

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 n th deposit, then we can write $B_1 = \$800$.

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

- the balance, B_2 , of the account on the day immediately after the second deposit.
- the balance, B_3 , of the account on the day immediately after the third deposit.
- the balance, B_4 , of the account on the day immediately after the fourth deposit.

n (Number of deposits)	B_n (\$)
1	\$800
2	\$ 1720 (It is more than \$920.)
3	\$ 2778
4	\$ 3994.70

NORMAL FLOAT AUTO REAL RADIAN MP	
800	800
Ans*1.15+800	1720

NORMAL FLOAT AUTO REAL RADIAN MP	
800	800
Ans*1.15+800	1720
Ans*1.15+800	2778
Ans*1.15+800	3994.7



(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

- $B_{436} = 800 \cdot 15^{437} + 800 \cdot 15^{436} + \dots + 800 \cdot 15^2 + 800 \cdot 15 + 800$
- $B_{436} = 800 \cdot 1.15^{437} + 800 \cdot 1.15^{436} + \dots + 800 \cdot 1.15^2 + 800 \cdot 1.15 + 800$
- $B_{436} = 800 \cdot 1.15^{436} + 800 \cdot 1.15^{435} + \dots + 800 \cdot 1.15^2 + 800 \cdot 1.15 + 800$
- $B_{436} = 800 \cdot 15^{435} + 800 \cdot 15^{434} + \dots + 800 \cdot 15^2 + 800 \cdot 15 + 800$
- (E) $B_{436} = 800 \cdot 1.15^{435} + 800 \cdot 1.15^{434} + \dots + 800 \cdot 1.15^2 + 800 \cdot 1.15 + 800$**
- $B_{436} = 800 \cdot 15^{436} + 800 \cdot 15^{435} + \dots + 800 \cdot 15^2 + 800 \cdot 15 + 800$
- None of these.

NORMAL FLOAT AUTO REAL RADIAN MP	
X	Y1
1	800
2	1720
3	2778
4	3994.7
.	.
.	.
34	612292
35	704936
36	811477
37	933998

Y1=811476.5436574

$a = 800, r = 1.15$
There are 436 deposits of 800
so 800 appears in each of the 436 terms.

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

- $B_{436} = \$1572474166441745500000000000000$
- $B_{436} = \$1916780055504192500000000000000$
- (C) $B_{436} = \$1553306365886703700000000000000$**
- $B_{436} = \$1350701187727568500000000000000$
- $B_{436} = \$1786302320769709200000000000000$
- The value of B_{436} can not be computed.!

NORMAL FLOAT AUTO REAL RADIAN MP	
X	Y1
436	1.6E30
437	1.8E30
438	2.1E30
439	2.4E30
440	2.7E30
441	3.1E30
442	3.6E30
443	4.1E30
444	4.8E30
445	5.5E30
446	6.3E30

Y1=1.5533063658876E30

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 options¹.

- 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.

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

NORMAL FLOAT AUTO REAL RADIAN MP	
PRESS * FOR $\Delta T \theta 1$	
X	Y1
1	800
2	1720
3	2778
4	3994.7
.	.
.	.
.	.
34	612292
35	704936
36	811477
37	933998

Y1=811476.5436574