IEGR 350: Engineering Economy
Spring 2016
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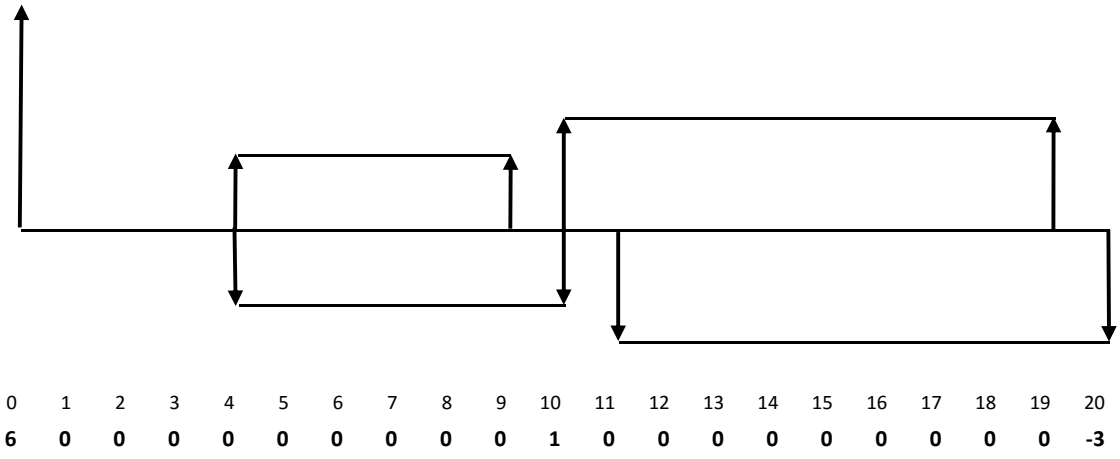
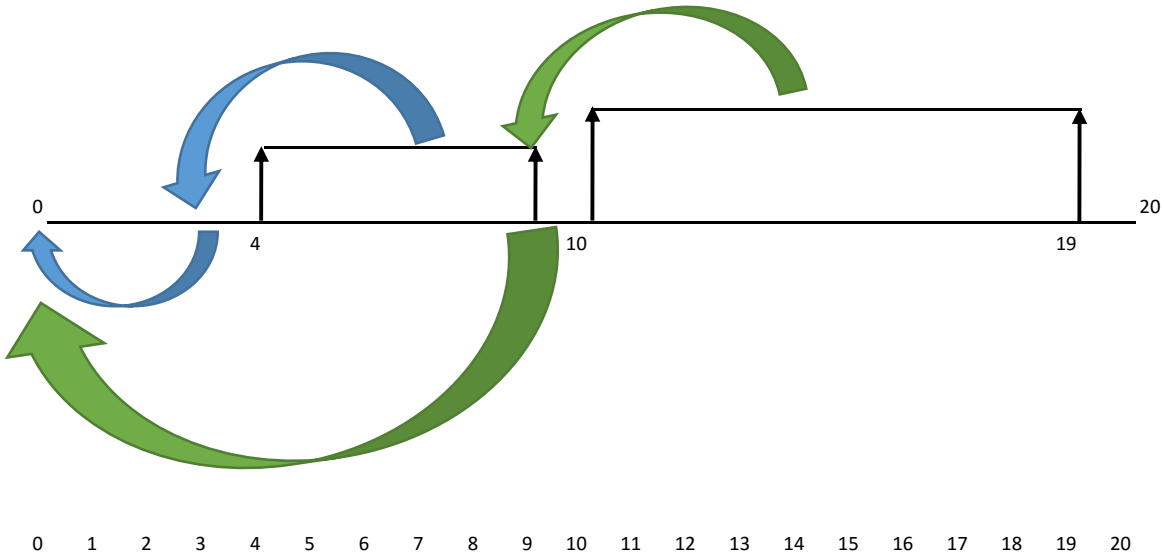
Assignment 2 Solution Key
Each vertical grid represents one year and each horizontal grid $55.
PROBLEM: Given the cashflow and for the interest rate of 8% compounded annually, perform the following steps:

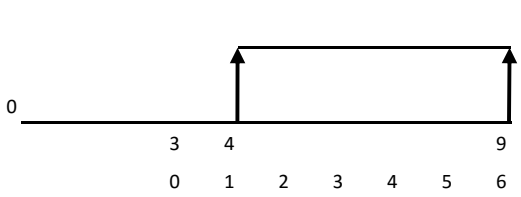
1. Calculate the present worth of the project, as it is, using formulas or tables for factors.
2. Calculate future worth of the project, as it is, at the end of year 20 using formulas or tables.
3. Calculate the worth of project, as it is, at the end of year 14.
4. Calculate the equivalent annual series between years 5 and 15 for the entire project.
   (Hint: you can use one of the values calculated in part 1 or 2.)

