

3-1 Checking Accounts

Key Math Concepts

- Total deposit = sum of deposits – cash recieved
- To update the running balance of a check register, add deposits and subtract debits.
- $-a + b = b - a$; $-a - b = -a + (-b)$

Guided Exercises

1. Mitchell has a balance of \$1,200 in his First State Bank checking account. He deposits a \$387.89 paycheck, a \$437.12 dividend check, and a personal check for \$250 into his account. He wants to receive \$400 in cash. How much will he have in his account after the transaction?

Balance + Deposits + Withdrawal = New Balance

$$1,200 + (387.89 + 437.12 + 250) - 400 = \text{New Balance}$$

$$1,200 + \underline{1,075.01} - 400 = \underline{1,875.01}$$

Add the deposits.

Mitchell's new balance is \$1,875.01.

2. New Merrick Bank charges a \$21-per-check overdraft protection fee. On June 5, Lewis had \$989.00 in his account. Over the next few days, the following checks were submitted for payment at his bank: June 6, \$875.15, \$340.50, and \$450.63; June 7, \$330; and June 8, \$560.00. How much will he pay in overdraft protection fees? How much will he owe the bank after June 8?

Check	Balance
	\$989.00

Subtract each debit for the current balance.

1st	\$873.15	<u>\$113.85</u>
2nd	<u>\$340.50</u>	<u>– \$226.63</u>
3rd	<u>\$450.63</u>	<u>– \$677.28</u>
4th	<u>\$330.00</u>	<u>– \$1,007.28</u>
5th	<u>\$560.00</u>	<u>– \$1,567.28</u>

Lewis had 4 checks returned. His bank charges \$21 for each returned check.

Overdraft fee × Number of checks = Total Fees Paid

$$\underline{21} \times \underline{4} = \underline{84} \quad \text{Lewis owes his bank } \underline{\$84} \text{ in bank fees.}$$

Amounts of returned checks + bank fees = Total amount Lewis owes the bank

$$\underline{1,567.28} + \underline{84} = \underline{1,651.28} \quad \text{Lewis owes the bank a total amount of } \underline{\$1,651.28}.$$

Exercises

3. Create a check register for the transactions listed.
 - a. Your balance on 1/5 is \$822.67.
 - b. You write check 1076 on January 6 for \$600.00 to Excel Health Club.
 - c. You deposit a paycheck for \$227.45 on 1/11.
 - d. You deposit a \$50 rebate check on 1/15.
 - e. On 1/16, you begin writing a donation check to Clothes for Kids but make an error and have to void the check. You write the very next check for \$100 to this organization.
 - f. On 1/20, you withdraw \$200 from the ATM at the mall. The company owning the ATM charges you \$3.50 and your bank charges you \$2.50 for the ATM transaction.
 - g. On 1/21, you made a debit card purchase at Stacy's Store for \$134.87.

NUMBER OR CODE	DATE	TRANSACTION DESCRIPTION	PAYMENT AMOUNT	✓	FEE	DEPOSIT AMOUNT	\$ BAL
							822.67
1076	1/6	Excel Health Club	\$ 600 00				- 600.00
							222.67
	1/11	Deposit (Paycheck)				227 45	+ 227.45
							450.12
	1/15	Deposit (Rebate Check)				50 00	+ 50.00
							500.12
1077	1/16	VOID					
1078	1/16	Clothes for Kids	100 00				- 100.00
							400.12
	1/20	ATM Withdraw	200 00				- 200.00
							200.12
	1/20	ATM Charge	3 50		FEE		- 3.50
							196.62
	1/20	ATM Bank Charge	2 50		FEE		- 2.50
							194.12

4. Dean has a checking account at City Center Bank. During the month of April, he made deposits totaling \$2,458.52 and wrote checks totaling \$789.23. He paid a maintenance fee of \$25 and earned \$3.24 in interest. His balance at the end of the month was \$4,492.76. What was the balance at the beginning of April?

\$2,845.23

5. Elaine has m dollars in her checking account. On December 8, she deposited \$1,200, r dollars, and \$568.90. She also cashed a check for t dollars and one for \$73.70. Write an algebraic expression that represents the amount of money in her account after the transactions.

