6.3 Identifying Rate, Base, and Amount

6.3 OBJECTIVES

1. Identify the rate in an application problem
2. Identify the base in an application problem
3. Identify the amount in an application problem

There are many practical applications of our work with percents. All these problems have three basic parts that need to be identified. Let’s look at some definitions that will help with that process.

**Definitions: Base, Amount, and Rate**

The base is the whole in a problem. It is the standard used for comparison. The amount is the part of the whole being compared to the base. The rate is the ratio of the amount to the base. It is written as a percent.

Let’s look at some examples of determining the parts of a percent problem.

**Example 1**

**Identifying Rates**

Identify each rate.

(a) What is 15% of 200?

Here 15% is the rate because it has the percent symbol attached.

(b) 25% of what number is 50?

25% is the rate.

(c) 20 is what percent of 40?

Here the rate is unknown.

**NOTE** The rate (which we will label R%) is the easiest of the terms to identify. The rate is written with the percent symbol (%) or the word “percent.”

**CHECK YOURSELF 1**

Identify the rate.

(a) 15% of what number is 75?  
(b) What is 8.5% of 200?  
(c) 200 is what percent of 500?

The base (B) is the whole, or 100%, in the problem. The base will often follow the word “of.” Look at our next example.
Example 2
Identifying Bases
Identify each base.

(a) What is $15\%$ of $200$?

$B$

200 is the base. It follows the word “of.”

(b) $25\%$ of what number is $50$?

$B$

Here the base is the unknown.

(c) $20$ is what percent of $40$?

$B$

40 is the base.

CHECK YOURSELF 2
Identify the base.

(a) $70$ is what percent of $350$?  
(b) What is $25\%$ of $300$?  
(c) $14\%$ of what number is $280$?

The amount $(A)$ will be the part of the problem remaining once the rate and the base have been identified. In many applications, the amount is found with the word “is.”

Example 3
Identifying Amounts
Identify the amount.

(a) What is $15\%$ of $200$?

$A$

Here the amount is the unknown part of the problem. Note that the word “is” follows.

(b) $25\%$ of what number is $50$?

$A$

Here the amount, $50$, follows the word “is.”

(c) $20$ is what percent of $40$?

$A$

Again the amount, here $20$, can be found with the word “is.”

CHECK YOURSELF 3
Identify the amount.

(a) $30$ is what percent of $600$?  
(b) What is $12\%$ of $5000$?  
(c) $24\%$ of what number is $96$?
Identifying the Rate, Base, and Amount

Determine the rate, base, and amount in this problem:

12% of 800 is what number?

Finding the *rate* is not difficult. Just look for the percent symbol or the word “percent.” In this exercise, 12% is the rate.

The *base* is the whole. Here it follows the word “of.” 800 is the whole or the base.

The *amount* remains when the rate and the base have been found. Here the amount is the unknown. It follows the word “is.” “What number” asks for the unknown amount.

Example 4

Identifying the Rate, Base, and Amount

determine the rate, base, and amount in the following application.

In an algebra class of 35 students, 7 received a grade of A. What percent of the class received an A?

The *base* is the whole in the problem, or the number of students in the class. 35 is the base.

The *amount* is the portion of the base, here the number of students that receive the A grade. 7 is the amount.

The *rate* is the unknown in this example. “What percent” asks for the unknown rate.

CHECK YOURSELF 4

Find the rate, base, and amount in the following statements or questions.

(a) 75 is 25% of 300. (b) 20% of what number is 50?

We will use percents to solve a variety of applied problems. In all these situations, you will have to identify the three parts of the problem. Let’s work through some examples intended to help you build that skill.

Example 5

Identifying the Rate, Base, and Amount

determine the rate, base, and amount in the following application.

In Example 6, we look at a practical (business) application.

CHECK YOURSELF 5

Determine the rate, base, and amount in the following application: In a shipment of 150 parts, 9 of the parts were defective. What percent were defective?

In Example 6, we look at a practical (business) application.

