

Employment Basics

Choose a job you love, and you will never have to work a day in your life.

Confucius, Ancient Chinese Philosopher

6-1 Look for Employment

6-2 Pay Periods and Hourly Rates

6-3 Commissions, Royalties, and Piecework Pay

6-4 Employee Benefits

6-5 Social Security and Medicare

What did Confucius mean by this statement?

About 70% of the time you are awake during your lifetime is spent at work. Knowing that this much of your waking time is spent at a job makes it extremely important to learn and understand as much as possible about the jobs you hold, the salaries you make, the benefits your job offers, and the taxes you pay. In this chapter, you will study employment basics so that you can become an educated employee. You won't have to wait years to use the information you will learn here. You will be able to apply this knowledge while you are searching, applying, accepting, and working at a job, whether it is in a part-time or full-time capacity. Many people start working in their early to mid-twenties, and continue working until they are in their 60s or 70s.

Really?

The American workforce is vast, diverse, and strong. As of May 2008, there were approximately 155 million workers in the United States. The occupations of some of these workers are shown in the table, according to the *Statistical Abstract of the United States: 2009*.

Occupation	Number of Employees
Teachers	7.2 million
Hairdressers, hairstylists and cosmetologists	773,000
Chefs and head cooks	351,000
Taxi drivers and chauffeurs	373,000
Firefighters	293,000
Roofers	234,000
Pharmacists	243,000
Musicians, singers and related workers	186,000
Gaming industry (gambling)	111,000
Tax preparers	105,000
Service station attendants	87,000
Inspectors, testers, sorters, samplers, weighers	751,000

- 7.7 million workers are called *moonlighters*. They hold more than one job. Close to 300,000 of those moonlighters work two full-time jobs.
- 28% of workers work more than 40 hours per week.
- 17 million workers leave for work between midnight and 5:59 A.M.
- 3.1 million workers travel over 90 minutes to work.
- 10.4 million workers are self-employed.
- 5.7 million workers work from home.



© CLAUDE BEAUBIEN, 2009/USED UNDER LICENSE FROM SHUTTERSTOCK.COM

Really!

In today's competitive job market, it's important to realize that finding a job is in itself a full time job.

Lee Marc, American Businessman and Developer of Online Resume Site

6-1

Look for Employment

Objectives

- Compute periodic salary based on annual contract salary.
- Interpret abbreviations in classified ads.
- Express classified ad prices as piecewise functions.

Key Terms

- employment agency
- fee paid
- resume
- Form W-4 Employee's Withholding Allowance Certificate
- benefits
- discount

HOW DO PEOPLE IN DIFFERENT STAGES OF THEIR CAREERS FIND EMPLOYMENT?

Many students take on after-school and summer jobs. Sometimes these are not related to their eventual career choice—they are jobs to meet the growing expenses of being a teenager. Many students find out about these jobs by signs in store windows, the school guidance department, bulletin board postings, and word-of-mouth.

When choosing a career, you usually choose a field of interest. You then need to develop skills in that area. Your career will be based on the training you receive in college, trade school, or as an on-the-job as an apprentice.

All electricians, lawyers, teachers, plumbers, actors, dentists, and so on had to learn their trade and then practice it. How do you go about looking for employment? You can look in the classified ad section of the newspaper.

You can also look online. There are many Internet sites available to job seekers. These ads cover all types of employment, from summer jobs for teenagers to careers in all fields. You will find it helpful to learn the special shorthand that is used in help-wanted classified ads. There are many abbreviations that are special for individual fields. Some commonly used abbreviations are shown in the table.

agcy	employment agency
asst	assistant
bi/ling	you are bilingual
comp lit	you must be computer literate
email res	email your resume
eves	evenings
exp'd	experienced
fee paid	employer pays employment agency fee
F/T	full-time
gd	good
K	\$1,000
P/T	part-time
pd vac	paid vacation
req	required
to \$ <i>m</i>	maximum pay is \$ <i>m</i> per hour
w/	with

You can also look for work through an employment agency. An **employment agency** is a business that has lists of job openings. Some employment agencies specialize in certain fields of work. If you are placed in a job by an employment agency, you may have to pay a fee to the agency. When the employer is willing to pay this fee, the job is listed as **fee paid**.

When you decide to apply for a specific job, you will have to send your resume to the employer. A **resume** is a short account of your education and qualifications for employment. Some employers want resumes submitted electronically online. Project 3 in the Chapter 6 Reality Check will help you familiarize yourself with resume writing. If the employer is impressed with your resume, you will be invited to an interview and you might be hired.

Once you are hired, you will need to fill out numerous forms, including a **Form W-4 Employee's Withholding Allowance Certificate**. This form is used by employers for income tax purposes. As you embark on your job search, salary isn't your only consideration. Among other factors, you need to consider **benefits**—additional compensation from your employer. Benefits can include health and dental insurance, child care, retirement, and travel expenses.



© STEPHEN VANHORN, 2009/USED UNDER LICENSE FROM SHUTTERSTOCK.COM

Skills and Strategies

Here you will learn about interpreting classified ads, computing salaries, and employment agency fees.

EXAMPLE 1

Julianne found a job listed in the classified ads that pays a yearly salary of \$41K. What is the weekly salary based on this annual salary?

SOLUTION Julianne must interpret \$41K. The K stands for \$1,000. Julianne multiplies to compute the annual salary.

$$41 \times 1,000 = 41,000$$

The annual salary is \$41,000.

To compute the weekly salary, divide the annual salary by 52. There are 52 weeks in a year. Round to the nearest cent.

$$41,000 \div 52 \approx 788.46$$

The weekly salary is \$788.46.

CHECK YOUR UNDERSTANDING

Karen found a job with an annual salary of \$67.3K. What is her monthly pay, rounded to the nearest dollar?

EXAMPLE 2

Dylan took a job through an employment agency. The job pays \$395 per week. Dylan must pay a fee to the employment agency. The fee is 20% of his first four weeks' pay. How much money must Dylan pay the agency?

SOLUTION Dylan multiplies his weekly pay by four to compute his first four weeks' pay.

$$395 \times 4 = 1,580$$

He then finds 20% of \$1,580.

$$1,580 \times 0.20 = 316.00$$

The employment agency fee that Dylan must pay is \$316.00.

■ CHECK YOUR UNDERSTANDING

The Alpha Employment Agency is advertising a job in the construction industry. The fee is 15% of the first month's pay. If the job pays x dollars annually, express the agency fee algebraically.

EXAMPLE 3

Ken is a mechanic who owns Ace Auto Repair. He needs a foreign car expert and is placing a twelve-line classified ad. The cost of an ad x lines long is given by the following piecewise function.

$$c(x) = \begin{cases} 56 & \text{when } x \leq 4 \\ 56 + 6(x - 4) & \text{when } x > 4 \end{cases}$$

Find the cost of a twelve-line ad.

SOLUTION Because 12 is in the domain $x > 4$, Ken can substitute 12 into the second equation of the piecewise function.

Use the second equation. $c(x) = 56 + 6(x - 4)$

Substitute. $c(12) = 56 + 6(12 - 4)$

Calculate. $c(12) = 104$

The total cost is \$104.

■ CHECK YOUR UNDERSTANDING

A local newspaper charges \$13 for each of the first four lines of a classified ad, and \$7.50 for each additional line. Express the cost of an x -line ad, $c(x)$, as a piecewise function.

■ EXTEND YOUR UNDERSTANDING

If the local newspaper from the Check Your Understanding above wanted the price of their per line charge for the first four lines to be k , what would change in the piecewise function?



© SUDHEER SAKTHAN, 2009/USED UNDER LICENSE FROM SHUTTERSTOCK.COM

EXAMPLE 4

An online job search site charges employers fees to post job listings. Their price list is shown in the table. The prices per posting decrease as the number of postings increase. What is the percent savings if an employer decides to post four jobs?

SOLUTION The price for posting one job is \$395. If four jobs are posted, the price per job is \$350. The amount the fee was lowered is the **discount**. There is a \$45 discount per job. Set up a fraction to find the percent of the discount.

$$\text{Percent discount} = \frac{\text{Original price} - \text{Discount price}}{\text{Original price}}$$

Substitute, solve, and round to the nearest percent.

$$\text{Percent discount} = \frac{395 - 350}{395} \approx 0.113 \approx 11\%$$

The employer saves 11% per posting.

Number of Job Postings	Price per Job Posting
1	\$395.00 each
2	\$385.00 each
3	\$375.00 each
4	\$350.00 each
5–20	\$320.00 each
21–50	\$265.00 each
51–100	\$200.00 each
101–150	\$165.00 each
151–250	\$135.00 each

■ CHECK YOUR UNDERSTANDING

JobFind charges employers x dollars to post a job on their website. They offer a 16% discount if 20 or more jobs are posted. If 31 jobs are posted by a specific employer, express the discount as a percent.

EXAMPLE 5

Jane's Printing Services charges \$29.95 to print 200 high quality copies of a one-page resume. Each additional set of 100 copies costs \$14. Express the cost, $r(x)$, of printing x sets of 100 resumes, as a piecewise function.

SOLUTION The printing service charges for multiples of 100 only. If you think in sets of 100 copies, 200 copies represent 2 sets. Split the function into rules for the two different domains.

$$r(x) = \begin{cases} 29.95 & \text{when } x \text{ is an integer and } x \leq 2 \\ 29.95 + 14(x - 2) & \text{when } x \text{ is an integer and } x > 2 \end{cases}$$

Notice the additional restriction on each domain. Notice that x must be a positive integer. These prices are for bulk orders only.

■ CHECK YOUR UNDERSTANDING

Pete needs 77 copies of his resume. Jane's charges 39 cents per resume-quality copy. Should he pay individually for the 77 copies or get 100 copies at the prices from Example 5? Explain.

■ EXTEND YOUR UNDERSTANDING

Write an inequality that compares the unit costs of a resume printed using each option Pete has in the Check Your Understanding above.

Applications

In today's competitive job market, it's important to realize that finding a job is in itself a full time job.

