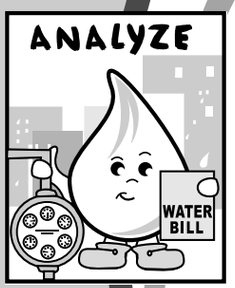


READ A WATER METER AND WATER BILL

▼Summary

Students will learn to read a water meter and water bill to get an overview of the school's total water consumption and the cost of that water. They will monitor the water meter twice a day for two weeks, which will help them develop an idea of water consumption patterns.

Objectives

After completing this activity, students will be able to

- tell how much money the school spends on water
- discuss how water use changes throughout the day
- discuss how a water meter and water bills can demonstrate a need to conserve water and also show the results of water conservation efforts

Prepare

Review information on the student copy pages ***Reading a Water Meter*** (page 36) and ***Reading a Water Bill*** (pages 37-38).

If your school's water meter was not included on the tour conducted during "Learn About Your School Water System," arrange for a school maintenance staff member to show you and your students the meter. When looking at the meter, point out the kind of meter (straight-reading or circular-reading) installed.

Request copies of your school's water bills for the past two or three years so that your class will have a basis for comparing changes in water consumption and price rates. If your school uses well water, students may be able to compare pumping costs contained in electricity bills. Check with school administrators first, but realize that you may need to make a few phone calls to determine the best way to access school water bills. Your local water utility may be able to tell you which school or district office receives your school's water bills–possibly Accounts Payable, the Controller, or Operations.

Materials

- *Copies of school water bills for past 2-3 years*
- *Copies of* ***Reading a Water Meter*** (p. 36)
- *Copies of* ***Reading a Water Bill*** (pp.37-38)

Procedure

▼*Warm Up*

Lead a brief discussion using the questions below.

- **How much does water cost your school? What is the cost per student?** You might use these questions to allow students to guess at costs, which they can then confirm or correct as they complete the activity.
- **How does total water consumption change throughout the day?** Students should be able to discuss the basic water patterns at school.
- **How can a water meter and water bills demonstrate a need to conserve water and also show the results of conservation efforts?** Water bills will show the cost of water. The water meter can be used to identify times or uses that consume the greatest amounts of water, helping the observer identify activities that consume water or even leaks. Both bills and a water meter can indicate the results of water conservation measures by providing data on water use before and after the measures were applied.

▼*The Activity*

1. As a class, set up a schedule to monitor the overall water consumption at school for two weeks. Create a two-week chart on butcher paper or poster board on which students can record the readings. It may be set up like the incomplete chart on the next page. Students should plan to read and record results at the beginning and end of each school day, and the schedule should provide ALL students the opportunity to read the meter and contribute data to the class chart.

Date	Meter Readings 9:00 A.M.	Meter Readings 2:00 P.M.

2. Prepare your students to successfully read the school's water meter and monitor school water consumption. Distribute copies of ***Reading a Water Meter*** and walk students through the process of reading the meters on the student page.

Students should easily understand how to read the straight-reading meter but may need help with the circular-reading meter. (Even if your school has a straight-reading meter, students may find circular-reading meters in their homes.) Point out how each dial on the circular-reading meter corresponds to one of the digits in the reading. Also emphasize that when the hand is between any two numbers on a dial, the lower digit should be recorded.

You may also want to review the mathematics of reading a meter and converting cubic feet to Ccf and gallons and vice versa. The following example is based on the circular-reading meter on the student page.

Current Reading 3,047 Ccf
Previous Reading -3,034 Ccf
13 Ccf
x 748
9,724 gallons

3. After students have monitored and recorded data on school water consumption for a two week period, lead a class discussion and analysis of the results. How does water use change during the day and from day to day? What patterns of usage do you see?

4. Prepare your students to discover how much water costs your school. Distribute copies of ***Reading a Water Bill*** and work through the first sample bill with students to help them understand how to read a water bill. Allow time for students to review and answer questions about the second sample bill.

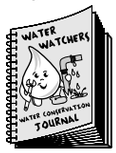
5. Review ***Reading a Water Bill*** with students, referring to the **Teacher Key** below as necessary. Show students copies of your school's water bills and discuss any differences between them and the samples on the student page. Lead a discussion of your school's water bills and the changes in water usage and costs over the period covered by the available bills. How has water consumption changed from year to year or season to season? How has the cost of water changed?

