Gradient series
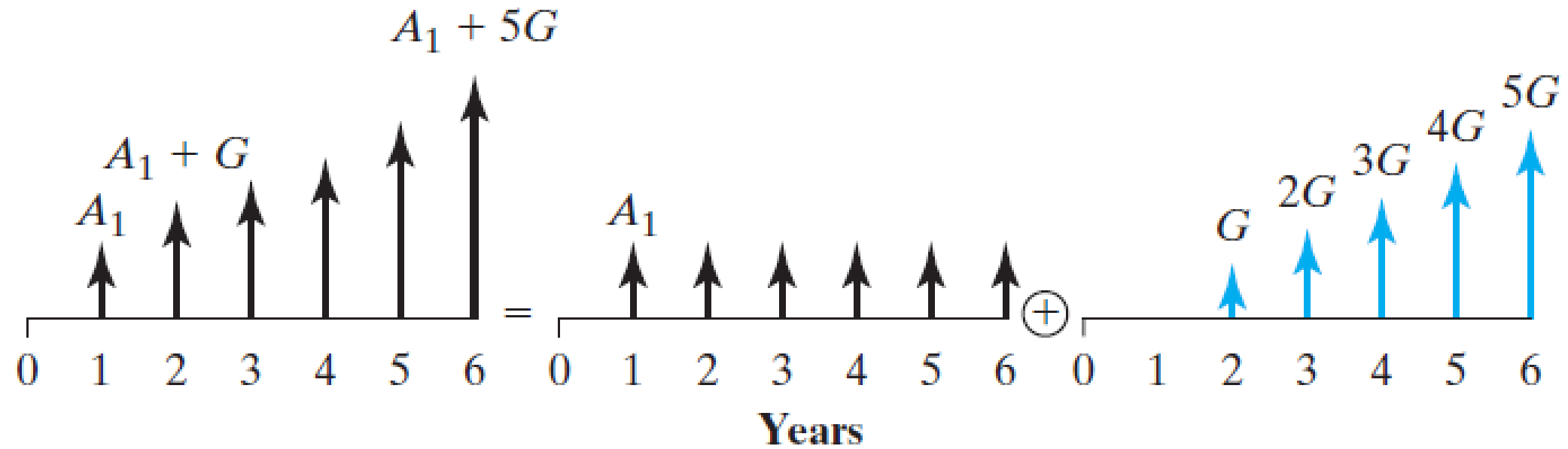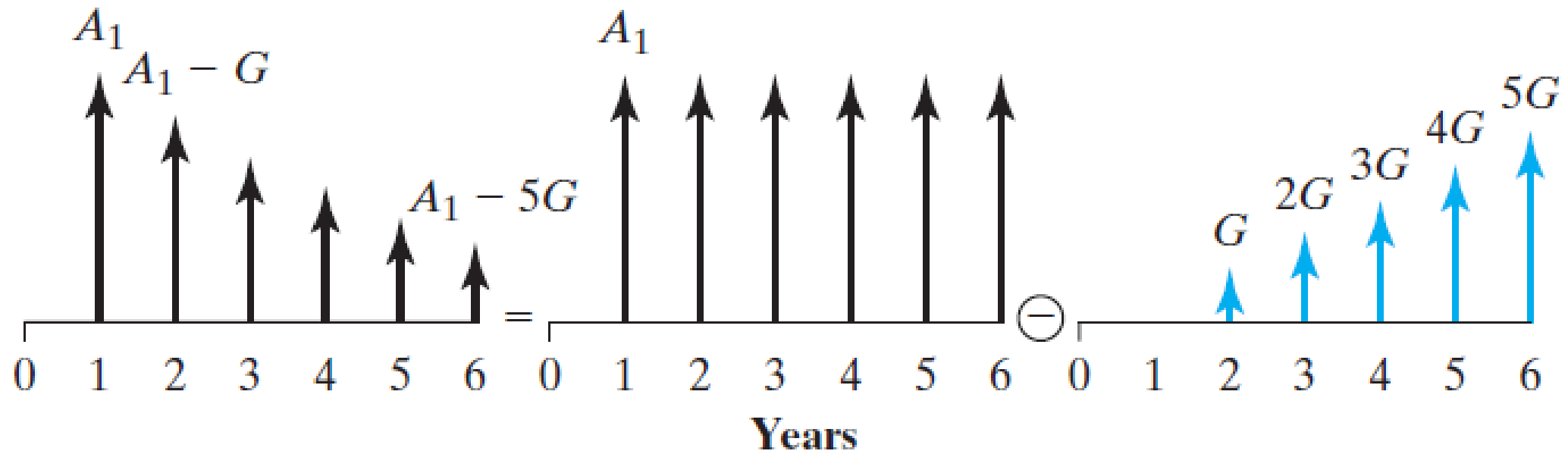