Lee Marc, American Businessman and Developer of Online Resume Site

1. Interpret the quote in the context of what you learned about job seeking.
2. Danny just answered a help-wanted ad. The ad states that the job pays \$27K annually. What would Danny's monthly salary be if he gets this job?
3. Becky is looking for a new job as an account executive. She responds to a classified ad for a position that pays 34.5K. What would Becky's weekly salary be to the nearest cent, if she gets this job?
4. Enid got a job through an employment agency that charges a fee equal to 40% of the first five weeks' pay. The job pays \$315 per week. How much does Enid have to pay the employment agency?
5. Melanie got a new job through the Jones Employment Agency. The job pays \$32,400 per year, and the agency fee is equal to 45% of one month's pay. How much must Melanie pay the agency?
6. The Rockville Employment Agency just placed Howard Jacobson in a job as a junior pharmacist. The job pays \$51.2K. The agency fee is equal to 40% of the first three weeks' pay.
 - a. What is Howard's weekly salary to the nearest cent?
 - b. What will Howard earn during the first three weeks?
 - c. How much must Howard pay the employment agency to the nearest dollar?
7. Maple Place Garage is posting five job listings with the online service from Example 4.
 - a. How much is each posting?
 - b. How much less does Maple Place pay per posting compared to the price for one posting?
 - c. What is the cost of the five postings?
 - d. What is the total savings for the five postings?
 - e. Express the total savings as a percent of the total cost for the five postings. Round to the nearest percent.
8. Roger wants to have 400 copies of his resume printed. His local print shop charges \$21.50 for the first 200 copies and \$10 for every 100 additional copies.
 - a. How much will the 400 copies cost, including a sales tax of 6%?
 - b. If the number of sets of 100 resumes is represented by x , express the cost of the resumes, $r(x)$, as a piecewise function of x .
9. Pat earns \$575 per week at her new job. Express her annual salary using the K abbreviation found in classified ads.

- 10.** Kareem earns y dollars per month at his accounting job. Express his annual salary using the K abbreviation found in classified ads.
- 11.** Mike is a veterinarian. He is placing a 9-line classified ad for an assistant. The following piecewise function gives the price of an x -line ad.
- $$a(x) = \begin{cases} 45 & \text{when } x \leq 3 \\ 45 + 9(x - 3) & \text{when } x > 3 \end{cases}$$
- a.** Find the difference between the cost of a 2-line ad and the cost of a 3-line ad.
- b.** Find the cost of a 10-line ad.
- c.** Find the cost of an 11-line ad.
- d.** Can you find the difference between the cost of a 15-line ad and a 17-line ad, without finding out the cost of each ad first? Explain.
- 12.** Joanne is looking for a job as a teacher. She plans to send resumes to 123 schools in her county. Her local printer charges \$23 per 100 copies, and sells them only in sets of 100.
- a.** How many copies must Joanne purchase if she is to have enough resumes?
- b.** How much will the copies cost her, including 8% sales tax?
- c.** If the number of sets of 100 resumes is represented by x , express the cost, with 8% sales tax, of the resumes, $r(x)$, as a function of x .
- 13.** Cathy is looking for a job as a bookkeeper. One classified ad lists a job in a stereo store that pays 34.6K. Another job, in a clothing store, has a weekly salary of \$620.
- a.** Which job is the higher-paying job?
- b.** What is the difference in the weekly salaries of these two jobs? Round to the nearest dollar.
- 14.** An online job seeking service allows job seekers to post their resumes for free. The service charges employers looking for applicants a fee to look through the resumes. The fee is based on how long the employer wants access to the resumes, and how many miles from the workplace address the employer wants to consider. The fees are \$585 for a 100-mile radius for 3 weeks and \$675 for a 150-mile radius for 3 weeks.
- a.** If there are 98 resumes within a 100-mile radius, what is the average cost to the nearest cent to the employer for looking at each resume?
- b.** If there are 208 resumes within a 150-mile radius, what is the average cost to the employer for looking at each resume?
- c.** Under the 150-mile radius option, an employer would see the same 98 resumes from part a that he would have seen under the 100-mile radius option. What is the average cost to the employer for looking at the extra resumes he would see if he opted for the more expensive plan? Explain.
- d.** Give an advantage and a disadvantage of opting for the more expensive plan.

Never confuse the size of your paycheck with the size of your talent.

Marlon Brando, Actor

6-2 Pay Periods and Hourly Rates

Objectives

- Compute weekly, semimonthly, and biweekly earnings given annual salary.
- Compute hourly pay and overtime pay given hourly rate.

Key Terms

- weekly
- biweekly
- semimonthly
- monthly
- direct deposit
- hourly rate
- regular hours
- overtime hours
- overtime hourly rate
- time-and-a-half overtime
- double-time pay
- gross pay
- minimum wage

WHAT DO YOU NEED TO KNOW TO MAKE SURE EACH PAYCHECK IS CORRECT?

Everybody looks forward to payday. Most high school students are paid on a **weekly** basis, which means they receive 52 paychecks per year. Their paydays usually fall on the same day each week. However, not all jobs have a pay period of one week.

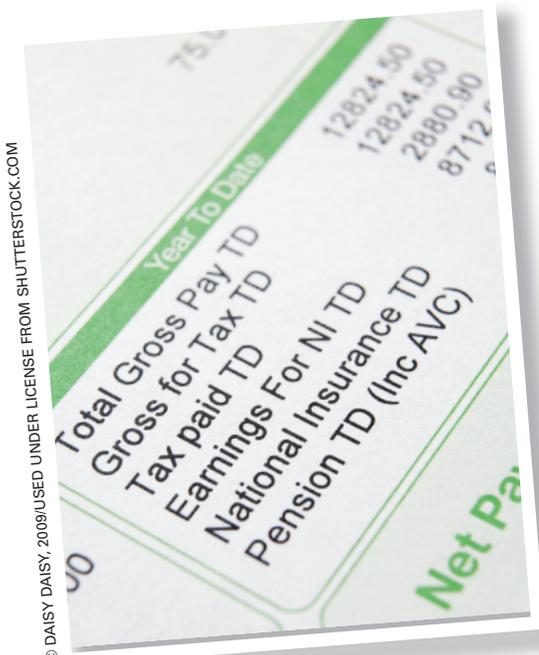
Some employees receive a paycheck every two weeks. They receive 26 paychecks per year. These people are paid **biweekly**. Their paydays fall on the same day of the week. Businesses that distribute paychecks biweekly save time, money, and paperwork, when compared with businesses that pay their employees weekly.

Some businesses pay their employees twice a month, or **semimonthly**. There are 12 months in a year, so these employees receive 24 paychecks per year. The paychecks are distributed on the same dates each month. For example, an employer may choose to pay employees on the 1st and 15th of each month. Note that biweekly and semimonthly payment schedules are slightly different.

Although it is not common, some businesses pay their employees **monthly**. These employees receive 12 paychecks per year. They are usually paid on the same date of each month, for example, the 15th.

Most employers offer their employees **direct deposit**. This means their paycheck amounts are automatically deposited electronically into their bank accounts on payday.

Most part-time jobs that students hold pay a set amount for each hour they work, called the **hourly rate**. Many people in full-time jobs also are paid at an hourly rate.



Certain jobs, whether full- or part-time, require the employee work a specific number of hours per week. These are the employee's **regular hours**. Employees may work more hours than their regular hours. These extra hours are called **overtime hours**. The **overtime hourly rate** is usually greater than the hourly rate for the regular hours. Often the overtime rate is $1\frac{1}{2}$ times the regular hourly rate, called **time-and-a-half overtime**. Sometimes the overtime rate is 2 times the hourly rate, called **double-time pay**. Your total pay, which is the sum of your hourly pay and your overtime pay, is your **gross pay**.

There are federal and state laws on the lowest hourly rate that can be paid to an employee in the United States. This rate is the **minimum wage**. Other laws involve the number of hours employees can work, and conditions in the workplace. It is important to have a clear understanding of your rights and responsibilities as an employee.

Skills and Strategies

Here you will learn how to make computations involving different pay periods and hourly rates. When you take a job, be sure to ask about everything you need to know regarding your paycheck.

EXAMPLE 1

Christina is paid biweekly. Her annual salary is \$37,000. What is her biweekly salary, rounded to the nearest cent?

SOLUTION There are 26 biweekly paychecks per year. Christina divides her annual salary by the number of paychecks to compute her weekly salary.

$$37,000 \div 26 = 1,423.08$$

Christina earns \$1,423.08 per biweekly pay period.

■ CHECK YOUR UNDERSTANDING

Carlos earns x dollars biweekly. Express his annual salary algebraically.

EXAMPLE 2

Manny is paid semimonthly. His semimonthly salary is \$1,239. What is his annual salary?

SOLUTION Manny receives 24 paychecks per year. He multiplies the monthly amount by the number of paychecks to calculate his annual salary.

$$1,239 \times 24 = 29,736$$

Manny's annual salary is \$29,736.

■ CHECK YOUR UNDERSTANDING

Alex is paid semimonthly. His annual salary is y dollars. Express his semimonthly salary algebraically.

EXAMPLE 3

Maureen works at a local Chicken King restaurant. Her regular hourly wage is \$9.70. If she regularly works 40 hours per week, what is her regular weekly pay?

SOLUTION Multiply the hours worked by the hourly wage.

$$9.70 \times 40 = 388$$

Maureen's regular weekly pay is \$388.

■ CHECK YOUR UNDERSTANDING

Roger regularly works h hours per week at a rate of d dollars per hour. Express his annual salary algebraically.

EXAMPLE 4

If Maureen from Example 3 works overtime, she receives an hourly rate of $1\frac{1}{2}$ times her regular hourly rate. What is Maureen's hourly overtime rate?

SOLUTION Multiply her hourly rate by $1\frac{1}{2}$, which is 1.5 as a decimal.

$$9.70 \times 1.5 = 14.55$$

Maureen's hourly overtime rate is \$14.55.