Example 6

Identifying the Rate, Base, and Amount in a Business Application

Determine the rate, base, and amount in the following application:

Doyle borrows $2000 for 1 year. If the interest rate is 12%, how much interest will he pay?
The **base** is again the whole, the size of the loan in this example. $2000 is the base. 
The **rate** is, of course, the interest rate. 12% is the rate. 
The **amount** is the quantity left once the base and rate have been identified. Here the amount is the amount of interest that Doyle must pay. The amount is the unknown in this example.

**CHECK YOURSELF 6**

*Determine the rate, base, and amount in the following application: Robert earned $120 interest from a savings account paying 8% interest. What amount did he have invested?*

**CHECK YOURSELF ANSWERS**

1. (a) 15%; (b) 8.5%; (c) what percent (the unknown)
2. (a) 350; (b) 300; (c) what number (the unknown)
3. (a) 30; (b) “what is” (the unknown); (c) 96
4. (a) \( R\% = 25\% \), \( B = 300 \), \( A = 75 \); (b) \( R\% = 20\% \), \( B = \) “what number,” \( A = 50 \)
5. \( B = 150 \), \( A = 9 \), \( R\% = \) “what percent” (the unknown)
6. \( R\% = 8\% \), \( A = \$120 \), \( B = \) “what amount” (the unknown)
6.3 Exercises

Identify the rate, base, and amount in each statement or question. Do not solve the exercise at this point.

1. 23% of 400 is 92.
2. 150 is 20% of 750.
3. 40% of 600 is 240.
4. 200 is 40% of 500.
5. What is 7% of 325?
6. 80 is what percent of 400?
7. 16% of what number is 56?
8. What percent of 150 is 30?
9. 480 is 60% of what number?
10. What is 60% of 250?
11. What percent of 120 is 40?
12. 150 is 75% of what number?

Identify the rate, base, and amount in the following applications. Do not solve the applications at this point.

13. Commission. Jan has a 5% commission rate on all her sales. If she sells $40,000 worth of merchandise in 1 month, what commission will she earn?

14. Salary. 22% of Shirley’s monthly salary is deducted for withholding. If those deductions total $209, what is her salary?

15. Chemistry. In a chemistry class of 30 students, 5 received a grade of A. What percent of the students received A’s?
16. **Mixtures.** A can of mixed nuts contains 80% peanuts. If the can holds 16 ounces (oz), how many ounces of peanuts does it contain?

17. **Selling price.** The sales tax rate in a state is 5.5%. If you pay a tax of $3.30 on an item that you purchase, what is its selling price?

18. **Manufacturing.** In a shipment of 750 parts, 75 were found to be defective. What percent of the parts were faulty?

19. **Enrollments.** A college had 9000 students at the start of a school year. If there is an enrollment increase of 6% by the beginning of the next year, how many additional students are there?

20. **Investments.** Paul invested $5000 in a time deposit. What interest will he earn for 1 year if the interest rate is 3.5%?

21. Using the latest census figures for your state, determine the percent of the following minorities: African-American, Hispanic, and Asian. These figures can be found on the World Wide Web at www.census.gov.

**Answers**

1. 23% of 400 is 92
2. 40% of 600 is 240
3. What is 7% of 325

4. $\frac{R\%}{B} \quad \frac{A}{R\%}$
5. $\frac{B}{A} \quad \frac{A}{R\%} \quad \frac{B}{R\%}$

6. 16% of what number is 56
7. $\frac{R\%}{B} \quad \frac{A}{R\%}$
8. 480 is 60% of what number

9. $\frac{A}{R\%} \quad \frac{B}{R\%}$
10. What percent of 120 is 40

11. $\frac{R\%}{B} \quad \frac{A}{R\%}$
12. $\frac{B}{A}$

13. $\frac{\text{commission}}{\text{rate}} = \frac{\text{unknown}}{\text{amount}}$

14. $\frac{\text{base}}{\text{rate}} = \frac{\text{amount}}{\text{unknown}}$

15. 30 is the base. 5 is the amount. The unknown percent is the rate.
16. 5.5% is the rate. The tax, $3.30, is the amount. The unknown selling price is the base.
17. The base is 9000. The rate is 6%. The unknown number of additional students is the amount. 21.