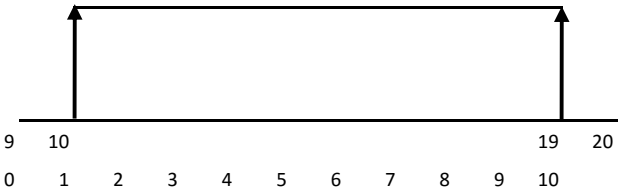


0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
6	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**-3**



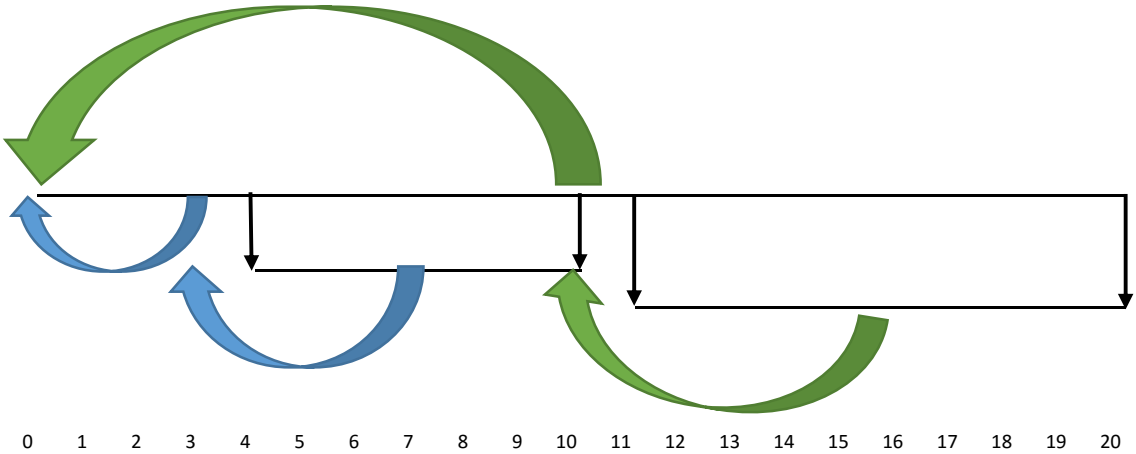
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

