

Section 8.5 Summary

Installment Buying

Installment Buying

a. A fixed installment loan is paid off with a series of equal periodic payments. An open-end installment loan is paid off with variable monthly payments. Credit card loans are open-end installment loans.

b. Terms of fixed installment loans:

The **amount financed** is what the consumer borrows:

$$\text{Amount financed} = \text{Cash price} - \text{Down payment.}$$

The **total installment price** is the sum of all monthly payments plus the down payment:

$$\text{Total installment price} = \text{Total of all monthly payments} + \text{Down payment}$$

The **finance charge** is the interest on the installment loan:

$$\text{Finance charge} = \text{Total installment price} - \text{Cash price.}$$

c. The interest rate per year on a loan is called the annual percentage rate (APR).

d. Steps for finding annual percentage rate using an APR table:

1. Compute the finance charge per \$100 financed: $\frac{\text{Finance charge}}{\text{Amount financed}} \times \$100.$
2. Look in the row corresponding to the number of payments to be made. Find the entry closest to the value in step 1.
3. Find the APR at the top of the column in which the entry from step 2 is found.

Number of Monthly Payments	Annual Percentage Rate (APR)					
	11.0%	11.5%	12.0%	12.5%	13.0%	13.5%
	(Finance charge per \$100 of amount financed)					
12	\$6.06	\$6.34	\$6.62	\$6.90	\$7.18	\$7.46
24	\$11.86	\$12.42	\$12.98	\$13.54	\$14.10	\$14.66
36	\$17.86	\$18.71	\$19.57	\$20.43	\$21.30	\$22.17
48	\$24.06	\$25.23	\$26.40	\$27.58	\$28.77	\$29.97
60	\$30.45	\$31.96	\$33.47	\$34.99	\$36.52	\$38.06

- e. Unearned interest is the amount by which the original finance charge is reduced when a fixed installment loan is paid off early. The two methods for computing unearned interest are explained in the following box.

Actuarial Method	Rule of 78
$u = \frac{kRV}{100 + V}$	$u = \frac{k(k+1)}{n(n+1)} \times F$
u = unearned interest k = remaining number of scheduled payments (excluding current payment) R = regular monthly payment V = finance charge per \$100 (from the APR table) for a loan with the same APR and k monthly payments	u = unearned interest k = remaining number of scheduled payments (excluding current payment) n = original number of payments F = original finance charge

- f. Open-end installment loans such as credit cards calculate interest, I , using the simple interest formula $I = Prt$. For all three of the following methods r is the monthly rate, t is one month, and P is explained below.

Unpaid balance method: The principal, P , is the balance on the first day of the billing period less payments and credits.

Previous balance method: The principal, P , is the unpaid balance on the first day of the billing period.

Average daily balance method: The principal, P , is the average daily balance. This is determined by adding the unpaid balances for each day in the billing period and dividing by the number of days in the billing period.

Example 1

The cost of a new car is \$16,500. We can finance the purchase by paying \$500 down and \$350 per month for 60 months.

- Determine the amount financed.
- Determine the total installment price.
- Determine the finance charge.
- Use the table from the previous page to find the APR for this loan.

Solution:

$$\text{a. Amount financed} = \overbrace{\$16,500}^{\text{cash price}} - \overbrace{\$500}^{\text{down payment}} = \overbrace{\$16,000}^{\text{amount financed}}$$

$$\text{b. Total installment price} = \overbrace{60(\$350)}^{\text{total of monthly payments}} + \overbrace{\$500}^{\text{down payment}} = \overbrace{\$21,500}^{\text{total installment price}}$$

$$\text{c. Finance charge} = \overbrace{\$21,500}^{\text{total installment price}} - \overbrace{\$16,500}^{\text{cash price}} = \overbrace{\$5000}^{\text{finance charge}}$$

d. First, compute the finance charge per \$100 financed.

$$\begin{aligned} \text{Finance charge per } \$100 &= \frac{\text{Finance charge}}{\text{Amount financed}} \times \$100 \\ &= \frac{\$5000}{\$16,000} \times \$100 \\ &= \$31.25 \end{aligned}$$

Next, look for the value that is closest to \$31.25 in the 60-month row of the APR table. Since \$31.25 is closest to \$31.96, look for the interest rate at the top of that column. The APR is approximately 11.5%.

Example 2

In Example 1, instead of making the forty-eighth payment, the borrower decides to pay the remaining balance and terminate the loan for the car. Calculate how much interest is saved by repaying the loan early. Use both the Actuarial Method and the Rule of 78. Then find the total amount due on the day of the loan's termination based on the two different methods.

