THE UNIVERSITY OF MELBOURNE

FNCE10002 Principles of Finance
Semester 1, 2019

Introduction to Financial Mathematics I
Suggested Answers to Tutorial Questions for Week 1

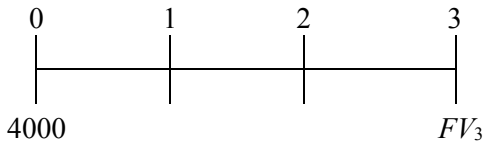
Note that detailed answers to tutorial questions from Part II will only be provided in tutorials. The following abridged answers are intended as a guide to those detailed answers. This policy is in place to ensure that you attend your tutorial regularly and receive timely feedback from your tutor. If you are unsure of your answers you should check with your tutor, a pit stop tutor, online tutor or me.

While detailed answers to Part I appear below, if you are not sure of the answers to these questions please ask your tutor in the following week's tutorial.

Part I – Answers Submitted to Your Tutor

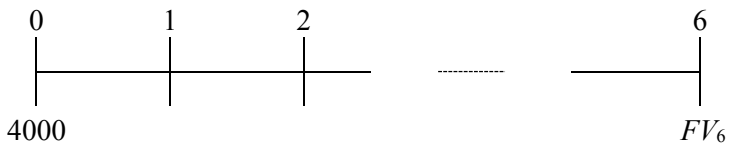
A. Problems

A1. a) The timeline is as follows:



$FV_3 = 4000(1 + 0.06)^3 = \$4{,}764.06$.

b) The timeline is as follows:



$FV_6 = 4000(1 + 0.06)^6 = \$5{,}674.08$.

c) The timeline is the same as in part (a) but the interest rate now is higher.

$FV_3 = 4000(1 + 0.12)^3 = \$5{,}619.71$.

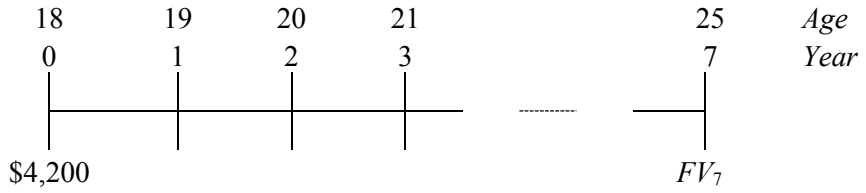
d) The total amount of interest earned in part (a) is less than half the amount of interest earned in part (b) because in the last 3 years you earn interest on the interest earned in the first 3 years in addition to interest on the original $4,000.

e) The breakup of the total interest, simple interest and interest-on-interest in parts (a) and (b) are as follows:

Part (a) Total interest earned = 4764.06 – 4000 = $764.06.
Simple interest = 4000 × 0.06 × 3 = $720.
Interest-on-interest = 4764.06 – 4000 – 720 = $44.06.

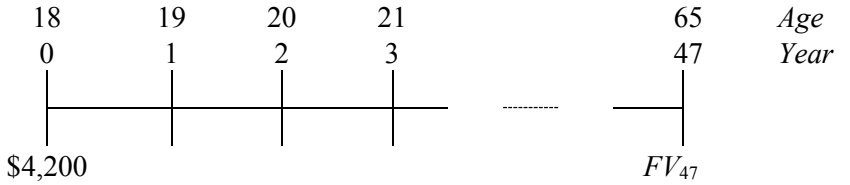
Part (b) Total interest earned = 5674.08 – 4000 = $1674.08.
Simple interest = 4000 × 0.06 × 6 = $1,440.
Interest-on-interest = 5674.08 – 4000 – 1440 = $234.08.

A2. a) The timeline shows your friend's age as well as the end of the year to which it corresponds:



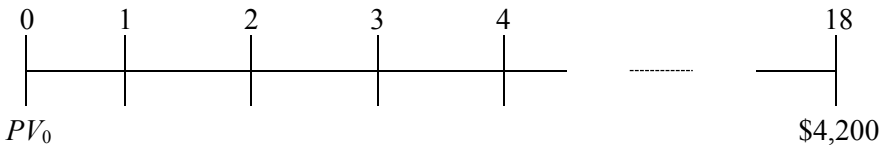
$FV_7 = 4200(1 + 0.12)^7 = \$9{,}284.86$.

b) The timeline now is:



$FV_{47} = 4200(1 + 0.12)^{47} = \$863{,}965.41$.

c) The relevant timeline now is:



$PV_0 = 4200/(1 + 0.12)^{18} = \$546.17$.