$m + 1,695.20 + r - t$

3-2**Reconcile a Bank Statement****Key Math Concepts**

- Revised statement balance = ending statement balance + outstanding deposits – outstanding debits (withdrawals, charges, and bank fees)
- A reconciled bank statement is when the revised statement balance = check register balance.
- “+” means to add to a balance and a “–” means to subtract from a balance.

Guided Exercises

1. Pina filled out the following information on the back of her monthly statement:

Ending balance from statement	\$1,139.78
Deposits outstanding	+ \$280.67
Total of checks outstanding	– \$656.91
Revised statement balance	\$_____
Balance from checkbook	\$763.54

Find Pina’s revised statement balance. Does her account reconcile?

Revised Balance = Ending Balance + Outstanding Deposits – Outstanding Debits

$$\text{Revised Balance} = 1,139.78 + 280.67 - 656.91 = \underline{763.54}$$

Perform the calculations.

Pina’s revised statement balance is \$763.54.

Her bank account does reconcile because the revised statement balance is the same as the balance from the checkbook.

2. On the back of Elise’s monthly statement, she listed the following outstanding withdrawals: #123, \$76.09; #117, \$400; #130, \$560.25; debit card, \$340.50; and #138, \$83.71. She also determined that a deposit for \$500 and the other for \$328.90 are outstanding. Using these outstanding transactions, what adjustment will have to be made to her statement balance?

$$\text{Outstanding Deposits} = \underline{500} + \underline{328.90} = \underline{828.90}$$

$$\text{Outstanding Debits} = \underline{76.09} + \underline{400} + \underline{560.25} + \underline{340} + \underline{83.71} = \underline{1,460.05}$$

Statement Adjustment = Outstanding Deposits – Outstanding Debits

$$\text{Statement Adjustment} = \underline{828.90} - \underline{1,460.05} = \underline{-631.15}$$

Elise needs to adjust her statement balance by subtracting \$631.15.

A positive adjustment is added and a negative adjustment is subtracted from the balance.

Exercises

3. Below you will find Mitch West's monthly statement and his check register. Use them to complete parts a – e in his checking account summary. Does his account reconcile?

Checking Account Summary

Ending Balance from Statement	a. \$2,368.29
Deposits Outstanding	+ b. \$300.00
Total of Checks Outstanding	– c. \$119.00
Revised statement balance	d. \$2,549.29
Balance from Checkbook	e. \$2,549.29

Mitch West 23 Sycamore Lane Benridge, NY 10506			ACCOUNT NUMBER: 456213-A232 STATEMENT PERIOD: 5/15 - 6/15	
			STARTING BALANCE → \$ 2,312.70	
DATE	DESCRIPTION	CHECK NUMBER	TRANSACTION AMOUNT	BALANCE
8/16	W/D	1056	\$ 256.00	
8/20	DEPOSIT		\$ 1,200.80	
8/22	W/D	Debit card	\$ 234.81	
8/22	W/D	1058	\$ 334.90	
8/23	W/D	Debit Card	\$ 34.72	
8/25	W/D	1060	\$ 145.78	
8/26	W/D	1059	\$ 56.00	
8/27	DEPOSIT		\$ 150.00	
9/1	W/D	1061	\$ 230.00	
			ENDING BALANCE → \$2,368.29	

NUMBER OR CODE	DATE	TRANSACTION DESCRIPTION	PAYMENT AMOUNT	✓	FEE	DEPOSIT AMOUNT	\$
1056	8/15	Best Offer Inc.	256 00				2,309.70
							- 256.00
							2,053.70
1057	8/16	Dept. of Motor Vehicles	86 50				- 86.50
							1,967.20
1058	8/16	AutoWorld	334 90				- 334.90
							1,632.30
	8/18	Car Nation	234 81				- 234.81
							1,397.49
	8/20	Deposit				1,200 80	+ 1,200.80
							2,598.29
1059	8/21	Print Makers	56 00				- 56.00
							2,542.29
1060	8/22	Book Bonanza	145 78				- 145.78
							2,396.51
	8/23	Fast Freddy's Fast Food	34 72				- 34.72
							2,361.79
	8/27	Deposit				150 00	+ 150.00
							2,511.79
1061	8/30	Lincoln Savings Bank	230 00				- 230.00
							2,281.79
1062	9/1	VOID					
1063	9/1	Pasta Pete's	32 50				- 32.50
							2,249.29
	9/2	Deposit				300 00	+ 300.00
							2,549.29