▼*Wrap Up*

Instruct students to calculate the amount of water used each day during the two week monitoring period and the cost of that water. Encourage them to calculate total cost, total daily cost and daily cost per person (you will need to provide an estimate of your school's total population). Invite volunteers to share results of their calculations and lead a discussion about how water is used at school throughout the day and how it can be conserved.

Extensions

▼*Journals*



Follow-Up

Invite volunteers to share information they gathered about water use in their homes. How is water use in their homes similar or different? What water conservation strategies do their families use?

New Assignment

Instruct students to locate their residential water meters and read them at the same time every day for one week. Tell them to record the dates, times, and meter readings in their journals. Encourage them to check their families' water bills over the past year to see if there are seasonal differences in water use.

Please note: *It may be difficult or impossible for students living in multi-family housing complexes to monitor their family's water use using a water meter.*

WET in the City Connections

In "Water Work Shuffle" students explore and sequence water-related careers involved in transporting water to and from the home, including that of the meter reader who is responsible for recording the monthly water consumption of utility customers.

Teacher Key: READING A WATER BILL

1. What was the most recent reading recorded by the meter reader?

5,232 Ccf

2. When was the meter last read?

5/20/03

3. How many months were in this service period?

two months

4. How many units were used during this service period?

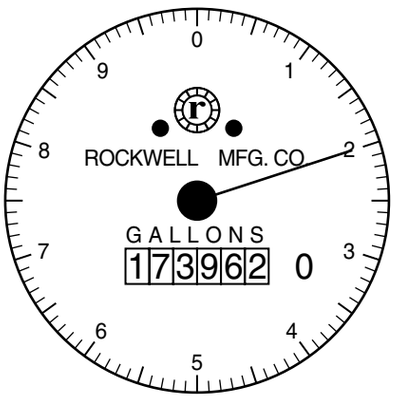
116 units

5. What formula did the water company use to determine this figure?

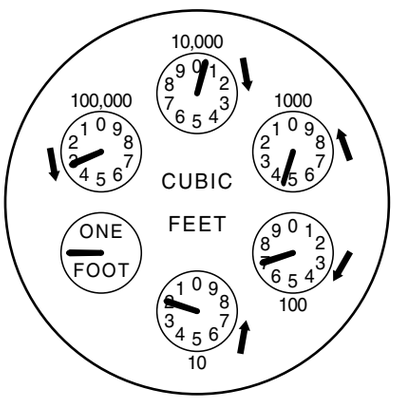
Total gallons used divided by number of days in the service period, or 86,768 ÷ 61 days = 1,422 gallons/day

READING A WATER METER

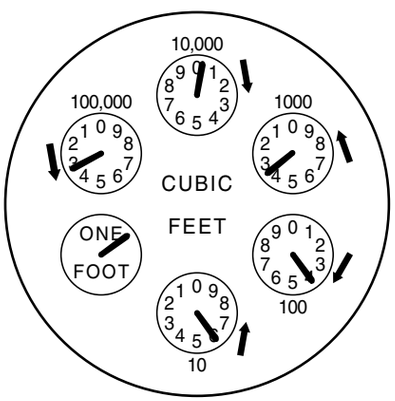
Straight-Reading Meter



Circular-Reading Meter



Current Reading



Previous Reading

Water meters are located in a variety of places. Often they are in the basement, or they may be in a concrete or metal box buried outside near the curb. An iron lid provides access. Sometimes the lid is labeled "water meter."

There are two common types of water meters, straight-reading meters and circular-reading meters. Either type will measure the amount of water used by schools, businesses and homes in either gallons as in the sample straight-reading meter or cubic feet as in the sample circular-reading meter.

Straight-reading meters are read in the same way mileage is read on an automobile or bicycle odometer. Just read and record the number shown.

Circular-reading meters have six or seven dials. To read, start with the dial measuring the greatest volume, 100,000 cubic feet in the example, and then read the dials in descending order. Read the "One Foot" dial as "0." If the hand on any dial is between two numbers, record the lower number. (The hands on individual dials may rotate either clockwise or counter clockwise.) Note that most water departments charge for water in units of 100 cubic feet for meters measuring in cubic feet (Note: 100 cubic feet = 1 Ccf) or 100 gallons for meters measuring in gallons, so meter readers record the "10" and "One Foot" dials as "0," or disregard them altogether.