■ CHECK YOUR UNDERSTANDING

If Mary Ann earns y dollars per hour regularly, express her hourly overtime rate algebraically if she is paid time-and-a-half.

EXAMPLE 5

Janice earns \$10 per hour. If her regular hours are 40 hours per week, and she receives time-and-a-half overtime, find her total pay for a week in which she works 45 hours.

SOLUTION

Find her regular pay for the 40 regular hours. $40 \times 10 = 400$

Subtract to find the number of overtime hours. $45 - 40 = 5$

Her overtime rate is 1.5 times the hourly rate. $10 \times 1.5 = 15$

Multiply the overtime hourly rate by the number of overtime hours to find the overtime pay. $15 \times 5 = 75$

Add her regular pay to her overtime pay. $400 + 75 = 475$

Janice earned \$475 for her 45 hours of work.

■ CHECK YOUR UNDERSTANDING

Ron regularly works 40 hours per week, at a rate of x dollars per hour. Last week he worked y overtime hours at time-and-a-half. Express his total weekly salary algebraically.

EXAMPLE 6

Samantha worked her 40 regular hours last week, plus 7 overtime hours at the time-and-a-half rate. Her gross pay was \$611.05. What was her hourly rate?

SOLUTION Let x represent the hourly rate. Her regular pay is $40x$. Her overtime rate is $1.5x$. Her overtime pay is $7(1.5x)$.

$$\text{Regular pay} + \text{Overtime pay} = \text{Total pay}$$

Substitute. $40x + 7(1.5x) = 611.05$

Simplify. $40x + 10.5x = 611.05$

Combine like terms. $50.5x = 611.05$

Divide each side by 50.5. $x = 12.10$

Samantha's regular hourly rate is \$12.10.

■ CHECK YOUR UNDERSTANDING

Jillian worked her 40 regular hours last week, plus 2 overtime hours at a double-time rate. Her gross pay was \$484. What was her hourly rate?

EXAMPLE 7

Last week, Saul worked r regular hours and t overtime hours at a time-and-a-half rate. He earned \$700. If x represents his hourly rate, express x in terms of r and t .

SOLUTION Regular gross pay is rx . Total overtime pay is $t(1.5x)$.

$$\text{Regular pay} + \text{Overtime pay} = \text{Total pay}$$

Substitute. $rx + t(1.5x) = 700$

Remove the parentheses. $rx + 1.5tx = 700$

Factor out x . $x(r + 1.5t) = 700$

Divide each side by $(r + 1.5t)$. $x = \frac{700}{r + 1.5t}$

Saul's hourly rate can be represented by $\frac{700}{r + 1.5t}$.

■ CHECK YOUR UNDERSTANDING

Jonathan worked h hours at an hourly rate of r dollars. He also worked w hours at an overtime rate of double time. Express his total pay for the week algebraically.

■ EXTEND YOUR UNDERSTANDING

Jovanna gets paid a regular-pay rate of r dollars for 40 hours worked. She is paid at a time-and-a-half rate for up to 16 overtime hours worked and a double-time rate for any overtime hours worked greater than 16 hours. Write a piecewise function, $p(z)$, for Jovanna's pay when she works z hours.

Applications

Never confuse the size of your paycheck with the size of your talent.

Marlon Brando, Actor

1. Interpret the quote in the context of what you learned about jobs and salaries.
2. Yoko is paid semimonthly. How many fewer paychecks does she receive in a year compared to someone who is paid weekly?
3. Sean is paid biweekly. His annual salary is \$42,500. What is his biweekly salary to the nearest cent?
4. Cynthia's semimonthly salary is \$1,371.50. What is her annual salary?
5. Baseball player Alex Rodriguez earned \$27,708,525 in 2007. He played in 158 games. What was his salary per game to the nearest thousand dollars?
6. Ceil gets paid biweekly. Her biweekly salary is \$1,763.28. What is her annual salary?
7. John's weekly salary is \$478.25. His employer is changing the pay period to semimonthly.
 - a. What is John's annual salary?
 - b. What will John's semimonthly salary be to the nearest cent?
8. Ralph earns \$72,000 annually as an architect and is paid semimonthly. Alice also earns \$72,000 but she is paid biweekly.
 - a. How many more checks does Alice receive in a year when compared to Ralph?
 - b. What is the difference between Ralph's semimonthly salary and Alice's biweekly salary? Round to the nearest cent.
9. Last year Beth's annual salary was \$38,350. This year she received a promotion and now earns \$46,462 annually. She is paid biweekly.
 - a. What was her biweekly salary last year?
 - b. What is Beth's biweekly salary this year?
 - c. On a biweekly basis, how much more does Beth earn as a result of her promotion?
10. Justin is a golf pro. He works eight months per year, and is paid \$76,000. During the winter months, he teaches golf privately and earns another \$12,500. What is his average monthly salary based on his yearly earnings?
11. Last year Nancy's annual salary was x dollars. This year she received a raise of y dollars per year. She is paid semimonthly.
 - a. Express her semimonthly salary last year algebraically.
 - b. Express her semimonthly salary this year algebraically.
 - c. On a monthly basis, how much more does Nancy earn as a result of her raise?

- 12.** Hector works in a gas station and earns \$8.60 per hour. Last week he worked 29 hours. What was his gross pay?
- 13.** Eddie works at Beep-N-Kleen car wash. He earns \$8.40 per hour. Last week he worked x hours at this rate. Express his gross pay algebraically.
- 14.** Lynn regularly works a 40-hour week and earns \$9 per hour. She receives time-and-a-half pay for each hour of overtime she works. Last week she worked 43 hours.
 - a.** What was her regular gross pay?
 - b.** What was her hourly overtime rate?
 - c.** What was her overtime pay?
 - d.** What was her total pay for the week?
- 15.** Amy regularly works 20 hours per week at Pook's Dry Cleaners from Monday through Friday. She earns \$8.10 per hour and receives double-time pay for working Sundays. Next week she will work her regular 20 weekday hours, and an additional eight hours on Sunday. What will her total pay be for the week?
- 16.** Tom earns \$12.50 per hour at the Yankee Bowling Alley. He regularly works 40 hours per week. He is paid time-and-a-half for each hour of overtime work. Last week he worked 42 hours. What was his gross pay for the week?
- 17.** Pedro works 35 regular hours per week at the Meadow Deli. His hours over 35 are considered overtime. He earns \$9.20 per hour and receives time-and-a-half pay for each hour of overtime he works. Last week he worked 41 hours and received a gross pay of \$305.80. This amount is incorrect. How much does Pedro's boss owe him?
- 18.** Colby and Cheryl work in different local supermarkets. Colby regularly earns \$8.90 per hour, and he is paid time-and-a-half for each hour of overtime he works. Cheryl regularly earns \$7.10 per hour, and she is paid double time for an hour of overtime. Who earns more for one hour of overtime? How much more?
- 19.** Ron earns x dollars per hour. He regularly works 40 hours per week. Express his annual salary algebraically.
- 20.** Michael earns \$10 per hour. He regularly works 40 hours per week. How many overtime hours would he have to work in a week for his overtime pay to be greater than his regular gross pay?
- 21.** Jim worked 40 regular hours last week, plus 8 overtime hours at the time-and-a-half rate. His gross pay was \$1,248.
 - a.** What was his hourly rate?
 - b.** What was his hourly overtime rate?
- 22.** Julianne works as a waitress. She earns \$5.90 per hour plus tips.
 - a.** Today she worked x hours. Express her pay for these hours algebraically.
 - b.** She served nine tables. The total bill for these nine tables was y dollars. Julianne received 18% in tips from these bills. Express the amount she received in tips algebraically.
 - c.** Express Julianne's total earnings for the day algebraically.

- 23.** Mike works at Cheesecake King. He earns \$11 per hour as a busboy. The waiters he helps give him 25% of their tips.
- If Mike worked 6 hours today, how much did he earn, without tips?
 - The waiters Mike assisted waited on 16 tables, and the total bill from all these tables was \$1,188. The waiters earned 15% in tips, and gave 25% of these earnings to Mike. How much did Mike make in tips?
 - What was Mike's total salary for the day?
 - What were Mike's average earnings per hour, including tips? Round to the nearest cent.
- 24.** Max works x hours per week and has a 3-week vacation each year. Mindy works y hours per week and has a four-week vacation each year. Express their combined number of work hours per year.
- 25.** Gary earns 42,990 per year. He is paid weekly. He currently has a \$456-per-month car loan payment, and he pays \$1,277 per year for auto insurance. Is one week's paycheck enough to pay for his monthly auto loan and his monthly cost of insurance? Explain.
- 26.** The following spreadsheet can be used to compute total weekly pay, given the hours, hourly rate, and overtime rate.

	A	B	C	D	E	F	G	H
1	Hours Worked	Regular Hours	Hourly Rate	Regular Gross Pay	Overtime Hours	Time-and-a-Half Overtime Rate	Total Overtime Pay	Total Gross Pay
2	42	40	10.50					
3	44	40	9.00					
4	45	40	14.00					

- Write the formula to compute the regular gross pay in cell D2.
 - Write the formula to compute the overtime hours in cell E2.
 - Write the formula to compute the time-and-a-half overtime hourly rate in cell F2.
 - Write the formula to find the total overtime pay in cell G2.
 - Write the formula to compute the total weekly pay in cell H2.
 - Use your spreadsheet to fill in the missing entries.
- 27.** Marty is working with a math problem that defies intuition. He is going to pay his gardener for the entire month of July. He will pay the gardener every day. On the first day, he will pay the gardener \$0.01. On the second day, he will pay double the first day, \$0.02. On the third day, he will double the second day's pay and pay \$0.04.
- Make a grid that looks like a calendar with 7 columns and 5 rows.
 - Fill in the dates from July 1–July 31.
 - Enter the amount Marty pays his gardener on each day.
 - On what day will the gardener's pay exceed \$1,000,000 for the first time?
 - If x represents the day and y represents the salary for that day, draw a scatterplot for the first two weeks of July.
- 28.** Melissa has bought a \$2 lottery ticket every week for the past 20 years. This week she won for the first time—\$2,000 in her state lottery. Compare these winnings to her total investment, and explain if the lottery was a worthwhile endeavor for her.

