

- 30.-42. Recalculate Exercises 4-16 to reflect late fees of \$20.00 in months 3 and 9 and an annual fee of \$40.00 in month 8.
- 43.-55. Recalculate Exercises 17-29 to reflect late fees of \$15.00 in months 2, 4 and 9 and an annual fee of \$30.00 in month 10.

MIXED REVIEW

1. If you earn \$25,900.00 and your FICA withholding is 7.65% of your earnings, how much do you pay for Social Security and Medicare?
2. If you can afford a monthly payment of \$285, how much money can you borrow at 8.75% for 5 years?
3. Determine the monthly payment that must be made to reduce a \$2599.90 VISA balance to zero in 42 months if the card carries an APR of 14.5%.
4. Determine the effective rate of interest on a credit card purchase if the APR is 17.9%.
5. How much money can you save by financing a \$215,000 mortgage at 7.5% over 15 years rather than 30 years?
6. How much money can you save by financing a \$10,500 car at 9% over 3 years rather than 5 years?

A cookie factory makes at least 2000 plain cookies per day and at least 3000 chocolate chip cookies per day. However, the packaging machinery cannot process more than 7500 cookies per day. The profit on each plain cookie is \$0.20 and \$0.25 on each chocolate chip cookie. Let x and y represent the number of plain and chocolate chip cookies, respectively, that are produced each day.

7. Write the objective function for the profit on the day's production of cookies.
8. Write the inequalities to express the constraints.
9. Graph the inequalities and use the graph to find the number of plain and chocolate chip cookies that gives the greatest profit.

Matilda wants to have a stereo system that costs \$700. The store offers to let her purchase the set with an installment loan at 12.5% over 2 years. They also offer her a rent-to-own credit plan that allows her to rent the set for a fixed number of months and to apply all of the rent payments to the purchase price. Find the cost of each of the following rental options.

10. \$35 per month for 24 months with no other payment required
11. \$24 per month for 24 months with no other payment required
12. \$30 per month for 24 months with an additional payment of \$50 due at the end of the 24 months
13. Which, if any, of the rental options is a better deal than the installment loan?



Ursula likes her job as a sales clerk at Joyful Toys. There is only one part of her job that she does not enjoy doing. Each time a customer presents a credit card for a purchase, Ursula must verify that the customer's bank will approve the charge. Sometimes the credit is denied. Ursula does not like to inform a customer of this fact.

One time a customer became angry with Ursula when she told him that his credit was denied. He acted as though she was at fault. He yelled at her and demanded to see the store manager. As he left, he hurled a handful of action figures and a model rocket toward the display case, knocking over a tower of blocks and almost breaking the glass. The store manager did not blame Ursula for the mess or for the fact that several customers left while all this was happening. Nevertheless the incident made her feel very uncomfortable.

The bank that issues a customer's credit card may refuse to pay Joyful Toys if Ursula or another clerk neglects to verify the customer's credit. If that happens, Joyful Toys will lose the entire cost of the items that are purchased. The store already pays a service fee to the bank each time a purchase with a bank card is made.

When Ursula handles a customer's credit card, she must be careful to process the information correctly. After verifying the charge with the customer's bank, she makes an imprint of the card on the sales slip. She circles the expiration date on the sales slip. Ursula then asks the customer to sign the sales slip and compares the customer's signature on the sales slip with the signature on the card. She can then be satisfied that she has done everything possible to verify the customer's right to use the card.

OBJECTIVES: In this lesson, we will help Ursula to:

- Identify costs paid by retailers for selling on credit.
- Find the average daily balance of a credit card account for the month.
- Explore how the timing of a monthly payment affects the interest charge.

