

Chapter Review Problems

Unless noted otherwise, use 2 decimal places for answers.

Unit 12.1 Cost of installment buying

For Problems 1–3, calculate the payment.

	Loan amount	Frequency	Term	Rate	Payment
1.	\$15,000	Semiannually	5 years	8.5%	\$1,872.45
2.	750,000 Japanese yen	Quarterly	10 years	10.5%	¥30,509.53
3.	45,000 British pounds	Monthly	8 months	19.5%	£6,044.06

N	i	PV	PMT	FV
$5 \times 2 = 10$	$8.5 \div 2 = 4.25$	15,000	-1,872.45	
$10 \times 4 = 40$	$10.5 \div 4 = 2.625$	750,000	-30,509.53	
8	$19.5 \div 12 = 1.625$	45,000	-6,044.06	

4. Refer to the following ad. Which payments, if any, are stated incorrectly?

NEW COMPACT \$16,399 <small>13977</small> Pmt \$355.74	NEW 1/2 TON 4X4 PU \$24,249 <small>17975</small> Pmt \$526.02	NEW CUSTOM VAN \$27,999 <small>18078</small> Pmt \$607.37
<small>Note: All payments based on 10.9% loan for 60 months. Buyer must pay tax & license in cash.</small>		

N	i	PV	PMT	FV
60	$10.9 \div 12 = 0.908\bar{3}$	16,399	-355.74	
↑	↑	24,249	-526.02	
↑	↑	27,999	-607.37	

None; all payments are stated correctly.

5. If you purchase a video camera for \$900 and the store finances the entire amount over 24 months at a monthly rate of 1.75%, what is your monthly payment?

N	i	PV	PMT	FV
24	1.75	900	-46.25	

6. Mr. Farmer, who lives in California, purchases some farm equipment and asks his bank for a 10-year \$75,000 loan at 9.5% interest. Mr. Farmer harvests his crops each 4 months, and the bank wants payments scheduled accordingly. What will his payment be?

N	i	PV	PMT	FV
$10 \times 3 = 30$	$9.5 \div 3 = 3.1\bar{6}$	75,000	-3,909.34	

For Problems 7–10, assume that you are thinking about buying a sports car.

7. The sports car you have in mind is priced at \$28,500. You must pay tax and license fees of \$1,700. You have \$3,000. Your bank will make you a loan at 7.2% for 4 years. They charge a \$300 origination fee for making the loan, which they will add to the loan amount. If you use your \$3,000 toward the purchase, how much will you need to borrow?

Purchase price	\$28,500
Tax and license fees	1,700
Origination fee	+ 300
Total cost	\$30,500
Less down payment	- 3,000
Required loan	\$27,500

8. Determine your monthly payment.

N	i	PV	PMT	FV
$4 \times 12 = 48$	$7.2 \div 12 = 0.60$	27,500	-661.08	

9. What is your total finance charge?

Step 1	Total of all payments: $48 \times \$661.08$	\$31,731.84
Step 2	Less loan amount	-27,500.00
	Interest portion of payments	\$ 4,231.84
Step 3	Plus prepaid loan costs	+ 300.00
	Total finance charges	\$ 4,531.84

10. What is the total cost of the car, including finance charges?

Step 1	Cost of the purchase: $\$28,500 + \$1,700$ tax and license	\$30,200.00
Step 2	Add finance charges (from Problem 9)	+ 4,531.84
	Total cost, including finance charges	\$34,731.84

Unit 12.2 Annual percentage rate (APR)

11. In Problem 7, you are thinking about getting a \$27,500 loan for 4 years at 7.2% interest. Your bank will withhold \$300 for an origination fee. What is the APR?

N	i	PV	PMT	FV
$4 \times 12 = 48$	$7.2 \div 12 = 0.60$	27,500	-661.08	
↑	$0.65 \times 12 \approx 7.77$	27,200	↑	

12. You buy some furniture for \$2,500. You pay \$350 down and the retailer finances the remainder with 36 monthly payments of \$77.64. Calculate your APR.

N	i	PV	PMT	FV
36	$1.49 \times 12 \approx 17.92$	2,150	-77.64	

13. You buy a used pick-up truck from a friend for \$4,000. Your friend agrees to finance the entire amount with payments of \$135 per month for 36 months, starting in 1 month. If you can borrow the \$4,000 from your credit union at 11.75%, should you do so? Explain your answer by determining the rate that your friend is charging.

N	i	PV	PMT	FV
36	$1.09 \times 12 \approx 13.12$	4,000	-135	

You should borrow from your credit union at 11.75% because your friend is charging you 13.12% interest.

14. You buy some furniture for \$800. The retailer finances the entire amount for 1 year and says you will be charged 10% interest. However, the retailer uses the add-on method. First calculate your monthly payment. Then calculate the real rate you are paying.

