Unit 8 – Financial Mathematics

8.3 – Compound Interest and Present Value

Learning Goal: We are learning how to determine the present value remaining on a loan or investment.

Last day we looked at the idea of Compound Interest (Future Value). Today we continue looking at Compound Interest with a focus on Present Value.

Compound Interest Formulae:

Future Value	Present Value
$A = P(1+i)^n$	$P = \frac{A}{(1+i)^n}$

where: A = Future Value P = Present Value

i = interest rate per compounding period n = total number of compounding periods

Example 8.3.1

You want \$10 000 in your bank account 20 years from now. Your account pays 1.8% per year, compounded annually. What is the amount of money you have to deposit today? present

Given	Want
$A = 10\,000$	P
$i = \frac{0.018}{1}$	
$n = (1)(20)$	

$P = \frac{A}{(1+i)^n} = \frac{10\,000}{(1.018)^{20}}$

$= \$6999.14$

∴ You need to deposit \$6999.14 today

Example 8.3.2

You want to buy a house at 30 years old (14 years from now). You estimate that you will need a down payment of \$450 000. You find a bond which matures in 14 years paying 3.6% interest compounded monthly. How much do you need to invest in the bond today?

Given	Want
$A = 450\,000$	P
$i = \frac{0.036}{12}$	
$= 0.003$	
$n = (12)(14)$	
$= 168$	

$P = \frac{A}{(1+i)^n}$

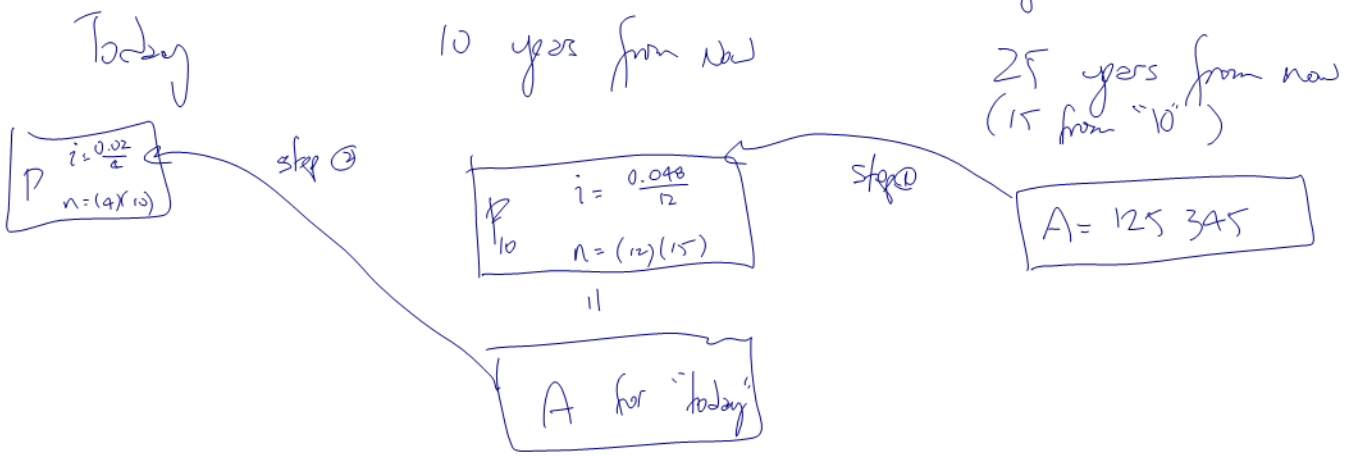
$= \frac{450\,000}{(1.003)^{168}}$

$= \$272\,054.41$

∴ I need " in the bank today.

Example 8.3.3

Today Henry invests some money in an account which pays 2% compounded quarterly. 10 years from now he takes the money in his account and reinvests it in an account which pays 4.8% compounded monthly. After an additional 15 years ~~Scott~~ Henry has $125,345 in his account. How much did he originally invest?



Step ①

Given	Want
$A = 125\,345$	P_{10}
$i = \frac{0.048}{12} = 0.004$	
$n = (12)(15) = 180$	

$$P_{10} = \frac{A}{(1+i)^n} = \frac{125\,345}{(1.004)^{180}} = \$61,099.65$$

Step ②

Given	Want
$A = 61099.65$	P
$i = \frac{0.02}{4} = 0.005$	
$n = (4)(10) = 40$	

$$P = \frac{A}{(1+i)^n} = \frac{61099.65}{(1.005)^{40}} = \$50\,049.10$$

Success Criteria:

- I can use the Present Value formula to solve various financial problems
- I can calculate the total interest earned/paid by taking A – P.