CHAPTER 6: QUESTIONS

i. You just put $1,000 in a bank account that pays 6 percent nominal annual interest, compounded monthly. How much will you have in your account after 3 years?

a. $1,006.00
b. $1,056.45
c. $1,180.32
d. $1,191.00
e. $1,196.68

ii. You are interested in saving money for your first house. Your plan is to make regular deposits into a brokerage account that will earn 14 percent. Your first deposit of $5,000 will be made today. You also plan to make four additional deposits at the beginning of each of the next four years. Your plan is to increase your deposits by 10 percent a year. (That is, you plan to deposit $5,500 at t = 1, and $6,050 at t = 2, etc.) How much money will be in your account after five years?

a. $24,697.40
b. $30,525.00
c. $32,485.98
d. $39,362.57
e. $44,873.90

iii. Foster Industries has a project that has the following cash flows:

Year	Cash Flow
0	-$300.00
1	100.00
2	125.43
3	90.12
4	?

What cash flow will the project have to generate in the fourth year in order for the project to have a 15 percent rate of return?

a. $ 15.55
b. $ 58.95
c. $100.25
d. $103.10
e. $150.75

iv. If it were evaluated with an interest rate of 0 percent, a 10-year regular annuity would have a *present value* of $3,755.50. If the *future (compounded) value* of this annuity, evaluated at Year 10, is $5,440.22, what effective annual interest rate must the analyst be using to find the future value?

a. 7%
b. 8%
c. 9%
d. 10%
e. 11%

v. You are willing to pay $15,625 to purchase a perpetuity that will pay you and your heirs $1,250 each year, forever. If your required rate of return does not change, how much would you be willing to pay if this were a 20-year annual payment, ordinary annuity instead of a perpetuity?

a. $10,342
b. $11,931
c. $12,273
d. $13,922
e. $17,157

vi. If you buy a factory for $250,000 and the terms are 20 percent down, the balance to be paid off over 30 years at a 12 percent rate of interest on the unpaid balance, what are the 30 equal annual payments?

a. $20,593
b. $31,036
c. $24,829
d. $50,212
e. $ 6,667

vii. You are saving for the college education of your two children. One child will enter college in 5 years, while the other child will enter college in 7 years. College costs are currently $10,000 per year and are expected to grow at a rate of 5 percent per year. All college costs are paid at the beginning of the year. You assume that each child will be in college for four years.

You currently have $50,000 in your educational fund. Your plan is to contribute a fixed amount to the fund over each of the next 5 years. Your first contribution will come at the end of this year, and your final contribution will come at the date when you make the first tuition payment for your oldest child. You expect to invest your contributions into various investments, which are expected to earn 8 percent per year. How much should you contribute each year in order to meet the expected cost of your children's education?

a. $2,894
b. $3,712
c. $4,125
d. $5,343
e. $6,750

viii. Suppose you put $100 into a savings account today, the account pays a nominal annual interest rate of 6 percent, but compounded semiannually, and you withdraw $100 after 6 months. What would your ending balance be 20 years after the initial $100 deposit was made?

a. $226.20
b. $115.35
c. $ 62.91
d. $ 9.50
e. $ 3.00

ix. You are contributing money to an investment account so that you can purchase a house in five years. You plan to contribute six payments of $3,000 a year. The first payment will be made today (t = 0) and the final payment will be made five years from now (t = 5). If you earn

11 percent in your investment account, how much money will you have in the account five years from now (at t = 5)?

a. $19,412
b. $20,856
c. $21,683
d. $23,739
e. $26,350

x. Your employer has agreed to make 80 quarterly payments of $400 each into a trust account to fund your early retirement. The first payment will be made 3 months from now. At the end of 20 years (80 payments), you will be paid 10 equal annual payments, with the first payment to be made at the *beginning* of Year 21 (or the end of Year 20). The funds will be invested at a nominal rate of 8 percent, quarterly compounding, during both the accumulation and the distribution periods. How large will each of your 10 receipts be? (Hint: You must find the EAR and use it in one of your calculations.)

a. $ 7,561
b. $10,789
c. $11,678
d. $12,342
e. $13,119

SOLUTIONS CHAPTER 7

i. FV under monthly compounding **Answer: e Diff: M**

Tabular solution:
$\$1,000(1.005)^{36} = \$1,196.68$.