(a) Increasing gradient series
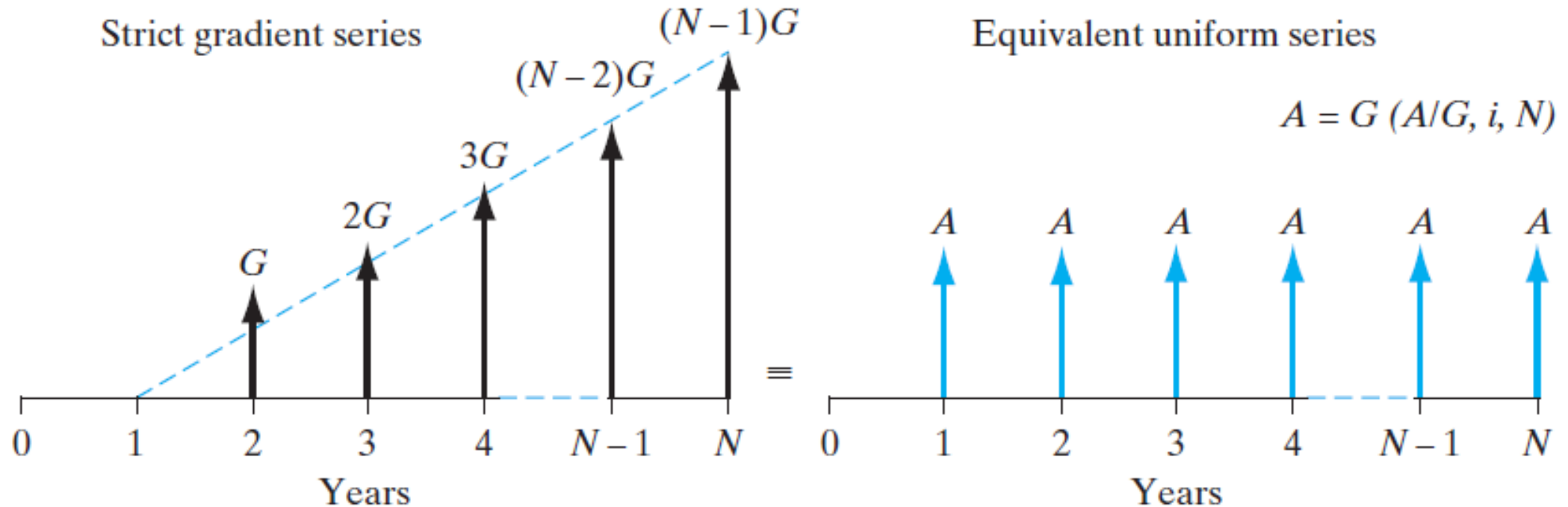
(b) Decreasing gradient series

Gradient series

Present worth factor

$$P = G\left[\frac{(1 + i)^N - iN - 1}{i^2(1 + i)^N}\right] = G(P/G, i, N).$$

A textile mill has just purchased a lift truck that has a useful life of five years. The engineer estimates that maintenance costs for the truck during the first year will be $1,000. As the truck ages, maintenance costs are expected to increase at a rate of $250 per year over the remaining life. Assume that the maintenance costs occur at the end of each year. The firm wants to set up a maintenance account that earns 12% annual interest. All future maintenance expenses will be paid out of this account. How much does the firm have to deposit in the account now?

Gradient series

Gradient to Equal payment series conversion

Strict gradient series

$(N-1)G$

$(N-2)G$

$3G$

$2G$

G

Equivalent uniform series

$A = G\ (A/G, i, N)$

$A \quad A \quad A \quad A \quad A \quad A$

$0 \quad 1 \quad 2 \quad 3 \quad 4 \quad N-1 \quad N$

Years

$0 \quad 1 \quad 2 \quad 3 \quad 4 \quad N-1 \quad N$

Years

$$A = G\left[\frac{(1+i)^N - iN - 1}{i[(1+i)^N - 1]}\right] = G(A/G, i, N),$$

Source: CHan S Park; compiled by Lt Cdr Geethalakshmi PM

Gradient to Equal payment series conversion

John and Barbara have just opened two savings accounts at their credit union. The accounts earn 10% annual interest. John wants to deposit $1,000 in his account at the end of the first year and increase this amount by $300 for each of the next five years. Barbara wants to deposit an equal amount each year for the next six years. What should be the size of Barbara's annual deposit so that the two accounts will have equal balances at the end of six years

Suppose that you make a series of annual deposits into a bank account that pays 10% interest. The initial deposit at the end of the first year is $1,200. The deposit amounts decline by $200 in each of the next four years. How much would you have immediately after the fifth deposit?

