

Section 3.2 – Practice Problems

Find the amount of each annuity

Payment	Rate	Compounded	Time	Future Value
1. \$2500	5%	Annually	10 years	$F = \frac{2500 \left[\left(1 + \frac{0.05}{1} \right)^{1 \cdot 10} - 1 \right]}{0.05}$ $F = 31444.73$
2. \$6000	6.5%	Semi-Annually	25 years	$729\ 015.78$
3. \$1200	4%	Quarterly	8 years	$44\ 992.88$
4. \$500	9%	Monthly	15 years	$189\ 202.88$
5. \$300	10%	Bi-Weekly	5 years	$50\ 476.98$

Find the Periodic payment need to attain the future amount of each annuity

Future Value	Rate	Compounded	Time	Periodic Payment
6. \$7500	3.6%	Semi-Annually	6 years	$7500 = R \left[\frac{(1 + \frac{0.036}{2})^{2 \cdot 6} - 1}{\frac{0.036}{2}} \right]$ $R = \frac{7500 \left(\frac{0.036}{2} \right)}{(1 + \frac{0.036}{2})^{2 \cdot 6} - 1} = 565.51$
7. \$35 000	5.4%	Quarterly	9 years	<div style="border: 1px solid black; padding: 5px; display: inline-block;">761.45</div>
8. \$1 000 000	7.5%	Monthly	25 years	<div style="border: 1px solid black; padding: 5px; display: inline-block;">1139.91</div>

9. In order to plan for their retirement, a married couple decides to buy an annuity that pay 6% interest compounded semi-annually. If they invest \$2500 semi-annually for 35 years, how much interest would they earn?

$$F = 2500 \left[\frac{(1 + \frac{0.06}{2})^{2 \cdot 35} - 1}{\frac{0.06}{2}} \right]$$

$$F = 576\,485.16$$

$$I = 576\,485.16 - (2500 \cdot 2 \cdot 35)$$

$$= 401\,485.16$$

10. You have \$5000 to invest and are offered a 5 year investment at 4.5% simple interest, or an annuity of \$1000 per year for 5 years at 9% compounded annually. If your only concern is the future amount, what is the better investment?

$$i) I = 5000(0.045)(5) = 6125$$

$$ii) F = 1000 \left[\frac{(1 + 0.09)^5 - 1}{0.09} \right]$$

$$= 5984.71$$

Simple Interest better by: \$140.29

11. Sally bought a stereo for \$760. She made a down payment of \$60, and paid \$65 per month for a year. What was the installment price of the stereo? What was the total cost?

$$\begin{aligned} \text{Installment Price} &= \frac{\$65}{\text{month}} \cdot 12 \text{ months} \\ &= \$780 \end{aligned}$$

$$\begin{aligned} \text{Total Cost} &= \text{Down Payment} \\ &\quad + \text{Installment Price} \\ &= \$60 + \$780 \\ &= \$840 \end{aligned}$$

13. A \$12 000 loan is to be paid off in 48 monthly payments of \$292.96. The borrower decides to pay off the loan after 30 payments have been made. Find the amount of interest saved.

$$\begin{aligned} \text{Installment Price} &= \frac{\$292.96}{\text{month}} \cdot 48 \text{ months} \\ &= \$14062.08 \end{aligned}$$

$$\begin{aligned} \text{Interest} &= \text{Installment Price} - \text{Principle} \\ &= \$14062.08 - \$12000 \\ &= \$2062.08 \end{aligned}$$

$$\text{Monthly Interest} = \frac{\$2062.08}{48 \text{ months}} = \$42.96 \text{ month}$$

$$\begin{aligned} \text{Interest paid after 30 payments} \\ \frac{\$42.96}{\text{month}} \cdot 30 \text{ months} &= \$1288.80 \end{aligned}$$

$$\text{Interest saved} = \$2062.08 - \$1288.80 = \$773.28$$

12. Hunter bought a 75 inch TV for \$2600, including taxes. He made a down payment of 20% and paid the balance over 18 months. The financial charges were 6% of the amount financed. Determine the instalment price of the TV, and monthly payments.

