Percent Homework

4/year

41. Blue Bank offers five-year certificates of deposit that pay 6.5% compounded quarterly. Red Bank offers five-year certificates of deposit that pay 7% compounded semiannually. Which is a better deal? If Rosa Klebb has $30,000 to spend on a certificate of deposit, how much would each option be worth for her at the end of five years?

2/year

Blue Bank

$0.065 \div 4 = 0.01625$ rate per quarter

Compound Interest Formula

$$\text{Final Amount} = \text{Principal} \cdot \left(1 + \text{rate per payout}\right)^{\#\text{ of payouts}}$$

5 years · 4 = 20 quarters

$$= \$30{,}000 \cdot 1.01625^{20}$$

$$\approx \boxed{\$41{,}412.59}$$

or

$$= \$30{,}000 \cdot \left(1 + 0.065 \div 4\right)^{(5 \cdot 4)}$$

Red Bank

$$\text{Final Amount} = \text{Principal} \cdot \left(1 + \text{rate per payout}\right)^{\#\text{ of payouts}}$$

Principal = \$30,000

time units now match compounding

Rate per payout = $0.07 \frac{\text{per year}}{} \div 2 = 0.035$ per half-year

# of payouts = 5 years $\cdot$ 2 = 10 half-years

$$\text{Final Amount} = \$30{,}000 \cdot 1.035^{10} \approx \boxed{\$42{,}317.96}$$

the better deal!

42. Mr. Largo invests $1,000 for seven years at 6% annual interest compounded monthly. Additionally, at the beginning of the fifth year she deposits an additional $2,000 into the account. What is the investment worth at the end of all seven years?

Part A - Years 1 through 4

$$\text{Final Amount} = \text{Principal} \cdot \left(1 + \text{rate per payout}\right)^{\#\text{ of payouts}}$$

Principal = $1,000

Rate per payout = $0.06 \frac{\text{per}}{\text{year}} \div 12 = 0.005$ per month

# of payouts = $4 \text{ years} \cdot 12 = 48$ months

$$\text{Final Amount} = \$1{,}000 \cdot 1.005^{48} \approx \$1{,}270.49$$

Part B - Years 5 through 7

$$\text{Final Amount} = \text{Principal} \cdot \left(1 + \text{rate per payout}\right)^{\#\text{ of payouts}}$$

Principal = \$1,270.49 + \$2000 = \$3,270.49

Rate per payout = still 0.005 per month

# of payouts = 3 more years · 12 = 36 months

$$\text{Final Amount} = \$3{,}270.49 \cdot 1.005^{36} \approx \boxed{\$\ 3{,}913.73}$$

Sum of Annuity Due

The Sum of Annuity Due Formula

Final Amount = [Principal × (1 + rate)$^{(years + 1)}$ − Principal × (1 + rate)] ÷ rate

$$\text{Final Amount} = \left(\text{Principal} \cdot (1+\text{rate})^{\text{years}+1} - \text{Principal} \cdot (1+\text{rate}) \right) \div \text{rate}$$

Example

Principal = $1500

Rate = 7% = 0.07 per year

Years = 28 years

$$\text{Final Amount} = \left(\$1{,}500 \cdot 1.07^{29} - \$1{,}500 \cdot 1.07 \right) \div .07$$

$$\approx \boxed{\$129{,}519.79}$$