Step 1 (dollar amount of interest): $I = PRT = \$800 \times 10\% \times 1 = \80.00

Step 2 (add to loan amount): $\$800 + \$80 = \$880$

Step 3 (divide by total number of payments): $\$880 \div 12 = \73.33

N	i	PV	PMT	FV
12	$1.50 \times 12 \approx 17.96$	800	-73.33*	

*Note: Entered as a rounded amount (not the unrounded result of Step 3, above).

15. You just received your insurance bill for your home. The company gives you a choice of (1) paying the \$272 annual premium now or (2) paying the premium in four equal quarterly installments (starting today). If you elect option 2, a \$5 carrying charge will be added to each quarterly payment. What interest rate will you be paying if you elect option 2?

N	i	PV	PMT	FV
4	$4.95 \times 4 \approx 19.78$	272	-73* Begin	

*Note: $PMT = (\$272 \div 4) + \$5 = \$68 + \$5 = \$73$. Don't forget to put back in "end" mode when finished.

Unit 12.3 Paying off an installment loan

16. Interest is always more during the latter part of an installment loan. (T or F) **False.** Because interest is figured on the unpaid balance, interest decreases as the loan balance goes down.
17. You get a \$12,000 car loan at 8.9% interest. Calculate the monthly payments assuming you pay off the loan over (a) 3 years, (b) 4 years, and (c) 5 years.

N	i	PV	PMT	FV
$3 \times 12 = 36$	$8.9 \div 12 = 0.741\bar{6}$	12,000	-381.04	
$4 \times 12 = 48$	↑	↑	-298.05	
$5 \times 12 = 60$	↑	↑	-248.52	

18. Refer to Problem 17. How many months will it take to pay off the loan if you pay \$450 per month? Use 5 decimal places in your answer.

N	i	PV	PMT	FV
29.82281 months	↑	↑	-450	

19. Refer to Problems 17 and 18. Figure the total interest you would pay for each of the four situations.

Monthly payment	Total amount paid	Interest portion
\$450.00	$\$450 \times 29.82281 = \$13,420.26$	$\$13,420.26 - \$12,000 = \$1,420.26$
\$381.04	$\$381.04 \times 36 = \$13,717.44$	$\$13,717.44 - \$12,000 = \$1,717.44$
\$298.05	$\$298.05 \times 48 = \$14,306.40$	$\$14,306.40 - \$12,000 = \$2,306.40$
\$248.52	$\$248.52 \times 60 = \$14,911.20$	$\$14,911.20 - \$12,000 = \$2,911.20$

20. Kelly McGrath's car loan balance is \$3,710.69. Her monthly payment is \$222 and the interest rate is 9.5%. How many payments does she have left?

N	i	PV	PMT	FV
18 months	$9.5 \div 12 = 0.791\bar{6}$	3,710.69	-222	

For Problems 21 and 22, assume you buy a motorcycle on July 1 for \$1,500 with \$500 down. You agree to pay the seller the remaining \$1,000 at 9% with four monthly payments. The first payment is due August 1.

21. Calculate the monthly payment.

N	i	PV	PMT	FV
4	$9 \div 12 = 0.75$	1,000	-254.71	

22. Calculate interest, principal, and remaining balance for each payment using the U.S. Rule. Payment dates are shown in the table. Remember, the final payment may be slightly different because of rounding and actual payment date.

Due date	Date received	Total payment	Interest	Principal	Balance
July 1	(Start)	—	—	—	\$1,000.00
Aug. 1	July 28	\$254.71	\$6.66	\$248.05	\$751.95
Sep. 1	Aug. 29	\$254.71	\$5.93	\$248.78	\$503.17
Oct. 1	Sep. 27	\$254.71	\$3.60	\$251.11	\$252.06
Nov. 1	Nov. 1	\$254.24	\$2.18	\$252.06	\$0.00

Procedure for August 1 payment

Number of days: $28 - 1 = 27$

Interest: $I = PRT = \$1,000 \times 9\% \times \frac{27}{365} = \6.66

Principal: $\$254.71 - \$6.66 = \$248.05$

New balance: $\$1,000 - \$248.05 = \$751.95$

Procedure for November 1 payment

Number of days: 3 days in Sep. + 31 days in Oct. + 1 day in Nov. = 35

Interest: $I = PRT = \$252.06 \times 9\% \times \frac{35}{365} = \2.18

Principal: \$252.06 (previous balance)

Total payment: $\$2.18 + \$252.06 = \$254.24$

23. Amir Rafati has been making payments on his 13.5% boat loan for what seems like forever! Amir made a payment October 1. His balance after that payment was \$2,182.64. He just sold some stock and decides to use part of the money to pay off the boat loan on October 27. Calculate the payoff amount.

