

Solutions to Present Worth, Future Worth, and Interest Calculations

1. **Problem 1:** A person invests \$5,000 in a savings account that earns 6% annual compound interest. Determine the future worth after 10 years.

Solution: The future value F is calculated using the compound interest formula:

$$F = P(1 + i)^n$$

where:

- P = principal amount = \$5,000
- i = annual interest rate = 0.06
- n = number of years = 10

Substituting the given values:

$$F = 5000 \times (1 + 0.06)^{10} = 5000 \times 1.790847 = \$8,954.24$$

Video Solution: <https://www.youtube.com/watch?v=Hn0eLc0SQGw>

2. **Problem 2:** What is the present worth of \$10,000 to be received in 8 years if the discount rate is 5% per year?

Solution: The present value P is calculated using the formula:

$$P = \frac{F}{(1 + i)^n}$$

where:

- F = future amount = \$10,000
- i = discount rate = 0.05
- n = number of years = 8

Substituting the given values:

$$P = \frac{10000}{(1 + 0.05)^8} = \frac{10000}{1.477455} = \$6,770.08$$

Video Solution: <https://www.youtube.com/watch?v=cy4PiY5ERTI>

3. **Problem 3:** A loan of \$20,000 is repaid in full after 5 years at an interest rate of 7% per year, compounded annually. Determine the total amount to be paid.

Solution: The future value F is calculated using the compound interest formula:

$$F = P(1 + i)^n$$

where:

- P = principal amount = \$20,000
- i = annual interest rate = 0.07
- n = number of years = 5

Substituting the given values:

$$F = 20000 \times (1 + 0.07)^5 = 20000 \times 1.402552 = \$28,051.04$$

Video Solution: <https://www.youtube.com/watch?v=Hn0eLcOSQGw>

4. **Problem 4:** An investor deposits \$2,500 in an account that earns 8% compounded quarterly. Find the effective annual interest rate.

Solution: The effective annual interest rate i_{eff} is calculated using the formula:

$$i_{eff} = \left(1 + \frac{i}{m}\right)^m - 1$$

where:

- i = nominal annual interest rate = 0.08
- m = number of compounding periods per year = 4

Substituting the given values:

$$i_{eff} = \left(1 + \frac{0.08}{4}\right)^4 - 1 = (1 + 0.02)^4 - 1 = 1.08243216 - 1 = 0.08243216 = 8.2432\%$$

Video Solution: <https://www.youtube.com/watch?v=Hn0eLcOSQGw>

5. **Problem 5:** A company plans to purchase equipment worth \$50,000 in 3 years. How much should they invest today in an account earning 4% annual interest to accumulate this amount?

Solution: The present value P is calculated using the formula:

$$P = \frac{F}{(1 + i)^n}$$

where:

- F = future amount = \$50,000
- i = annual interest rate = 0.04
- n = number of years = 3

Substituting the given values:

$$P = \frac{50000}{(1 + 0.04)^3} = \frac{50000}{1.124864} = \$44,453.21$$

Video Solution: <https://www.youtube.com/watch?v=cy4PiY5ERTI>