He that is of the opinion money will do everything may well be suspected of doing everything for money.

Benjamin Franklin, American Statesman

Commissions, Royalties, and Piecework Pay

6-3

Key Terms

- commission
- royalty
- pieceworker
- piecework rate

Objectives

- Compute pay based on percent commission.
- Compute piecework pay.
- Understand advantages and disadvantages of pay based on production.

WHAT JOBS BASE THEIR PAY ACCORDING TO THE AMOUNT PRODUCED?

Some employees are not paid by the number of hours they work. Their pay is based on the amount of sales they make. Stockbrokers, travel agents, authors, musicians, and salespersons may all be paid based upon money from sales. These people are paid a **commission**, or a **royalty**. The commission or royalty rate is usually expressed as a percent. People who get paid commissions or royalties earn more money as more sales are made. Even if they work many hours, they can earn very little money if they make very few sales. Some employees get a commission in addition to a regular salary. Can you think of any advantages or disadvantages of getting paid only by commission?

A real estate salesperson receives a commission on the sale of each home. Money is not made until there is a sale. When an author writes a book, the author's job is basically done. Royalties depend on sales, but the author does not have to do any more writing to make more money. However, an author can do promotional events and book signings to increase awareness of the book, which may increase sales of the book.

Compare commission workers to people who are paid according to the amount of items they produce. They are paid by production, rather than the length of time that it takes them to do the job. These employees are called **pieceworkers**. Pieceworkers are paid a certain amount of money, called a **piecework rate**, for each item they complete. Although piecework is not as common as in years past, there are still jobs in farming, manufacturing, and journalism where this method of payment is used.

Piecework pay is sometimes used in combination with an hourly wage. The employee gets paid by the hour and receives a certain amount of money for each piece of work completed. The greater the number of pieces of work completed, the more money the employee makes. What are the benefits to both the employer and the worker?

Skills and Strategies

In these examples you will examine how certain occupations pay their workers based on sales and production, not just on hours worked.

EXAMPLE 1

Aдрианна wrote a textbook for high school students. She receives a 10% royalty based on the total sales of the book. The book sells for \$47.95, and 17,000 copies were sold last year. How much did Адрианна receive in royalty payments for last year?

SOLUTION Determine the total amount of sales from the 17,000 books.

$$17,000 \times 47.95 = 815,150$$

The total amount of sales is \$815,150.

Multiply the total sales by the commission rate expressed as a decimal.

$$815,150 \times 0.10 = 81,515$$

Адрианна received \$81,515 in royalty payments for last year.

■ CHECK YOUR UNDERSTANDING

Xander writes math textbooks that sell for x dollars each. He received a bonus of \$2,500 for signing a contract, and he receives 8% commission on each book sale. Express the total amount of income Xander earns from selling y books algebraically.

EXAMPLE 2

Allison sells cosmetics part-time from door-to-door. She is paid a monthly commission. She receives 11% of her first \$900 in sales and 17% of the balance of her sales. Last month she sold \$1,250 worth of cosmetics. How much commission did she earn last month?

SOLUTION Find the commission on the first \$900 of sales by multiplying 900 by the commission rate expressed as a decimal.

$$900 \times 0.11 = 99.00$$

The commission based on the first \$900 is \$99.

Determine the amount over \$900 by subtracting 900 from total sales.

$$1,250 - 900 = 350$$

The balance over \$900 is \$350.

Multiply 350 by the 17% commission rate expressed as a decimal.

$$350 \times 0.17 = 59.50$$

The commission on the balance of sales over \$900 is \$59.50.

Find the sum of the commission on the first \$900 and the commission on the \$350 balance.

$$99.00 + 59.50 = 158.50$$

The total commission for last month was \$158.50.

■ CHECK YOUR UNDERSTANDING

Arthur sells electronics on commission. He receives 7% of his first x dollars in sales and 10% of the balance of his sales. Last week he sold y dollars worth of electronics. Express the commission he earned last month algebraically.

EXAMPLE 3

• Kate works in a dress factory that makes dresses for designer boutiques. She is paid a piecework rate of \$85 per unit (piece) produced. Yesterday she made 3 dresses. How much did she earn?

• **SOLUTION** Multiply the number of pieces, 3, by the piecework rate, which is \$85.

$$3 \times 85 = 255$$

• Kate earned \$255 yesterday.

■ CHECK YOUR UNDERSTANDING

Martin writes magazine articles. He is paid a rate of p dollars for each article he writes. Last year he wrote s articles. Express his total piecework earnings algebraically.

EXAMPLE 4

• Tony picks strawberries and gets paid at a piecework rate of 45 cents per container for the first 200 containers picked. He receives 65 cents per container for every container over 200 that he picks. Last week, Tony picked 270 containers. How much did he earn?

• **SOLUTION** Compute the piecework pay for 200 containers at a rate of 45 cents per container. Then compute the pay for the containers over 200. Add these amounts to find his total pay.

• Multiply 200 by piecework pay. $200 \times 0.45 = 90$

• Subtract to find the amount picked over the initial 200 containers. $270 - 200 = 70$

• Multiply 70 by additional container pay. $70 \times 0.65 = 45.50$

• Total pay is the sum of the two amounts. $90.00 + 45.50 = 135.50$

• Tony earned \$135.50 in piecework pay last week.

■ CHECK YOUR UNDERSTANDING

Brianna picks tomatoes on a local farm. She receives 11 cents per crate. Last week, her total piecework earnings was x dollars. Express the number of crates she picked algebraically.

EXAMPLE 5

Glassman Chevrolet pays commission to its car salespeople. They are paid a percent of the profit the dealership makes on the car, not on the selling price of the car. If the profit is under \$750, the commission rate is 20%. If the profit is at least \$750 and less than or equal to \$1,000, the commission rate is 22% of the profit. If the profit is above \$1,000, the rate is 25% of the profit. If x represents the profit, express the commission $c(x)$ as a piecewise function.

SOLUTION There is a different rule for each of the different domains.

The 20% commission rate is for profits less than \$750.

The 22% commission rate is for profits from \$750 to \$1,000, inclusive.

The 25% commission rate is for profits greater than \$1,000.

Translate the words into algebraic symbols.

$$c(x) = \begin{cases} 0.20x & \text{when } 0 \leq x < 750 \\ 0.22x & \text{when } 750 \leq x \leq 1,000 \\ 0.25x & \text{when } x > 1,000 \end{cases}$$

■ CHECK YOUR UNDERSTANDING

Find the difference between the commission paid if a Glassman Chevrolet salesman, from Example 5, sells a car for a \$750 profit compared to selling a car for a \$749 profit.

EXAMPLE 6

Joyce works at Fortunato's Furniture. She is paid on commission. She receives 10% of her first \$900 in sales and 15% of the balance of her sales. Last week she earned \$750. What was the total value of the furniture she sold?

SOLUTION Let x represent the total value of the furniture.

Commission for the first \$900. $0.10(900)$

Balance of sales after the first \$900. $x - 900$

Commission for the balance. $0.15(x - 900)$

Add the two commissions. $0.10(900) + 0.15(x - 900) = 750$

Simplify. $90 + 0.15x - 135 = 750$

Combine like terms. $0.15x - 45 = 750$

Add 45 to each side. $0.15x = 795$

Divide each side by 0.15. $x = 5,300$

Joyce sold \$5,300 worth of furniture last week.

■ CHECK YOUR UNDERSTANDING

Lauren is a salesperson at Koslow's Tires. She is paid a monthly commission. She receives 6% of her first \$1,000 in sales and 11% of the balance of her sales. Today she earned \$203. What was the total value of the tires she sold?

Applications

He that is of the opinion money will do everything may well be suspected of doing everything for money.

Benjamin Franklin, American Statesman

1. Interpret the quote in the context of your experiences with money.
2. Rock musician Donny West is paid 15% on his CD sales and tour video sales. Last year, he sold one million CDs and 550,000 videos. The CDs were sold to music stores for \$5 each and the videos for \$6 each.
 - a. What was the total amount of CD sales?
 - b. What was the total amount of video sales?
 - c. What was the combined total of CD and video sales?
 - d. How much did Donny West receive in royalties last year?
3. Joan sells new cars at a local dealership. She receives a 25% commission on the profit each car is sold for. Last month she sold 9 cars, for a total of \$8,870 dealer profit. How much did she earn in commission?
4. Liz works at Heedle's Computer Outlet. She receives a weekly salary of \$200 plus 3% commission on her sales. Last week, she sold \$29,700 of computer equipment. How much did Liz earn last week?
5. Oscar sells Internet access subscriptions by telephone. He receives 12% of the first \$1,000 and 15% on the balance over \$1,000. Last month he sold \$7,500 worth of Internet access subscriptions. What was his commission for last month?
6. Professional baseball player Rusty Raspberry earns \$1,715,000 a year playing baseball. Last year, a biography that he had written sold 300,000 copies at a price of \$24 each. Raspberry received 10% in royalties on the book sales. What was his total salary last year from the book and his baseball career?
7. Maram is a real estate agent. She earns 6.5% commission on each sale she makes. Last month she sold one house for \$250,000 and another for \$310,000. What did Maram earn in commissions for the month?
8. Glen has a job selling magazine subscriptions by phone. He makes a base salary of \$9.60 per hour plus a 5% commission on all sales. Last week, Glen worked 35 hours and sold \$230 worth of subscriptions. What was his gross pay for the week?
9. Hillside Travel pays its employees \$10 per hour plus 8% commission on all trips booked. Tyrus worked 20 hours last week and booked trips amounting to \$2,100. What was his gross pay for last week?
10. Silvan picks berries at Seymour's Berry Farm. He receives 28 cents for each small basket picked. Last weekend, he was able to pick 731 baskets. How much did he earn?

