B.3 Installment Loans

Essential Question How can you find the total amount of interest paid on an installment loan?

1 ACTIVITY: Monthly Loan Payments

Work with a partner.

You borrow $1000 for 6 months. Your annual interest rate is 12%, which means that your monthly interest rate is

$$\text{Monthly Interest Rate} = \frac{\text{Annual Interest Rate}}{\text{Months in a Year}} = \frac{0.12}{12} = 0.01.$$

LOAN STATEMENT	
Amount of Loan	$1000.00
Monthly Payment	$172.55
Annual Interest Rate	12.00%
Monthly Interest Rate	1.00%
Payment Due Date	1st of Month
Term	6 Months

a. Copy and complete the table.

t	Balance Before Payment	Monthly Payment	Monthly Interest	Balance After Payment
1	$1000.00	$172.55	$1000.00(0.01) = $10.00	$1000.00 − 172.55 + 10.00 = $837.45
2	$837.45	$172.55	$837.45(0.01) = $8.37	$837.45 − 172.55 + 8.37 = $673.27
3		$172.55		
4		$172.55		
5		$172.55		
6		$172.53		

b. How much interest do you pay during the 6 months?

c. How is your answer to part (b) related to the expression $6(172.55) - 1000$?

ACTIVITY: Finding the Total Interest Paid

Work with a partner. Use the result of Activity 1.

a. **CAR LOAN** You borrow $18,000 for a car. Make a table that shows about how much interest you pay for each annual interest rate and term.

Monthly Payments					
Term \ Annual Interest Rate	6%	8%	10%	12%	14%
36 months	$547.59	$564.05	$580.81	$597.86	$615.20
48 months	$422.73	$439.43	$456.53	$474.01	$491.88
60 months	$347.99	$364.98	$382.45	$400.40	$418.83
72 months	$298.31	$315.60	$333.47	$351.90	$370.90

b. **HOME MORTGAGE** You borrow $180,000 to buy a house. Make a table that shows about how much interest you pay for each annual interest rate and term.

Monthly Payments					
Term \ Annual Interest Rate	4%	6%	8%	10%	12%
20 years	$1090.76	$1289.58	$1505.59	$1737.04	$1981.96
30 years	$859.35	$1079.19	$1320.78	$1579.63	$1851.50
40 years	$752.29	$990.38	$1251.56	$1528.46	$1815.30
50 years	$694.27	$947.53	$1222.69	$1510.39	$1804.61

What Is Your Answer?

3. **IN YOUR OWN WORDS** How can you find the total amount of interest paid on an installment loan? Why is it important to search for low interest rates and short terms when you are applying for an installment loan?

Practice Use what you learned about installment loans to complete Exercise 3 on page A26.

Key Vocabulary 🔊

loan, *p. A24*
term, *p. A24*
installment loan,
 p. A24
mortgage, *p. A25*

A **loan** is money borrowed for a specified amount of time, called the **term** of the loan. The lender may add interest to the principal, increasing the total amount due. When the total amount due is paid back in equal increments over the term of the loan, it is called an **installment loan**.

EXAMPLE ① **Paying Interest on a Loan**

A student borrows money for college. The loan summary is shown below. How much interest is paid on the loan?

LOAN AMOUNT	$1450.00
MONTHLY PAYMENT AMOUNT	$250.20
ANNUAL INTEREST RATE	12% annual interest
TERM	6 months

Study Tip

Due to rounding, the last payment of an installment loan may be a few cents more or less than the regular monthly payment.

The annual interest rate is 12%. So, the monthly interest rate is $\frac{0.12}{12} = 0.01$.

Use a table to track the payment and the balance each month.

Balance Before Payment	Monthly Payment	Monthly Interest	Balance After Payment
$1450.00	$250.20	$1450.00(0.01) = $14.50	$1450.00 − 250.20 + 14.50 = $1214.30
$1214.30	$250.20	$1214.30(0.01) ≈ $12.14	$1214.30 − 250.20 + 12.14 = $976.24
$976.24	$250.20	$976.24(0.01) ≈ $9.76	$976.24 − 250.20 + 9.76 = $735.80
$735.80	$250.20	$735.80(0.01) ≈ $7.36	$735.80 − 250.20 + 7.36 = $492.96
$492.96	$250.20	$492.96(0.01) ≈ $4.93	$492.96 − 250.20 + 4.93 = $247.69
$247.69	$250.17	$247.69(0.01) ≈ $2.48	$247.69 − 250.17 + 2.48 = $0.00

Find the sum of the monthly interest totals in the table.

$14.50 + $12.14 + $9.76 + $7.36 + $4.93 + $2.48 = $51.17

∴ So, $51.17 in interest is paid on the loan.

● **On Your Own**

Now You're Ready
Exercises 4–7

1. In Example 1, the loan amount is $1750 and the monthly payment amount is $301.96. How much interest is paid on the loan?

🔊 **Multi-Language Glossary at BigIdeasMath.com.**

A **mortgage** is an installment loan used to buy a house. The term of a mortgage is usually greater than the terms of other types of loans.