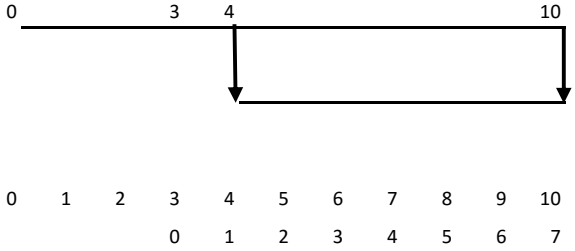


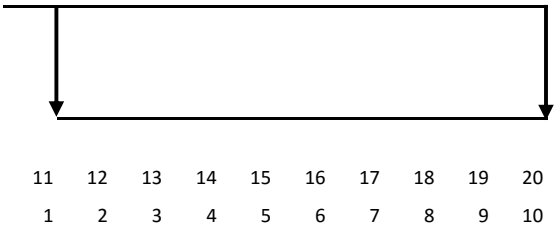


PW1 = 2 (P/A, 8%, 6)(P/F, 8%, 3)
PW1 = 2 (4.6229) (0.7938) = 7.34

PW2 = 3 (P/A, 8%, 10)(P/F, 8%, 9)
PW2 = 3 (6.7101) (0.5002) = 10.07



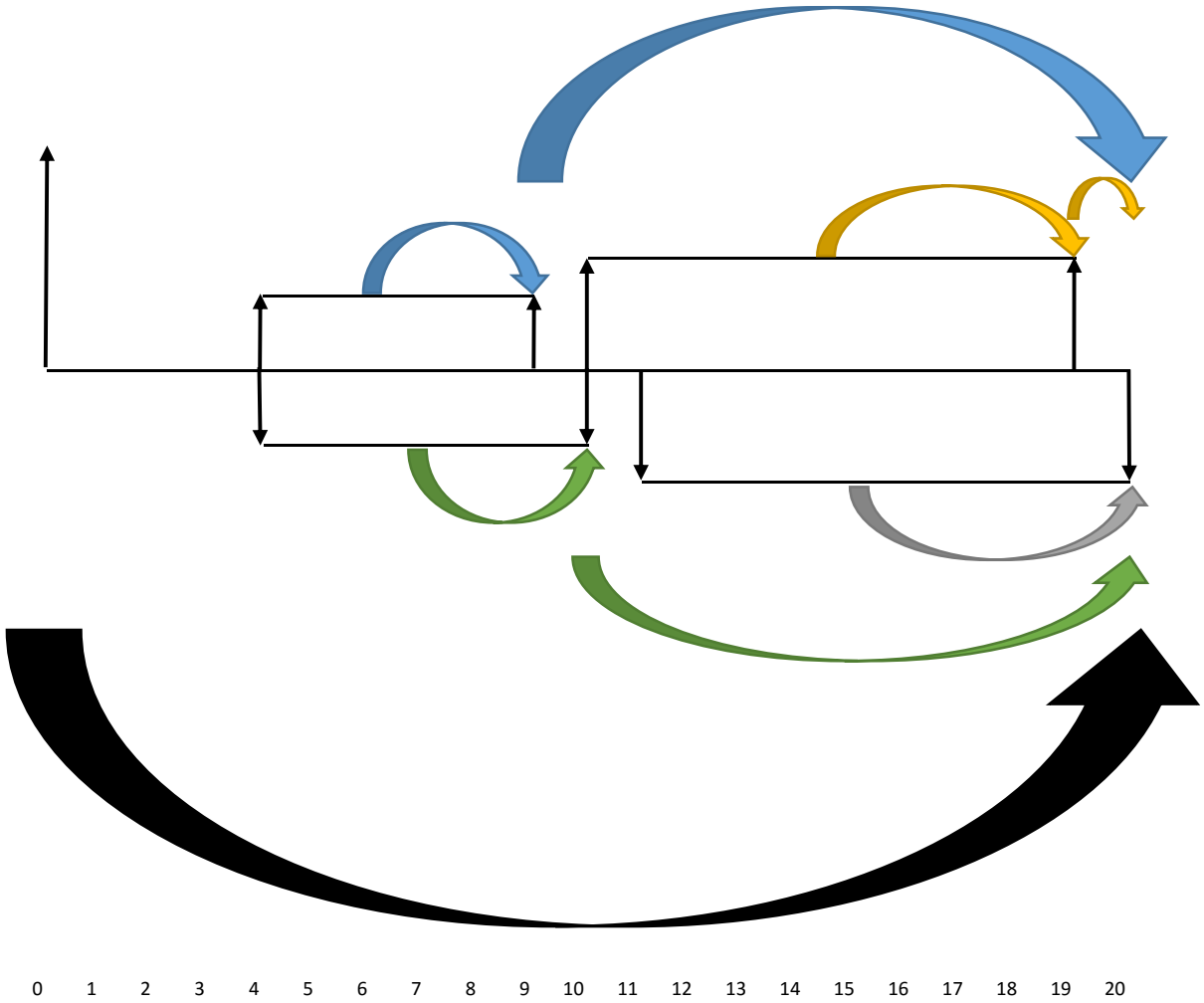




PW3 = - 2 (P/A, 8%, 7)(P/F, 8%, 3)
PW3 = - 2 (5.2064) (0.7938) = - 8.27

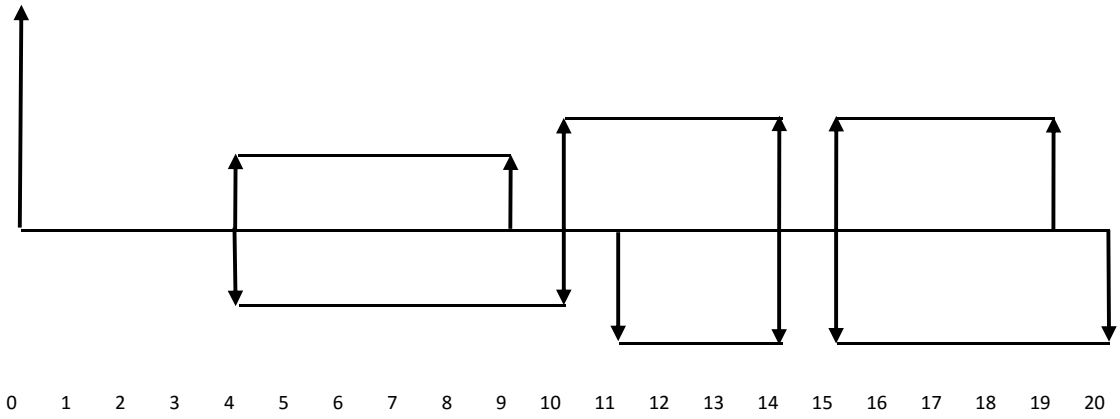
PW4 = - 3 (P/A, 8%, 10)(P/F, 8%, 10)
PW4 = - 3 (6.7101) (0.4632) = - 9.32

