Use the Matlab `linprog` function to solve the multi-period planning problem with the following data.

Cash needed:

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Cash (in $1,000s)	11	14	16	17	19	22	24	25	27	28	29	31	32	34	37	38

Annual interest rate of guaranteed savings account = 7%

Securities available:

Security	Current Cost	Yearly Return	Years to Maturity	Principal Repayment at Maturity
1	$975	$65	12	$1,000
2	$975	$70	13	$1,000
3	$985	$60	4	$1,000

Give the the minimum amount of the lump sum needed (in $1,000s).

Let Si be the amount invested in savings account at year I, 7%

Let B1 be the face value invested in security 3

Let B2 be the face value invested in security 1

Let B3 be the face value invested in security 2

Min = L

Time Period 0: L – 0.985*B1 – 0.975*B20 – 0.975*B3 – S0 = 11

Time Period 1: 0.06*B1 + 0.065*B2 + 0.07*B3 + 1.07*S0 – S1 = 14

Time Period 2: 0.06*B1 + 0.065*B2 + 0.07*B3 + 1.07*S1 – S2 = 16

Time Period 3: 0.06*B1 + 0.065*B2 + 0.07*B3 + 1.07*S2 – S3 = 17

Time Period 4: 1.06*B1 + 0.065*B2 + 0.07*B3 + 1.07*S3 – S4 = 19

Time Period 5: + 0.065*B2 + 0.07*B3 + 1.07*S4 – S5 = 22

Time Period 6: + 0.065*B2 + 0.07*B3 + 1.07*S5 – S6 = 24

Time Period 7: 0.065*B2 + 0.07*B3 + 1.07*S6 – S7 = 25

Time Period 8: 0.065*B2 + 0.07*B3 + 1.07*S7 – S8 = 27

Time Period 9: 0.065*B2 + 0.07*B3 + 1.07*S8 – S9 = 28

Time Period 10: 0.065*B2 + 0.07*B3 + 1.07*S9 – S10 = 29

Time Period 11: 0.065*B2 + 0.07*B3 + 1.07*S10 – S11 = 31

Time Period 12: 1.065*B2 + 0.07*B3 + 1.07*S11 – S12 = 32

Time Period 13: 0.065*B3 + 0.07*B3 + 1.07*S12 – S13 = 34

Time Period 14: 1.07*S13 – S14 = 37

Time Period 15: 1.07*S14 – S15 = 38

Hence, problem statement is, find minimal value of L, subject to the constraints as shown above.

We want to minimize L

#MatLab Code

```
f = [1; 0;0;0;0;0;0;0;0;0;0;0;0;0;0;0;0;0;0;0;0];
A = [1 -0.985 -0.975 -0.975    -1   0    0    0    0    0    0    0    0    0
0     0    0    0    0  0
     0  0.06   0.065  0.070 1.07   -1    0    0    0    0    0    0    0    0
0     0    0    0    0  0
     0  0.06   0.065  0.070    0 1.07   -1    0    0    0    0    0    0    0
0     0    0    0    0  0
     0  0.06   0.065  0.070    0    0 1.07   -1    0    0    0    0    0    0
0     0    0    0    0  0
     0  1.06   0.065  0.070    0    0    0 1.07   -1    0    0    0    0    0
0     0    0    0    0  0
     0  0.00   0.065  0.070    0    0    0    0 1.07   -1    0    0    0    0
0     0    0    0    0  0
     0  0.00   0.065  0.070    0    0    0    0    0 1.07   -1    0    0    0
0     0    0    0    0  0
     0  0      0.065  0.070    0    0    0    0    0    0 1.07   -1    0    0
0     0    0    0    0  0
     0  0      0.065  0.070    0    0    0    0    0    0    0 1.07   -1    0
0     0    0    0    0  0
     0  0      0.065  0.070    0    0    0    0    0    0    0    0 1.07   -1
0     0    0    0    0  0
     0  0      0.065  0.070    0    0    0    0    0    0    0    0    0 1.07
-1     0    0    0    0  0
     0  0      0.065  0.070    0    0    0    0    0    0    0    0    0    0
1.07    -1    0    0    0  0
     0  0      1.065  0.070    0    0    0    0    0    0    0    0    0    0
0  1.07   -1    0    0  0
     0  0         0  1.070    0    0    0    0    0    0    0    0    0    0
0     0 1.07   -1    0  0
     0  0         0   0.00    0    0    0    0    0    0    0    0    0    0
0     0    0 1.07   -1  0
     0  0         0      0    0    0    0    0    0    0    0    0    0    0
0     0    0    0 1.07 -1 ];
 B = [11 ; 14; 16; 17; 19; 22; 24; 25;27;28;29;31;32;34;37;38];
 lb = zeros(20,1);

 [x, fval, exitflag, output, lambda]= linprog(f, [], [], A,B, lb);
 disp(lambda)
```

Ans: 228.1538