6 (Bad Credit and 7-year term): A car costs $22,000. After a down payment of $4,000, the balance will be paid off in 72 equal monthly payments with the interest of 18% per year on the unpaid balance. Find the amount of each payment. Ans:

Additional Problems

1) How many days will it take for a sum of $1,500 to earn $25 interest if it is deposited in a bank paying 5% a year? (Use a 365-day a year.) Ans: 121.67 days

2) How long will it take an investment of $5,000 to triple if the investment earns interest at the rate of 8% a year compounded quarterly? Ans: 13.87 years
3) Today, the price of a gallon of milk is $4.25, assuming inflation rate to be 4.5 % a year. What will be the price of a gallon of milk 10 years from now? \textit{Ans:} $6.67

4) Five and half years ago, Chris invested $10,000 in a retirement fund that grew at the rate of 10.82 % per year compounded quarterly. What is his account worth today? \textit{Ans:} $17,989.33

5) 5 years ago, Johnny Cash invested a sum of money in a saving account with interest of 8 % per year compounded quarterly. His investment is now worth $22,289.22. How much did he originally invest? \textit{Ans:} $15,000

6) Find the future value of ordinary annuity for $150 per month for 15 years at 10 % per year compounded monthly? \textit{Ans:} $62,170.55

7) Find the present value of ordinary annuity for $150 a month at 8 % per year compounded quarterly for 10 years? \textit{Ans:} $4,103.32

8) If you contribute $5,000 a year into a trust account, then how much will be in the account after 25 years if the account earns interest at the rate of 8.5 % per year compounded yearly? \textit{Ans:} $38,433.81

9) Pope invested only $24,000 in a retirement fund 5 years ago. Today his investment is worth $34616. Find the effective annual rate of return on his investment over 5-yr period. \textit{Ans:}

10) Find the rate of interest per year compounded on a daily basis that is equivalent to 9.6 % per year compounded monthly. \textit{Ans:}

11) If $54,000 is invested at an interest rate of 9% for 7.5 years compounded continuously, then find its future value. \textit{Ans:} $106,057.78
12) Find the monthly house payments for a loan of 188,000 at 5.74% for 15 years. \textit{Ans:} $2,122.91

13) Find the future value of an annuity of $672 deposited at the beginning of each quarter for 7 years at 8% compounded quarterly. 
\textit{Ans:} $24,898.41

14) A company has ordered 20 new PCs at a cost of $1800 each. They will not be delivered for 5 months. What amount should the firm deposit in an account paying 8.1% to have enough money to pay for them? \textit{Ans:} $34,824.67

15) A pack-a-day smoker spends about $120 per month on cigarettes. Suppose the smoker invests that amount at the end of each month in a savings account at 6.7% compounded monthly. What would the account be worth after 45 years? \textit{Ans:} $413,061.41

16) The Blues Clues family bought a house for $315,000. They paid $20,000 down and took out a 30-year mortgage for the balance at 7%. Find their monthly rent. \textit{Ans:} $1,962.64

17) Find the total interest Blues Clues family will pay. \textit{Ans:} $391,550.4

18) Find the amount of each payment that must be paid into a sinking fund to accumulate $6,000 at 8% compounded monthly for 3 years. \textit{Ans:} $148.02

19) If money can be borrowed at 8% compound monthly, which one is larger: $10,000 now or $15,000 in 5 years? Use present value to decide. \textit{Ans:} $15,000 in 5 years

20. One of us classmates needs to borrow $18,000 for 1 year. He has been offered a loan with interest compounded monthly and a compound amount of $19,952.42. Find the rate. \textit{Ans:} 10.34%
21) Billy Jean King deposited $6500 in an account paying 7.5 %compounded quarterly. After 3 years the rate drops to 4% compounded semiannually. Find the amount in her account at the end of 7 years. \textit{Ans: $9,517.58}

22) For one year, a student loan of $52,000 at 9% compounded semiannually resulted in a maturity value of $5,934.06. \textit{Ans: 1.96 year, \textit{yr,11months}}

23) Bobby Cash deposited $10,000 at 8% compounded quarterly. Two years after she makes the first deposit, he adds another $20,000, also at 8% rate compounded quarterly. What total amount will he have 4 years after his first deposit? \textit{Ans: $37,161.04}

24) Bobby Cash deposited $10,000 at 8% compounded quarterly. Two years after she makes the first deposit, he adds another $20,000, also at 8% rate compounded quarterly. What total amount will he have 6 years after his first deposit? \textit{Ans: $43,540.08}

25) John and Jill have $20,000 cash for the down payment of a house and they can afford a 15-year mortgage payment of $2,500/month. If the best mortgage rate that they can get is 7.5% then what will be the most affordable home that they can buy by their current budget plan? \textit{Ans:$269,683.58 + 20,000 = $289,683.57 = $290,000}

26) Adam and Eve need to borrow $115,000 to purchase a cave and are debating whether they should use a 20-year mortgage or 30-year mortgage. They also want to know the effect of two interest rates, a 6% and 8%, on

\begin{tabular}{|c|c|c|}
\hline
\textbf{a) Monthly payment} & \textbf{b) Total cost} & \textbf{c) Total interest paid} \\
\hline
\textbf{Interest rate} & \\
\hline
\textbf{Term of the mortgage} & \textit{6\%} & \textit{8\%} \\
\hline
20 years & $823.89 & $961.40 \\
\hline
30 years & $690.00 & 844.10 \\
\hline
\end{tabular}

\begin{tabular}{|c|c|c|}
\hline
\textbf{Interest rate} & \\
\hline
\textbf{Term of the mortgage} & \textit{6\%} & \textit{8\%} \\
\hline
20 years & $197,616.60 & $232,736 \\
\hline
30 years & $248,400 & $303,876 \\
\hline
\end{tabular}

\begin{tabular}{|c|c|c|}
\hline
\textbf{Interest rate} & \\
\hline
\textbf{Term of the mortgage} & \textit{6\%} & \textit{8\%} \\
\hline
20 years & $82,616 & $117,736 \\
\hline
30 years & $133,400 & $188,876 \\
\hline
\end{tabular}