

ALGEBRA REFRESHER

Solve each system of equations for x and y using substitution.

Example

$$x + y = 10 \quad (1)$$

$$2x - y = 8 \quad (2)$$

$$y = 10 - x \quad \text{Solve (1) for } y.$$

$$2x - (10 - x) = 8 \quad \text{Substitute } 10 - x \text{ for } y \text{ in (2).}$$

$$2x - 10 + x = 8 \quad \text{Simplify.}$$

$$3x = 18 \quad \text{Collect terms.}$$

$$x = 6$$

$$6 + y = 10 \quad \text{Substitute 6 for } x \text{ in (1).}$$

$$y = 4$$

The solution is $x = 6$ and $y = 4$. Check the solution in both original equations.

1. $x - 2y = 11$
 $2x + y = 7$

2. $2x + 3y = -1$
 $-5x - y = 9$

3. $x + y = 4$
 $x - y = 1$

4. $y = -2.5$
 $2x + 3y = 2.5$

A system of linear equations can also be solved using the addition and subtraction method. First multiply or divide one or both equations by numbers so that one pair of like terms has opposite coefficients. Then add or subtract the equations to eliminate one variable.

Solve each system of equations using the addition and subtraction method.

Example

$$x + y = 1 \quad (1)$$

$$2x + 5y = -4 \quad (2)$$

$$-2x - 2y = -2 \quad \text{Multiply equation (1) by } -2.$$

$$2x + 5y = -4 \quad \text{Equation (2)}$$

$$3y = -6 \quad \text{Add equations.}$$

$$y = -2 \quad \text{Divide by 3.}$$

$$x + (-2) = 1 \quad \text{Substitute } -2 \text{ for } y \text{ in equation (1).}$$

$$x = 3 \quad \text{Add 2 to both sides.}$$

The solution is $(3, -2)$. Check the solution in both original equations.

5. $x + y = 7$
 $2x - 3y = -1$

6. $2x + y = 3$
 $x - 2y = 9$

7. $2x + 3y = 7$
 $3x - 2y = 4$

8. $x - y = 1$
 $-3x + 2y = 0$

9. $x + 5y = 3$
 $2x - y = 6$

10. $x - y = 0$
 $5x + 4y = -9$

Check Out the Account

IN THIS CHAPTER THE young people in our story will learn about checking accounts. Jeff will examine the differences among services offered with checking accounts at different banks and will compare charges. He will calculate new checking account balances based on the cost of checks, service charges, extra fees, and interest earned.

Latoya will show us how to write a check, endorse it correctly, and keep a proper check register. She imagines herself the treasurer of the Eldorado Open Golf Tournament, writing checks for thousands of dollars to the winners. If she pursues her interest in business and finance, she may some day be responsible for large amounts of money.

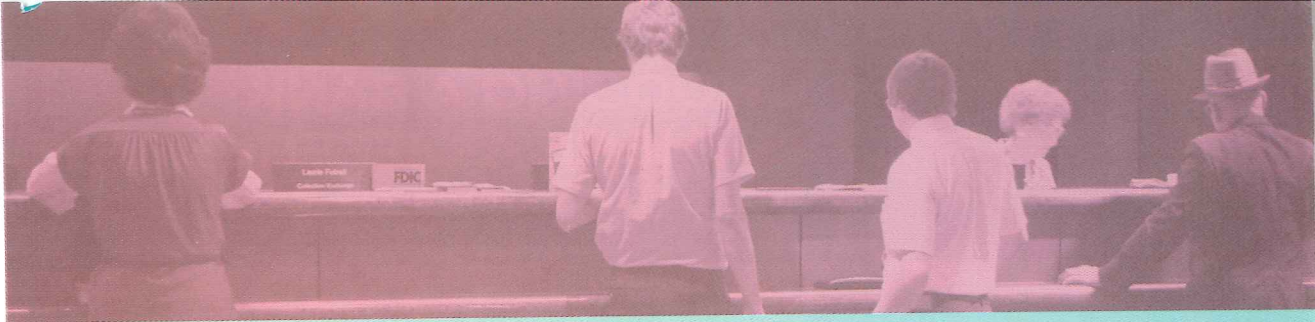
Larry will discover the necessity of keeping a close watch on how much money he has in his checking account and will reconcile his check register with a bank statement. He is fascinated by automated teller machines, or ATMs, which give him money from his checking account at convenient locations all over town—just for entering the correct codes. But he is still a little uncertain about exactly what happens at the other end—in his checking account at the bank. He needs to learn more.