3-3 Savings Accounts

Key Math Concepts

- Divide a percent by 100 to change it to a decimal. Then remove the % sign.
- Multiply a decimal by 100 to change it to a percent. Then insert a % sign.
- To change a fraction to a decimal, divide the numerator by the denominator.
- Simple interest $I = prt$
- To solve for principal, use $p = \frac{I}{rt}$; to solve for time, use $t = \frac{I}{pr}$;
to solve for rate, use $r = \frac{I}{pt}$.

Guided Exercises

1. Gary deposits \$3,700 in an account that pays 2.15% simple interest. He keeps the money in the account for three years, but doesn't make any deposits or withdrawals. How much interest will he receive after the three years?

$$p \times r \times t = I$$

$$3,700 \times 2.15\% \times 3 = I$$

Write the percent as a decimal.

$$3,700 \times \underline{0.0215} \times 3 = \underline{238.65}$$

After 3 years, Gary will receive \$238.65 in interest.

2. What simple interest rate, to the nearest tenth, is needed for \$15,000 to double in 8 years?

When \$15,000 doubles, it becomes \$30,000. This means the account would earn \$15,000 in interest.

$$\frac{I}{pt} = r$$

$$\frac{15,000}{15,000 \times 8} = \underline{0.125}$$

The simple interest rate needed is 12.5%.

Write the decimal as a percent.

Exercises

3. How much simple interest would \$1,500 earn in 11 months at an interest rate of 3.75%?

\$51.56

4. Jesse estimates that it will cost \$300,000 to send his newborn son to a private college in 18 years. He currently has \$65,000 to deposit in an account. What simple interest rate would he need so that \$65,000 grows into \$300,000 in 18 years? Round to the nearest percent.

20%

5. How much principal would you have to deposit to earn \$700 simple interest in $1\frac{1}{2}$ years at a rate of 4%?

\$11,666.67

6. Dillon has a bank account that pays 3.2% simple interest. His balance is \$1,766. How long will it take for the amount in the account to grow to \$2,000? Round to the nearest year.

4 years

7. How much simple interest would \$1,000 earn in 275 days at an interest rate of 4.21%? (There are 365 days in a year.)

\$31.72

8. How long will it take \$5,000 to double in an account that pays 5.6% simple interest? Round to the nearest year.

18 years

3-4**Explore Compound Interest****Key Math Concepts**

- $I = prt$
- To change a fraction to a decimal, divide the numerator by the denominator.
- Interest compounded semiannually, $t = \frac{6}{12}$ or 0.5.
- Interest compounded quarterly, $t = \frac{1}{4}$ or 0.25.
- Interest compounded monthly, $t = \frac{1}{12}$ or 0.083.
- Interest compounded daily, $t = \frac{1}{365}$ or 0.00274.

Guided Exercises

1. How much interest does \$5,300 earn at a rate of 2.8% interest compounded quarterly, in three months?

$$p \times r \times t = I$$

For interest compounded quarterly, $t = 0.25$.

$$5,300 \times 2.8\% \times 0.25 = I$$

$$\underline{5,300} \times \underline{0.028} \times \underline{0.25} = \underline{37.10}$$

Write the percent as a decimal.

In 3 months, the account earns \$37.10 in interest.

2. How much interest would \$2,000 earn, compounded annually, in two years at the rate of 4.2%?

$$p \times r \times t = I$$

$$2,000 \times \underline{0.042} \times 1 = \underline{84}$$

$$2,000 \times \underline{84} = \underline{2,084}$$

$$2,084 \times \underline{0.042} \times 1 \approx \underline{87.53}$$

$$2,084 + \underline{87.53} = \underline{2,171.53}$$

Add the interest to the principal.

The account balance is \$2,171.53 after two years. The account would earn \$171.53 in interest, compounded annually, in two years.

Exercises

3. Margaret deposits \$1,000 in a savings account that pays 5.4% interest compounded semi-annually. What is her balance after one year?