THE COST TO RETAILERS OF ISSUING THEIR OWN CARDS

Retailers who issue their own cards to sell on credit incur additional costs on every sale. These costs are a result of the following factors:

- The clerical work necessary to record sales and collect payments
- Losses from customers who fail to make payments
- An increased tendency of charge customers to return goods for exchange

Retailers who neglect to investigate a customer's ability to pay are likely to have high losses from unpaid debts. Stores that recklessly advertise generous credit terms to everyone may have to raise their prices to offset their potential losses. Stores that have sound credit policies are likely to have few losses from customers who fail to make payments. Some retailers elect to accept MasterCard, VISA, or American Express instead of (or in addition to) extending their own credit.

Banks that issue all-purpose cards like VISA and MasterCard collect a percentage of every sale made on their cards from retailers. This charge provides some protection for the banks against the money they stand to lose if



the cardholders fail to pay for the purchases they charged. Even though the salesperson takes every precaution, a few illegitimate uses of cards are bound to slip through.

Banks also pass some of their costs on to their credit card customers by charging interest on unpaid balances. The maximum amount of interest that a bank can charge a customer is set by state laws. Differences in state interest rate limitations caused at least one large bank to move its national credit card operation from New York to South Dakota. In South Dakota the interest rate that a bank can charge is higher than it is in New York.

As was stated in Lesson 6-1, banks often allow customers a grace period before they must pay the bill. If they pay the bill on time, they can avoid interest charges. If cardholders do not wish to pay the entire balance due, they can make a minimum payment (on some types of credit card accounts) and pay interest charges on the remainder.

The amount of interest that a customer must pay is based upon the **average daily balance**, which is found by adding the unpaid balances for each day of the billing cycle and then dividing this number by the number of days in the billing cycle. In this chapter a billing cycle is assumed to be a calendar month. Customers can save money by making their payments as early in the month as is possible.

ALGEBRA REVIEW

When an *average* is to be determined from a number of scores in which some scores are repeated, the number of times a score is repeated is called the *frequency*.

Find the average of the following scores with the indicated frequencies.

Example:

Score	82	75	91
Frequency	3	2	4

$$\text{Average} = \frac{3(82) + 2(75) + 4(91)}{9} = 84.4$$

1.

Score	35	61	78
Frequency	5	3	2

2.

Score	468	721	325
Frequency	1	20	3

3.

Score	10.2	15.5	25.3
Frequency	18	5	2

4.

Score	804	246	760
Frequency	2	28	1

5.

Score	65	945	607
Frequency	20	4	6

ASK YOURSELF

1. Why do banks that issue cards such as MasterCard and VISA charge the retailers who accept these cards?
2. How is the average daily balance computed?
3. How is the maximum amount of interest that a bank can charge determined?

SHARPEN YOUR SKILLS

SKILL 1

The average daily balance b is determined by dividing the sum of the daily balances s by the total number of days d in the billing cycle.

Average Daily Balance Formula

$$b = \frac{s}{d} \quad \begin{array}{l} \text{where } b = \text{average daily balance} \\ s = \text{sum of the daily balances} \\ d = \text{total number of days in the billing cycle} \end{array}$$

EXAMPLE 1 Scott's MasterCard account has a monthly interest rate of 1.5%. He had the following daily balances and payments for the month of May:

From 5/1 through 5/16 his daily balance was \$385.00.

On 5/17 he made a payment of \$80.

From 5/18 through 5/31 his daily balance remained at \$305.00.

QUESTION What are the average daily balance, the monthly finance charge, and the ending balance during the month of May?

SOLUTION

Complete the following chart to find the sum of the daily balances.

Dates	Payment	Balance at End of Day	Number of Days	Sum of Daily Balances
5/1–5/16	0.00	\$385.00	16	\$ 6160.00
5/17	\$80.00	305.00	1	305.00
5/18–5/31	0.00	305.00	14	4270.00
			Total 31	\$10,735.00

$$b = \frac{s}{d} \quad \text{Use the average daily balance formula,}$$

$$b = \frac{10,735}{31}$$

$$b = 346.29 \quad \text{To the nearest cent}$$

$$\text{Average daily balance: } 10,735 \div 31 = 346.29$$

$$\text{Finance charge (May 17): } 0.015(346.29) = 5.19$$

$$\text{Ending balance for May: } 305.00 + 5.19 = 310.19$$

EXAMPLE 2 Scott always makes his MasterCard payments in the middle of the month when he receives his second bimonthly paycheck. He has often wondered whether the timing of his payment influences the amount he pays in monthly interest.