- 11.** Alanna is a stockbroker. She receives a commission based on the value of the trades she makes.
 - a.** If Alanna earns \$50 for sales of \$1,000, what is her percent of commission?
 - b.** If she earns x dollars for sales of y dollars, express her percent of commission algebraically.
- 12.** Barb works in a local factory. She receives 92 cents for each of the first 100 units she produces and \$1.01 for each unit over 100. Yesterday, she produced 120 units. How much did Barb earn?
- 13.** Bill works for the Stuff-It Mailing Service. He receives 25 cents for each document he puts together and prepares for mailing. Last week, Bill prepared 2,000 documents for mailing for a local department store. He received a check with gross pay of \$474 and is certain that the amount is incorrect.
 - a.** What is Bill's correct total piecework pay?
 - b.** How much does his boss owe him?
- 14.** Audrey works in a factory. She receives a salary of \$8 per hour and piecework pay of 12 cents per unit produced. Last week she worked 38 hours and produced 755 units.
 - a.** What was her piecework pay?
 - b.** What was her total hourly pay for the week?
 - c.** What was her total pay for the week?
 - d.** What would her total weekly salary have been if she produced 0 units?
- 15.** Anton picks corn at a local farm. He is paid 80 cents per bushel for the first 50 bushels, 90 cents per bushel for the next 50 bushels, and \$0.95 per bushel for all bushels picked over 100. Express algebraically the amount Anton earns if he picks x bushels, where $x > 100$.
- 16.** Danielle works in an exclusive dress factory. She is paid \$156 for each dress she sews. Last month she sewed 30 dresses. What was her total pay for the month?
- 17.** Jason types papers for local college students. He charges \$6.50 per page. How much will he receive for a 22-page paper?
- 18.** Neil sells subscriptions by phone. He makes \$2.10 for each subscription sold. At the holiday time last year, he sold n subscriptions. Express his earnings algebraically.
- 19.** Last week Eric received a total piecework paycheck of \$252.48. He receives 12 cents per unit produced. How many units did he produce?
- 20.** Arielle receives a piecework rate of 10 cents per unit from the Wiggy Factory. Her production record for last week was affected by a machinery breakdown on Tuesday. Her production results were: Monday, 375 units; Tuesday, 22 units; Wednesday, 410 units; Thursday, 390 units; and Friday, 390 units.
 - a.** What is the mean number of units produced per day?
 - b.** What is the median number of units produced?
 - c.** What is the mode number of units produced?

- 21.** Janice is a travel agent. She receives a 7% commission based on the value of the trips she books. Today she spent five hours arranging a \$3,300 cruise for a newlywed couple.
- How much commission did she earn?
 - What was her mean hourly pay for the work she did?
- 22.** Linda is a salesperson for Spooner's Cleaning Service, which cleans office buildings. She receives a 14% commission for every office that signs a contract for the cleaning services. Last week she received \$1,233.60 in commissions. What was the total value of the cleaning contracts she sold, rounded to the nearest dollar?
- 23.** Appel's Music Store pays its sales staff a commission of 9.5% of the first \$1,000 in sales and 15.5% of the balance of sales. Alex, the store's drum expert, received \$1,234.25 in commission last week. What were his total sales for the week?
- 24.** Salespersons at the Kings Park Auto Giant are paid a commission, $c(p)$, based on the profit, p . The following piecewise function gives the commission rules.

$$c(p) = \begin{cases} 0.20 p & \text{when } 0 \leq p < 900 \\ 0.23 p & \text{when } 900 \leq p < 1,500 \\ 0.25 p & \text{when } p \geq 1,500 \end{cases}$$

- If the profit is \$1,500, what is the percent commission rate?
 - If the profit is \$900, what is the percent commission rate?
 - What is the commission on a car sold for a \$970 profit?
 - Kings Park Auto Giant purchases a car for \$32,090 and sells it for \$33,200. What commission is paid to the salesperson?
- 25.** McCormack Chrysler pays their sales staff by commission. They are paid a percent of the profit the dealership makes on the car. If the profit is \$500 or less, the commission rate is 17%. If the profit is greater than \$500 and less than or equal to \$1,100, the commission rate is 20%. If the profit is above \$1,100, the rate is 22%.
- If x represents the profit, express the commission $c(x)$ as a piecewise function.
 - If the dealer purchases the car for \$21,696 and Kristin, a salesperson, sells it for \$22,800, how much commission does Kristin earn for the sale?
 - Kristin is thinking of leaving McCormack Chrysler and working at Glassman Chevrolet, from Example 5. How much more commission would she have made for the same sale at Glassman?
- 26.** A car dealer pays d dollars for a car, which is sold for c dollars. The commission paid to the salesperson is 24% of the profit. Express the commission algebraically.
- 27.** Aileen is a salesperson at Lopez Sporting Goods. She is paid a monthly commission on all Little League uniforms she sells. She receives 10% of her first \$2,000 in sales and 12% of the balance of her sales. Last week she earned \$231.20. What was the total value of the uniforms she sold?

To find joy in work is to discover the fountain of youth.

Pearl S. Buck, American Novelist

6-4

Employee Benefits

Objectives

- Understand and calculate the value of certain employee benefits.

Key Terms

- employee benefits
- insurance
- paid vacation time
- paid holiday time
- retirement plans
- stock ownership plans
- childcare leave
- family health care
- individual health care
- pension
- unemployment insurance
- base period
- worker's compensation

WHAT ARE THE BENEFITS OF A JOB?

The first time you get a full-time job, someone will probably ask you, “Does it come with benefits?” You might think this is a foolish question because the best benefit you know of is that the job is salaried. This is a monetary benefit. You might respond that you will find satisfaction in working in a career you trained for. This is an emotional benefit. But the questioner is probably asking you about employee benefits. **Employee benefits** are value-added options that an employer may choose to offer employees. Typically, benefits are in the forms of **insurance** (health, life, and disability), **paid vacation time**, **paid holiday time**, **retirement plans**, **stock ownership plans**, **childcare leave**, and more. **Family health care** covers all members of the immediate family for health care bills to the extent outlined in the health care coverage plan. **Individual health care** covers only the employee. A **pension** is compensation that an employee receives from an employer after retirement.

While the above benefits are not required, there are some benefits that are required. **Unemployment insurance** is a government program that offers benefits to eligible employees who, through no fault of their own, have become unemployed. These workers must meet certain eligibility requirements. The program is meant to offer temporary assistance to people who are out of a job, but looking for replacement employment. For example, suppose that you work for a telephone company. Over the last few years, land lines have increasingly been replaced by cellular phones. As a result, your employer found that she must reduce the workforce in order to stay in business. She informed you that you would no longer have a job in the company. Here, your impending loss of a job was not your fault. If you also meet other requirements as outlined by state law, you could be eligible for unemployment compensation. The amount you receive is based on a percentage of what you earned at your job over a qualifying period of employment. There is a state maximum for this benefit. The benefits are sometimes extended by federal and state agencies beyond the initial compensation period. The

actual formula used to compute the weekly compensation varies from state to state, but most states make the determination on salaries that the employee earned during a fixed period of time known as a **base period**.

Another benefit that is required by the government is **worker's compensation**. The extent of compensation from this program is governed by state laws. But, the purpose of the program is to offer assistance to employees who are injured while working at their job.

The question that you may be asked about whether or not you have benefits when you get your job is the question you should be asking before you accept your job. Employee benefits add to the value of employment beyond the salary for that job.

Skills and Strategies

Here you will learn about a variety of employee benefits and the mathematics that is needed to get the most out of them.

EXAMPLE 1

Alan works for a printing company. It has been a little over four years since he was hired. He now makes \$54,080 per year. When he was hired, he was told that he had five days of paid vacation time. For each year that he worked at the company, he would gain another two days of paid vacation time to a maximum of 20 days. How many paid vacation days does he now get at the end of four years of employment and how much will he make during the time he is on vacation?

SOLUTION Examine the table. Alan has completed four full years of work for his company. He is in his fifth year of employment and is entitled to 13 paid vacation days. Because he is making \$54,080 per year, you can determine his weekly salary by dividing this amount by 52 weeks.

$$54,080 \div 52 = 1,040$$

Alan makes \$1,040 per week. A typical workweek consists of five business days. Therefore, Alan has two work weeks plus three days of paid vacation coming to him this year. The remaining three vacation days can be expressed as a fractional part of a work week. The fraction $\frac{3}{5}$ can be written as 0.6. Alan gets 2.6 work weeks of paid vacation time.

$$\text{Weekly salary} \times 2.6 \quad 1,040 \times 2.6 = 2,704$$

Alan will make \$2,704 while on vacation this year.

Number of Years Worked	Number of Paid Vacation Days
0	5
1	$5 + 2 = 7$
2	$5 + 2 + 2 = 9$
3	$5 + 2 + 2 + 2 = 11$
4	$5 + 2 + 2 + 2 + 2 = 13$

■ CHECK YOUR UNDERSTANDING

Let x represent the number of the working year and y represent the number of paid vacation days. Based on the table above, write an algebraic equation that models the relationship between these two variables.

EXAMPLE 2

Frieda's employer offers her family health care. Frieda must contribute 12% of the cost, and her employer will cover the rest. Frieda gets paid on a biweekly basis, and she notices that \$88.50 is taken out of each paycheck for her portion of the contribution to the family health care coverage. How much does Frieda's employer contribute for her coverage?

SOLUTION Let x represent the cost of Frieda's family health care. Frieda's total contribution is 12% of that cost, or $0.12x$. Since Frieda has \$88.50 taken out of her biweekly paychecks for the coverage, her total yearly contribution is determined by multiplying that biweekly amount times 26 which is the number of biweekly paychecks.

Frieda's health care contribution $88.50 \times 26 = 2,301$

Frieda's contribution of \$2,301 is 12% of the total amount.

Write an equation and solve for x . $0.12x = 2,301$

Divide each side by 0.12. $\frac{0.12x}{0.12} = \frac{2,301}{0.12}$

$$x = 19,175$$

Frieda's family health care coverage costs \$19,175. She contributes \$2,301 to that amount, and her employer pays the rest.