Financial calculator solution:
N = 3 × 12 = 36; I = 6/12 = 0.5; PV = -1,000; PMT = 0; and then solve for FV = $1,196.68.

ii. FV of an uneven CF stream **Answer: e Diff: M**

Tabular solution:
$PMT_0 = \$5,000$; $PMT_1 = \$5,000 \times 1.10 = \$5,500$; $PMT_2 = \$5,000 \times (1.10)^2 = \$6,050$; $PMT_3 = \$5,000 \times (1.10)^3 = \$6,655$; $PMT_4 = \$5,000 \times (1.10)^4 = \$7,320.50$.
$FV = \$5,000(1.14)^5 + \$5,500(1.14)^4 + \$6,050(1.14)^3 + \$6,655(1.14)^2 + \$7,320.50(1.14) = \$44,873.90$.

Financial calculator solution:
First, calculate the payment amounts:
$PMT_0 = \$5,000$, $PMT_1 = \$5,500$, $PMT_2 = \$6,050$, $PMT_3 = \$6,655$, $PMT_4 = \$7,320.50$. Then, find the future value of each payment at t = 5: For PMT_0, N = 5; I = 14; PV = -5,000; PMT = 0; thus, FV = $9,627.0729. Similarly, for PMT_1, FV = $9,289.2809, for PMT_2, FV = $8,963.3412, for PMT_3, FV = $8,648.8380, and for PMT_4, FV = $8,345.3700. Finally, summing the future values of the respective payments will give the balance in the account at t = 5 or $44,873.90.

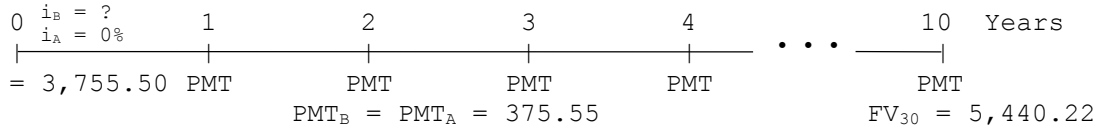
iii. Value of missing cash flow **Answer: d Diff: M**

Tabular solution:
$PV = -\$300 + (\$100)(0.8696) + (\$125.43)(0.7561) + (\$90.12)(0.6575)$
$= -\$58.95$.
Now, solve for CF_4:
$\$58.95(1.15)^4 = \$103.10$.

Financial calculator solution:
Enter the first 4 cash flows, enter I = 15, and solve for NPV = -$58.945. The future value of $58.945 will be the required cash flow.
N = 4; I/YR = 15; PV = -58.945; PMT = 0; and then solve for FV = $103.10.

iv. Effective annual rate **Answer: b Diff: M**

Time Line:

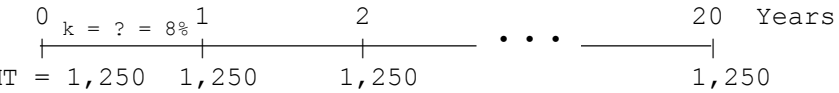


Tabular solution:
Solve for annuity payment; use payment to solve for interest rate
Annuity payment = \$3,755.50/10 = \$375.55.
\$5,440.22 = \$375.55($FVIFA_{i,10}$)
$FVIFA_{i,10}$ = 14.486
i = 8%.

Financial calculator solution:
Calculate the PMT of the annuity
Inputs: N = 10; I = 0; PV = -3,755.50; FV = 0. Output: PMT = \$375.55.
Calculate the effective annual interest rate
Inputs: N = 10; PV = 0; PMT = -375.55; FV = 5,440.22.
Output: I = 7.999 ≈ 8.0%.

v. Value of a perpetuity **Answer: c Diff: M**

Time Line:



Solve for required return, k. We know $V_p = \frac{PMT}{k}$ *, thus,*

$$k = \frac{PMT}{V_p} = \frac{\$1,250}{\$15,625} = 8\%.$$

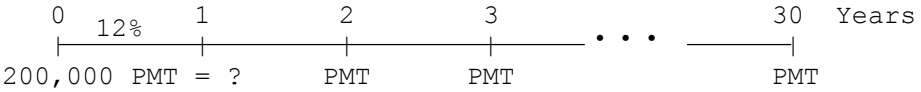
Tabular solution:
Calculate the value of the annuity using k = 8%
$V_{Annuity}$ = \$1,250($PVIFA_{8\%,20}$) = \$1,250(9.8181) = \$12,272.63 ≈ \$12,273.

Financial calculator solution:
Inputs: N = 20; I = 8; PMT = -1,250; FV = 0.

