

# *On the Job* Math



## **Topics Include:**

Career Options, Providing Products or Services,  
Community Service, Profit & Loss, Getting to the Job,  
Getting Paid, Teamwork, Unemployment

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### Preview

#### How You Will Use This Unit

As you think about career options, you will consider many different things. Salary and take-home pay are just two examples. You will probably also consider types of work and benefits that come with the job. You may also think about whether to work indoors or outdoors and how you might work with people or products. As you compare options and make choices, you will often use math. The math skills you use include mental math and estimation, basic operations and equations, statistics and probability, and measurement of circles.



#### What You Will Do in This Unit

In this unit, math steps demonstrate how to solve problems. These steps can help you answer questions such as these:

*You run an express delivery service. You pick up a package in the northeast quadrant of the city and deliver it to an address in the southeast quadrant. In what general direction do you head?*

*You work at the local bookstore. You earn \$12,500 a year. There is a job opening at the big bookstore downtown. The salary is \$14,000. What is the percent increase in pay?*

*You are a dental assistant. You prefer to work only in the afternoons. Each week, the schedule changes. What is the probability of working only in the afternoons three weeks in a row?*

*You work for a local construction company. During the week, the company pays you \$12 an hour. On Saturdays, you do charity work at half pay. How much do you earn on Saturdays?*

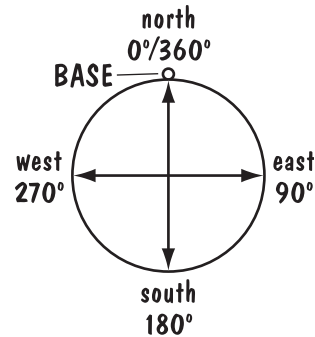
#### What You Can Learn from This Unit

When you complete this unit, you will have used mathematics to solve problems related to career options. These problems are similar to those that may actually occur in your daily life.

# Lesson 1

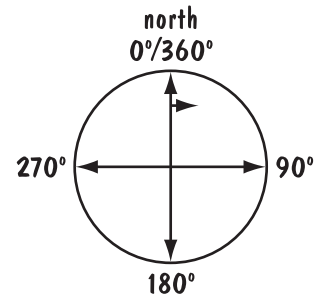
## Outdoor Careers

**Example** Enrique is a paramedic. He flies in a helicopter that does emergency pickups of hurt or sick people. Today, he heads in a direction  $245^\circ$  from the base. Mark that heading on this diagram. In which direction is Enrique heading (north, northeast, east, southeast, south, southwest, west, or northwest)?



### Solve

**Step 1:** Headings are always measured in a clockwise direction starting from north at  $0^\circ$ . Draw a small arrow to show where to start measuring Enrique's direction.



**Step 2:** Now, plot Enrique's heading. You can use a protractor to draw the  $245^\circ$  angle from  $0^\circ$  north. OR you can subtract the angle from  $360^\circ$  north and plot that angle in the negative (counter-clockwise) direction.

$$360^\circ - 245^\circ = 115^\circ$$

### Answer the Question

**Step 3:** Enrique is heading toward the southwest.

### Now try these problems.

1. Bette runs an express delivery service around the city. She picks up a package in the northeast quadrant of the city. She delivers it to an address in the southeast quadrant. In what general direction should she head?

**Answer:** Generally, Bette heads toward the \_\_\_\_\_.

2. Margo conducts walking tours of the island. Before a tour, she checks the heat index on the following chart. When the heat index is above 100, she does indoor tours of the museums. Otherwise she does outdoor tours. On the chart, the heat index is in the cell where a row and column meet.
- a. Yesterday morning, the air temperature was 85° and the relative humidity was 80%. Circle the heat index.

Air Temp (°F)	Relative Humidity (%)											
	45	50	55	60	65	70	75	80	85	90	95	100
95°	104	107	110	114	119	124	130	136				
90°	95	96	98	100	102	106	109	113	117	122		
85°	87	88	89	90	91	93	95	97	99	102	105	108
80°	80	81	81	82	83	85	86	86	87	88	89	91

- b. This morning, the relative humidity is 65%. According to this chart, how high can the air temperature be for Margo still to do outdoor tours?

A 80°                      B 85°                      C 90°                      D 91°

3. Kael earns \$6,500 over the four-month ski season as a ski instructor. During the rest of the year he earns \$1,875 a month as a sports-club coach. What is his annual income before taxes?