A3. a) The present value of each cash flow today is calculated as: $PV_0 = FV_n/(1 + r)^n$. The individual calculations are as follows:

End of Year	Budget Shortfall	PV of \$1 in year *n*	PV(Budget Shortfall)
1	\$5,000	\$0.9259	\$4,630
2	\$4,000	\$0.8573	\$3,429
3	\$6,000	\$0.7938	\$4,763
4	\$10,000	\$0.7350	\$7,350
5	\$3,000	\$0.6806	\$2,042
Total			**\$22,214**

$PV_0 = 5000/(1.08)^1 + 4000/(1.08)^2 + 6000/(1.08)^3 + 10000/(1.08)^4 + 3000/(1.08)^5$.

$PV_0 = \$22{,}214$.

An initial deposit of \$22,214 would be needed to fund the budget shortfall.

b) You start with the amount calculated in part (a) which earns a compounded interest rate of 8% per annum over time. After meeting the expenses in each year, the remaining amount earns that interest over time. The future value over time is calculated as follows:

$FV_n = PV_0(1 + r)^n$.

In the first year, \$22,214 earns a return of 8% and cumulates to:

$FV_1 = 22214(1 + 0.08)^1 = \$23{,}991$.

The net amount available at the end of year 1 is: 23991 – 5000 = \$18,991.
In the second year, this amount cumulates to: $FV_2 = 18991(1 + 0.08)^1 = \$20{,}510$.

The net amount available at the end of year 2 is: 20510 – 4000 = \$16,510.
In the third year, this amount cumulates to: $FV_3 = 16510(1 + 0.08)^1 = \$17{,}831$.

The net amount available at the end of year 3 is: 17831 – 6000 = \$11,831.
In the fourth year, this amount cumulates to: $FV_4 = 11831(1 + 0.08)^1 = \$12{,}778$.

The net amount available at the end of year 4 is: 12778 – 10000 = \$2,778.
In the fifth year, this amount cumulates to: $FV_5 = 2778(1 + 0.08)^1 = \$3{,}000$.

To summarize:

End of Year	Value at the End of Year	Amount Spent	Net Amount Remaining
0	\$22,214	–	–
1	\$23,991	\$5,000	\$18,991
2	\$20,510	\$4,000	\$16,510
3	\$17,831	\$6,000	\$11,831
4	\$12,778	\$10,000	\$2,778
5	\$3,000	\$3,000	\$0

c) An increase in the interest rate would reduce the amount calculated in part (a). A lower amount would be needed today as this amount can earn a higher compounded interest over time.

Part II – Submission of Answers Not Required

B. Multiple Choice Questions

B1. C is correct. We need to calculate the future value of the $50,000 at the end of five years.

B2. B is correct. The amount required today is the sum of the present values of each amount at 6% p.a.

B3. B is correct. The present values are:

Alternative 1: $129.63.

Alternative 2: $156.53.

Alternative 3: $148.22.

B4. A is correct.

The balance at the end of 20 years, FV_{20} = $14,859.47.

Simple interest earned over this period = $4,000.

Interest-on-interest earned over this period = $859.47.

B5. A is correct. We need the *NPV* and note that there are two investments involved rather than the typical single investment at time 0.

C. Problems

C1. The present value of second offer is the sum of the present values of each year's cash flow, which is $1,066,601. She should take the second offer.

C2. The future value on the original retirement date if early retirement is chosen is: $805,255.

The future value on the retirement date if early retirement is not chosen is: $808,015.

He should not retire.

C3. a) *NPV* = –$10,276.10.

Since the NPV < 0, don't accept the investment.

b) *NPV* = $270.86 > 0.

Since the NPV > 0, accept the opportunity.