Output: PV = $12,272.68 ≈ $12,273.

vi. Amortization **Answer: c Diff: M**

Time Line:



Tabular solution:
Initial balance = 0.8($250,000) = $200,000.
$200,000 = PMT($PVIFA_{12\%,30}$)
$200,000 = PMT(8.0552)
PMT = $200,000/8.0552 = $24,828.68 ≈ $24,829.

Financial calculator solution:
Inputs: N = 30; I = 12; PV = -200,000; FV = 0.
Output: PMT = $24,828.73 ≈ $24,829.

vii. Required annuity payments **Answer: b Diff: T**

College cost today = $10,000, Inflation = 5%. CF_0 = $10,000 × $(1.05)^5$ = $12,762.82 × 1 = $12,762.82; CF_1 = $10,000 × $(1.05)^6$ = $13,400.96 × 1 = $13,400.96; CF_2 = $10,000 × $(1.05)^7$ = $14,071.00 × 2 = $28,142.00; CF_3 = $10,000 × $(1.05)^8$ = $14,774.55 × 2 = $29,549.10; CF_4 = $10,000 × $(1.05)^9$ = $15,513.28 × 1 = $15,513.28; CF_5 = $10,000 × $(1.05)^{10}$ = $16,288.95 × 1 = $16,288.95.

Tabular solution:
Find PV of college costs in Year 5:
PV = $12,762.82 + $13,400.96(0.9259) + $28,142(0.8573) + $29,549.10(0.7938) + $15,513.28(0.7350) + $16,288.95(0.6806)
= $95,241.50.
Find FV of educational fund in 5 years:
$50,000$(1.08)^5$ = $73,466.40.
Now, find net amount needed in Year 5:
$95,241.50 – $73,466.40 = $21,775.10.
Finally, find PMT needed to accumulate $21,775.10 in Year 5:
FVA_5 = PMT($FVIFA_{8\%,5}$)
$21,775.10 = PMT(5.8666)
PMT = $3,711.71.

Financial calculator solution:
Enter cash flows in CF register; I = 8; solve for NPV = $95,244.08.
Calculate annuity:
N = 5; I = 8; PV = -50,000; FV = 95,244.08; and then solve for PMT = $3,712.15.

viii. FV of a sum **Answer: d Diff: M**

Time Line:

Tabular/Numerical solution:

Solve for amount on deposit at the end of 6 months.
Step 1: $FV = \$100(FVIF_{3\%,1}) - \$100 = \$3.00$.
$FV = \$100(1 + 0.06/2) - \$100 = \$3.00$.

Step 2: *Compound the $3.00 for 39 periods at 3%*
$FV = \$3.00(FVIF_{3\%,39}) = \$9.50$.
Since table does not show 39 periods, use numerical/calculator exponent method.
$FV = \$3.00(1.03)^{39} = \$9.50$.

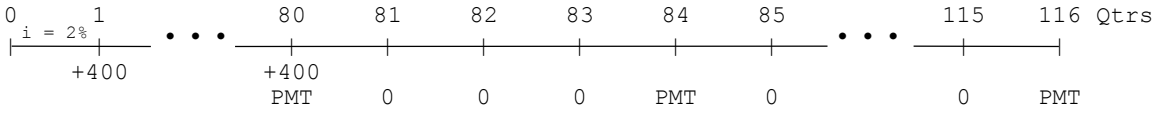
Financial calculator solution: (Step 2 only)
Inputs: N = 39; I = 3; PV = -3.00; PMT = 0. Output: FV = $9.50.

ix. FV of annuity due **Answer: d Diff: M**

There are a few ways to do this. One way is shown below.
To get the value at t = 5 of the first 5 payments:
BEGIN mode, N = 5; I = 11; PV = 0; PMT = -3,000; and then solve for FV = $20,738.58.

Now add on to this the last payment that occurs at t = 5.
$20,738.58 + $3,000 = $23,738.58 ≈ $23,739.

x. PMT and quarterly compounding **Answer: b Diff: T**



Find the FV at t = 80 of $400 quarterly payments:
N = 80; I = 2; PV = 0; PMT = 400; and then solve for FV = $77,508.78.

Find the EAR of 8%, compounded quarterly, so you can determine the value of each of the receipts:

$$EAR = \left(1 + \frac{0.08}{4}\right)^4 - 1 = 8.2432\%.$$

Now, determine the value of each of the receipts, remembering that this is an annuity due.
Put the calculator in BEG mode and enter the following input data in the calculator:
N = 10; I = 8.2432; PV = -77,508.78; FV = 0; and then solve for PMT = $10,788.78 ≈ $10,789.