QUESTION What would his interest payment have been if he paid his May MasterCard bill on the first day of the month instead of on the seventeenth day? On the last day instead of the seventeenth day?

SOLUTION

Set up two charts similar to the chart in Example 1, one with a payment on May 1 and the other with a payment on May 31.



Dates	Payment	Balance at End of Day	Number of Days	Sum of Daily Balances
5/1	\$80.00	\$305.00	1	\$ 305.00
5/2–5/31	0.00	305.00	30	9150.00
			Total 31	\$9455.00

Average daily balance: $9455.00 \div 31 = 305.00$
 Finance charge (May 1): $0.015(305.00) = 4.58$
 Ending balance for May: $305.00 + 4.58 = 309.58$

Dates	Payment	Balance at End of Day	Number of Days	Sum of Daily Balances
5/1–5/30	0.00	\$385.00	30	\$11,550.00
5/31	\$80.00	305.00	1	305.00
			Total 31	\$11,855.00

Average daily balance: $11,855.00 \div 31 = 382.42$
 Finance charge (May 31): $0.015(382.42) = 5.74$
 Ending balance for May: $305.00 + 5.74 = 310.74$

Paying his bill on May 1 instead of May 17 saves: $5.19 - 4.58 = 0.61$
 Paying his bill on May 17 instead of May 31 saves: $5.74 - 5.19 = 0.55$
 Paying his bill on May 1 instead of May 31 saves: $5.74 - 4.58 = 1.16$

Although the savings in one month do not seem like a lot of money, they will be greater if your balance is larger. The savings accumulate over the months and years. Also, you may have many credit cards with balances. Therefore you can save a substantial amount of money on all of these cards by making credit card payments as early in the month as possible.

When finding the average daily balance be sure to use the correct number of days. Remember that April, June, September and November only have 30 days and February has 28 days unless it is a leap year.

SKILL 2

EXAMPLE 3 Consumers often make additional charges on their accounts each month. These additional charges affect the average daily balance in the account.

QUESTION If Scott had purchased a new jacket for \$50.00 on 5/11 in Example 1, what would have been his average daily balance, monthly interest charge, and ending balance?

SOLUTION

Use a spreadsheet program.



Dates	Payment	Purchase	Balance at End of Day	Number of Days	Sum of Daily Balances
5/1–5/10	0.00	0.00	\$385.00	10	\$ 3850.00
5/11	0.00	\$50.00	435.00	1	435.00
5/12–5/16	0.00	0.00	435.00	5	2175.00
5/17	\$80.00	0.00	355.00	1	355.00
5/18–5/31	0.00	0.00	355.00	14	4970.00
Total				31	\$11,785.00

Average daily balance: $11,785 \div 31 = 380.16$
 Finance charge (May 31): $0.015(380.16) = 5.70$
 Ending balance for May: $355.00 + 5.70 = 360.70$

TRY YOUR SKILLS

- Complete the following chart to determine the average daily balance, the finance charge, and the ending balance shown on Jerry's VISA statement for the month of September. Assume that his VISA card carries a monthly interest rate of 1.25%.

Dates	Payment	Balance at End of Day	Number of Days	Sum of Daily Balances
9/1–9/14	0.00	\$642.00	14	\$8988.00
9/15	\$75.00	567.00		
9/16–9/30	0.00	567.00		
Total				

- Average daily balance
- Finance charge
- Ending balance

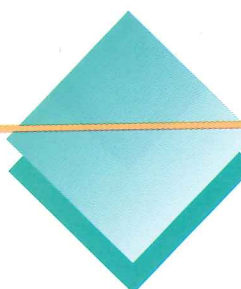
2. Complete the chart below to find how much Jerry can save if he makes his September payment on 9/1 instead of 9/15.

