

Problem 3: Introduction to Compound Interest

Concept: Annual compounding and calculating growth over multiple periods.

Question:

A student invests **\$500** in a certificate of deposit (CD) that pays **4%** interest, compounded **annually**.

Calculate the total value of the investment after **2** years. (Ignore any contributions beyond the initial investment.)

Guidance:

1. Calculate the interest earned in **Year 1** and add it to the principal to get the balance at the end of Year 1.
2. Calculate the interest earned in **Year 2** based on the *new, larger balance* from the end of Year 1.
3. Add the Year 2 interest to the Year 1 balance to find the final value.

Next

Step 1: Calculate the Value After Year 1

In the first year, the interest is calculated only on the initial principal.

1. **Calculate the Interest Earned in Year 1:**

$$\text{Interest} = \text{Principal} \times \text{Rate}$$

$$\text{Interest} = \$500 \times 0.04 = \mathbf{\$20.00}$$

2. **Calculate the Balance at the end of Year 1:**

$$\text{Balance}_{\text{Year 1}} = \text{Principal} + \text{Interest}$$

$$\text{Balance}_{\text{Year 1}} = \$500 + \$20.00 = \mathbf{\$520.00}$$

next

Step 2: Calculate the Value After Year 2 (Compounding)

In the second year, the interest is calculated on the **new, larger balance** from the end of Year 1 (\$520.00). This is the essence of compounding.

1. **Calculate the Interest Earned in Year 2:**

$$\text{Interest} = \text{New Principal} \times \text{Rate}$$

$$\text{Interest} = \$520.00 \times 0.04 = \mathbf{\$20.80}$$

2. **Calculate the Final Balance at the end of Year 2:**

$$\text{Balance}_{\text{Year 2}} = \text{Balance}_{\text{Year 1}} + \text{Year 2 Interest}$$

$$\text{Balance}_{\text{Year 2}} = \$520.00 + \$20.80 = \mathbf{\$540.80}$$

Summary of Growth

Notice that the interest earned in Year 2 (\$20.80) is greater than the interest earned in Year 1 (\$20.00). The extra \$0.80 is the interest earned *on the interest* from the first year.

Final Answer:

The total value of the investment after 2 years is **\$540.80**.