"I Use THAT much Water?!" Grade 9

Subject: Mathematics – Review of Algebraic Skills

Topic: How Much Water Do We Really Have and How Much Do We Use?

Time Frame: 60 – 70 minutes

Objectives:

- Students will be able to use their algebraic skills and their word problem skills to solve mathematical questions about water.
- Students will be able to use percentages to determine the water content of water certain items.

Methodology:

- Skills Review
- Independent Study
- Class Discussion

Materials:

- Lecture Notes
- Data on Water Consumption
- Student Worksheets
- Information on the price/cost of water in your community and the number of toilets in the school.

  * Students/Teacher will also need to research the additional data required for questions 12, 13 and 15. The information could be given to students, or the students could be presented with the task of finding the information through individual or group research.

Space Requirements:

- No additional space needed

Background Information:

- This lesson is intended to **act as a review** of basic algebra skills. Students should be able to: add, subtract, multiply, convert percentages into decimal numbers and determine an unknown.

Directions/Procedure:

1. Skills Review
    a. Review procedures of isolating the unknown variable by adding, subtracting, multiplying and dividing.
        i. Example: 2x=6, 5=2x-5, 10+2x = 50,
    b. Review procedures of changing a percentage into a decimal.
        i. Example: 7% = 0.07, 25% = 0.25

2. Hand out the "How Much Water Do We Really Have and How Much Do We Use?" worksheet to students and review the data chart with them. It may also be beneficial to do an example, or question #1, together as a class. Allow students 30 minutes to work on the questions.

3. Once students have completed their worksheets, there are a number of options. Students could be given time to discuss/review their answers with a partner before they are taken up in class to promote a cooperative learning environment in the classroom. The students could check/discuss their answers together as a group before handing them in to be graded. The students could switch papers and assess each other's work as a means of peer assessment. Choose a strategy that works best for your students.

4. Discuss, as a class, the numbers and facts determined through the assignment. Some example questions include:
    - Did you realize how much water is used during a load of laundry?
    - What can we do to decrease the amount of water we use everyday?

5. Follow-up/wrap-up/Exit slip question – Ask the students, using the water consumption facts table, to calculate how much water (in litres) they use in one day. Values can be compared and discussed at the end of the period, or at the beginning of the following lesson to create continuity.

Evaluation:

Formal Assessment– Marking students' worksheets.

Informal Assessment– Observing students' behaviour as they work on their assignments and discuss the answers in class.

Resources:

Youth Zone – Canadian International Development Agency
http://www.acdi-cida.gc.ca/acdi-cida/acdi-cida.nsf/eng/JUD-12882713-HSK

Environment Canada
http://www.ec.gc.ca/eau-water/

Lenntech
http://www.lenntech.com/specific-questions-water-quantities.htm

How Much Water Do We Really Have and How Much Do We Use?

Answer the following questions (1-15), using the data table below.

Water Use in One Day	Water Facts
Dripping Faucet = 50 L	70% of your body is made of water
Conventional Washing Machine = 165 L Low Water usage Washing machine = 102 L	95% of a tomato is water
Dishwasher = 40 L	85% of an apple is water
Brushing Teeth, Faucet Running = 10 L	88% of a potato is water
10 Minute Shower = 100 L	91% of spinach is water
Conventional Toilet = 16 L Low Flush Toilet = 6 L Dual Low Flush Toilet = 3 L / 6 L	61% of beef is water

1. You have used 175L of water already today. You have washed your laundry once and have brushed your teeth an unknown number of times. How many times have you brushed your teeth today?

2. You have used 255L of water already today. You have washed a load of laundry, had a shower and washed the dishes in the dishwasher. How long did you shower?

3. You received a notice from the city saying that because of a dripping faucet in the house, you have used 250L of water. How many days was your faucet dripping?

4. You are making applesauce and you have brought in 3 kg of apples from your backyard. How much water (in kg) is contained in the apples?

5. You are making a large salad with 1 kg of tomatoes, 1 kg of potatoes and 2 kg of spinach. How much water (in kg) will be contained in your salad?

6. If Sally weighs 50 kg, how much of her body mass is made up of water? If all of the water were removed from Sally, how much would Sally weigh?

7. In the whole world there is 1.4×10^{21} L of water. However, only 0.26% of that water is available for human and plant use. How many litres are available for human and plant use?

8. Out of the water available for humans and plants (answer to question #7), only 0.014% is available to be used as safe drinking water. How many litres of safe drinking water does the world have?

9. If there are 6.5 billon people living in the world and the average person uses 330 L/day, how many days of safe drinking water does the world have with its present supply?

10. You have used 142L of water already today. You have brushed your teeth once, had one 10-minute shower and flushed the toilet – perhaps more than once. How many times have you flushed the toilet?

11. If you had a low flush toilet as is currently used in the United States or Europe, how much water could you have saved today compared to what you used here in Canada?

12. What is the price/cost of water in your community?

13. How much could you save on your water bill if you replaced conventional toilets with low flush or dual low flush toilets?

Consider the following information when answering questions 14 and 15.

- In Canada, a low flush toilet costs approx $350 and a dual low flush toilet costs approx $450.

14. Which of the following would save the greatest amount of money (water) by converting to low flush or dual low flush toilets?
    a. A home with one toilet and four persons living there
    b. A home with three toilets and four people living there
    c. A school with 12 toilets and 400 students
    d. A school with 12 toilets and 1000 students

15. What is the "pay back" time if you converted to low flush or dual low flush toilets in your home and in your school?
    a. Less than two years
    b. Less than five years
    c. Less than ten years