1. A man turns 40 today and wishes to provide supplemental retirement income of 3000 at the beginning of each month starting on his 65th birthday. Starting today, he makes monthly contributions of X to a fund for 25 years. The fund earns a nominal rate of 8% compounded monthly. Each 1000 will provide for 9.65 of income at the beginning of each month starting on his 65th birthday until the end of his life. Calculate X.
   (A) 324.73  (B) 326.89  (C) 328.12  (D) 355.45  (E) 450.65
   [11/01 #27]

2. At time t=0, Paul deposits P into a fund crediting interest at an effective annual interest rate of 8%. At the end of each year in years 6 through 20, Paul withdraws an amount sufficient to purchase an annuity-due of 100 per month for 10 years at a nominal interest rate of 12% compounded monthly. Immediately after the withdrawal at the end of year 20, the fund value is zero. Calculate P.
   (A) 41,000  (B) 42,000  (C) 43,000  (D) 44,000  (E) 45,000
   [SOA 11/93 #4]

3. On January 1, an insurance company has 100,000 which is due to Linden as a life insurance death benefit. He chooses to receive the benefit annually over a period of 15 years, with the first payment immediately. The benefit he receives is based on an effective interest rate of 4% per annum. The insurance company earns interest at an effective rate of 5% per annum. Every July 1, the company pays 100 in expenses and taxes to maintain the policy. At the end of nine years, the company has X remaining. Calculate X.
   (A) 46,000  (B) 47,100  (C) 47,700  (D) 52,800  (E) 53,900
   [SOA 11/88 #16]

4. A company has a lease expiring on December 31, 1986. The company is notified that the monthly rent will double as of January 1, 1987. This rate will be good for two years. The company wishes to dampen the effect of the rent increase by paying a higher rent for 2 ½ years, starting July 1, 1986. Calculate the percentage increase on July 1, 1986 assuming an interest rate of 12% compounded monthly.
   (A) 70%  (B) 72%  (C) 74%  (D) 76%  (E) 78%
   [SOA 11/86 #1]

5. An annuity provides a payment of $n at the end of each year for n years. The effective annual interest rate is 1/n. What is the present value of the annuity?
(A) \( n^2 \left[ 1 - \left( \frac{n}{n+1} \right)^n \right] \)

(B) \( n^2 \left[ 1 + \left( \frac{n}{n+1} \right)^n \right] \)

(C) \( n^2 - n^{n+1}(n+1)^{-n+2} \)

(D) \( n^2(n+1)^{-n} \)

(E) \( n^2 - n^{n+1}(n+1)^{-n+1} \)

[CAS 11/82 #7]

6. The present values of the following three annuities are equal:
(i) perpetuity – immediate paying 1 each year, calculated at an annual effective interest rate of 7.25%
(ii) 50-year annuity-immediate paying 1 each year, calculated at an annual effective interest rate of j%
(iii) N-year annuity-immediate paying 1 each year, calculated at an annual effective interest rate of j – 1%

Calculate n.

(A) 30  (B) 33  (C) 36  (D) 39  (E)42

[5/01 #50]

7. Mary deposits 1000 into a fund at the beginning of each year for 10 years. At the end of 15 Years, she makes an additional deposit of X.

At the end of 20 years, Mary uses the accumulated balance in the fund to buy a perpetuity-immediate with annual payments of 2000 per year for 10 years, and 1000 per year thereafter.

Interest is credited at an annual effective rate of 5%.

Calculate X

(A)4865  (B)5065  (C)5265  (D)5465  (E)5665

[SOA 5/95 #4]

8. Ralph buys a perpetuity-due paying 500 annually. He deposits the payments into a savings account earning interest at an effective annual rate of 10%.

Ten years later, before receiving the eleventh payment, Ralph sells the perpetuity based on an effective annual interest rate of 10%.

Using the proceeds from the sale plus the money in the savings account, Ralph purchases an annuity due paying X per year for 20 years at an effective annual rate of 10%.

Calculate X.

(A)1145  (B)1260  (C)1385  (D)1525  (E)1675

[SOA 11/92 #4]

9. Victor wants to purchase a perpetuity paying 100 per year with the first payment due at the end of year 11. He can purchase it by either:
(i) paying 90 per year at the end of each year for 10 years; or
(ii) paying K per year at the end of each year for the first 5 years and nothing for the next 5 years.

Calculate K

(A) 150  (B)160  (C)170  (D) 175  (E) 180

[SOA11/90 #8]

Answer: AAEEA    AADA