\$1,054.73

4. Jonathan deposits \$6,000 in a savings account that pays 3.2% interest compounded quarterly. What is his balance after one year?

\$6,194.32

5. How much interest would \$1,000,000 earn at 5% compounded daily, in one day?

\$136.99

6. Kristin deposited \$9,000 in an account that has an annual interest rate of 4.1% compounded monthly. How much interest will she earn at the end of one month?

\$30.75

7. Kelly has d dollars in an account that pays 3.4% interest compounded weekly. Express her balance after one week algebraically.

$$d + \frac{0.034d}{52}$$

8. Mr. Nolan has a bank account that compounds interest daily at a rate of 3.7%. On the morning of December 7, the principal is \$2,644.08. That day he withdraws \$550 to pay for a snow blower. Later that day he receives a \$934 paycheck from his employer, and he deposits that in the bank. On December 8, he withdraws \$300 to go holiday shopping. What is his balance at the end of the day on December 8?

\$2,728.67

3-5 Compound Interest Formula

Key Math Concepts

- The compound interest formula is $B = P\left(1 + \frac{r}{n}\right)^{nt}$, where B is the ending balance, P is the principal, r is the interest rate as a decimal, n is the number of times compounded in a year, and t is the time in years.
- $APY = \left(1 + \frac{r}{n}\right)^n - 1$

Guided Exercises

1. Jeff deposits \$2,300 at 3.13% interest compounded weekly. What will be his ending balance after one year?

$$B = P\left(1 + \frac{r}{n}\right)^{nt}$$

$$B = 2,300\left(1 + \frac{0.0313}{4}\right)^{(4)(1)}$$

$$B = \underline{2,300} \left(\underline{1.007825} \right)^{\underline{(4)}}$$

$$B \approx \underline{2,373.11}$$

Substitute and simplify.

Round to the nearest cent.

Jeff's ending balance will be \$2,373.11.

2. Knob Hill Savings Bank offers a one-year CD at 3.88% interest compounded daily. What is the APY for this account? Round to the nearest hundredth of a percent.

$$APY = \left(1 + \frac{r}{n}\right)^n - 1$$

$$APY = \left(1 + \frac{0.0388}{365}\right)^{(365)(1)} - 1$$

$$APY \approx \underline{0.0396} = \underline{3.96\%}$$

Substitute.

Round to the nearest hundredth.

The annual percentage yield is 3.96%.

Exercises

3. Ms. Santoro is opening a one-year CD for \$16,000. The interest is compounded daily. She is told by the bank representative that the annual percentage rate (APR) is 4.8%. What is the annual percentage yield (APY) for this account?

4.92%

4. Mr. Weinstein has a savings account with a balance of \$19,211.34. It pays 4% interest compounded daily. What is his ending balance after three years, if no other deposits or withdrawals are made? How much interest does he earn over the three years?

\$21,660.58; \$2,449.24

5. Imagine that you invest \$100,000 in an account that pays 5.9% annual interest compounded monthly. What will your balance be at the end of 18 years?

\$288,463.33

6. Danielle has a CD at Crossland Bank. She invests \$22,350 for four years at 4.55% interest, compounded monthly. What is her ending balance? How much interest did she make?

\$26,802.15; \$4,452.15

7. How much more would \$5,000 earn in ten years, compounded daily at 6%, when compared to the interest on \$5,000 over ten years, at 6% compounded semiannually?

\$79.58

3-6 Continuous Compounding

Key Math Concepts

- Continuous compound interest formula: $B = pe^{rt}$
- Compound interest formula: $B = P\left(1 + \frac{r}{n}\right)^{nt}$

Guided Exercises

1. Given the function $h(x) = \frac{8x-3}{4x+5}$, as the values of x increase towards infinity, use a table to find out what happens to the values of $h(x)$.

