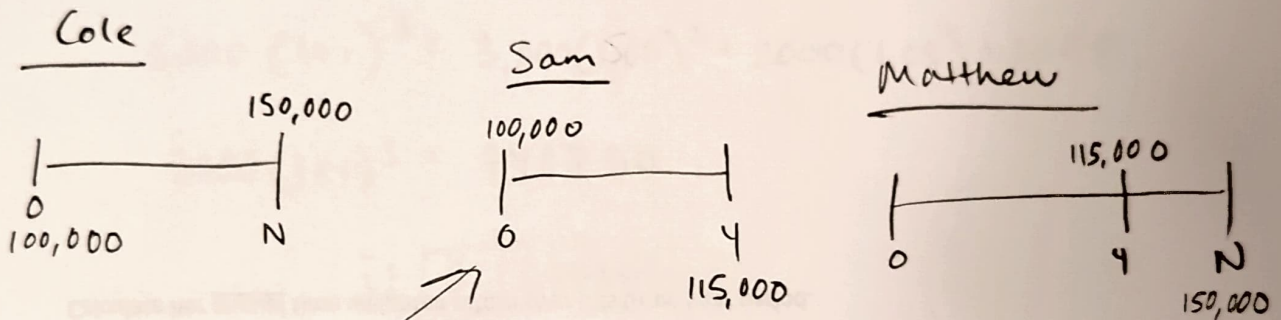


**MATH 373**  
**Quiz 5**  
**Spring 2024**  
 April 4, 2024

1. Cole, Sam, and Matthew enter a three-way loan agreement. As part of this agreement, Cole pays Sam 100,000 at time 0. Additionally, at the end of 4 years, Sam agrees to pay 115,000 to Matthew. Finally, at the end of  $N$  years, Matthew pays Cole a total of 150,000.

Using the bottom line approach, all three participants have the same annual yield.

Determine  $N$ . (Please note that  $N$  is not an integer.)



Use Sam's to determine annual yield.

$$100,000(1+i)^4 = 115,000$$

$$i = 0.035558076$$

Use Cole's or Matthew's to find  $N$ .

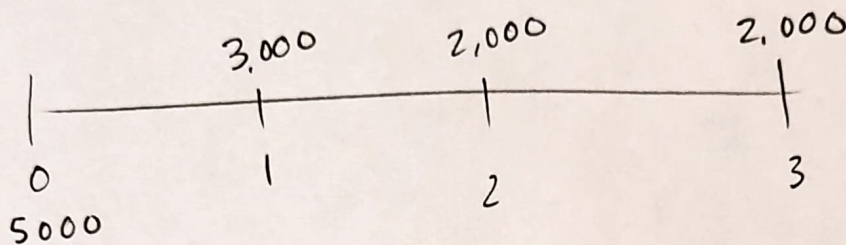
$$\text{Cole: } 100,000(1.035558076)^N = 150,000$$

$$N \ln(1.035558076) = \ln(1.5)$$

$$N = \boxed{11.60444972}$$

2. You loan me 5,000. I repay the loan by paying you 3,000 at the end of 1 year and 2,000 at the end of years 2 and 3. You immediately reinvest the repayments in an account that earns an annual effective interest rate of 5%.

Determine your return on the loan taking into account reinvestment.



$$5000(1+i)^3 = 3,000(1.05)^2 + 2000(1.05) + 2000$$

$$5000(1+i)^3 = 7407.50$$

$$i = \boxed{0.1399887}$$

$\approx 0.14$

3. You have a loan that requires four annual non-level payments to repay the loan, listed in the table below. The loan has an annual effective interest rate of 6%. Complete the following amortization table. Please show your work for at least the first two rows for full credit.

Time	Payment	Payment Interest	Payment Principal	Outstanding Loan Balance
0	N/A	N/A	N/A	34,950.64
1	11,000	$(34,950.64)(0.06)$ $= 2097.04$	$11,000 - 2097.04$ 8902.96	$34,950.64 - 8902.96$ 26,047.68
2	12,000	1562.86	10,437.14	15,610.54
3	9,000	936.63	8063.37	7547.17
4	8,000	452.83	7547.17	0

$$\begin{aligned}
 OLB &= \frac{11,000}{1.06} + \frac{12,000}{(1.06)^2} + \frac{9,000}{(1.06)^3} + \frac{8,000}{(1.06)^4} \\
 &= 34,950.63862
 \end{aligned}$$