



Problem of the Week

Problem B

Simply Interesting!

Problem

A boy named Richard has \$1000 to invest in one of two longterm plans. He intends to withdraw only the interest at the end of each year, but leave his \$1000 invested. The two plans are as follows:

Plan 1: This plan pays \$50 interest each year as long as the original investment is untouched. This \$50 is called 5% simple interest.

Plan 2: This plan pays \$500 interest at the end of the first year. (This \$500 interest is 50% of the original investment.) At the end of each of the following years, the \$1000 investment earns half as much interest as the year before. (So in the second year it would only earn \$250 in interest.)



- After 5 years, what is the total interest that Richard would make from each plan? After 10 years?
- Which option should he choose to maximize the total interest if he invests for 15 years?
- If Richard left his \$1000 invested for a very long time, which plan do you think would provide the greatest total interest?

Solution

The completed table on the next page reveals the answers to parts a) and b).

There are two sets of answers for Plan 2: the first carries 4 decimals in the calculations and is the more accurate; the bracketed numbers use rounding to the nearest cent, and are inaccurate, especially after year 6, due to round-off error. Answers will vary depending on how many decimals are used.

Clearly Plan 2 will earn Richard more in 15 years. However, if he leaves the \$1000 invested indefinitely, Plan 2 total interest appears to reach a maximum of at \$1000, whereas Plan 1 total interest continues to grow at \$50 each year, and will surpass \$1000 by year 21.





Year	Plan 1			Plan 2		
	Investment	Interest	Total Interest	Investment	Interest	Total Interest
1	\$1000	\$50	\$ 50	\$1000	\$500.00	\$500.00
2	\$1000	\$50	\$100	\$1000	\$250.00	\$750.00
3	\$1000	\$50	\$150	\$1000	\$125.00	\$875.00
4	\$1000	\$50	\$200	\$1000	\$ 62.50	\$937.50
5	\$1000	\$50	\$250	\$1000	\$ 31.25	\$968.75
6	\$1000	\$50	\$300	\$1000	\$15.625 (15.63)	\$984.375 (984.38)
7	\$1000	\$50	\$350	\$1000	\$7.8125 (7.81)	\$992.1875 (992.19)
8	\$1000	\$50	\$400	\$1000	\$3.9063 (3.91)	\$996.0938 (996.10)
9	\$1000	\$50	\$450	\$1000	\$1.9531 (1.95)	\$998.0469 (998.05)
10	\$1000	\$50	\$500	\$1000	\$0.9766 (0.98)	\$999.0234 (999.03)
11	\$1000	\$50	\$550	\$1000	\$0.4883 (0.49)	\$999.5117 (999.52)
12	\$1000	\$50	\$600	\$1000	\$0.2441 (0.24)	\$999.7559 (999.76)
13	\$1000	\$50	\$650	\$1000	\$0.1221 (0.12)	\$999.8779 (999.88)
14	\$1000	\$50	\$700	\$1000	\$0.0610 (0.06)	\$999.9390 (999.94)
15	\$1000	\$50	\$750	\$1000	\$0.0305 (0.03)	\$999.9695 (999.97)

The completed table reveals the answers to parts a) and b). Total interest from Plan 1 after 5 years is \$250 whereas the total interest after 5 years from Plan 2 is \$968.75. Total interest from Plan 1 after 10 years is \$500 whereas the total interest after 10 years from Plan 2 is \$999.02.

There are two sets of answers for Plan 2: the first carries 4 decimals in the calculations and is the more accurate; the bracketed numbers use rounding to the nearest cent, and are inaccurate, especially after year 6, due to round-off error. Answers will vary depending on how many decimals are used.

For c), clearly Plan 2 will earn Richard more in 15 years. However, if he leaves the \$1000 invested indefinitely, Plan 2 total interest appears to reach a maximum of \$1000, whereas Plan 1 total interest continues to grow at \$50 each year, and will surpass \$1000 by year 21.