Many young people open their own checking accounts when they begin working at regular jobs and handling money that is truly their own. A checking account can help you use money safely and efficiently. But it needs to be managed carefully so that you always know how much money you have!

2-1 Choosing a Bank: Is There a Difference?

2-2 Using Checks: Write It Down

2-3 Reconciliation: Do the Bank and I Agree?



Eldorado Golf Tournament

001

Eldorado Golf Club
Inland, IN 47304
Telephone 555-7902

March 4, 19 --

Cynthia Alvarez

\$ 352,000.00

Pay to the order of

Three hundred fifty-two thousand and ⁰⁰100 _____

Dollars

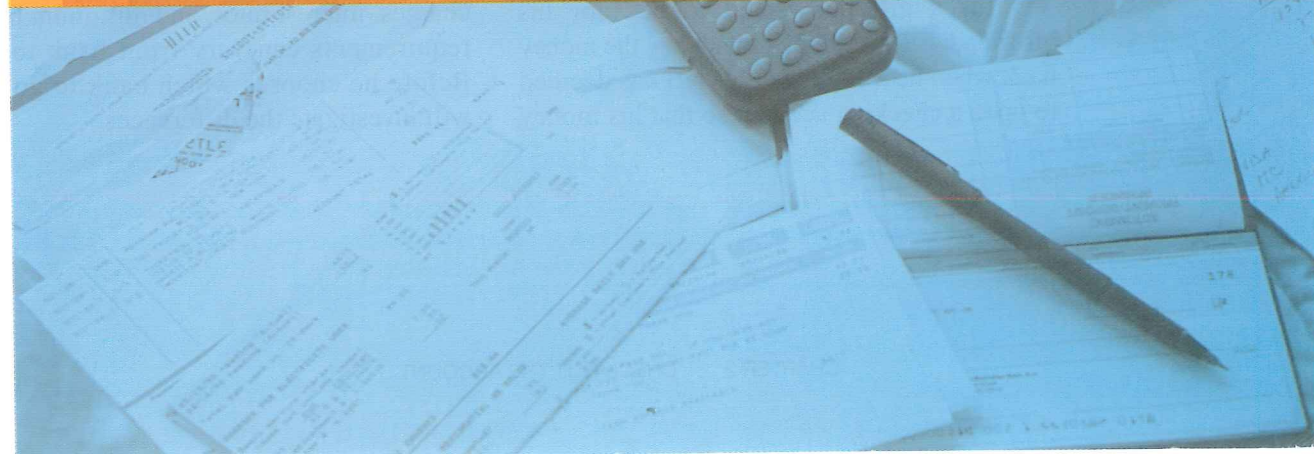


Inland Bank
15 Commercial Street
Inland, IN 47304

For: _____

Latoya S. Marshall

Signature





Jeff has been keeping track of his own money ever since he started receiving a dollar a week in allowance when he was seven. Jeff's older brother, Jeremy, never seems to know where all his money goes, but Jeff keeps very careful records of what he has earned, spent, and saved. Jeff earned \$305 last summer tutoring some of his classmates as they took algebra in summer school. He spent only \$15 of his summer earnings and saved the rest.

Jeremy has asked to borrow money from Jeff several times. The last time, he borrowed \$25 for a gift he wanted to buy for his girlfriend, Ellen. Jeremy did not pay the money back when he said he would. Jeff has decided to open a checking account so that his money

will be a little safer. He will be doing some more tutoring now that semester exams are coming up, and he knows that a bank account will help him keep track of his income in preparation for filing a tax return next spring.