Subtract to find her employer's contribution. $19,175 - 2,301 = 16,874$

The employer's contribution is \$16,874.

■ CHECK YOUR UNDERSTANDING

Mark's employer offers individual health care. Mark pays d dollars out of his biweekly paycheck for his share of the total cost. If Mark's contribution is a percentage of the total cost, where p represents that percentage written as an equivalent decimal, represent the total cost of Mark's coverage in terms of d and p .

EXAMPLE 3

Marina works at Washington Performing Arts Center. Her employer offers her a pension. Marina's employer uses a formula to calculate the pension. A retiring employee will receive 1.5% of their average salary for the last five years of employment for every year worked. Marina is planning on retiring at the end of this year after 25 years of employment. Marina would receive this amount each year until her death. Her salaries for the last five years are \$88,900, \$92,200, \$96,000, \$98,000, and \$102,000. Calculate Marina's pension.

SOLUTION Find Marina's 5-year average salary.

$$\frac{88,900 + 92,200 + 96,000 + 98,000 + 102,000}{5} = 95,420$$

- Marina's average salary for her last five years of work is \$95,420. For each of the 25 years she worked at the Center, she will receive 1.5% of that average.
- Find 1.5% of \$95,420. $0.015 \times 95,420 = 1,431.30$
- Multiply this amount by 25 years. $1,431.30 \times 25 = 35,782.50$
- Marina will receive a pension of \$35,782.50 per year until her death.

■ CHECK YOUR UNDERSTANDING

DeBrown Corporation offers employees a retirement plan based upon the following formula. The retiree will get 2% of the average of the final three year salaries times the number of years employed by the company. Suppose an employee's last three years of salaries are A , B , and C , and the employee worked at DeBrown for D years. Write the algebraic expression that represents the employee's yearly pension.

EXAMPLE 4

In Reese's state, the weekly unemployment compensation is 60% of the 26-week average for the two highest-salaried quarters. A quarter is three consecutive months. For July, August, and September, he earned a total of \$9,024. In October, November, and December, he earned a total of \$9,800. Determine Reese's unemployment compensation.

SOLUTION Find Reese's total earnings for the two quarters.

$$9,024 + 9,800 = 18,824$$

Divide the total of \$18,824 earned during these months by 26, since there are 26 weeks in this half-year period.

$$18,824 \div 26 = 724$$

His 26-week average is \$724 per week.

Find 60% of 724. $0.60 \times 724 = \$434.40$

Some states have a maximum compensation amount. In Reese's state, \$434.40 falls below that maximum. He will receive that amount for the next 26 weeks or until he finds another job during that time.

■ CHECK YOUR UNDERSTANDING

Wanda lives in the same state as Reese. Her weekly unemployment compensation is \$360. What were the total 26-week earnings for her highest two consecutive quarters of employment?

■ EXTEND YOUR UNDERSTANDING

Lara lives in the same state as Reese. Lara made the same weekly salary for each of the 26 weeks in her two highest consecutive quarters. She will receive a weekly unemployment compensation check for \$570. What was Lara's weekly salary when she worked for her company?

Applications

To find joy in work is to discover the fountain of youth.

Pearl S. Buck, American Novelist

1. How can the quote be interpreted in light of what you have learned?
2. Roberto's employer offers a sliding paid vacation. When he started work, he was given three paid days of vacation. For each six-month period he stays at the job, his vacation is increased by two days.
 - a. Let x represent the number of 6-month periods worked and y represent the total number of paid vacation days. Write an equation that models the relationship between these two variables.
 - b. How much vacation time will he have earned after working for 4.4 years?
3. When Lisa started at her current job, her employer gave her two days of paid vacation time with a promise of three additional paid vacation days for each year she remains with the company to a maximum of four work weeks of paid vacation time.
 - a. Let x represent the number of years she has worked for this employer and y represent the number of paid vacation days she has earned. Write an equation that models the relationship between these two variables.
 - b. It has been five years since Lisa began working for this employer. How many paid vacation days has she earned?
 - c. When will she reach the maximum number of paid vacation days allowed?
4. When Lou started his current job, his employer told him that he would receive two vacation days for each full year he worked. Let x represent the number of years he has worked for the company and y represent the number of paid vacation days he earned.
 - a. Write an equation that models the relationship between these two variables.
 - b. How long will it take him to earn 18 paid vacation days?
5. When George started his current job, his employer told him that at the end of the first year, he would receive two vacation days. After each year worked, his number of vacation days would double up to five work weeks of paid vacation.
 - a. Let x represent the work year and y represent the number of paid vacation days. Write an equation that models the relationship between these two variables.
 - b. How many vacation days will he have earned after four years?
 - c. In what year will he have maxed out his vacation days?
6. Ruth contributes 18% of the total cost of her individual health care. This is a \$67.50 deduction from each of her biweekly paychecks. What is the total value of her individual coverage for the year?

7. At Richardson Manufacturing Company, there are two factors that determine the cost of health care. If an employee makes less than \$55,000 per year, he pays \$40 per month for individual coverage and \$85 per month for family coverage. If an employee makes at least \$55,000 per year, individual coverage is \$70 per month and family coverage is \$165 per month.
- Arielle is an office assistant at Richardson. She makes \$47,700 per year. She has individual health care. Her yearly contribution is 5% of the total cost. How much does her employer contribute?
 - Catherine is a department manager at Richardson. Her annual salary is \$68,300. She has family health care. Her employer contributes \$935 per month towards her total coverage cost. What percent does Catherine contribute toward the total coverage?
8. Eddie is a plant manager at North Salem Construction Company. He has been employed there for 20 years and will be retiring at the end of this year. His pension is calculated on the average of his last four years' salaries. In those years, he earned \$82,000, \$96,000, \$105,000, and \$109,000. His employer will give him 1.2% of that average for each year he worked. Calculate Eddie's pension.
9. As part of their employee benefits, all workers at Middletown Electronics receive a pension that is calculated by multiplying the number of years worked times 1.65% of the average of their three highest years' salary. Maureen has worked for Middletown for 27 years and is retiring. Her highest salaries are \$97,000, \$97,800, and \$98,198. Calculate Maureen's pension.
10. The spreadsheet calculates a yearly pension. Users enter the pension percentage as a percent in cell B1, the number of years worked in cell B2, and the last four working years' salaries in cells B3–B6. That 4-year average salary is calculated and displayed in cell B7. The yearly pension amount is calculated and displayed in cell B8.
- Write the spreadsheet formula for cell B7.
 - Write the spreadsheet formula for cell B8.
11. Natalia worked in an automobile plant. She lost her job when the plant relocated to another state. She applied for unemployment compensation. In her state, the amount is calculated by taking 55% of the average of the last 26 weekly salary amounts. The gross incomes from her last 26 paychecks are listed in the table. Determine Natalia's unemployment compensation weekly amount to the nearest cent.

	A	B
1	Pension percentage	
2	Years worked	
3	Year 1 salary	
4	Year 2 salary	
5	Year 3 salary	
6	Year 4 salary	
7	Average salary	
8	Yearly pension	

Week	1	2	3	4	5	6	7	8	9	10	11	12	13
Salary	\$715	\$700	\$730	\$730	\$730	\$720	\$700	\$720	\$720	\$720	\$725	\$720	\$725
Week	14	15	16	17	18	19	20	21	22	23	24	25	26
Salary	\$730	\$730	\$735	\$735	\$735	\$740	\$740	\$740	\$740	\$740	\$740	\$740	\$740

12. In Rodger's state, unemployment compensation is calculated by finding the total of the quarterly wages of two consecutive quarters and dividing by 26. The weekly unemployment is 65% of that amount. In the quarter of January, February, and March, Rodger made a total of \$13,950.80. In the quarter of April, May, and June, he made a total of \$14,250.10. Find Rodger's weekly unemployment amount.

A nation's strength lies in the well-being of its people. The Social Security program plays an important part in providing for families, children, and older persons in the time of stress.

President John F. Kennedy

6-5

Social Security and Medicare

Objectives

- To compute paycheck deductions for Social Security.
- To compute paycheck deductions for Medicare.

Key Terms

- Social Security
- Federal Insurance Contributions Act (FICA)
- FICA tax
- Social Security tax
- Medicare tax
- maximum taxable income
- Social Security number

WHAT ARE SOCIAL SECURITY AND MEDICARE?

An insurance program is available jointly through your employer and the United States government. This insurance, **Social Security**, covers 90% of all American jobs. President Franklin D. Roosevelt started Social Security in 1935. It was established in the **Federal Insurance Contributions Act (FICA)**. Social Security provides income for people after they retire. Social Security also pays benefits to disabled workers. If an eligible worker dies, benefits are paid to surviving family members.

When you work at a job covered by Social Security, you must pay **FICA taxes**. Both **Social Security tax** and **Medicare tax** fall under this category. These taxes help cover the cost of these federal insurance programs. Medicare is the nation's largest health insurance program for people 65 years of age and older and some disabled people under 65.

The costs of Social Security and Medicare are split evenly between you and your employer. The amount of Social Security tax you pay depends on the Social Security percentage and the **maximum taxable income** for that year. A percentage of each worker's salary is taken out of each paycheck, up to a set maximum amount. Any annual income greater than that amount is not subject to Social Security tax. Medicare tax is paid on all of your income. The money that you and your employer contribute to Social Security and Medicare is used to pay the *current* benefits to someone else. When you become eligible for benefits, the people working at that time will be paying for your benefits.

The government keeps records of the amounts that you have paid to Social Security and Medicare under your own personal **Social Security number**. Your Social Security number is a unique nine-digit number that belongs only to you. It will be on all of your paycheck stubs, so be sure to check that it is correct every time you get paid. You will have the same Social Security number for your entire life. It is important to keep your Social Security number private to prevent identity theft.

Skills and Strategies

Here you will learn about Social Security and Medicare payments, and how they have changed over the years.

