

39. Sir Topham Hatt invests \$11,000 by letting that amount grow for 28 years in an account that earns 5% annual interest, compounded monthly. At the start of the next year, he moves all the money into a different account for 23 years at 3% annual interest, compounded weekly. How much is in the account at the end of all 51 years?

a) compounded monthly

$$\text{Total amount} = \text{Principal} \cdot \left(1 + \frac{\text{rate per payout}}{\# \text{ of payouts}}\right)$$

$$\text{total amount} = \text{solve for}$$

$$\text{principal} = \$11,000$$

$$\text{rate per payout} = 0.05 \div 12 = 0.0041\bar{6} \text{ per month}$$

$$\# \text{ of payouts} = 28 \text{ yrs} \cdot 12 = 336 \text{ months}$$

$$= \$11,000 \cdot 1.0041\bar{6}^{336}$$

$$\approx \$44,477.63$$

b) compounded weekly

$$\text{Total amount} = \text{Principal} \cdot \left(1 + \frac{\text{rate per payout}}{\# \text{ of payouts}}\right)$$

$$\text{total amount} = \text{solve for}$$

$$\text{principal} = \$44,477.63$$

$$\text{rate per payout} = 0.03 \div 52 = 0.000576923 \text{ per week}$$

$$\# \text{ of payouts} = 23 \text{ yrs} \cdot 52 = 1,196 \text{ weeks}$$

$$= \$44,477.63 \cdot 1.000576923^{1196}$$

$$= \boxed{\$88,658.10}$$

# Sum of Annuity Due

once per year make the same deposit *always uses years + 1*

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

$$\text{Principal} = \$1,200$$

$$\text{annual rate} = 0.05 \quad (5\% \text{ per year})$$

$$\text{years} = 10 \text{ years}$$

$$= \left( \$1,200 \cdot 1.05^{\underline{11}} - \$1,200 \cdot 1.05 \right) \div \underline{0.05}$$

*careful!* *careful!*

$$\approx \boxed{\$15,848.14}$$

Typical American retirement expenses are greater than retirement income by about \$20,000 per year. This means that for most Americans a good plan is to save \$400,000 for retirement.

### Cindy, Clara, and Chloe

Cindy, Clara, and Chloe are three sisters. Each has plans to save for retirement, but their plans are somewhat different.

Despite their different lives, by the time each was 25 years old she had the ability to set aside \$3,000 per year for retirement. All three use a retirement account that earns 8% annual compound interest.

Which of them end up saving at least \$400,000 for retirement?

**12.** Cindy annually puts the \$3,000 into her retirement account for ten years (from age 25 to 34). Then she decides she has saved enough, and her kids are old enough to travel without hassle, so she switches to annually spending the \$3,000 on a vacation for thirty years (from age 35 to 64). How much will Cindy have saved when she retires at age 65?

Answer 12

**13.** Clara wants to enjoy herself before she gets older, and annually spends the \$3,000 on a vacation (from age 25 to 34). Then she starts worrying about retirement, so she switches to annually putting the \$3,000 into her retirement account for thirty years (from age 35 to 64). How much will Clara have saved when she retires at age 65?

Answer 13

**14.** Chloe likes consistency. Every year she puts \$1,500 into her retirement account, and spends \$1,500 on a vacation (from age 25

	Cindy	Clara	Chloe
			
Years 25 to 34 (ten years)	\$3,000 to savings <i>SUAD</i>	\$3,000 to vacation <del>X</del>	\$1,500 to savings, \$1,500 to vacation <i>SUAD</i>
Years 35 to 64 (thirty years)	\$3,000 to vacation <i>Compound</i>	\$3,000 to savings <i>SUAD</i>	\$1,500 to savings, \$1,500 to vacation

# Amortization Table

want \$1,100 mortgage payment each month

7% rate }  
20 year loan } \$7.75 ← from table

then  $\$1,100 \div \$7.75 = 141.9354839$   
then  $\times \$1,000$

so

\$141,000 mortgage