Bridges to Advanced Algebra Name:_____

Comparing Compounds

1. You go to the bank and are offered a choice: How many times a year do you want your money to be compounded? You make tables to compare the different compounding periods. Assume you have $1000 and earn 12% interest.

If you have 12% interest, that becomes 0.12 as a decimal. That is your ANNUAL interest. To change it to your compound interest, divide by "n" (the number of compounds in a year).

Compounded Semi-Annually (n=2)
0.12÷2 = 0.06

Month	Start	Interest	End
1	1000	—	1000
2	1000	—	1000
3	1000	—	1000
4	—	—	—
5	—	—	—
6	1000	60	1060
7	1060	—	1060
8	1060	—	1060
9	—	—	—
10	—	—	—
11	—	—	—
12	1060	63.60	1123.60

Compounded Quarterly (n=4)
0.12÷4 = 0.03

Month	Start	Interest	End
1	1000	—	1000
2	—	—	—
3	1000	30	1030
4	—	—	—
5	—	—	—
6	1030	30.9	1060.90
7	—	—	—
8	—	—	—
9	1060.90	31.83	1092.73
10	—	—	—
11	—	—	—
12	1092.73	32.78	1125.51

Please notice that there are a lot of months where you DO NOT earn interest. This is what the words "semi-annually" and "quarterly" mean. You do not earn interest every month. For semi-annually, you earn interest every 6 months. That is why the majority of months have the number 0 in the interest column. For quarterly, you earn interest every 3 months.

You can verify the final row in the table by using the compound interest formula: $F = P(1 + \frac{r}{n})^{nx}$

$1000(1 + \frac{0.12}{2})^{2\cdot1} = 1123.6$	$1000(1 + \frac{0.12}{4})^{4\cdot1} = 1125.51$

2. This time the bank offers you two different plans: you can invest your $1000 and earn 12% interest, compounded monthly, or you can pay the bank $1000 today and they will pay you back $2400 a year, in monthly payments.

Compounded Monthly (n=12)

Month	Start	Interest	End
1	1000	10	1010
2	1010	10.1	1020.1
3	1020.1	10.2	1030.3
4	1030.3	10.3	1040.6
5	1040.6	10.41	1051.01
6	1051.01	10.51	1061.52
7	1061.52	10.62	1072.14
8	1072.14	10.72	1082.86
9	1082.86	10.83	1093.69
10	1093.69	10.94	1104.62
11	1104.62	11.05	1115.67
12	1115.67	11.16	1126.83

Monthly Payments ($2400 total per year)

Month	Start	Interest	End
1	-1000	200	-800
2	-800	200	-600
3	-600	200	-400
4	-400	200	-200
5	-200	200	0
6	0	200	200
7	200	200	400
8	400	↓	600
9	600	↓	800
10	800	↓	1000
11	1000	↓	1200
12	1200	↓	1400

a. Which plan is better at the start?

Compounded Monthly 1000 vs -1000

b. Which plan is better after a year?

Monthly Payments 1400 vs 1126.83

c. Use the compound interest formula and a linear equation to verify the final lines of each table.

$1000\left(1+\frac{.12}{12}\right)^{12\cdot 1}$ VS $y=+200(12)+-1000$

1126.83 1400

d. We know that exponential plans always beat linear plans, eventually. When does the exponential plan pass the linear plan?

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