EXAMPLE 1

Ramiro got his first job in 2006. In that year, Social Security tax was 6.2% of income up to \$94,200. Medicare tax was 1.45%. If Ramiro earned \$73,210 in 2006, how much did he pay for Social Security and Medicare taxes?

SOLUTION Ramiro's income was below the 2006 maximum taxable income of \$94,200, so he paid Social Security tax on all of his income.

Multiply his income by 6.2%. $73,210 \times 0.062 = 4,539.02$

His Social Security tax for 2006 was \$4,539.02. Find the Medicare tax.

Multiply his income by 1.45%. $73,210 \times 0.0145 = 1,061.545$

His Medicare tax for 2006 was \$1,061.55, rounded to the nearest cent.

To find his total Social Security and Medicare tax, add them together.

$$4,539.02 + 1,061.55 = 5,600.57$$

Ramiro paid \$5,600.57 for Social Security and Medicare in 2006. He should verify that the government has these exact numbers in their files.

■ CHECK YOUR UNDERSTANDING

Lisa made a total of x dollars last year, which was less than the maximum taxable income for the year. Social Security tax was 6.2% and Medicare tax was 1.45%. Write an expression that represents what Lisa paid to Social Security and Medicare combined.

EXAMPLE 2

Express the Social Security tax for 2006 as a piecewise function.

SOLUTION Let x represent the income. Use the tax rate and maximum taxable income from Example 1. For incomes less than or equal to \$94,200, Social Security tax is modeled by the equation

$$f(x) = 0.062x$$

All incomes over \$94,200 pay the same Social Security tax, 6.2% of 94,200.

$$94,200(0.062) = 5,840.40$$

Social Security tax, $f(x)$, can be represented by a piecewise function, as

$$f(x) = \begin{cases} 0.062x & \text{when } 0 < x \leq 94,200 \\ 5,840.40 & \text{when } x > 94,200 \end{cases}$$

It is not necessary to use a piecewise function to represent the Medicare tax for 2006, because the Medicare tax for that year was 1.45% of total income. The Medicare tax function $m(x)$ is

$$m(x) = 0.0145x$$

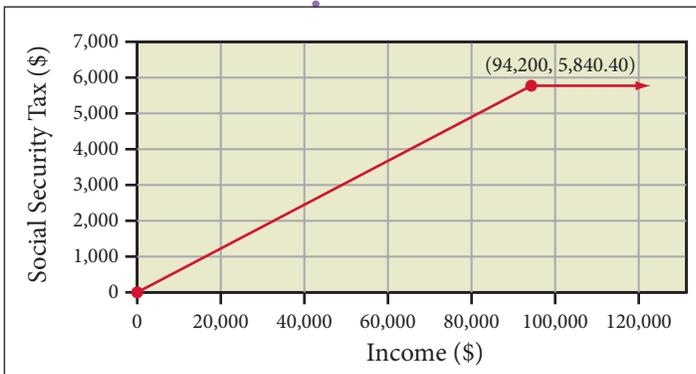
■ CHECK YOUR UNDERSTANDING

Ming worked three jobs in 2006. The total of her incomes was less than \$94,200. At QuickMart, she made x dollars. At the College Book Store, she made y dollars. At the Mail Depot, she made z dollars. Express the combined total of her Social Security and Medicare taxes algebraically.

EXAMPLE 3

Graph the Social Security tax piecewise function from Example 2.

SOLUTION Determine appropriate values for the x - and y -axes. The maximum value you need to graph on the y -axis is \$5,840.40. The x -axis should extend beyond \$94,200. Social Security tax on 0 dollars is 0, so the point $(0, 0)$ is on the graph. The maximum taxable income, \$94,200, and the maximum you could pay to Social Security, \$5,840.40, are coordinates of a second point. Draw a line segment connecting $(94,200, 5,840.40)$ to $(0, 0)$. This line segment has the equation $y = 0.062x$. The slope is the Social Security tax rate. For incomes greater than \$94,200, the Social Security tax is \$5,840.40, so a horizontal ray finishes



the graph. The horizontal ray has a slope of 0. Notice that there is a sharp point where the ray and the line segment with different slopes meet. This point, located at $(94,200, 5,840.40)$, is a *cusp*.

■ CHECK YOUR UNDERSTANDING

Mark's Social Security tax was \$3,500 during the year in the graph in Example 3. Use the graph to approximate his taxable income.

EXAMPLE 4

In 1988, Social Security tax was 7.51%, to the maximum income of \$45,000. If Grace earned \$51,211 in 1988, how much Social Security did she pay?

SOLUTION Grace's income, \$51,211, is over the maximum taxable income of \$45,000 for that tax year.

Find 7.51% of income. $45,000 \times 0.0751 = 3,379.50$

Grace's Social Security tax for 1988 was \$3,379.50.

This was the most anybody contributed to Social Security in 1988.

Even if you earned millions of dollars, this is the amount you contributed to Social Security.

■ CHECK YOUR UNDERSTANDING

In 1988 Ramona paid \$2,853.80 in Social Security tax. What was Ramona's taxable income in 1988?

Applications

A nation's strength lies in the well-being of its people. The Social Security program plays an important part in providing for families, children, and older persons in the time of stress.

President John F. Kennedy

- How can the quote be interpreted in the context of what you have learned?

- The table on the right gives a historical look at Social Security tax before there was a separate Medicare tax. Find the maximum you could pay into Social Security for each year.

Year	Social Security (%)	Maximum Taxable Income (\$)	Maximum You Could Pay Into Social Security
1978	6.05%	17,700	a.
1980	6.13%	25,900	b.
1982	6.7%	32,400	c.
1984	6.7%	37,800	d.
1986	7.15%	42,000	e.
1988	7.51%	45,000	f.
1990	7.65%	51,300	g.

- In 1990, Jerry's gross pay was \$78,000.
 - What was his monthly gross pay?
 - In what month did Jerry hit the maximum taxable Social Security income?
 - How much Social Security tax did Jerry pay in January?
 - How much Social Security tax did Jerry pay in December?

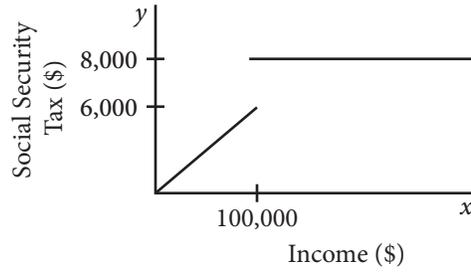
- In 1978, Dawn earned \$48,000.
 - What was her monthly gross pay?
 - In what month did Dawn reach the maximum taxable Social Security income?
 - How much Social Security tax did Dawn pay in February?
 - How much Social Security tax did Dawn pay in May?
 - How much Social Security tax did Dawn pay in November?

Year	Social Security (%)	Maximum Taxable Income for Social Security (\$)	Medicare (%)	Maximum Taxable Income for Medicare (\$)
1991	6.2%	53,400	1.45%	125,000
1992	6.2%	55,500	1.45%	130,200
1993	6.2%	57,600	1.45%	135,000
1994	6.2%	60,600	1.45%	All income
1995	6.2%	61,200	1.45%	All income
1996	6.2%	62,700	1.45%	All income
1997	6.2%	65,400	1.45%	All income
1998	6.2%	68,400	1.45%	All income
1999	6.2%	72,600	1.45%	All income
2000	6.2%	76,200	1.45%	All income
2001	6.2%	80,400	1.45%	All income
2002	6.2%	84,900	1.45%	All income
2003	6.2%	87,900	1.45%	All income
2004	6.2%	87,900	1.45%	All income
2005	6.2%	90,000	1.45%	All income
2006	6.2%	94,200	1.45%	All income
2007	6.2%	97,500	1.45%	All income
2008	6.2%	102,000	1.45%	All income
2009	6.2%	106,800	1.45%	All income

- In 1991, Social Security and Medicare taxes were itemized separately on paycheck stubs and tax forms for the first time. The table on the right gives a historical look at Social Security and Medicare taxes.
 - Find the maximum a person could contribute to Social Security and Medicare in 1993.
 - If $f(x)$ represents the Social Security tax, and x represents income, express the 2002 Social Security tax as a piecewise function.

For Exercises 6–10, use the table on the previous page that provides a historical look at Social Security and Medicare.

6. Express the 1993 Social Security tax function as a piecewise function $t(x)$, where x is the annual income. Graph the function. What are the coordinates of the cusps on the graph?
7. Graph the Social Security tax function for 1992. What are the coordinates of the cusp? On the same axes, graph the Medicare function.
8. In 2007, Jessica earned p dollars, where $p > 100,000$. Express the amount her employer contributed to her Social Security tax in February algebraically.
9. In 1995, Eve earned d dollars, where $d < 50,000$. Express the amount she paid to Social Security and Medicare as a function of d .
10. Keesha earned x dollars per month in 2006, where $x < \$5,600$.
 - a. Did she earn more or less than the maximum taxable income for 2006?
 - b. Express her Social Security tax for the year algebraically.
 - c. Express her Medicare tax for the year algebraically.
11. Explain why the slope of the Social Security function, before it becomes horizontal, cannot equal 1.
12. A politician is considering removing the maximum taxable income and having all income subject to Social Security tax. Why might this be unfair to very affluent people?
13. Find the Social Security and Medicare tax rates for the current year. Also find the maximum taxable income for the Social Security tax. Use the information to graph this year's Social Security tax function.
14. A politician is listening to a proposal for a new Social Security tax plan. The graph is shown. The two parts of the graph are disconnected where $x = 100,000$. Explain why this would be an unfair Social Security tax function.