Due date	Date received	Total payment	Interest	Principal	Balance
Oct. 1	Oct. 1	—	—	—	\$2,182.64
—	Oct. 27	\$2,203.63	\$20.99	\$2,182.64	\$0.00

Procedure for October 27 payment

Number of days: $27 - 1 = 26$

Interest: $I = PRT = \$2,182.64 \times 13.5\% \times \frac{26}{365} = \20.99

Principal: \$2,182.64 (previous balance)

Total payment: $\$20.99 + \$2,182.64 = \$2,203.63$

Unit 12.4 Open-end credit

24. For an annual rate of 13%, find (a) the monthly periodic rate and (b) the daily periodic rate (using a 365-day year). Express each rate with 6 decimal places.

a. $\frac{13}{12} \approx 1.083333(\%)$

b. $\frac{13}{365} \approx 0.035616(\%)$

25. You are thinking about getting a credit card. One credit card company charges interest at 1.75% per month. Another charges interest at 15.9% per year. Which rate is lower?

Let's convert the 1.75% periodic rate to an annual rate: $1.75 \times 12 = 21.00$ So, the 15.9% rate is lower.

26. You have a charge card. You receive a bill dated July 10. Your previous bill was dated June 10. Calculate your average daily balance.

Charge card statement: July 10			
Date	Item	Amount	New balance
6/11	Previous balance brought forward		\$420
6/18	Charge	\$50	\$470
6/24	Payment	\$150 Credit	\$320
6/30	Charge	\$80	\$400
7/5	Charge	\$40	\$440

Number of days		Balance	=	Subtotal
7 (June 11, 12, 13, 14, 15, 16, 17)	×	\$420	=	\$ 2,940
6 (June 18, 19, 20, 21, 22, 23)	×	470	=	2,820
6 (June 24, 25, 26, 27, 28, 29)	×	320	=	1,920
5 (June 30, July 1, 2, 3, 4)	×	400	=	2,000
<u>+ 6 (July 5, 6, 7, 8, 9, 10)</u>	×	<u>440</u>	=	<u>+ 2,640</u>
30				\$12,320

$$\text{Average daily balance} = \frac{\$12,320}{30} = \$410.67$$

27. Refer to Problem 26. Calculate the monthly finance charge, assuming you are charged a monthly periodic rate of 1.25%.

$$\$410.67 \text{ (average daily balance)} \times 1.25\% = \$5.13$$

28. Your credit card balance is \$1,277. You are charged interest at 1.25% per month and are required to make a minimum payment of \$20. You decide to quit using your credit card and pay off the balance by making the minimum payment. How many months will it take until the balance is paid off?

N	i	PV	PMT	FV
128.81 months	1.25	1,277	-20	

29. Calculate the finance charge on a home equity loan based on an average daily balance of \$48,700 during a 31-day billing period. The lender charges 8.75% interest and calculates interest based on the resulting daily periodic rate. Assume a 365-day year and round the daily periodic rate to 8 decimal places.

$$\text{Daily periodic rate: } \frac{8.75}{365} \approx 0.02397260(\%) \quad \text{Interest} = \$48,700 \times 0.02397260\% \times 31 = \$361.91$$

Challenge problems

30. Calculate the term for an 8% \$500 loan with monthly payments of \$5.

N	i	PV	PMT	FV
165.34 months	$8 \div 12 = 0.6\bar{6}$	500	-5	

31. Refer to Problem 30. Calculate the term with monthly payments of \$10.

N	i	PV	PMT	FV
61.02 months	↑	↑	-10	

32. Refer to Problems 30 and 31. By doubling the monthly payment, do you exactly halve the term? Explain why or why not.

No. The extra \$5 a month applies entirely to principal, reducing the balance more quickly.

33. You have just made your \$326.14 monthly payment on your 11% car loan. Your balance, after the payment, is \$13,841.90. How many months will it take to pay off the loan?

N	i	PV	PMT	FV
54 months	$11 \div 12 = 0.91\bar{6}$	13,841.90	-326.14	

34. Refer to Problem 33. You just received an income tax refund of \$834. If you apply the refund as an extra principal payment immediately after making the above monthly payment, how many monthly payments will you save?

N	i	PV	PMT	FV
49.87 months	↑	13,007.90*	↑	

*Note: \$13,841.90 - \$834 extra principal = \$13,007.90

The loan term will be reduced by 4.13 months (54 months before making the extra payment - 49.87 months = 4.13 months).

35. You see a car advertisement, showing the dealer will give the buyer either (a) a \$3,500 cash rebate, or (b) 2.9% financing for 5 years. The dealer's price (before rebate) is \$25,500, and the current interest rate on 5-year car loans is 8.5%. Calculate a monthly payment for each choice, assuming that you use the cash rebate to reduce the loan amount.

