

“Add It Up” Lesson Plan

Part 2—Home Usage

Objectives and Activity Description

Students will be able to measure the amount of water they use at home on an average day and will develop an awareness of how much water they consume and dirty. They will work cooperatively in groups and compare their personal results with those of the group. Students will understand how to calculate percentages and angle measures, as well as how to construct and interpret basic circle graphs. Groups will present their data and the class will analyze and make inferences from the data displays. Students will also consider how their consumption of water impacts the environment. They will briefly discuss the role of Sanitation District No. 1 (SD1), as the primary wastewater utility in the Northern Kentucky community.

Core Content

MA-07-1.1.3 Students will convert among whole numbers, fractions, decimals, percents and π , and will compare and order these numbers.

MA-07-1.3.1 Students will add, subtract, multiply and divide whole numbers, fractions and decimals to solve real-world problems and apply order of operations (including positive whole number exponents) to simplify numerical expressions.

MA-07-2.1.4 Students will find the measures of angles by estimation and measurement with a protractor or angle ruler.

MA-07-4.1.1 Students will analyze and make inferences from data displays (drawings, tables/charts, pictographs, bar graphs, circle graphs, line plots, Venn diagrams, line graphs, stem-and-leaf plots, scatter plots).

PL-07-3.1.4 Students will describe consumer actions (reuse, reduce, recycle) and explain how these actions impact the environment (e.g., conserving resources, reducing pollution, reducing solid waste, conserving energy).

PL-07-3.1.5 Students will identify and describe resources and services provided by community agencies: Public health department, Fire department, Police department, Family resource center

Supplies

Introduction and Instruction Page
Water Usage Guide
Calculation Sheets
Graphing Sheets

Pens/Pencils
Calculator (by discretion of teacher)
Protractor
Ruler

Procedure

The Day Before the Classroom Lesson

One day before this lesson, assign the students the “Calculation Sheet—Home Water Usage” page for homework. Students will also need the “Water Usage Guide” page for reference. They should have the Calculation Sheet completed before the classroom portion of the lesson. Be sure to specify whether or not they are permitted to use a calculator to find the products.

“Add It Up” Lesson Plan

Part 2—Home Usage

Procedure

The Day of the Classroom Lesson

3. Review “Add it up”, Part 1. Have students read the “Introduction and Instructions” page for this lesson.
4. Tell the students to get out their completed “Calculation Sheet—Home Water Usage” worksheet. Divide the students into groups of no more than five. Have them sit with their groups.
5. Each student should share their individual totals with their group and record them on the “Group Calculation Sheet”. Groups should fill in totals for each row and column (you may decide whether they have to complete one set of worksheets per group or per student).
6. Students will fill in the blanks on the remaining “Calculation Sheets” and then graph their answers. There are directions for constructing circle graphs to represent their data on the “Circle Graph” worksheets.
7. Groups will share the results of their circle graphs with the class. Compare percentages and make inferences about the percentages found.

Some questions for discussion while reviewing the circle graphs include:

Q: Based on the graphs we saw, which classmate used the highest percentage of water? Did this classmate actually use the greatest number of gallons out of everyone in the class, or were the numbers for their group members below average? (Answers will vary)

Q: Based on the data representations (circle graphs) we looked at, what appears to be the trend: do male or female classmates use higher percentages of water? (Answers will vary)

Q: Review the total number of gallons used by each group for all activities (these should be listed at the bottom of the circle graphs). Estimate the average number of gallons of water used in one day by five members of your class. (Answers will vary)

Q: Did you observe any trends in the circle graphs? (Answers will vary)

8. Briefly discuss students’ theories on how water usage impacts the environment. Ask them what they have learned about wastewater and how they can reduce their own water consumption.
9. Optional Extension—Research average daily water usage for individuals in at least 4 countries other than the United States. Using the formulas you learned in this lesson, calculate the total number of gallons used by the countries. Then calculate percentages of total water used for each country. See where the United States falls in your data analysis.

Assessment

Students complete worksheets with 85% accuracy.

“Add It Up”

Introduction and Instructions

Review—What is wastewater?

In the first “Add it Up” lesson, we learned that the term “wastewater” refers to water that leaves any residential, commercial or industrial establishment after being used. Sanitation District No. 1 (SD1) provides wastewater service to Northern Kentucky, transporting and treating wastewater.

In lesson one, you learned about three ways you use water at school. On average, each person uses about 100 gallons of water per day. This average is based on all daily activities that use water, including both the water you use at home and at school. Today’s lesson focuses on the many ways you use water at home.

Question for discussion: Did you use more water in one day at school or at home?