**Answer:** \_\_\_\_\_

4. Terry is head groundskeeper for the city's park system. He works 8 hours a day and earns \$12 an hour. He works about 220 days a year. On the job, he walks an average of 11 miles a day. About how many miles does he walk in one year? What is the mean (average) rate of pay per mile? Draw a line to join the correct pair of answers.

132 miles	\$8.73 per mile
2,420 miles	\$96 per mile
2,640 miles	\$20 per day
4,015 miles	\$27.50 per day

### ☆ Challenge Problem

*You may want to talk this one over with a partner.*

The salary of one leading baseball player was \$120,000 in 1997. In 2002 it was \$1,250,000. He says that each year his salary *increase* is twice the increase of the year before. Find his salary in 2003.

**Answer:** \_\_\_\_\_



## Lesson 2

## Indoor Careers

**Example** Marnie is the librarian in the downtown library. She earns \$24,690 a year. There is an opening for a librarian at the local high school. The salary is \$27,400. Marnie interviews and gets the job. What is the percent increase in her salary?



### Solve

**Step 1:** Find the *amount* of increase from Marnie's old salary to her new salary.

$$\$27,400 - \$24,690 = \$2,710$$

**Step 2:** Now, write an expression for percent increase.

$$\text{Percent increase} = \frac{\text{Amount of increase}}{\text{Original salary}} \times 100\%$$

**Step 3:** Substitute the amount of increase and original salary.

$$\text{Percent increase} = \frac{\$2,710}{\$24,690} \times 100\% = 10.98\%$$

### Answer the Question

**Step 4:** The percent increase in Marnie's salary is 10.98%.

### Now try these problems.

1. Lamar is a chef at a hotel in the suburbs. He earns \$20,200 a year. There is an opening for head chef at a hotel downtown. The salary is \$29,800. Lamar interviews and gets the job. What is the percent increase in his salary?

**Answer:** The percent increase in Lamar's salary is \_\_\_\_\_%.

2. Charlie suggests that his legal assistant go to a paralegal seminar. She submits an expense request for this trip to the

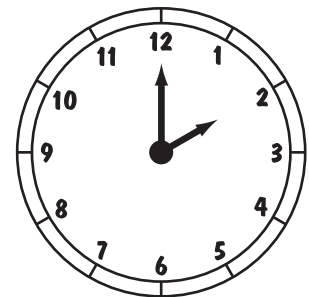
seminar. Complete the entries for the blank lines on the request. How much will the trip cost?

EXPENSE REQUEST			
Item	Price Detail	Quantity	Estimated Total
Airfare:	round trip		\$250
Hotel:	\$85 per day	3 days	\$ _____
Meal allowance:	\$9.50 per meal	9	\$ _____
Mileage:	\$0.28 cents a mile	50 miles	\$ _____
Airport parking:	maximum of \$25		\$25
Telephone:	maximum of \$25		\$10
TOTAL			\$ _____

3. Darien is a bank teller. She works from 8:45 a.m. to 4:15 p.m. five days a week. On Saturdays, she volunteers at the local animal shelter for 8 hours. How many hours does she work each week, including her volunteer work?

A 15.50      B 16      C 45.5      D 48

4. The state law says a minor cannot spend more than 40 hours a week going to school and working. Kyla goes to school between 7:45 a.m. and 1:15 p.m., Monday through Friday. She works in a doctor's office every afternoon, starting at 2:00 p.m. At what time does she leave each day in order to obey the state law? Mark that time on the clock face.



### ☆ Challenge Problem

*You may want to talk this one over with a partner.*

An e-mail ad says, "Work from home online and earn \$2,500 per month part-time." What does "part-time" mean to you? How many work days does a "month" mean to you? Use your definitions and write an expression for the rate of pay per hour for this job. Suppose you worked twice as many hours to do this job. Would that mean that your income goes up or that your hourly rate of pay goes down? Explain.

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## Lesson 3

## Working with People

**Example** Corey is a dental assistant. He prefers to work *only* in the afternoons. Each week the office assigns him randomly to any one of their five different work schedules. What is the probability that he gets to work *only* in the afternoons three weeks in a row?

<b>Work Schedules</b>		
<b>Schedule</b>	<b>Start</b>	<b>Finish</b>
A	6:00 a.m.	2:00 p.m.
B	7:30 a.m.	3:30 p.m.
C	9:00 a.m.	5:00 p.m.
D	11:00 a.m.	7:00 p.m.
E	1:00 p.m.	9:00 p.m.