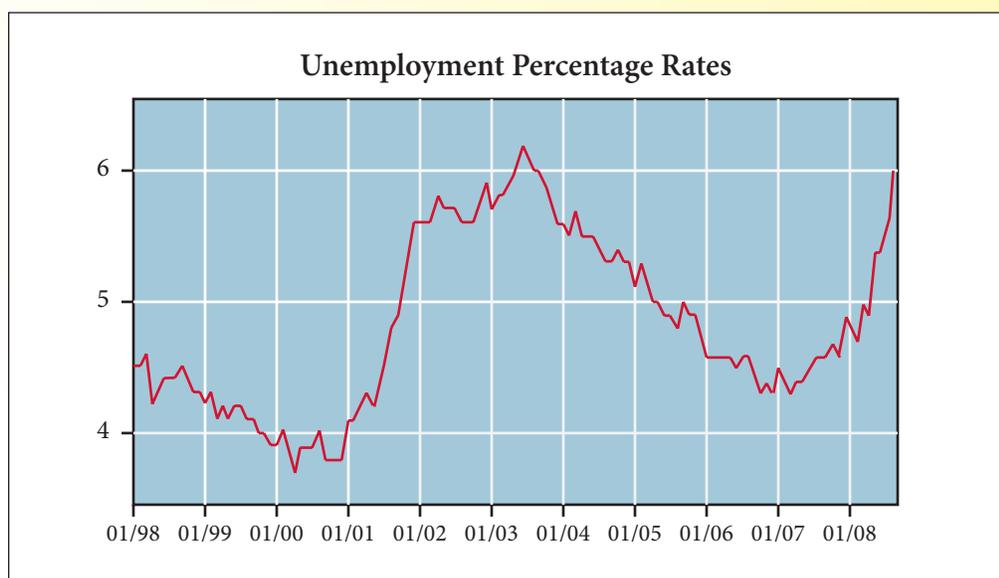

15. In a year when the maximum income for Social Security was \$106,800, Bart worked at two jobs. In one job he earned \$99,112. In his second job, he earned \$56,222. Both of his employers took out Social Security tax. As a result, Bart had paid excess Social Security tax, and the government must return some of it to him. How much does the government owe him for excess Social Security paid?
16. An All-Star baseball player earning \$25,000,000 per year plays 162 games per year. If you divide the salary by the number of games, does that baseball player reach this year's maximum taxable income in the first game of the year?

Assessment

Real Numbers

You Write the Story!!

Write a short newspaper-type article based on the graph below. You can find an electronic copy at www.cengage.com/school/math/financialalgebra. Copy and paste it into your article.



Source: Bureau of Labor Statistics

Reality Check

1. Every taxpayer should periodically ask the Social Security Administration for a copy of their Social Security records. This is a record of every dollar ever earned in a taxpayer's entire life, shown year-by-year. Visit the Social Security website for more information. Discuss this with your parents. Ask them if they might walk you through their record to illustrate their working history.
2. You are going to research benefits payable under Social Security. Go to the Social Security website. Do an Internet search for other sites about Social Security benefits. Read through each site and compile a list of benefits and a description of each benefit in a few sentences. Prepare a written report, oral report, or PowerPoint report on your findings.

3. Do an Internet search and speak to your librarian and English teacher about sources available to you so you can learn how to write a job resume. Pretend you are applying for a job of your choice. Prepare a cover letter and job resume about yourself that can include fictional colleges or trade schools, employment, community experience, and so on.
4. Contact the Department of Labor for your state by mail or email, or visit their Internet site. Gather information about unemployment insurance, state minimum wage for different industries, labor laws, child labor laws, and so on. Ask them to send you informative brochures, or download information from the website. Compile a list of facts you found in your readings. Create a presentation board to be displayed in your classroom.
5. Search a newspaper's help-wanted classified ads. Cut out 20 ads related to a specific profession. Interpret each ad in full sentences. Compute the annual, weekly, and monthly gross salary based on information given in the ad. Present your information in a report.
6. Do a library or Internet search on the federal minimum wage over the past two decades. Also research your state's minimum wage over the past two decades. The minimum wage could be different in different industries. Pick two of them. Create a graph that shows both federal and state minimum wages over the past 20 years. Present your graph on a poster.
7. Visit a local business that employs teenagers. Make an appointment to interview the manager. Prepare a list of questions for the manager about pay, pay periods, benefits, and other job-related facts. Prepare your information in a report.
8. Interview your parents about their opinions on what to consider when taking a job or choosing a career. How do they weigh benefits compared to salary? What other factors have their experiences taught them should be considered when planning a career?
9. Use the Internet to find the salaries of famous, highly paid athletes, movie stars, and other personalities. Set up rates that compare their salaries per day, per inning, per hour, per race, per pitch, per lap, per goal, per hour, per game, and so on. Present your information in graph form on a poster.
10. Call the help-wanted customer service line for several local newspapers. Find out the cost to an employer of placing a classified ad in the help-wanted section. Express the cost as a piecewise function. Present your findings on a poster.



Go to www.cengage.com/school/math/financialalgebra where you will find a link to a website containing current issues about employment. Try one of the activities.

REVISITED

Really?
Really!

In Really? Really! you were introduced to statistics about the American workforce. Now take a look at statistical predictions of how that workforce may look by the year 2016.

According to the U.S. Department of Labor's Bureau of Labor Statistics, the following is a list of the 10 fastest growing occupations from 2006 to 2016.

Job Title	Employment Number (in thousands)	
	2006	2016
Network systems and data communications analysts	262	402
Personal and home care aides	767	1,156
Home health aides	787	1,171
Computer software engineers, applications	507	733
Veterinary technologists and technicians	71	100
Personal financial advisors	176	248
Makeup artists, theatrical and performance	2	3
Medical assistants	417	565
Veterinarians	62	84
Substance abuse and behavioral disorder counselors	83	112

Based on the data in the list, explain how these ten jobs were sorted with network systems and data communications analyst as the fastest growing occupation and substance abuse and behavioral disorder counselors as the tenth fastest growing occupation. Justify your response.

Applications

1. Josephine is looking for a new part-time job as a plumber. She responds to a classified ad for a position that pays 44.5K. What would her weekly salary be to the nearest cent if she gets this job?
2. Frank got a new job through the Valley Employment Service. The job pays \$51K per year, and the agency fee is equal to 35% of one month's pay. How much must Frank pay the agency?
3. Derek is placing a seven-line classified job for an assistant. The following piecewise function gives the price of an x -line ad.

$$a(x) = \begin{cases} 32 & \text{when } x \leq 3 \\ 32 + 9(x - 3) & \text{when } x > 3 \end{cases}$$

Find the difference between the cost of a 6-line ad and the cost of a 7-line ad.

4. Carole worked her 40 regular hours last week plus 5 overtime hours at the time-and-a-half rate. Her gross pay was \$451.25. What was her hourly rate?
5. Tania earns \$13.50 per hour at the Glendale Florist. She regularly works 40 hours per week. She is paid time-and-a-half for each hour of overtime work. Last week she worked 43 hours. What was her gross pay for the week?
6. Patrick earns x dollars per hour for his regular 40 hours per week. He also works three hours overtime each week, at a time-and-a-half rate. Express his annual salary algebraically.
7. An author writes a computer self-help manual that sells for x dollars each. He received a bonus of \$1,000 to sign with his publisher, and he receives 10% commission on each book sale. Express the total amount of income he earns from selling y books algebraically.
8. Jim received a total piecework paycheck of \$291.81. He receives 71 cents per unit produced. How many units did he produce?
9. The Price King Auto Mall pays their sales staff by commission. They are paid a percent of the profit the dealership makes on each sold car. If the profit is \$900 or less, the commission rate is 18%. If the profit is greater than \$900 and less than or equal to \$1,500, the commission rate is 20% of the profit. If the profit is above \$1,500, the rate is 25% of the profit. If x represents the profit, express the commission $c(x)$ as a piecewise function.
10. Jean's Jeans pays its sales staff a commission of 4% of the first \$1,000 in sales and 6% of the balance of sales, plus a weekly salary. If a salesperson sold x dollars worth of clothing and $x > \$1,000$, express the commission earned algebraically.
11. Gabe contributes 15% of the total cost of his individual health care coverage. He pays \$28.80 per week towards this contribution. What is the total value of Gabe's health care coverage for the year?

- 12.** Anton works at First National Bank. His employer offers him a pension retirement plan which will be 1.45% of his average salary for the last five years of employment for every year worked. Anton is planning on retiring at the end of this year after 22 years of employment. His salaries for the last five years are \$92,000; \$92,800; \$99,000; \$100,500; and \$105,000. Calculate Anton's pension.
- 13.** In Don's state, the unemployment compensation is calculated by finding the total of the quarterly wages of two consecutive quarters and dividing that amount by 26. The weekly unemployment amount is 47% of that figure. In the quarter consisting of January, February, and March, Don made a total of \$19,574. In the quarter consisting of April, May, and June, he made a total of \$21,974. Find Don's weekly unemployment amount.
- 14.** In 2008, the Social Security percentage was 6.2% for the first \$102,000 earned. The Medicare percentage was 1.45% of your entire salary. Darby made \$143,000 in 2008.
- Write the combined taxes, y , as a piecewise function where x represents the income.
 - How much did Darby pay in Social Security tax?
 - How much did Darby pay in Medicare tax?
- 15.** The percentages at the turn of the 21st century are shown in the table. Ray worked at the same job for those three years making \$80,400 without any increase in salary.

	Social Security	Maximum Taxable Income	Medicare	Maximum Taxable Income
2000	6.2%	\$76,200	1.45%	All income
2001	6.2%	\$80,400	1.45%	All income
2002	6.2%	\$84,900	1.45%	All income

- Calculate his Social Security and Medicare taxes for those years.
 - Calculate the percent of his salary for the combined taxes in each year. What do you notice?
- 16.** In many states, the weekly unemployment compensation is a certain percentage of the 26-week average for the two highest-salaried quarters. A quarter is three consecutive months. In the spreadsheet below, the user enters the two highest quarter salaries and the state unemployment compensation percentage in the indicated cells.

	A	B
1	Enter your state's unemployment compensation percentage.	
2	Enter the two highest quarter salaries for the year.	
3		Quarter 1
4		Quarter 2
5		Quarter 3
6		Quarter 4
8	Your weekly unemployment compensation will be:	

Write a spreadsheet formula that will calculate the weekly unemployment compensation.