3.39 Solve for the present worth of this cash flow using at most three interest factors at 10% interest compounded annually.
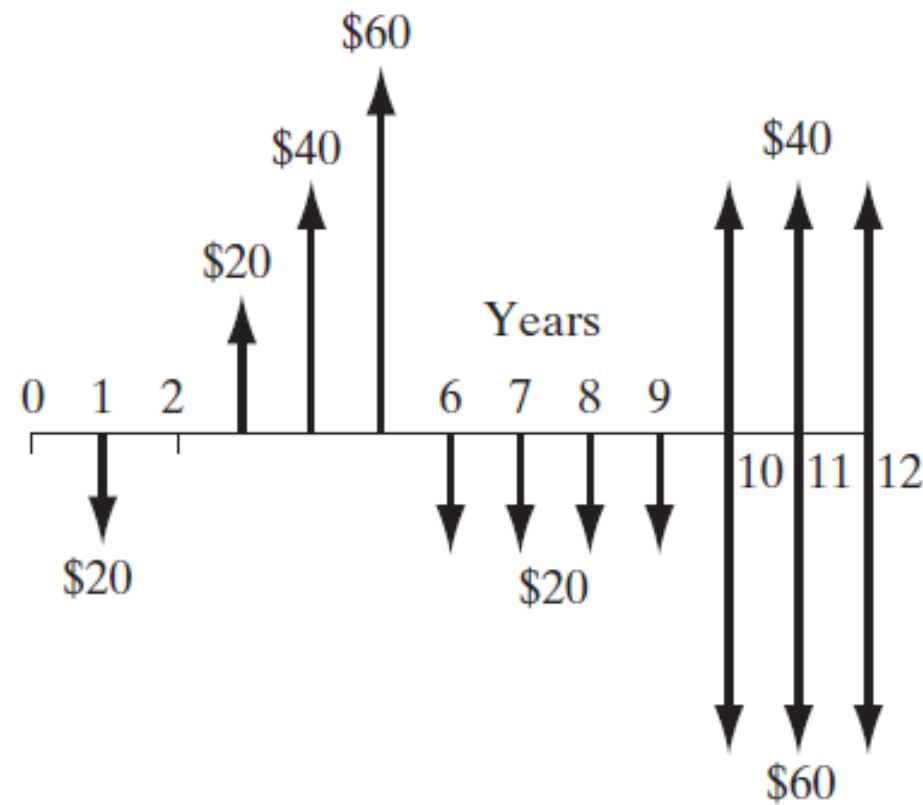
Apple Computer wants to have $2.1 billion available 5 years from now to finance production of a handheld "electronic brain" that, based on your behavior, will learn how to control nearly all the electronic devices in your home, such as the thermostat, coffee pot, TV, and sprinkler system. The company expects to set aside uniformly increasing amounts of money each year to meet its goal. If the amount set aside at the end of year 1 is $50 million, how much will the constant increase G have to be each year? Assume the investment account grows at a rate of 18% per year.

Ans: G = 145

Tacozza Electric, which manufactures brush dc servomotors, budgeted $75,000 per year to pay for certain components over the next 5 years. If the company expects to spend $15,000 in year 1, how much of a uniform (arithmetic) increase each year is the company expecting in the cost of this part? Assume the company uses an interest rate of 10% per year.