Find the value of $h(x)$ for the values of x in the table.

$$h(x) = \frac{8x-3}{4x+5}$$

As the value of x increases, the value of the function

$$h(x) = \frac{8x-3}{4x+5} \text{ approaches } \underline{2}.$$

x	$h(x)$
100	1.967901235
1,000	1.996754057
90,000	1.999963889
900,000	
8,000,000	
50,000,000	

2. If you deposit \$10,000 at 3.85% simple interest, what would your ending balance be after three years?

$$I = prt = \underline{10,000} \times \underline{0.0385} \times \underline{1,155}$$

Substitute.

$$\text{The ending balance} = \underline{10,000} + \underline{1,155} = \underline{11,155}$$

What would your ending balance be if the interest is compounded daily?

$$B = P\left(1 + \frac{r}{n}\right)^{nt} = \underline{10,000} \left(1 + \frac{\underline{0.0385}}{\underline{365}}\right)^{(\underline{365})(\underline{3})} \approx \underline{\$11,224.28}$$

Substitute.

What would your ending balance be if the interest is compounded continuously?

$$B = pe^{rt} = (\underline{10,000})e^{(\underline{0.0385})(\underline{3})} \approx \underline{11,224.35}$$

Substitute.

The ending balance with simple interest is \$11,155.

The ending balance with interest compounded daily is \$11,224.28.

The ending balance with interest compounded continuously is \$11,224.35.

Exercises

3. Given the function $f(x) = \left(\frac{1}{2}\right)^x$, use a table to find $\lim_{x \rightarrow \infty} f(x)$.
0

4. Given the function $f(x) = 2^x$, find $\lim_{x \rightarrow \infty} f(x)$.
no limit

5. Eric deposits \$4,700 at 5.03% interest, compounded continuously for five years. What is his ending balance? How much interest did the account earn?
\$6,043.98; \$1,343.98

6. Find the interest for \$50,000 for $2\frac{1}{2}$ years at a rate of 4.3% compounded monthly, daily, hourly, and continuously.
\$5,663.85; \$5,674.19; \$5,674.53; \$5,674.54

7. Use a table of increasing values of x to find $\lim_{x \rightarrow \infty} f(x)$ if $f(x) = \frac{5x-2}{x+3}$.
5

8. Find the interest earned on a \$14,000 balance for nine months at $3\frac{3}{4}\%$ interest compounded continuously.
\$399.34

3-7 Future Value of Investments

Key Math Concepts

■ Future value of a periodic deposit: $B = \frac{P \left(\left(1 + \frac{r}{n} \right)^{nt} - 1 \right)}{\frac{r}{n}}$

Guided Exercises

Anton opened an account at BB Bank by depositing \$1,250. The account pays 2.325% interest compounded monthly. He deposits \$1,250 every month for the next two years.

1. How much will he have in the account at the end of the two-year period?

$$B = \frac{P \left(\left(1 + \frac{r}{n} \right)^{nt} - 1 \right)}{\frac{r}{n}}$$

$$B = \frac{1,250 \left(\left(1 + \frac{0.02325}{12} \right)^{(12)(2)} - 1 \right)}{\frac{0.02325}{12}}$$

$$B \approx \underline{\$30,687.03}$$

Substitute.

2. Write the future value function. Let x represent each of the monthly interest periods. Then use a graphing calculator to graph the future value function. What will the appropriate balance be after one year?

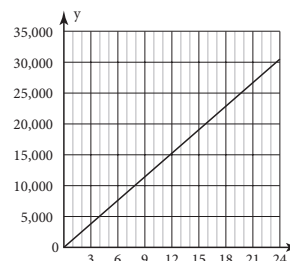
$$B = \frac{P \left(\left(1 + \frac{r}{n} \right)^{nt} - 1 \right)}{\frac{r}{n}} = \frac{1,250 \left(\left(1 + \frac{0.02325}{12} \right)^x - 1 \right)}{\frac{0.02325}{12}}$$

Substitute.

Locate 12 months on the x -axis of the graph.

At $x = 12$, $y \approx \underline{\$15,000}$.

Anton will have about \$15,000 in his account after one year.



Exercises

3. Sylvia wants to go on a cruise around the world in 5 years. If she puts \$50 into an account each week that pays 2.25% interest compounded weekly, how much will she have at the end of the five-year period?

\$13,756.31

4. Liam was born on October 1, 2009. His grandparents put \$20,000 into an account that yielded 3 interest compounded quarterly. When Liam turns 18, his grandparents will give him the money for a college education. How much will Liam get on his 18th birthday?

