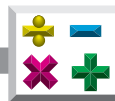




Lesson Two Purpose

- Associate verbal names, written word names, and standard numerals with integers, rational numbers, irrational numbers, and real numbers. (MA.A.1.4.1)
- Understand concrete and symbolic representations of real numbers in real-world situations. (MA.A.1.4.3)
- Understand that numbers can be represented in a variety of equivalent forms, including integers, fractions, decimals, percents, scientific notation, exponents, radicals, and absolute value. (MA.A.1.4.4)
- Understand and use the real number system. (MA.A.2.4.2)
- Add, subtract, multiply, and divide real numbers, including square roots and exponents, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator. (MA.A.3.4.3)
- Use estimation strategies in complex situations to predict results and to check the reasonableness of results. (MA.A.4.4.1)
- Use equations and inequalities to solve real-world problems graphically and algebraically. (MA.D.2.4.2)

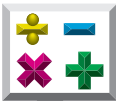


Problem Solving

Suppose you are living away from home for the first time and find that you are gaining weight. You believe an increase in your intake of fast food and a decrease in your activities are contributing to this. You are considering setting up a program of activities that would burn a minimum of 1,800 calories each week. In a health newsletter, you saw the following information:

Activities to Burn Calories

Activity	Number of Minutes	Number of Calories Burned
Aerobics	30	214
Basketball	60	572
Biking (leisurely)	30	214
Biking (moderate)	30	286
Dancing	60	322
Football	60	572
Jogging	30	250
Racquetball	60	716
Running (5 mph)	20	190
Stationary bike	30	214
Tennis	60	501
Walking (2 mph)	60	250
Walking (4.5 mph)	30	161
Weightlifting	30	143



Think about This!

If you chose aerobics for your activity, you could use several methods to determine how many minutes of aerobics each week would be required to burn a minimum of 1,800 calories per week.

- You might use a proportion like the following:

$$\frac{30}{214} = \frac{x}{1,800}$$

$$54,000 = 214x$$

$$252.3 = x$$

You would need to do aerobics at least 253 minutes (4 hours, 13 minutes) each week to burn at least 1,800 calories. You can see that 252 minutes would result in slightly less than 1,800 burned calories.

You might determine the calories burned per minute this way:

$$\frac{214}{30} = 7.13$$

If 7.13 calories are burned for each minute you participate in aerobics, then your 1,800 calorie goal can be divided by 7.13 to determine the number of required minutes.

$$\frac{1,800}{7.13} = 252.4 = 253$$

Note: Instead of **rounding**, change tenths of a minute to the *next whole minute*.

Based on changing any tenths of a minute to the *next whole minute*, you would need to do aerobics at least 253 minutes each week to burn a minimum of 1,800 calories.



- You might divide your goal of burning 1,800 a week by the 214 burned in 30 minutes to find how many 30-minute periods would be needed per week.

$$\frac{1,800}{214} = 8.41$$

Thus, 8.41 periods of 30 minutes each are needed per week. In addition, 8.41 times 30 minutes equals 252.3 minutes.

Changing any tenths of a minute to the next whole minute, you would need to do aerobics at least 253 minutes each week to burn at least 1,800 calories.

If you use a calculator to check the above calculations, you will note that some *rounding* of numbers took place. All numbers were changed to the next whole minute. This contributes to the one-tenth of a minute difference in answers.



Practice

Use the table on page 499 to answer the following.

For each problem choose a **different activity** of interest to you. For your chosen activity, determine **how long** each week you would need to engage in it to **burn at least 1,800 calories each week, changing tenths to the next whole minute**. Show all your work *or* explain how you got your answer.

1. Activity: _____

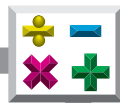
_____ minutes each week
would be required to burn at least 1,800 calories.

Explanation: _____

2. Activity: _____

_____ minutes each week
would be required to burn at least 1,800 calories.

Explanation: _____



3. Activity: _____

_____ minutes each week
would be required to burn at least 1,800 calories.

Explanation: _____

4. Activity: _____

_____ minutes each week
would be required to burn at least 1,800 calories.

Explanation: _____

5. Activity: _____

_____ minutes each week
would be required to burn at least 1,800 calories.

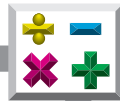
Explanation: _____



Complete the following.