Instructions

1. Get out your completed “Calculation Sheet—Home Water Usage” worksheet. Your teacher will divide the class into groups of no more than five.
2. Share your individual totals with your group. Record each group member’s totals on the “Group Calculation Sheet”. Your group should fill in totals for each row and column.
3. Fill in the blanks on the remaining “Calculation Sheets” and then graph your answers. There are directions for constructing circle graphs to represent your data on the “Circle Graph” worksheets.
4. After all of the groups in your class have completed the “Calculation Sheets” and “Circle Graph” worksheets, you will share the results of your circle graphs with the class. Be prepared to compare percentages and make inferences about the percentages found.

Calculation Sheet—Home Water Usage

Activity	# of times activity performed (# of minutes for shower)		# of gallons of used for activity (See "Water Usage Guide")		Total # of gallons used
Flushing the toilet		X		=	
Hand washing		X		=	
Tooth Brushing		X		=	
Shower		X		=	
Bath		X		=	
Drinking/ Cooking		X		=	
Dishes – hand wash		X		=	
Dishwasher		X		=	
Garbage Disposal		X		=	
Washing machine		X		=	
Shaving		X		=	
Other		X		=	

Total Number of Gallons Used for All Activities

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Group Calculation Sheet

Activity	Group Member 1 Total # of gallons used	Group Member 2 Total # of gallons used	Group Member 3 Total # of gallons used	Group Member 4 Total # of gallons used	Group Member 5 Total # of gallons used	Activity Total for Group
Flushing the toilet						
Hand washing						
Tooth Brushing						
Shower						
Bath						
Drinking/ Cooking						
Dishes – hand wash						
Dishwasher						
Garbage Disposal						
Washing machine						
Shaving						
Other						
Total number of gallons used for all activities						

Calculation Sheet

Water Usage for Group Members

Percentages of each activity based on group totals

Group member name	Total # of gallons used for all activities		Total # of gallons used for all activities (for entire group)		Quotient (should be a decimal)		% of total group usage
1.		÷		=		X 100 =	
2.		÷		=		X 100 =	
3.		÷		=		X 100 =	
4.		÷		=		X 100 =	
5.		÷		=		X 100 =	

Determine the angles of the sectors for your group's circle graph

Group member name			Quotient from above (should be a decimal)		# of degrees of angle of sector
1.	360°	X		=	
2.	360°	X		=	
3.	360°	X		=	
4.	360°	X		=	
5.	360°	X		=	