Dates	Payment	Balance at End of Day	Number of Days	Sum of Daily Balances
9/1	\$75.00	\$567.00	1	
9/2–9/30	0.00	567.00		
Total				

- a. Average daily balance b. Finance charge
 c. Ending balance
 d. How much can he save if he makes his payment on 9/1 instead of 9/15?
3. Complete the chart below to determine the average daily balance, the finance charge, and the ending balance shown on Savannah's VISA statement for the month of August. Assume that her VISA card carries a monthly interest rate of 1.75%.

Dates	Payment	Purchase	Balance at End of Day	Number of Days	Sum of Daily Balances
8/1–8/12	0.00	0.00	\$675.00	12	\$8100.00
8/13	\$95.00	0.00	580.00		
8/14–8/18	0.00	0.00			
8/19	0.00	\$60.00			
8/20–8/31	0.00	0.00			

- a. Average daily balance b. Finance charge
 c. Ending balance



KEY TERM
 average daily balance

EXERCISE YOUR SKILLS

1. Why does a clerk use a computer scanner to verify a customer's credit card before allowing the customer to use it for a purchase?
2. Does the day of the month on which you make a credit card payment influence the interest charge? Why or why not?



Complete each chart. Then determine the average daily balance, the finance charge, and the ending balance that will be shown on each monthly MasterCard statement. Assume that the card carries a monthly finance charge of 1.5%.

3.

Dates	Payment	Balance at End of Day	Number of Days	Sum of Daily Balances
1/1-1/7	0.00	\$1948.50	7	\$13,639.50
1/8	\$98.00	1850.50		
1/9-1/31	0.00	1850.50		

- a. Average daily balance b. Finance charge
c. Ending balance

4.

Dates	Payment	Balance at End of Day	Number of Days	Sum of Daily Balances
2/1-2/10	0.00	\$1878.59	10	
2/11	\$93.00	1785.59		
2/12-2/28	0.00	1785.59		

- a. Average daily balance b. Finance charge
c. Ending balance

5.

Dates	Payment	Balance at End of Day	Number of Days	Sum of Daily Balances
3/1-3/15	0.00	\$1812.87		
3/16	\$88.00	1724.87		
3/17-3/31	0.00	1724.87		

- a. Average daily balance b. Finance charge
c. Ending balance

6.

Dates	Payment	Balance at End of Day	Number of Days	Sum of Daily Balances
4/1-4/12	0.00	\$1751.38		
4/13	\$83.00	1668.38		
4/14-4/30	0.00	1668.38		

- a. Average daily balance b. Finance charge
c. Ending balance

7.

Dates	Payment	Balance at End of Day	Number of Days	Sum of Daily Balances
5/1–5/20	0.00	\$1693.90		
5/21	\$79.00	1614.90		
5/22–5/31	0.00	1614.90		

- a. Average daily balance b. Finance charge
 c. Ending balance

8.

Dates	Payment	Balance at End of Day	Number of Days	Sum of Daily Balances
6/1–6/13	0.00	\$1639.89		
6/14	\$75.00	1564.89		
6/15–6/30	0.00	1564.89		

- a. Average daily balance b. Finance charge
 c. Ending balance

9.

Dates	Payment	Balance at End of Day	Number of Days	Sum of Daily Balances
7/1–7/18	0.00	\$1588.85		
7/19	\$71.00	1517.85		
7/20–7/31	0.00	1517.85		

- a. Average daily balance b. Finance charge
 c. Ending balance

10.