The One Foot dial is a test hand used to indicate leaks in a water system. You will find one on both straight-reading and circular reading meters. To test a water system for leaks, a utility representative first makes sure the water is turned off throughout the building. He or she then monitors the One Foot dial for a few minutes. The hand should not move. If it does, there is a leak somewhere in the water system.

Read the sample circular-reading meters to the left. Record the number of water units, in this case Ccf, represented by the current and previous readings in the chart below. Remember that meter readers disregard the ten and One Foot dials and that one water unit (Ccf) is equal to 100 cubic feet. To find how many units have been used, subtract the previous reading from the current reading. To find out how many gallons this number represents, multiply the number of Ccf by 748. There are 7.48 gallons per cubic foot and 748 gallons per Ccf. (Note: To convert gallons to cubic feet or Ccf, divide the total number of gallons by 7.48 or 748, respectively.)

Current Reading: (Ccf) (cubic feet reading – last two digits)	
Previous Reading: (Ccf) (cubic feet reading – last two digits)	
Water Units Used: (Ccf) (Current Reading – Previous Reading)	
Water Used: (gallons) (Number of Ccf x 748)	

READING A WATER BILL

Every water utility company produces its own water bill. Though the specific information provided and how it is organized on the bill will vary, the following information and sample should help you interpret your local water bill.

Account Number: 0216257-03098 Service from 7/11/02 to 10/14/02
Bill Date: Oct. 17, 2002

METER READINGS			CONSUMPTION INFORMATION			
Current	Previous		Units (Ccf)	Gallons	Days	Gallons/Day
21,634	21,467		167	124,916	96	1,301
		LAST YEAR	174	130,152	90	1,446

Cost per Ccf = $1.04 Please Pay This Amount $173.68

Service from and to date: These dates show the billing or service period, which dates from the day after the last meter reading and runs to the date of the most recent meter reading. Generally, your meter is read on the same date for each billing period. Some water companies bill monthly, others every two months or quarterly. In the sample, the billing period is quarterly, so this bill covers three months.

"Current" and "Previous" readings: In the example, the current reading (21,634 Ccf) was made on October 14. The previous reading (21,467 Ccf) occurred at the close of the previous billing period, or July 10. Note that meter readers ordinarily only read in units of 100 cubic feet (Note: 100 cubic feet = 1 Ccf) or 100 gallons, therefore the dials or digits recording ten and one cubic feet or gallons are not reported on the bill.

Units: This is the number of water units used. Usually this is the number of Ccfs (100 cubic feet) or 100-gallon units consumed. In a case like this where meters are read in cubic feet and reported in Ccf, one unit equals one Ccf, 100 cubic feet or 748 gallons. (Remember that one cubic foot is equal to 7.48 gallons, so a unit that is 100 cubic feet is equal to 748 gallons.) To find the total number of gallons used, multiply the units by 748. (In the example: 167 units x 748 = 124,916 gallons.)

Days: This is the actual number of days during the billing period. Billing periods are usually for a regular period of time, such as 30 days, 60 days, or 90 days, but the actual number of days varies slightly because of weekends, holidays, sick days, and vacations taken by the meter reader. In the sample, the billing period is 96 days.

Gallons/Day: The average number of gallons used each day. Simply divide the total number of gallons (124,916) by the numbers of days in the service period (96). In the sample, it is 1301 gallons/day.

READING A WATER BILL (CONT.)

Name _____

Using what you learned from the information provided on the previous page, study the sample water bill below and answer the following questions.

Account Number: 0216257-03098 Service from 3/21/03 to 5/20/03
Bill Date: May 20, 2003

METER READINGS			CONSUMPTION INFORMATION			
Current	Previous		Units (Ccf)	Gallons	Days	Gallons/Day
5,232	5,116		116	87,763	61	1,422
		LAST YEAR	124	92,752	62	1,496

Cost per Ccf = $1.04 Please Pay This Amount $120.64

1. Look at the columns under Meter Readings. These figures show water use in hundreds of cubic feet (Ccf).

   What was the most recent reading recorded by the meter reader? _____

2. The service dates indicate the service period covered by this bill. The last date is the day on which the water meter was read.

   When was the meter last read? _____

3. **How many months were in this service period?** _____

4. The Units column indicates hundreds of cubic feet (Ccf) of water used. The water company has converted the units to gallons by multiplying the units by 748.

   How many units were used during this service period? _____

5. The Gallons/Day column indicates the average number of gallons of water used each day during the service period.

   What formula did the water company use to determine this figure? _____

   _____

   _____