$$\begin{aligned} \text{Down Payment} &= \$2600 (0.20) = \$520 \\ \text{Principle} &= \$2600 - \$520 = \$2080 \\ \text{Interest} &= P \cdot r \cdot t = 2080 (0.06) 1.5 = \$187.20 \\ \text{Installment Price} &= \text{Principle} + \text{Interest} \\ &= \$2080 + \$187.20 \\ &= \$2267.20 \end{aligned}$$

$$\begin{aligned} \text{Monthly Payments} &= \frac{\text{Installment Price}}{\# \text{ months}} \\ &= \frac{\$2267.20}{18} \\ &= \$125.96 \end{aligned}$$

14. Parker Publishing borrows \$20 000 to be paid off with 36 monthly payments of \$664.29. After good sales, they decide to pay off the loan in 24 months. Find the amount saved.

$$\begin{aligned} \text{Installment Price} &= \frac{\$664.29}{\text{month}} \cdot 36 \text{ months} \\ &= \$23914.44 \end{aligned}$$

$$\begin{aligned} \text{Interest} &= \text{Installment Price} - \text{Principle} \\ &= \$23914.44 - \$20000 \\ &= \$3914.44 \end{aligned}$$

$$\begin{aligned} \text{Monthly Interest} &= \frac{\$3914.44}{36 \text{ months}} \\ &= \$108.73/\text{month} \end{aligned}$$

$$\begin{aligned} \text{Interest payed after 24 months} \\ \frac{\$108.73}{\text{month}} \cdot 24 \text{ months} &= \$2609.63 \end{aligned}$$

$$\begin{aligned} \text{Interest saved} &= \$3914.44 - \$2609.63 \\ &= \$1304.81 \end{aligned}$$

15. For the month of March, Nadine had an unpaid balance of \$2340.62 on her credit card. She purchased \$369.78 and made a payment of \$300 during the month. If the interest is 2% on the unpaid balance, what is her new balance on April 1st, and what is the annual percentage rate?

Beginning March balance \$ 2340.62

Purchases are \$ 369.78

Payment is \$ 300.00

$$\begin{aligned} \text{New Balance } 2340.62 + 369.78 - 300.00 \\ = \$ 2410.40 \end{aligned}$$

$$\begin{aligned} \text{Interest } \$ 2410.40 (0.02) \\ = \$ 48.21 \end{aligned}$$

$$\begin{aligned} \text{Balance April: } \$ 2410.40 + 48.21 \\ = \$ 2458.61 \end{aligned}$$

Extra Work Space

now

$$\begin{aligned} r_{\text{annual}} &= (1 + r_{\text{monthly}})^{12} - 1 \\ &= (1 + 0.02)^{12} - 1 \\ &= 0.2682 \\ &= 26.82\% \end{aligned}$$

16. For the month of November, the unpaid balance on Alissa's credit card statement was \$1816.22. She purchased \$435.85 and made a payment of \$400 during the month. If the interest is 1.8% on the unpaid balance, what is her new balance on December 1st, and what is the annual percentage rate?

Beginning Nov' balance \$ 1816.22

Purchases are \$ 435.85

Payment \$ 400

$$\begin{aligned} \text{New Balance } 1816.22 + 435.85 \\ - 400 = \$ 1852.07 \end{aligned}$$

$$\begin{aligned} \text{Interest } \$ 1852.07 (0.018) \\ = \$ 33.34 \end{aligned}$$

$$\begin{aligned} \text{Balance Dec } \$ 1852.07 + \$ 33.34 \\ = 1885.41 \end{aligned}$$

now

$$\begin{aligned} r_{\text{annual}} &= (1 + r_{\text{monthly}})^{12} - 1 \\ &= (1 + 0.018)^{12} - 1 \\ &= 0.2387 \\ &= 23.87\% \end{aligned}$$