EXAMPLE **2** **Paying a Mortgage**

The table shows loan options for a $100,000 mortgage. (a) How much interest is paid on each option? (b) Discuss an advantage and a disadvantage of the 15-year mortgage.

Monthly Payments		
Annual Interest Rate / Term	5%	7%
15 years	$790.79	$898.83
20 years	$659.96	$775.30
30 years	$536.82	$665.30

a. Find the number of monthly payments for each term.

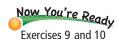| **15 years**	**20 years**	**30 years**
$15 \cdot 12 = 180$	$20 \cdot 12 = 240$	$30 \cdot 12 = 360$

Use a table to find the interest I paid on each option. The total amount paid for the mortgage is the product of the monthly payment and the number of payments. The interest paid is the difference of this product and the principal.

Total Interest Paid		
Annual Interest Rate / Term	5%	7%
15 years	$I = 180(790.79) - 100,000$ $= \$42,342.20$	$I = 180(898.83) - 100,000$ $= \$61,789.40$
20 years	$I = 240(659.96) - 100,000$ $= \$58,390.40$	$I = 240(775.30) - 100,000$ $= \$86,072.00$
30 years	$I = 360(536.82) - 100,000$ $= \$93,255.20$	$I = 360(665.30) - 100,000$ $= \$139,508.00$

b. You pay less interest with the 15-year mortgage than with the 20-year and 30-year mortgages, but the monthly payment for the 15-year mortgage is higher than the monthly payments for the 20-year and 30-year mortgages.

On Your Own

2. The principal on a home mortgage is $125,000, the monthly payment is $749.44, and the term is 30 years. How much interest is paid on the loan?

✓ Vocabulary and Concept Check

1. **VOCABULARY** Compare the principal of a loan and the total amount due.

2. **REASONING** As the term of a loan increases, what happens to the monthly payment? What happens to the total amount of interest paid?

Practice and Problem Solving

3. Copy and complete the table. How much interest do you pay during the 5 months? The annual interest rate is 12%

Balance Before Payment	Monthly Payment	Monthly Interest	Balance After Payment
$1135.00	$233.86		
	$233.86		
	$233.86		
	$233.86		
	$233.84		

A loan summary is shown. How much interest is paid on the loan?

1 **4.**

LOAN AMOUNT	$1020.00
MONTHLY PAYMENT	$176.00
ANNUAL INTEREST RATE	12% annual interest
TERM	6 months

5.

LOAN AMOUNT	$1635.00
MONTHLY PAYMENT	$277.29
ANNUAL INTEREST RATE	6% annual interest
TERM	6 months

6.

LOAN AMOUNT	$1500.00
MONTHLY PAYMENT	$129.10
ANNUAL INTEREST RATE	6% annual interest
TERM	12 months

7.

LOAN AMOUNT	$920.00
MONTHLY PAYMENT	$81.74
ANNUAL INTEREST RATE	12% annual interest
TERM	12 months

8. **ERROR ANALYSIS** Describe and correct the error in finding the balance after payment.

> ✗ Balance Before Payment: $1000
> Monthly Payment: $172.55
> Monthly Interest: $10
>
> Balance After Payment:
> $1000 − $172.55 − $10 = $817.45

The table shows loan options for a mortgage. How much interest is paid on each option?

9.

Monthly Payments $120,000 Mortgage		
Annual Interest Rate Term	5%	7%
20 years	$791.95	$930.36
25 years	$701.51	$848.14
30 years	$644.19	$798.36

10.

Monthly Payments $135,000 Mortgage		
Annual Interest Rate Term	4%	6%
20 years	$818.07	$967.18
25 years	$712.58	$869.81
30 years	$644.51	$809.39

11. TUITION You pay off a $15,000 college tuition loan in 10 years. The monthly payment is $166.53. What percent of the total amount paid is the interest on the loan?

12. CONDOMINIUM A luxury condominium in Miami Beach costs $13 million. The monthly payment for a 30-year mortgage on the condominium is $77,941.57. What percent of the total amount paid is the principal of the loan?

13. Critical Thinking You have $5000 in a savings account that earns 3.5% interest compounded annually. You need $16,000 to buy a car. What should you do? Explain.

- Let your savings earn interest for 3 years and get Loan A.
- Use your savings to get Loan B.

Loan A

APPLY NOW!
$16,000 for 36 months
7% annual interest rate
$494.03 monthly payment

Loan B

New Loan Special
$11,000 for 24 months
7% annual interest rate
$492.50 monthly payment

Fair Game Review *What you learned in previous grades & lessons*

Find the sum or difference.

14. $666.35 + 485.21$

15. $872.38 - 900.44$

16. MULTIPLE CHOICE Which data display is most appropriate for the information given in the table?

Ⓐ box-and-whisker plot

Ⓑ stem-and-leaf plot

Ⓒ circle graph

Ⓓ line graph

Year	Enrollment
2006	5042 students
2007	4921 students
2008	5198 students
2009	5003 students
2010	5117 students