6. Create a plan to burn at least 1,800 calories each week that involves participating in more than one activity. Write which activities you chose and how long you would need to participate in each. Show your work *or* explain how you got your answer.

Explanation: _____



Lesson Three Purpose

- Associate verbal names, written word names, and standard numerals with integers, rational numbers, irrational numbers, and real numbers. (MA.A.1.4.1)
- Understand concrete and symbolic representations of real numbers in real-world situations. (MA.A.1.4.3)
- Understand that numbers can be represented in a variety of equivalent forms, including integers, fractions, decimals, percents, scientific notation, exponents, radicals, and absolute value. (MA.A.1.4.4)
- Understand and use the real number system. (MA.A.2.4.2)
- Add, subtract, multiply, and divide real numbers, including square roots and exponents, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator. (MA.A.3.4.3)
- Use estimation strategies in complex situations to predict results and to check the reasonableness of results. (MA.A.4.4.1)
- Relate the concepts of measurement to similarity and proportionality in real-world situations. (MA.B.1.4.3)
- Select and use direct (measured) and indirect (not measured) methods of measurement as appropriate. (MA.B.2.4.1)
- Solve real-world problems involving rated measures (miles per hour, feet per second). (MA.B.2.4.2)
- Solve real-world and mathematical problems involving estimates of measurements, including length, time, weight/mass, temperature, money, perimeter, area, and volume and estimate the effects of measurement errors on calculations. (MA.B.3.4.1)
- Use equations and inequalities to solve real-world problems graphically and algebraically. (MA.D.2.4.2)



Scientific Notation

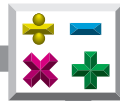
Standard form is a method of writing the common symbol for a numeral. For example, the *standard form* for ten is 10. **Scientific notation** is a shorthand method of writing very large or very small numbers using **exponents** in which a number is expressed as the product of a **power** of 10 and a number that is greater than one (1) and less than 10. For example 7.59×10^5 is the same as 759,000. Another example, 2.3×10^{-4} is the same as 0.00023.

It is based on the idea that it is easier to read *exponents* than it is to count zeros. If a number is already a *power* of 10, it is simply written as 10^7 rather than 1×10^7 .

Scientific calculators often have their own shorthand way such as $7.59e5$ for 759,000 or $7.59e-5$ for 0.0000759.

- Find the product of $234,000,000 \times 4,560,000$ to discover the notation used by your calculator.
- Find the product of $0.0000456 \times 0.0000095$ to discover the notation your calculator uses for very small numbers.

Calculators that do not have *scientific notation* in their memory will likely produce a message saying "Error."



Practice

Solve the following.

1. The first automated teller machine in the United States was installed at Citizens and Southern National Bank in Atlanta in 1971. In 2003, approximately 352,000 ATMs handled approximately 13.9 billion transactions. In 1993, the number of ATMs had dropped to 94,822 and made 7.7 billion transactions. How many more transactions were handled in 2003? Express your answer in scientific notation.

2. A news article reported that the U.S. government would sell and donate dry milk powder to reduce the amount it had in storage. In late 2002, the amount in storage would have made 1.7 billion gallons of skim milk. If there are 4 eight-ounce cups in a quart and 4 quarts in a gallon, how many cups of skim milk would the stored dry powder have made? Express your answer in scientific notation.



3. Workers spent 1.5 million working hours during 261 days removing the debris at the World Trade Center site. What was the mean number of working hours per day **rounded to the nearest hundred**? Express your answer in scientific notation.

4. By the end of 2002, \$900 million was raised from the Department of Transportation's \$2.50 passenger ticket fee to help pay for aviation security. How many of these ticket fees were necessary to produce that amount? Express your answer in scientific notation.

5. In 2001, Broadway shows grossed \$9.6 million for the week ending September 9, and \$3.5 million for the week ending September 16. What was the amount of decrease? Express your answer in scientific notation.