Ans: 33147

A certain power plant has upgraded an emission control valve. The modification costs $8000 and is expected to last 6 years with a salvage value of $ 200. The maintenance cost is expected to be $1700 in the first year and expected to increase by $180 per year thereafter. Determine the total equivalent present worth if interest rate is 8%.
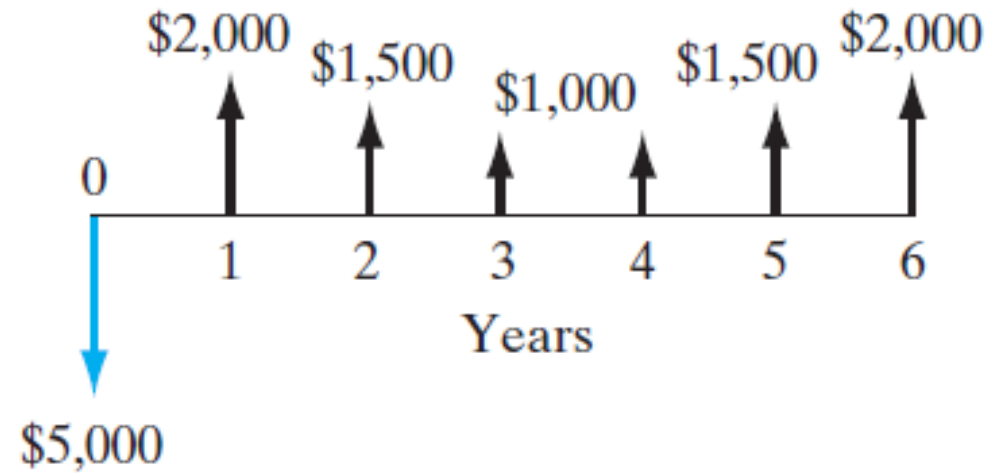
Note: Salvage value – Value of the asset at the end useful life, to be considered as Revenue (Income)

Consider the accompanying cash flow diagram. Compute the equivalent annual worth at $i = 13\%$.
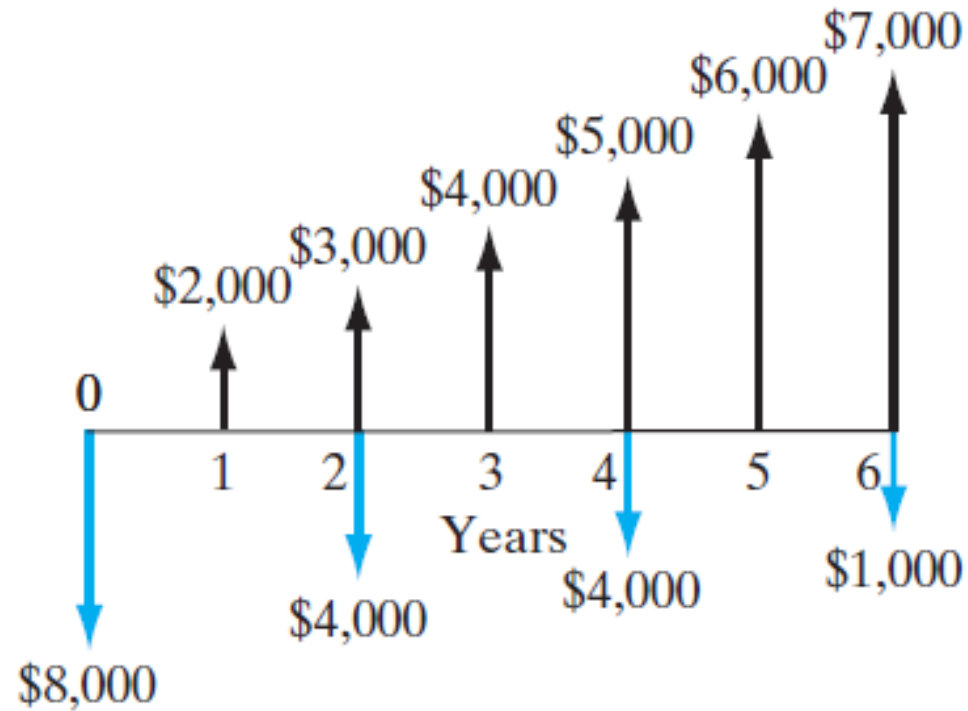
Ans: $ 627.5

Consider the accompanying cash flow diagram. Compute the equivalent annual worth at $i = 8\%$.

Ans: $ 421

Sun-Devil Company is producing electricity directly from a solar source by using a large array of solar cells and selling the power to the local utility company. Because these cells degrade over time, thereby resulting in lower conversion efficiency and power output, the cells must be replaced every four years, which results in a particular cash flow pattern that repeats itself as follows: $n = 0$, $-\$500,000$; $n = 1$, $\$600,000$; $n = 2$, $\$400,000$; $n = 3$, $\$300,000$, and $n = 4$, $\$200,000$. Determine the annual equivalent cash flows at $i = 12\%$.

Ans: $ 228894