Richie Rich Breaks the Bank

Once per year Richie Rich deposits an amount of \$800 in an account which pays 15% interest per year, compounded annually, with **additional deposits of \$800 continually made at the end of the year**.

If B_n is the balance in the account, in dollars, immediately after Richie makes the nth deposit, then we can write $B_1 = \$800$.

(a) Complete the table to find the following. Report to the nearest \$0.01.

i) the balance, B_2, of the account on the day immediately after the second deposit.
ii) the balance, B_3, of the account on the day immediately after the third deposit.
iii) the balance, B_4, of the account on the day immediately after the fourth deposit.

n (Number of deposits)	B_n (\$)
1	\$800
2	\$ (It is more than \$920.)
3	\$
4	\$

(b) Suppose Richie makes 36 deposits.
What is the balance of the account on the day immediately after the 36th deposit? (Select one)
A. $B_{36} = \$122{,}521.48$ B. $B_{36} = \$121{,}721.48$ C. $B_{36} = \$704{,}936.12$ D. $B_{36} = \$811{,}476.54$ E. $B_{36} = \$933{,}998.03$

(c) Suppose Richie makes 436 deposits. Which is true about the sum B_{436}?

i) The balance, B_{436}, of the account on the day immediately after the 436th deposit is

A $B_{436} = 800 \cdot 15^{437} + 800 \cdot 15^{436} + \ldots + 800 \cdot 15^2 + 800 \cdot 15 + 800$

B $B_{436} = 800 \cdot 1.15^{437} + 800 \cdot 1.15^{436} + \ldots + 800 \cdot 1.15^2 + 800 \cdot 1.15 + 800$

C $B_{436} = 800 \cdot 1.15^{436} + 800 \cdot 1.15^{435} + \ldots + 800 \cdot 1.15^2 + 800 \cdot 1.15 + 800$

D $B_{436} = 800 \cdot 15^{435} + 800 \cdot 15^{434} + \ldots + 800 \cdot 15^2 + 800 \cdot 15 + 800$

E $B_{436} = 800 \cdot 1.15^{435} + 800 \cdot 1.15^{434} + \ldots + 800 \cdot 1.15^2 + 800 \cdot 1.15 + 800$

F $B_{436} = 800 \cdot 15^{436} + 800 \cdot 15^{435} + \ldots + 800 \cdot 15^2 + 800 \cdot 15 + 800$

G None of these.

ii) The balance, B_{436}, of the account on the day immediately after the 436th deposit is approximately

A $B_{436} = \$157247416644174550000000000000$

B $B_{436} = \$191678005550419250000000000000$

C $B_{436} = \$155330636588670370000000000000$

D $B_{436} = \$135070118772756850000000000000$

E $B_{436} = \$178630232076970920000000000000$

F The value of B_{436} can not be computed.

Rhino Bonus Opportunity

In August, 2022, the Powerball jackpot had reached $206.9 million when a single winning ticket was sold in Pennsylvania. The winner had two options[1].

A. A lump sum payment of $122.3 million.

B. An annuity which offers an initial payment followed by 29 annual payments.
Each payment is 5 percent larger than the previous one.
Option B would have given the winner the full $206.9 million reward, paid out over three decades.

Assume the winner chooses Option B. Answer the following. Be sure to **show your work** for credit.

(+0.5) **i.** What is the amount of the **initial** payment? Report to the nearest penny, i.e. to $0.01 dollars.

(+0.5) **ii.** What is the amount of the **last** (29th) payment? Report to the nearest penny, i.e. to $0.01 dollars.

[1]The advantages of each option are compared at https://www.annuity.org/selling-payments/lottery/