Solution:

Actuarial Method	Rule of 78
<p>Interest saved:</p> <p>There are 12 remaining payments so $k = 12$. The regular monthly payment $R = \\$350$. The APR table shows that the finance charge per \$100 for a loan with an APR of 11.5% and 12 monthly payments is $V = \\$6.34$.</p> <p>Substitute the above values into the formula:</p> $u = \frac{kRV}{100 + V}$ $= \frac{(12)(350)(6.34)}{100 + 6.34}$ $\approx \$250.40$ <p>Using the actuarial method, the borrower saves \$250.40.</p>	<p>Interest saved:</p> <p>There are 12 remaining payments so $k = 12$. The original # of monthly payments, n, is 60. The original finance charge, F, is \$5000.</p> <p>Substitute the above values into the formula:</p> $u = \frac{k(k+1)}{n(n+1)} \times F$ $= \frac{12(12+1)}{60(60+1)} \times 5000$ $\approx \$213.11$ <p>Using the Rule of 78, the borrower saves \$213.11.</p>
<p>Payoff amount:</p> $\begin{array}{r} \text{48th payment} \\ \text{total of remaining payments after 48} \\ \text{interest saved} \end{array}$ $= \underbrace{\$350} + \underbrace{(12)(\$350)} - \underbrace{\$250.40}$ $= \$4299.60$ <p>Using the actuarial method, the payoff amount would be \$4299.60</p>	<p>Payoff amount:</p> $\begin{array}{r} \text{48th payment} \\ \text{total of remaining payments after 48} \\ \text{interest saved} \end{array}$ $= \underbrace{\$350} + \underbrace{(12)(\$350)} - \underbrace{\$213.11}$ $= \$4336.89$ <p>Using the Rule of 78, the payoff amount would be \$4336.89</p>

Example 3

The terms of a particular credit card are based on the unpaid balance method. The monthly interest rate is 1.5% on the unpaid balance on the first day of the billing period less payments and credits. Here are some of the details in the June 1–June 30 itemized billing:

June 1 Unpaid Balance: \$1300

Payment Received June 4: \$200

Purchases Charged to the Account: airline ticket, \$380; car repair, \$120; groceries, \$140

Last Day of Billing Period: June 30

Due Date: July 9

- Find the interest due on the payment due date.
- Find the total balance owed on the last day of the billing period.
- Terms for the credit card require a \$10 minimum monthly payment if the balance due is less than \$360. Otherwise, the minimum monthly payment is $\frac{1}{36}$ of the balance due, rounded to the nearest whole dollar. What is the minimum monthly payment due by July 9?

Solution:

- First, since interest on this credit card is calculated by using the unpaid balance method, we must find the unpaid balance.

$$\text{Unpaid balance: } P = \underbrace{\text{balance on the first day of the billing period}}_{\$1300} - \underbrace{\text{payments and credits}}_{\$200} = \underbrace{\text{Unpaid balance}}_{\$1100}$$

Next, find the simple interest with $r = 1.5\%$, t is one month, and $P = \$1100$.

Note: Do not use $\frac{1}{12}$ years for t . Since r is a monthly rate, t must also be given in months.

$$\begin{aligned} I &= Prt \\ &= (\$1100)(0.015)(1) \\ &= \$16.50 \end{aligned}$$

$$\text{b. Balance due} = \underbrace{\text{unpaid balance on first day of billing period}}_{\$1100} + \underbrace{\text{charges for items purchased during this billing period}}_{\$380 + \$120 + \$140} + \underbrace{\text{finance charge (interest)}}_{\$16.50} = \underbrace{\text{Balance due}}_{\$1756.50}$$

$$\begin{aligned} \text{c. Minimum monthly payment} &= \left(\frac{1}{36}\right)(\$1756.50) \\ &\approx \$49 \end{aligned}$$

Section 8.5 Worksheet

Name _____

For Exercises 1 and 2, solve the problem. Round answers to the nearest dollar.

1. The cost of a boat is \$34,000. Arthur finances this by paying \$5000 down and \$998.89 per month for 36 months.

- a. Determine the amount financed.

- b. Determine the total installment price.

- c. Determine the finance charge.

2. The cost of a home entertainment center is \$4700. We can finance this by paying \$300 down and \$388.67 per month for 12 months.

- a. Determine the amount financed.

- b. Determine the total installment price.

- c. Determine the finance charge.

3. A used car is financed for \$8442 over 60 months. If the total finance charge is \$3123, find the APR for this loan using the APR table given in the Summary.

4. The cash price for replacing all the water pipes and water fixtures in the house is \$6400. This can be financed by paying \$1200 down and \$176.23 per month for 36 months.

a. Determine the amount financed.

b. Determine the total installment price.

c. Determine the finance charge.

d. What is the APR for this loan?

6. A particular VISA credit card calculates interest using the unpaid balance method. The monthly interest rate is 1.57% on the unpaid balance on the first day of the billing period less payments and credits. Here are some of the details in the July 1–July 31 itemized billing:

July 1 Unpaid Balance: \$1552

Payment Received July 10: \$300

Purchases Charged to the VISA Account: meals, \$80; movie tickets, \$37; computer monitor, \$350

Last Day of the Billing Period: July 31

Payment Due Date: August 9

- a. Find the interest due on the payment due date.

- b. Find the total balance owed on the last day of the billing period.

- c. This credit card requires a \$10 minimum monthly payment if the total balance owed on the last day of the billing period is less than \$360. Otherwise, the minimum monthly payment is $\frac{1}{36}$ of the balance owed on the last day of the billing period, rounded to the nearest whole dollar. What is the minimum monthly payment due by August 9.