Jeff also has bills to pay now, too, since he applied for a gasoline credit card in his own name. Jeff does quite a lot of driving when he does the tutoring. He also pays the automobile insurance premium.

Jeff knows that different banks offer many of the same services but that service charges, interest rates, and minimum balance requirements can vary from bank to bank. Before he chooses which bank to go to, he will investigate the differences.

OBJECTIVES: *In this lesson, we will help Jeff to:*

- *Learn what different types of checking accounts are available.*
- *Calculate the interest and bank charges for a checking account.*
- *Compare the costs of banking services offered by various banks.*
- *Use a spreadsheet to compare costs of various checking account options.*

CHECKING ACCOUNTS

The check is the most widely used means of transferring money. Nearly 90% of all monetary transactions, such as buying goods and paying rent, are made with checks. **Checks** are orders written by a depositor directing a bank to pay out money. Checks are safe and convenient. They provide proof of payment and records for tax and budget purposes.

Most young people open their first checking account shortly after they get a job or go to college. When a person opens a checking account, the bank and the customer establish a contractual agreement that allows the customer to deposit money in the bank and to write checks on the account. The bank agrees to maintain the account, provide records, and honor checks when they are presented for collection. When a customer writes a check, it is a demand on the customer's deposits so checks are called **demand deposits**.

Following is an explanation of the different types of checking accounts that are available.



Cost-Per-Check Account Cost-per-check accounts are considered thrift accounts or minimum use accounts. Generally, one has to maintain a minimum balance and pay a fee for each check. The fee may range from \$0.02 to \$0.25 per check. Some banks also charge a service charge or maintenance fee that varies from \$0.50 to \$2.50 or more per month even if there is no activity in the account.

Minimum-Balance Account Minimum-balance accounts require the customer to maintain a certain balance. The minimum balance may be a low balance or an average balance. With a **low-balance account** the customer is charged a service fee even if the account falls below the minimum only one day in a month. An **average-balance account** can drop to zero as long as the customer deposits enough money during the month to bring the account average for the month up to the minimum required. Some banks advertise minimum-balance accounts as “free checking accounts.” They may be low-cost accounts, but they are not free.

Free Checking Account Some banks provide totally free checking; that is, there are no minimum balance requirements or service charges. Some banks provide free checking in the belief that checking account customers will also use the bank’s other services such as savings accounts, consumer loans, and safe-deposit boxes.

NOW (Negotiable Order of Withdrawal) Account Another type of checking service is an interest-bearing account known as a **NOW account**. One drawback to NOW accounts is the minimum balance requirement. If the account balance falls below the required balance, the bank charges a monthly service fee or a check-handling fee.

Ask Yourself

1. Why is a check referred to as a demand deposit?
2. Are minimum-balance accounts free?
3. Does a NOW account require a minimum balance?
4. Which is the least expensive account?

ALGEBRA REVIEW

Copy and complete the table for each equation by substituting the given values. Describe in words how the values for y in Exercises 2 through 5 relate to the values in Exercise 1.

x	1	2.5	7
y			

1. $y = 3x$
2. $y = 3x + 1$
3. $y = -3x$
4. $y = 3x - 1$
5. $y = -3x - 1$

Complete the table for each equation.

x	-2	0	2
y			

6. $y = 4x - 2.5$
7. $y = x$
8. $y = 1.5x + 1.05$
9. $y = -2x + 2.7$
10. $y = -(3x + 4.1)$

SHARPEN YOUR SKILLS

SKILL 1

In Chapter 1 you worked with percentages to find commissions. In this lesson you will work with percents less than 1%.

1% means 1 part out of 100.

0.5% means $\frac{1}{2}$ of 1%.

As a decimal, $0.5\% = 0.005$.

Interest is an amount of money paid for the use of money. Interest is based on percent, which means parts out of one hundred.

To find 0.5% of \$246, convert 0.5% to a decimal and multiply.

$$0.005 \cdot 246 = 1.23 \quad 0.5\% = 0.005$$

0.5% of \$246 is \$1.23

At the first bank he visits, Jeff reads a brochure about a Presto account. The brochure states that a checking account earns interest of 0.45% per month and that there is a charge of 5 cents per check.