Dates	Payment	Balance at End of Day	Number of Days	Sum of Daily Balances
8/1–8/9	0.00	\$1541.24		
8/10	\$68.00	1473.24		
8/11–8/31	0.00	1473.24		

- a. Average daily balance b. Finance charge
 c. Ending balance

11.

Dates	Payment	Balance at End of Day	Number of Days	Sum of Daily Balances
9/1–9/13	0.00	\$1495.63		
9/14	\$64.00	1431.63		
9/15–9/30	0.00	1431.63		

- a. Average daily balance b. Finance charge
 c. Ending balance

12.

Dates	Payment	Balance at End of Day	Number of Days	Sum of Daily Balances
10/1–10/21	0.00	\$1453.52		
10/22	\$61.00	1392.52		
10/23–10/31	0.00	1392.52		

- a. Average daily balance
- b. Finance charge
- c. Ending balance

13. If you pay the bill in Exercise 3 on the first day of the month, how much will you save?
14. If you pay the bill in Exercise 4 on the first day of the month, how much will you save?
15. If you pay the bill in Exercise 5 on the first day of the month, how much will you save?
16. If you pay the bill in Exercise 6 on the first day of the month, how much will you save?
17. If you pay the bill in Exercise 7 on the first day of the month, how much will you save?
18. If you pay the bill in Exercise 8 on the first day of the month, how much will you save?
19. If you pay the bill in Exercise 9 on the first day of the month, how much will you save?
20. If you pay the bill in Exercise 10 on the first day of the month, how much will you save?
21. If you pay the bill in Exercise 11 on the first day of the month, how much will you save?
22. If you pay the bill in Exercise 12 on the first day of the month, how much will you save?

Complete each chart to determine the average daily balance, the finance charge, and the ending balance shown on your VISA statement for the month. Assume that your VISA card carries a monthly interest rate of 1.25%

23.

Dates	Payment	Purchase	Balance at End of Day	Number of Days	Sum of Daily Balances
8/1–8/18	0.00	0.00	\$875.00		
8/19	\$90.00	0.00	785.00		
8/20–8/25	0.00	0.00			
8/26	0.00	\$135.00			
8/27–8/31	0.00	0.00			

- a. Average daily balance
- b. Finance charge
- c. Ending balance

24.

Dates	Payment	Purchase	Balance at End of Day	Number of Days	Sum of Daily Balances
2/1–2/11	0.00	0.00	\$500.00		
2/12	0.00	\$90.00	590.00		
2/13–2/20	0.00	0.00			
2/21	\$65.00	0.00			
2/22–2/28	0.00	0.00			

- a. Average daily balance b. Finance charge
c. Ending balance

25.

Dates	Payment	Purchase	Balance at End of Day	Number of Days	Sum of Daily Balances
4/1–4/8	0.00	0.00	\$1275.00		
4/9	0.00	\$225.00	1500.00		
4/10–4/17	0.00	0.00			
4/18	\$175.00	0.00			
4/19–4/30	0.00	0.00			

- a. Average daily balance b. Finance charge
c. Ending balance

MIXED REVIEW

- How much money can you save by financing an \$8800 car at 10.5% over 3 years rather than 5 years?
- A \$760.00 television purchase is financed at 15% per year with no down payment at a store that applies the Rule of 78. It must be paid in 12 equal installments. Determine the prepayment savings if it is prepaid after 5 months.
- If you buy a computer system for \$3500 and finance it at 18% over 2 years, how much will you save by making a down payment of 25% instead of 10%?
- What are your weekly earnings if you work 30.5 hours at \$14.75 per hour?
- Calculate the simple interest for one year on a \$1200 deposit earning 3.75%.
- Nancy always withdraws the interest on her savings account as soon as it is posted. Calculate the simple interest for three years on her original \$1200 deposit that earns 5% per year.
- If you buy a used automobile for \$7500 and finance it at 11% over 3 years, how much will you save by making a down payment of 25% instead of 10%?