

Answer key  
Questions 1-8  
p 330

Compound Interest

RA

## Chapter 9 - Page 330 - Compound interest

① find the maturity value:

$$\$5000 \rightarrow PV$$

$$3.5\% \rightarrow \text{p.a.} \quad (3.5\% / 2 \times \text{yr} = 1.75\% / \text{prd. (i)})$$

$$\text{Semi annual interest} \rightarrow 2 \times \text{yr}$$

$$5 \text{ yrs term} \rightarrow (5 \text{ yr} \times 2 \text{ prd} \times \text{interest a yr} = 10 \text{ periods})(t)$$

$$FV = PV(1+i)^N$$

$$= 5000(1 + 0.0175)^{10}$$

$$= \$6066.17$$

$\therefore$  \$5000 @ 3.5% earned interest calculated semi annually will grow to \$6066.17 in 5 yrs.

② find the Amount of interest

$$\$5000 \rightarrow PV$$

$$7.75\% \rightarrow \text{(Semiannual so } 7.75/2 = 3.875\% / \text{prd} \text{)}^{(i)}$$

$$\text{Semi annual} = 2 \times \text{yr}$$

$$5 \text{ yrs } 10 \text{ mths} = 5.833 \text{ years} \rightarrow \times 2 \times \text{year} = 11.667 \text{ periods}^{(N)}$$

$$FV = PV(1+i)^N$$

$$= 5000(1 + 0.03875)^{11.667}$$

$$= \$7791.20$$

$$\text{Interest} = 7791.20 - 5000 \text{ Principal} = \$2791.20$$

$\therefore$  There will be \$2791.20 of interest accumulated on a \$5000 investment earning 7.75% Semiannual interest for 70 months

③ Find Compounded Amount:

$$\$4000 = PV$$

$$4 \text{ yrs } 8 \text{ mths} = 56 \text{ mths} = 4.67 \text{ years}$$

$$3.38\% \text{ p.a.}$$

Annually Compounded

$$FV = PV(1+i)^n$$

$$= 4000(1+0.0338)^{4.67}$$

$$= 4000 \times 1.1679$$

$$= \$4671.60$$

$\therefore$  The Compounded Amount of 4000 invested for 4 yrs 8 mths @ 3.38% Annual interest is \$4671.60

④ Find Debt Value?

$$8000 = PV$$

$$7 \text{ yrs } 5 \text{ mths} = 89 \text{ mths} = 7.417 \text{ years}$$

$$10.8\%$$

Annual Compd

$$FV = PV(1+i)^n$$

$$= 8000(1+0.108)^{7.417}$$

$$= 17,117.54$$

$\therefore$  \$8000 invested @ 10.8% for 89 mths (7.417 yrs) Compounded Annually will accrue to \$17,117.54

- ⑤ Calculate Value Index in 2016 (25yrs hence)  
 CPI = 98.1 in Base year of 1991 = PV  
 Inflation = 3% = Rate  $g$  - test w Annual Comp

$$\begin{aligned} FV &= PV (1+i)^n \\ &= 98.1 (1+0.03)^{25} \\ &= \underline{206.24} \end{aligned}$$

$\therefore$  the value of CPI will be 206.24 in 2016. ie: a basket of groceries that cost 98.10 in 1991 will cost \$206.24 in 2016.

- ⑥ Peel Credit  $\rightarrow$  value of assets?

$$\begin{aligned} &8\% \text{ growth } (i) \\ \$2.5\text{m} &= \text{PV} \\ 5\text{yrs} &= \text{Annual Comp} \end{aligned}$$

$$\begin{aligned} FV &= PV (1+i)^n \\ &= 2.5\text{m} (1+0.08)^5 \\ &= \$3.673\text{m} \end{aligned}$$

$\therefore$  We'd expect the value of assets to be \$3.673 million in 5yrs time if we use a growth estimate of 8% annually.

This is a two part problem... Part 1  $\rightarrow$  first rate of interest  
Part 2  $\rightarrow$  second rate of interest.

⑦ Deposit

- \$2000 deposit  
3% p.a. ( $3\%/4 = 0.75\%/period$ )  
Quarterly Compounds - 4 times a year  
for 2.5 yrs ( $2.5 \text{ yr} \times 4 \text{ year} = 10^{(2)}$  compds)

Part 1

$$\begin{aligned} FV &= PV(1+i)^n \\ &= 2000(1+0.0075)^{10} \\ &= \$2155.17 \end{aligned}$$

$\therefore$  We expect the deposit of \$2000 earning 3% p.a. 2.5 yrs with quarterly compounding to grow to \$2155.17

THEN

Now that amount of money (\$2155.17) starts earning 2.75% p.a. for an additional 3.5 yrs compounding monthly

Part 2

$$\begin{aligned} FV &= PV(1+i)^n \\ &= 2155.17(1+0.006875)^{42} \\ &= \$2873.79 \end{aligned}$$

$\rightarrow 2.75\%/12$   
 $(i) = 0.6875\% \text{ p.pd}$   
 $\rightarrow 3.5 \text{ yrs} \times 12 \text{ mths/yr}$   
 $n = 42 \text{ p.pds}$

$\therefore$  The initial investment of 2000 will grow to \$2873.79 over the total period.



- ⑧ This is a two part problem - the first part is the 1st rate & interest, the second part is with the second rate & interest

PART 1 → \$ 2500 deposit → PV

$$4.5\% \text{ p.a.} \Rightarrow \frac{4.5\%}{12} = 0.375\% \text{ per prd.}$$

$$3 \text{ yr term} = 3 \times 12/\text{mth} = 36 \text{ periods}$$

$$\begin{aligned} FV &= PV (1+i)^N \\ &= 2500 (1+0.00375)^{36} \\ &= \$ 2860.82 \end{aligned}$$

→ AT THE END of the first rate you will have 2860.82 accumulated.

PART 2 → New rate 5%

$$\text{Compounds Quarterly} \quad \frac{5\%}{4/\text{tr}} = \frac{1.25\%}{(1)} \text{ per period}$$

$$\text{for } 1.5 \text{ yrs} = 1.5 \text{ yrs for } 4 \text{ prd} = \frac{6}{(1)} \text{ compounds}$$

$$\begin{aligned} FV &= PV (1+i)^N \\ &= 2860.82 (1+0.0125)^6 \\ &= 3082.20 \end{aligned}$$

∴ At the end, you will have ~~accumulated~~  
\$ 3082.20.