Jeff remembers that interest is an amount paid based on percentage. Jeff does a quick mental calculation and sees that if he left \$100 in the bank for a month, it would earn $0.0045 \cdot 100 = \$0.45$ in interest. Not much, he thinks, but it is something.

Each month the bank pays any interest due and charges any fees due. The interest that is paid is determined by multiplying the monthly average balance by the monthly interest rate. The charge for checks is determined by multiplying the number of checks by the charge for each check. The amount earned or charged can be expressed by the following formula.

Amount earned or charged = interest – charge for checks

$A = br - cn$ where A = amount earned or charged

b = monthly average balance

r = monthly interest rate

n = number of checks

c = charge for each check

EXAMPLE 1 Presto checking accounts pay 0.45% interest per month and charge \$0.05 per check.

QUESTION What is the amount earned or charged if 17 checks are written during one month and the average balance is \$620?

**SOLUTION**

Remember to add the interest paid and subtract the charges for checks.

$$A = br - cn$$

$$A = 620(0.0045) - 0.05(17)$$

$$A = 1.94$$

Use the formula.

$$b = 620, r = 0.0045, c = 0.05, n = 17$$

Use your calculator.

The amount earned is \$1.94.

SKILL 2

Jeff visits another bank to compare costs. This bank charges a service charge in addition to the charge for checks. So we need to adjust the formula.

Amount earned or charged = interest – charge for checks
 – service charge

$$A = br - cn - s \quad \text{where } A = \text{amount earned or charged}$$

b = monthly average balance
 r = monthly interest rate
 n = number of checks
 c = charge for each check
 s = service charge

**EXAMPLE 2** Super checking accounts earn interest of 0.4% per month and have the following service charges.

- For balances of \$500 or more, there is no service charge and no charge for checks.
- For balances under \$500, there is a charge of \$0.025 per check.
- For balances of \$200 to \$499.99, there is a service charge of \$4.00 per month.
- For balances under \$200, the service charge is \$6.00 per month.

QUESTION What amount will be earned or charged for the following average balances?

- a. \$650 with 20 checks
- b. \$400 with 18 checks
- c. \$150 with 16 checks

SOLUTION

Jeff used the formula above.

$$A = br - cn - s$$

- a. $A = 650(0.004) - 0(20) - 0 = 2.6$
The account earned \$2.60.
- b. $A = 400(0.004) - 0.025(18) - 4 = -2.85$
The account was charged \$2.85.
- c. $A = 150(0.004) - 0.025(16) - 6 = -5.8$
The account was charged \$5.80.

SKILL 3

EXAMPLE 3 Jeff learned that there are a number of differences in the interest rates and charges that banks use for checking accounts. He decided to make a spreadsheet to compare various interest rates and charges.

QUESTION What column headings and formulas should be used in a spreadsheet to calculate the interest and charges on Super checking accounts?

SOLUTION

For Super checking accounts there are three different ways of charging fees as shown in the spreadsheet.



	A	B	C	D	E	F	G	H
1		Interest	Interest	Number	Cost per	Cost of	Service	Amount Earned
2	Balance	Rate	Earned	of Checks	Check	Checks	Charge	or Charged
3	500 or more						+C4-F4-G4	
4	650	0.004	2.6	20	0	0	0	2.60
5	200 to 499.99	+A4*B4						
6	400	0.004	1.6	18	0.025	0.45	4	(2.85)
7	under 200					+D6*E6		
8	150	0.004	0.6	16	0.025	0.4	6	(5.80)
9								
10								
11								

The cost of checks and the service charge are different for all three cases. The formulas for the case of a \$500 balance are shown below.

Interest earned: $+A4*B4$

Interest rate times the average balance.

Cost of checks: $+D4*E4$

Number of checks times the cost per check.

Amount earned or charged: $+C4-F4-G4$

Interest earned minus the cost of checks minus the service charge.

You can use the COPY function of your spreadsheet to create the formulas for rows 6 and 8 of the spreadsheet. For example, if you copy cell C4 (interest earned) to cell C6, then the program will create the formula $+A6*B6$ for that cell. You will see the value 1.6 in the cell.

