


Grade 8 Mathematics

Measurement: Lesson 10

Read aloud to the students the material that is printed in **boldface type** inside the boxes. Information in regular type inside the boxes and all information outside the boxes should **not** be read to students. Possible student responses are included in parentheses after the questions.

NOTE: The directions read to students may depend on the available materials. Read only those parts of the lesson that apply to the materials you are using.

Any directions that ask you to do something, such as to turn to a page or to hand out materials to students, will have an arrow symbol () by them.

Purpose of Lesson 10:

- In this lesson, the tutor and the students will
 - ✓ understand rate measures, and
 - ✓ solve problems involving a variety of types of rates.

Equipment/Materials Needed:

- Copies of Student Sheets 104
- Paper and pencils
- Chalkboard

Preparations before beginning Lesson 10:

- Run one copy of Student Sheet 104 for each student.
- Have paper and pencils available.
- You should cover Lesson 14 in Number Relations before doing this lesson.

Lesson 10: Measurement

Say:

In Lesson 14 of Number Relations, you learned that a ratio is a comparison of two quantities. A *rate* is a type of ratio in which the units of measure are different. A rate shows how different units of measures are related. You have seen many rates before.

Write this problem on the board.

On a trip, your family drove 450 miles per day.

You traveled about 120 miles every two hours.

The car averaged 24 miles per gallon.

All of these are rates. The units of one quantity are not the same as the units of the other quantity.

450 miles ----- 1 day	120 miles ----- 2 hours	24 miles ----- 1 gallon
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Say:

Tell me some other rates that are used in everyday life. (12 inches per foot, \$10 per day, hits per times at bat, yards per carry, feet per second, days per week, etc.) **A *unit rate* is a rate in which the comparison is made to one unit. 450 miles per day is a unit rate. 120 miles per 2 hours could be changed into a unit rate. Simply divide both the 120 and the two by two. What would be the rate now? (60 miles per hour.)**

Say:

Suppose you are traveling at a rate of 60 miles per hour. How many miles will you travel in five hours if you continue at this rate? (300 miles) How did you solve this problem? Answers will vary.

A. I made a list.

60 miles in 1 hour
120 miles in 2 hours
180 miles in 3 hours
240 miles in 4 hours
300 miles in 5 hours

B. I set up a proportion and found the missing term.

$$\frac{60 \text{ miles}}{1 \text{ hr.}} = \frac{x \text{ miles}}{5 \text{ hrs.}} \quad x = 300 \text{ miles.}$$

C. I thought 60 miles in 1 hour, _____ miles in 5 hours. To get from 1 to 5, I multiply by 5, so I should also multiply 60 by 5. I get 300 miles.

⌚ Give students Student Sheet 104. Discussion is critical. Encourage using tables and thinking about equivalent rates, rather than rushing to set up a proportion. Students often set up a proportion incorrectly and miss a very easy question.

Answers:

1. 30 mg of sodium per serving
2. 6 grams of fat
3. 550 fat calories
4. 13 yards per carry
5. 60 miles per hour
6. 160 minutes or 2 hours and 40 minutes
7. 200 cartons in 1 hour
8. \$5 for 4 loads of clothes
9. 144 students out of 200
10.
 - a. 100 VCR's in 4 hours
 - b. 50 VCR's in 2 hours
 - c. 25 VCR's in 1 hour
 - d. 400 VCR's in 2 days

⌚ Have one student summarize today's lesson. Rates are one of the most common forms of proportional reasoning.

Student Sheet 104 (Measurement: Lesson 10)

Answer the following questions.

1. A can of almonds contains 180 mg of sodium. If there are six servings per container, how many milligrams of sodium would you get if you ate one serving?
2. The same can of almonds contains 18 grams of fat per serving. Each serving is about three tablespoons. If you ate only one tablespoon of almonds, how many grams of fat would you be eating?
3. In a jar of crunchy peanut butter, for every two tablespoons of peanut butter, you get 110 fat calories. How many fat calories would you get if you ate 10 tablespoons of peanut butter?
4. In the last football game, the quarterback gained 130 yards in 10 carries. How many yards did he average per carry?
5. Sondra drove 270 miles in four and one-half hours. How many miles did she average per hour?
6. A copy machine can make 100 copies in eight minutes. How long will it take to make 2000 copies?
7. A machine packs 10 cartons in three minutes. How many cartons will it pack in one hour?
8. At the laundry, it takes five quarters to wash a load of clothes. How much does it cost in dollars to wash four loads of clothes?
9. In a survey of 25 eighth grade students, 18 said they preferred rock music to country music. Based on this survey, if there are 200 students in the eighth grade class, how many would you expect to prefer rock music?
10. A company produces 200 VCR's in an eight-hour day.
 - a. How many VCR's are made in four hours?
 - b. How many VCR's are made in two hours?
 - c. How many VCR's are made per hour?
 - d. How many VCR's are made in two days?