APPENDIX C

Practice Problems

Basic Equivalence

1. If $250 is invested at 6% on January 1, year 1, how much will be accumulated by January 1, year 10?

2. How much must be invested on January 1, year 1, in order to accumulate $2000 on January 1, year 6 at 6%?

3. What is the present worth on January 1, year 1, of $2000 available at January 1, year 8, if interest is at 6%?

4. If $50 was invested at 6% on January 1, year 1, what equal year-end withdrawals could be made each year for 10 years, leaving nothing in the fund after the 10th withdrawal?

5. How much could be accumulated in a fund earning 6% at the end of 10 years if $20,000 is deposited at the end of each year for 10 years?

6. How much must be deposited at 6% each year beginning on January 1, year 1, in order to accumulate $5000 on the date of the last deposit, January 1, year 6?

7. What amount should be deposited at 6% in order to draw out $400 at the end of each year for seven years, and leave nothing in the fund at the end?

8. If $500 is invested now, $700 two years from now, and $900 four years from now (all at 4%), what will be the total amount in 10 years?

9. What is the compounded amount of $550 left for eight years with interest at nominal 6% compounded semiannually?

10. A savings certificate that costs $50 now will pay $75 in five years. What is the interest rate?

11. How much must be invested at the end of each month for 30 years in a sinking fund that is to amount to $50,000 at the end of 30 years if interest is nominal 4% compounded monthly?

12. How much would be accumulated in the sinking fund for problem 11 at the end of 18 years?

13. In 18 years, $20,000 is required for a child’s college expenses. How much should be deposited each year starting on the day of birth so that this goal will be met? Assume that the first payment is made at birth, the last payment is on the child’s 18th birthday, and that 5% interest is paid.
14. Starting on January 1, year 1, $50 is deposited in an account paying 6% annually. Each January 1 thereafter, up to and including January 1, year 10, another $50 will be deposited. Starting January 1, year 15 (the date of the first withdrawal), five uniform annual withdrawals are made. The last withdrawal will exhaust the fund. How much will be withdrawn each year?

**Practical Loans**

15. A $2000 loan is taken out at a bank. Monthly payments are $400 plus interest (10% nominal annual rate) on the unpaid balance. Round all values to the nearest whole dollar. (a) What will be the payments for the loan duration? (b) What principal remains to be paid off after the third payment? (c) What is the interest on the fourth payment?

**Present Worth**

16. Equipment is purchased for $12,000 and is expected to be sold after 10 years for $2000. The estimated maintenance is $1000 the first year, but is expected to increase by $200 each year thereafter. Using 10%, find the present worth of the project.

17. A fast-acting brake on a fast-turning lathe is estimated to save seven seconds per piece produced since the operator (paid at the rate of $15.00 per hour) does not have to wait as long for the lathe to stop. 40,000 pieces are produced annually. Assuming a three-year life, no salvage value, and an 8% interest rate, what should be the maximum purchase price of the brake?

**Capitalized Cost**

18. An item is purchased for $100,000. Annual costs are $18,000. Using 8%, what is the capitalized cost of perpetual service?

19. The heat loss from bare steam pipes costs a motel manager $400 annually. Two brands of insulation are available. Brand A will cost $120 and will reduce losses by 93%. Brand B will cost $70 and will reduce losses by 87%. (a) What are the capitalized costs of perpetual service for both brands? (b) Which insulation is economically superior? Use 10%.

**Annual Cost**

20. A new machine will cost $17,000 and will have an estimated salvage value of $14,000 in five years. Special tools for the new machine will cost $5000 and will have a resale value of $2500 at the end of five years. Maintenance costs are estimated at $200 per year. What will be the average annual cost of ownership during the next five years if interest is 6%?
21. A small building can be reroofed for $6000 (aluminum) or $3500 (shingles). The estimated lives are 50 years and 15 years, respectively. If the interest rate is 10%, which alternative is superior?

22. Designers need to decide how to condition the air in a new building with 40-year life. Two alternatives are available, both of which have 20-year lives. Costs are given below. Use 12% interest to find the best alternative.

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Rate of Return

23. A $14,000 plot of land can be purchased for $4000 down and $1200 per year for 12 years. What is the annual interest rate being charged?

24. A speculator in land and property pays $14,000 for a house that he expects to hold for 10 years. $1000 is spent in renovation and a monthly rent of $75 is collected from the tenants who live in the house. (Assume all rent is paid at the end of the year.) Taxes are $150 per year and maintenance costs are $250 per year. What must the sales price be in 10 years to realize a 10% rate of return?

25. An investor wishes to invest $40,000. Venture A, requiring $40,000, will return 8%. Venture B, requiring $10,000, will return 15%. What return on the remaining $30,000 is required to equal the overall profitability of venture A?

Benefit-Cost Ratio

26. A large sewer system will cost $175,000 annually. There will be favorable consequences to the general public of $500,000 annually, and adverse consequences to a small segment of the public of $50,000 annually. (a) What is the excess of benefits over costs? (b) What is the benefit-cost ratio?

27. A public works project has an initial cost of $1,000,000, benefits with a present worth of $1,500,000, and disbenefits with a present worth of $300,000. (a) What is the benefit-cost ratio? (b) What is the excess of benefits over costs?