\$34,251.05

Fatima opened a savings account with \$7,500. She decided to deposit that same amount semiannually. This account earns 3.975% interest compounded semiannually. Exercises 5-7 are about Fatima's account.

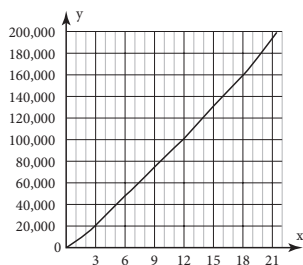
5. What is the future value of the account after 10 years?

\$182,003.62

6. Write the future value function. Let x represent the number of semiannual interest periods.

$$B = \frac{7,500 \left(1 + \left(\frac{0.03975}{2} \right)^x - 1 \right)}{\frac{0.03975}{2}}$$

7. Graph the future value function. Using your graph, what is the approximate amount in her account after 18 months?



about \$160,000

3-8**Present Value of Investments****Key Math Concepts**

- Present value of a single investment: $P = \frac{B}{\left(1 + \frac{r}{n}\right)^{nt}}$
- Present value of a periodic deposit investment: $P = \frac{B \times \frac{r}{n}}{\left(1 + \frac{r}{n}\right)^{nt} - 1}$

Guided Exercises

1. Martina will be attending 4 years of undergraduate school and four more years of graduate school. She wants to have \$200,000 in her savings account when she graduates in 8 years. How much, to the nearest dollar, must she deposit in an account now at a 2.6% interest rate that compounds monthly to meet her goal?

$$P = \frac{B}{\left(1 + \frac{r}{n}\right)^{nt}}$$

$$P = \frac{200,000}{\left(1 + \frac{0.026}{12}\right)^{(12)(8)}}$$

$$P \approx \underline{\$162,478}$$

Substitute.

Martina should deposit \$162,478 in her account.

2. Kate wants to install an inground pool in five years. She estimates the cost will be \$50,000. How much should she deposit monthly into an account that pays 3% interest compounded monthly to have enough money to pay for the pool in 5 years?

$$P = \frac{B \times \frac{r}{n}}{\left(1 + \frac{r}{n}\right)^{nt} - 1}$$

$$P = \frac{50,000 \times \frac{0.03}{12}}{\left(1 + \frac{0.03}{12}\right)^{(12)(5)} - 1}$$

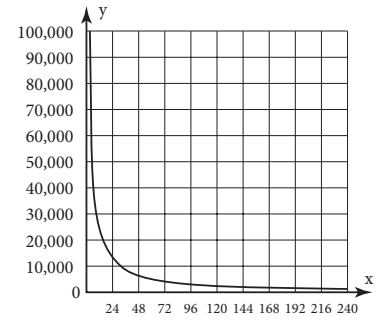
$$P \approx \underline{\$773.43}$$

Substitute.

Kate should deposit \$773.43 in her account each month.

Exercises

3. Amber wants to have saved \$300,000 by some point in the future. She set up a direct deposit account with a 1.75% APR compounded monthly, but she is unsure of how much to periodically deposit for varying lengths of time. Set up a present value function and graph that function to depict the present values for this situation from 12 months to 240 months.



4. When his daughter Alisa was born, Mike began saving for her wedding. He wanted to have saved about \$30,000 by the end of 20 years. How much should Mike deposit into an account that yields 3% interest compounded annually in order to have that amount? Round your answer to the nearest thousand dollars.

\$16,610.27

5. Anthony wants to repay the loan his parents gave him in three years. How much does he need to deposit into an account semi-annually that pays 3.25% interest twice a year in order to have \$35,000 to repay the loan?

\$5,600.81

6. Uncle Al wants to open an account for his nieces and nephews that he hopes will have \$100,000 in it after 25 years. How much should he deposit now into an account that yields 1.75% interest compounded monthly so he can be assured of meeting that goal amount?

\$64,585.43

7. Althea will need \$30,000 for her nursing school tuition in 18 months. She has a bank account that pays 2.45% interest compounded monthly. How much does she have to put in each month to have enough money for the tuition?

\$1,637.93

8. Lorna needs \$40,000 for a down payment when she buys her boat in 4 years. How much does she need to deposit into an account that pays 4.15% interest compounded quarterly in order to meet her goal?

\$33,910.84