Circle Graph

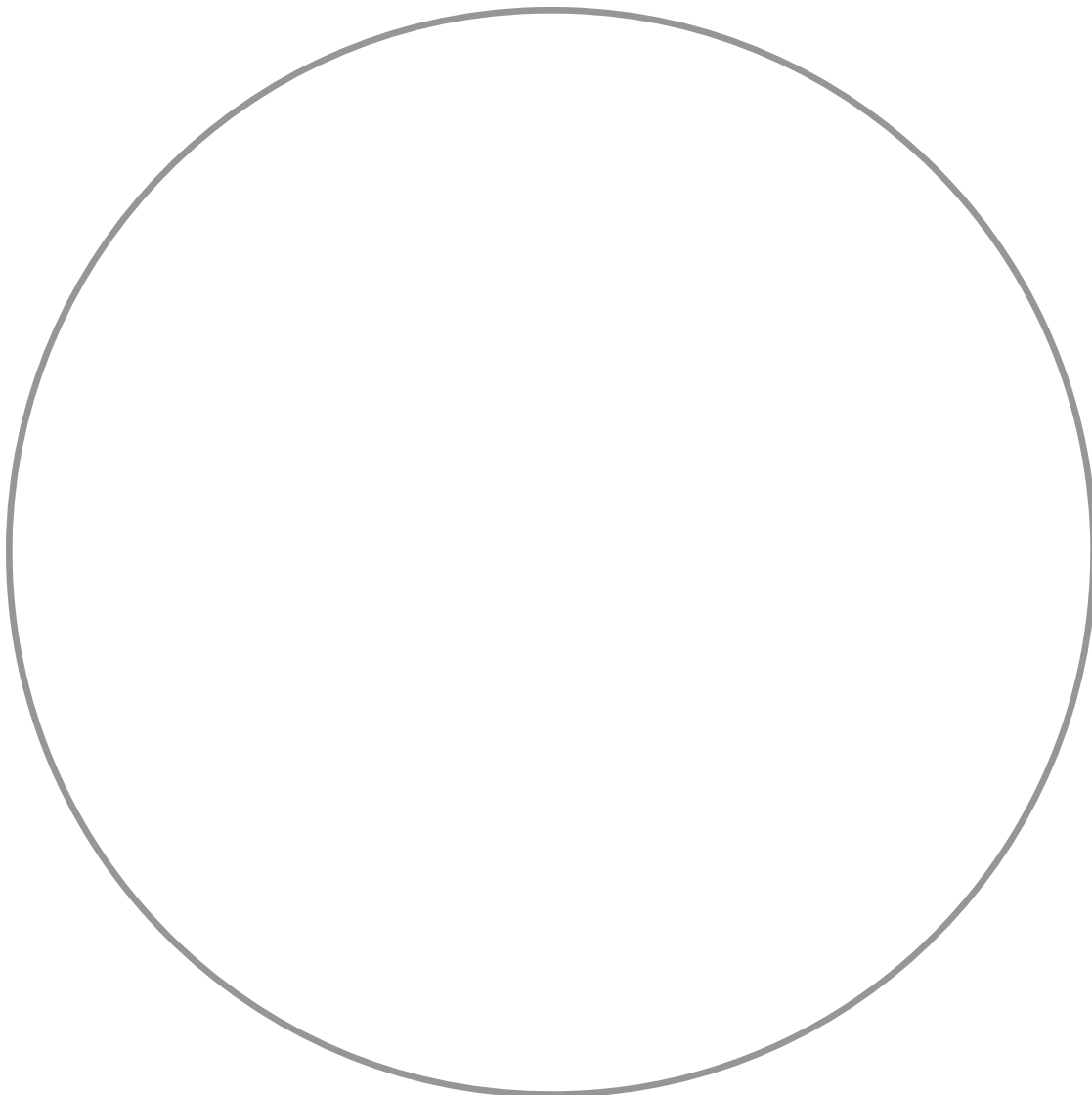
Water Usage for Group Members

Instructions for graphing:

Using your protractor, measure sectors to represent the water usage of each group member on the circle graph below. Measure angles to the nearest degree.

Label each section with the group member's name and percentage of total water used. Beneath the circle graph, fill in the total number of gallons your graph is based on. Color-code each sector and fill in the key below. Be sure to title your graph.

Title:



Graph based on _____ total gallons used by group.

Key

- Group Member 1
- Group Member 2
- Group Member 3
- Group Member 4
- Group Member 5

Calculation Sheet

Percentages of each activity based on group totals

Group total for Activity		Total # of gallons used for all activities	=	Quotient (should be a decimal)		X 100	=	% of total usage for all activities
Flushing the toilet	÷		=			X 100	=	
Hand washing	÷		=			X 100	=	
Tooth Brushing	÷		=			X 100	=	
Shower	÷		=			X 100	=	
Bath	÷		=			X 100	=	
Drinking/Cooking	÷		=			X 100	=	
Dishes –hand wash	÷		=			X 100	=	
Dishwasher	÷		=			X 100	=	
Garbage Disposal	÷		=			X 100	=	
Washing machine	÷		=			X 100	=	
Shaving	÷		=			X 100	=	
Other	÷		=			X 100	=	

Calculation Sheet

Percentages of each activity based on group totals

	Quotient from page ? (should be a decimal)		# of degrees of angle of sector
360° X	Flushing the toilet _____	=	
360° X	Hand washing _____	=	
360° X	Tooth Brushing _____	=	
360° X	Shower _____	=	
360° X	Bath _____	=	
360° X	Drinking/Cooking _____	=	
360° X	Dishes –hand wash _____	=	
360° X	Dishwasher _____	=	
360° X	Garbage Disposal _____	=	
360° X	Washing machine _____	=	
360° X	Shaving _____	=	
360° X	Other _____	=	