	N	i	PV	PMT	FV
a. Rebate	$5 \times 12 = 60$	$8.5 \div 12 = 0.708\bar{3}$	22,000*	-451.36	
b. 2.9%	↑	$2.9 \div 12 \approx 0.24$	25,500	-457.07	

*Note: \$25,500 - \$3,500 rebate = \$22,000

Practice Test

1. Find the monthly payment for a 66-month 4.75% car loan for \$15,500.

N	i	PV	PMT	FV
66	$4.75 \div 12 = 0.3958\bar{3}$	15,500	-267.32	

2. You buy a truck for \$22,200. You must also pay tax and license fees of \$1,500. You borrow \$20,000 at 6% interest for 5 years with monthly payments. What is the total cost of the truck, including tax and license fees and finance charges?

N	i	PV	PMT	FV
$5 \times 12 = 60$	$6 \div 12 = 0.50$	20,000	-386.66	

Finance charge

Step 1 Total of all payments: $60 \times \$386.66$ \$23,199.60

Step 2 Less loan amount -20,000.00

Interest portion of payments \$ 3,199.60

Total cost

Step 1 Cost of the purchase: \$22,200 + \$1,500 tax and license \$23,700.00

Step 2 Add finance charge (above) + 3,199.60

Total cost **\$26,899.60**

3. You get a \$2,000 furniture loan at 9% interest, to be repaid with monthly payments over 2 years. The lender charges you a \$200 set-up fee. What is the APR?

N	i	PV	PMT	FV
$2 \times 12 = 24$	$9 \div 12 = 0.75$	2,000	-91.37	
↑	$1.64 \times 12 \approx 19.72$	1,800	↑	

4. You get a 12-month \$4,000 loan at 12% interest using the add-on method. Calculate the APR.

Step 1 (dollar amount of interest): $I = PRT = \$4,000 \times 12\% \times 1 = \480

Step 2 (add to loan amount): $\$4,000 + \$480 = \$4,480$

Step 3 (divide by total number of payments): $\$4,480 \div 12 = \373.33

N	i	PV	PMT	FV
12	$1.79 \times 12 \approx 21.46$	4,000	-373.33	

5. You get a sewer bill in which the utility company offers you the choice of paying a \$36 annual fee today or four quarterly installments of \$12 starting today. What annual rate of interest will you be paying if you elect to pay \$12 per quarter?

N	i	PV	PMT	FV
4	$23.38 \times 4 \approx 93.50$	36	-12 Begin*	

*Note: Don't forget to put back in "end" mode.

6. You buy a boat from an individual for \$18,000. You pay \$3,000 down, and the seller finances the remaining \$15,000 at 13.5% interest. If you pay \$500 per month, how many months will it take to pay off the loan?

N	i	PV	PMT	FV
36.80 months	$13.5 \div 12 \approx 1.13$	15,000	-500	

7. On November 18, you get a 10% \$2,400 furniture loan with monthly payments of \$100. Your first payment is due December 18. What is the balance after your first payment, assuming the lender receives your payment on December 16?

Due date	Date received	Total payment	Interest	Principal	Balance
Nov. 18	(Start)	—	—	—	\$2,400.00
Dec. 18	Dec. 16	\$100.00	\$18.41	\$81.59	\$2,318.41

Procedure

Number of days: 12 days in Nov. ($30 - 18 = 12$) + 16 days in Dec. = 28

Interest: $I = PRT = \$2,400 \times 10\% \times \frac{28}{365} = \18.41

Principal: $\$100 - \$18.41 = \$81.59$

New balance: $\$2,400 - \$81.59 = \$2,318.41$

8. On May 24, Whitney Nickle made a payment on her 7.9% car loan. After making the payment, the balance was \$1,489.23. Whitney got her income tax refund, and on June 2 she pays off the loan. What is the payoff amount?

Due date	Date received	Total payment	Interest	Principal	Balance
—	May 24	—	—	—	\$1,489.23
—	June 2	\$1,492.13	\$2.90	\$1,489.23	\$0.00

Procedure

Number of days: 7 days in May ($31 - 24 = 7$) + 2 days in Jun. = 9

Interest: $I = PRT = \$1,489.23 \times 7.9\% \times \frac{9}{365} = \2.90

Principal: \$1,489.23 (previous balance)

Total payment: $\$2.90 + \$1,489.23 = \$1,492.13$

9. Calculate the finance charge on a home equity loan based on an average daily balance of \$92,817 during a 30-day billing period. The lender charges 8.5% interest and calculates interest based on a daily periodic rate. Assume a 365-day year and round the daily periodic rate to 8 decimal places.

Daily periodic rate: $\frac{8.5}{365} \approx 0.02328767(\%)$ Interest = $\$92,817 \times 0.02328767\% \times 30 = \648.45