You may wish to format the column for “Amount Earned or Charged” for currency as shown. Usually a negative amount will be shown in parentheses as in the spreadsheet on page 57.

SKILL 4

EXAMPLE 4 Jeremy’s father owns a small business and has to decide between two checking accounts. Bank A does not pay interest and does not charge for checks but has a \$4 per month service charge. Bank B pays 0.4% interest per month and charges \$0.075 per check. Jeremy’s father expects to maintain a balance of \$1000 but is not sure how many checks he will write.

QUESTION How does the monthly number of written checks affect the interest and charges for the two accounts?

SOLUTION

Write equations like the ones used before for the interest and charges. Let y be the total of the interest and charges. Let x be the number of checks. The interest for Bank B is $0.004(1000) = 4$.

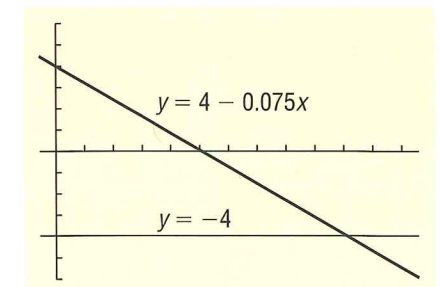
For Bank A: $y = -4$

For Bank B: $y = 4 - 0.075x$

Graph the equations on a graphing calculator using these range values.

Xmin: -5 Ymin: -6
 Xmax: 125 Ymax: 6
 Xscl: 10 Yscl: 1

The trace function shows that the graphs intersect at approximately $x = 107$, $y = -4$.



To confirm the calculator results, solve the system of equations by substituting the value for y in the second equation.

$$-4 = 4 - 0.075x$$

$$-8 = -0.075x$$

$$x = 106.67 \quad \text{To the nearest hundredth}$$

Both methods show that the interest-bearing account in Bank B will be less expensive if fewer than 106 checks are written per month, and more expensive if 107 or more checks are written per month.

TRY YOUR SKILLS

Three banks offer the following arrangements for checking accounts.

National: Interest 0.5% per month, a charge of \$0.09 per check for balances under \$500.

Central: Interest 0.54% per month, a charge of \$0.02 per check, \$4 service charge for balances under \$200.

Western: Interest 0.35% per month, a charge of \$0.06 per check for balances under \$1000.

Find the amount earned or charged for each of the following average balances for one month.

- \$400 at National, with 22 checks written
- \$500 at Western, with 9 checks written
- \$175 at Central, with 31 checks written
- \$760 at National, with 40 checks written
- \$340 at Central, with 28 checks written
- \$1280 at Western, with 60 checks written
- Copy and complete the table comparing the interest earned, charges, and changes in balance at each of the three banks for a balance of \$400 with 20 checks written.

Balance	Interest Earned	Cost of Checks	Service Charge	Amount Earned or Charged
National				
Central				
Western				

- Complete a table like that in Exercise 7 for an average balance of \$1220 with 30 checks written.

EXERCISE YOUR SKILLS

KEY TERMS

average-balance account
checks
cost-per-check account
demand deposits
free checking account
interest
low-balance account
minimum-balance account
NOW account

- Write a general algebraic equation that can be used to find the amount earned or charged in a checking account in a bank that pays interest, charges a monthly fee, and charges for each check written.
- What are two things that a bank agrees to do as its part of the agreement when a person opens a checking account?
- Explain how a spreadsheet will be useful to Jeff in organizing data and explaining checking accounts to his friends.
- Why might a person choose a bank even though it does not have high interest rates or low costs per check?
- What might lead a person to pay special attention to the cost per check that a bank charges?
- What is the difference between a low-balance account and an average-balance account?
- Set up a spreadsheet with headings and formulas as explained in Skill 3 and shown.