### Solve

**Step 1:** Underline the schedule(s) that Corey prefers.

E                      1 p.m.                      9 p.m.

**Step 2:** Write the probability that he gets this schedule the first week.

$$\frac{1}{5} \qquad \text{Probability} = \frac{\text{favorable outcome}}{\text{total possible outcomes}}$$

**Step 3:** Write the probability that he gets this schedule three weeks in a row.

$$\frac{1}{5} \times \frac{1}{5} \times \frac{1}{5}$$
$$\frac{1}{125}$$

### Answer the Question

**Step 4:** The probability that Corey gets to work *only* in the afternoons for three weeks in a row is  $\frac{1}{125}$ .

### Now try these problems.

1. Myrna is one of four night-shift customer service engineers. Each takes a two-hour shift between 11 p.m. and 7 a.m. at the online help desk. They toss a number cube each day to determine which shift each will take. What is the probability that Myrna will get the same shift four days in a row?

**Answer:** The probability is \_\_\_\_\_.

2. Greg now earns \$12 an hour as a lifeguard. He works 30 hours/week, 39 weeks/year. He plans to complete a teacher's certificate soon. He can earn \$30,000 as a first-year teacher. He calculates the percent increase from his present salary to a teacher's salary. Fill in the blanks to find the percent increase.

Difference between teacher's salary and lifeguard salary = \$\_\_\_\_\_

Percent increase in income = [ $\$ \_\_\_\_\_\_ \div \$ \_\_\_\_\_\_$ ]  $\times 100\% = \_\_\_\_\_\_ \%$

3. Rachael is a sports reporter. When the wind chill falls below  $-24^{\circ}\text{F}$ , games are postponed.
- a. Circle all the cells having a wind chill that means a game is postponed.

Wind speed (mph)	Actual thermometer reading ( $^{\circ}\text{F}$ )								
	40	30	20	10	0	-10	-20	-30	-40
5	37	27	16	6	-5	-15	-26	-36	-47
10	28	16	4	-9	-21	-33	-46	-58	-70
15	22	9	-5	-18	-36	-45	-58	-72	-85
20	18	4	-10	-25	-39	-53	-67	-82	-96

You will find the wind chill (for a given temperature and wind speed) in the cell where a row and column meet.

- b. Today the thermometer reading is  $10^{\circ}\text{F}$ , and the wind speed is 20 mph. Is today's game held or postponed? Check the correct box.

Answer: Held  Postponed

4. Faith earns \$100 an hour playing the piano for a dance school. She also works part-time as a physical therapist and earns \$18,000 a year. How many hours of playing the piano does it take for her to double her total yearly income?

A 20                      B 180                      C 200                      D 360

### ☆ Challenge Problem

*You may want to talk this one over with a partner.*

Rick and Gabe, compete for the greatest average (mean) sales per day in one week. Gabe still has to report his sales for Friday. How much does Gabe have to sell on Friday to beat Rick? Explain your answer.

	Monday	Tuesday	Wednesday	Thursday	Friday
Rick	\$1,208	\$734	\$525	\$ 904	\$450
Gabe	\$ 384	\$980	\$975	\$1,050	

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## A Board Game (for Two or More Players)

The goal of this game is to place five counters in a track. On the game board, the track can be a radius, an arc of a circle, or a spiral. (Examples of each are shown on the next page.) First, you place a counter at one intersection. Then you place your next counter at another intersection.

### Materials

Game board (on the next page), twelve counters in each of several colors

### Directions

1. Choose a counter color for each player. Sit with players around the game board.
2. Player 1 places one counter at a line-circle intersection.
3. Player 2 then takes a turn and places a counter at another line-circle intersection.
4. Players take turns placing their counters. You can try to block the track you think another player is trying to build. You block by placing one of your counters at a line-circle intersection. If you cannot develop this counter into a track, then it is a lost counter, or a lost career move.
5. The winner is the first player to have five counters making a track. Discuss the career track the winner built.

### Before you play the game, try these warm-up problems.

1. Three players are playing *Career Tracks*. Each player has four counters on the game board. Only one player has been blocked one time. In how many turns can there be a winner? Explain your answer.

**Answer:** \_\_\_\_\_

2. Taylor starts at the entry level sports coach position. She plans a spiral career track. In five moves where could she be?  
**A** firefighter                      **C** car mechanic  
**B** legal assistant                    **D** groundskeeper