Circle Graph

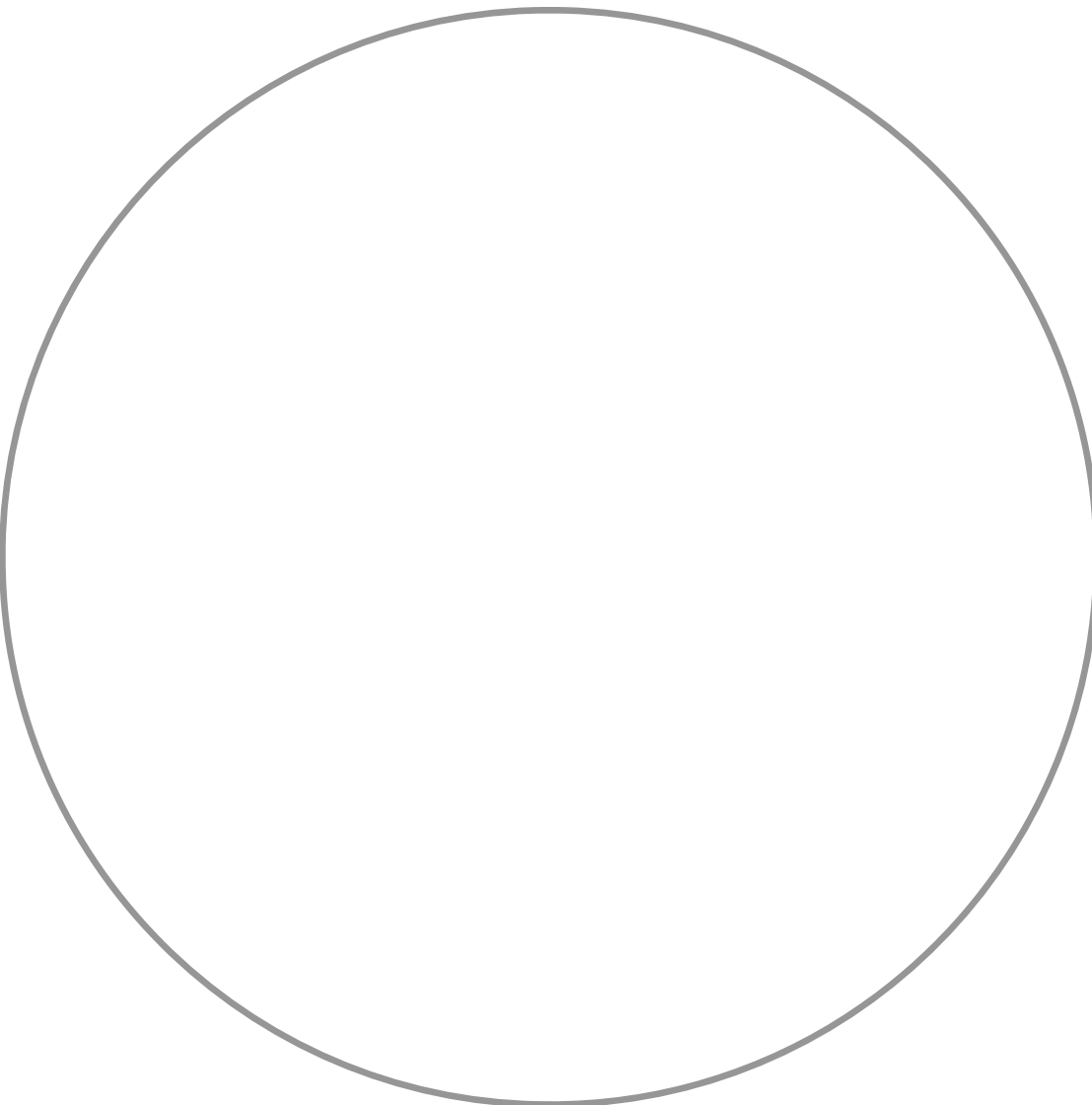
Water Usage for Each Activity

Instructions for graphing:

Using your protractor, measure sectors to represent the water usage for each activity on the circle graph below. Measure angles to the nearest degree.

Label each section with the activity and percentage of total water used. Beneath the circle graph, fill in the total number of gallons your graph is based on. Color-code each sector and fill in the key below. Be sure to title your graph.

Title: _____



Key

- | | |
|---------------------|--------------------------|
| Flushing the toilet | <input type="checkbox"/> |
| Hand washing | <input type="checkbox"/> |
| Tooth brushing | <input type="checkbox"/> |
| Shower | <input type="checkbox"/> |
| Bath | <input type="checkbox"/> |
| Drinking/Cooking | <input type="checkbox"/> |
| Dishes—hand wash | <input type="checkbox"/> |
| Dishwasher | <input type="checkbox"/> |
| Garbage disposal | <input type="checkbox"/> |
| Washing machine | <input type="checkbox"/> |
| Shaving | <input type="checkbox"/> |
| Other | <input type="checkbox"/> |

Graph based on _____ total gallons used by group.

Water Usage Guide



How much water do you use to complete your daily activities? Refer to this handy Water Usage Guide to find out!



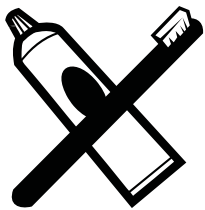
Toilet

5 gallons per flush
(Low-flow toilet, 2 gallons per flush)



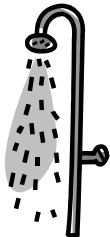
Hand Washing

2 gallons per wash



Tooth Brushing

2 gallons each time with water running



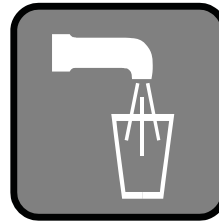
Shower

6 gallons per minute
(Low-flow shower, 2.5 gallons per minute)



Bath

15 gallons (full)



Drinking and Cooking

Number of gallons varies greatly, make your best estimation



Hand Washing

20 gallons with water running



Dishwasher

15 gallons per load



Garbage Disposal

3 gallons per day



Washing Machine

35 gallons for a full load



Shaving

3-5 gallons each time with water running