	A	B	C	D	E	F	G
1		Interest	Interest	Number of	Cost per	Cost of	Amount
2	Balance	Rate	Earned	Checks	Check	Checks	Earned
3			[+A3*B3]			[+D3*E3]	[+C3-F3]

- To use the spreadsheet correctly, in which cells must you enter numbers?
- Which cells do you leave blank, letting the spreadsheet fill them in?
- Write an algebraic expression to calculate the amount that will appear in cell C3.
- Write an algebraic expression to calculate the amount that will appear in cell F3.
- Write an algebraic equation to calculate the amount that will appear in cell G3.
- Show how the equation that you wrote is related to the formulas used in the spreadsheet.

For Exercises 14–16, use a spreadsheet with headings like the ones shown in the tables to calculate the interest, costs, and new balance for the banks as described. To find the new balance, it is necessary to add monthly interest and subtract monthly charges.

- At First Bank:

No interest is paid on the balance.

There are no service charges.

The cost per check is \$0.0225. If the beginning balance is below \$1000, First Bank charges an additional \$0.23 for each check written.

	Beginning Balance	Number of Checks	Interest Earned	Service Charges	Cost of Checks	Extra Charges	New Balance
a.	\$650	18					
b.	625	26					
c.	480	20					
d.	190	31					

15. At Second Bank:

Interest is paid on the beginning balance at the rate of 0.5% per month.

The service charge is \$3.00 per month.

The cost per check is \$0.0225. There are no additional charges whether or not a minimum balance is maintained.

	Beginning Balance	Number of Checks	Interest Earned	Service Charges	Cost of Checks	Extra Charges	New Balance
a.	\$650	18					
b.	625	26					
c.	480	20					
d.	190	31					

16. At Third Bank:

Interest is paid at the rate of 0.52% per month on the beginning balance.

There are no service charges.

The cost per check is \$0.0225. If the beginning balance is below \$500, Third Bank charges an additional \$0.25 for every check written.

	Beginning Balance	Number of Checks	Interest Earned	Service Charges	Cost of Checks	Extra Charges	New Balance
a.	\$650	18					
b.	625	26					
c.	480	20					
d.	190	31					

17. Write a formula for the amount of change in the balance of a checking account for which interest is paid but for which there is no service charge or charge per check.
18. Sarah's checking account has a balance of \$120 for one month, and it earns 42 cents in interest. Find the monthly interest rate at that bank.
19. Jason's bank has a monthly service fee of \$3. He finds that a balance of \$180 causes a decrease in his account of \$2.28. Find the monthly interest rate at the bank.

20. Marcia's bank has no service charge for a checking account but pays interest and charges \$0.04 for each check written. With a balance of \$160 and an interest rate of 0.3%, Marcia finds that her account shows a bank charge of \$0.04 for the month. How many checks did she write?
21. Bank S pays interest of 0.55% and charges \$0.07 per check. Bank T pays interest of 0.25% and charges \$0.025 per check. Susan expects to maintain a balance of \$800 but is not sure how many checks she will write. Write and graph equations as in Example 4 to determine which account is less expensive. Explain your results.
22. Henry expects to maintain a balance of \$500 in his checking account. Write and graph equations to determine which account is less expensive. Bank K pays interest of 0.35% and charges \$0.08 per check. Bank M pays no interest and charges \$0.025 per check. Explain your results.

MIXED REVIEW

1. At \$7.25 an hour, how much does Jessica earn for 38 hours of work?
2. Richard earns \$6.80 an hour but gets $1\frac{1}{2}$ times his regular pay for every hour that he works over 40 hours. What is his pay for 46 hours of work?
3. Jorge receives a salary of \$39,000 and takes vacation days and holidays for 24 of the company's 260 operating days. How much of his salary is paid for days during which he does not work?
4. What is the amount of a 7.5% commission on sales of \$1245?
5. Karen is paid a commission of \$40 on a sale of \$200. What is her rate of commission?

In a spreadsheet, cell B2 contains an hourly rate of pay, cell B3 contains the number of hours, cell B5 contains FICA deductions at 7.65%, and cell B6 contains all other deductions. Use this information to find each of the following.

6. a spreadsheet formula for the gross wages
7. a spreadsheet formula for the FICA withholding
8. a formula for the total deductions
9. a formula for the take-home pay