PW = 6 + 7.34 + 10.07 - 8.27 - 9.32 = 5.82 Grids
PW = 5.82 ($55) = = 320.10

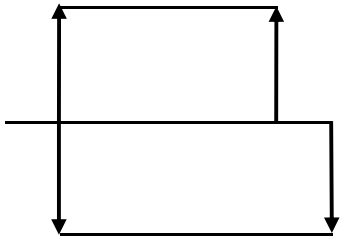


F1 = 6 (F/P, 8%, 20) = 6 (4.6610) = 27.97
F2 = 2 (F/A, 8%, 6) (F/P, 8%, 11) = 2 (7.3359) (2.3316) = 34.21
F3 = - 2 (F/A, 8%, 7) (F/P, 8%, 10) = - 2 (8.9228) (2.1589) = - 38.53
F4 = 3 (F/A, 8%, 10) (F/P, 8%, 1) = 3 (14.4866) (1.08) = 46.94
F3 = - 3 (F/A, 8%, 10) = - 3 (14.4866) = - 43.46
FW = F1 + F2 + F3 + F4 + F5 = 27.97 +34.21 - 38.53 + 46.94 - 43.46 = 27.12 Grids
FW = 27.12 ($55) = $1491.60
Note: We can verify the calculations by finding the present worth of the above value and comparing it with the prior calculation of PW
PW = $1,491.60 (P/F, 8%, 20) = $1,491.60 (0.2145) = $319.94
which is very close to the velue calculated before ($320.10).

Since we are told to use the cashflow as it is and find the value of the project as a single value at the end of year 14, we need to separate the cashflow into two parts, before to year 14, and parts after year 14 (Check assignment 1 for reason). Otherwise, we could use the present worth of the project calculated at step 1 and simply find its future value using (F/P, 8%, 14).

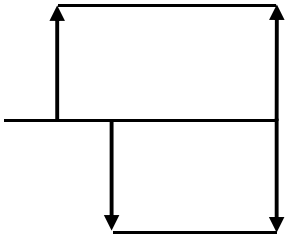


0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20



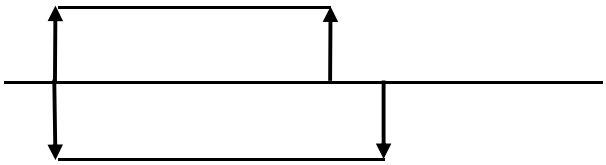
14 15 16 17 18 19 20
0 1 2 3 4 5
0 1 2 3 4 5 6

P1 = 3 (P/A, 8%, 5) = 3 (3.9924) = 11.98
P2 = - 3 (P/A, 8%, 6) = - 3 (4.6229) = - 13.87



9 10 11 12 13 14
0 1 2 3 4 5
0 1 2 3 4

F1 = 3 (F/A, 8%, 5) = 3 (5.8666) = 17.60
F2 = - 3 (F/A, 8%, 4) = - 3 (4.5061) = - 13.52



F3 = 2 (F/A, 8%, 6) (F/P, 8%, 5)
F3 = 2 (7.3359) (1.4693) = 21.56
F4 = - 2 (F/A, 8%, 7) (F/P, 8%, 4)
F4 = - 2 (8.9228) (1.3605) = - 24.28

3 4 5 6 7 8 9 10 11 12 13 14
0 1 2 3 4 5 6
0 1 2 3 4 5
0 1 2 3 4 5 6 7
0 1 2 3 4

F5 = 6 (F/P, 8%, 14) = 6 (2.9374) = 17.62

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

Equivalent single payment of the given cashflow at the end of year 14 =
P1 + P2 + F1 + F2 + F3 + F4 + F5 =
11.98 - 13.87 + 17.60 -13.52 + 21.56 - 24.28 + 17.62 = 17.09 Grids
Or, 17.09 ($55) = 939.95
Note: We can verify the calculations by finding the present worth of the above value and comparing it with the prior calculation of PW
PW = $939.95 (P/F, 8%, 14) = $939.95 (0.3405) = $320.05
which is close enough to the value calculated before ($320.10).

For question 4 we can simply use the present worth calculated in question 1, find its future worth at the end of year 4 and then find an equivalent annuities between years 5 and 15.

F1 = $320.10 (F/P, 8%, 4) = $320.10 (1.3605) = $435.50
A = $435.50 (A/P, 8%, 11) = $435.50 (0.1401) =$61.01