Bridge – Introduction to Variables Name:_____

In the last chapter, you worked with lengths, moving back and forth on a number line, and comparing signed numbers (+ and −). But what if there are lengths you *do not* know? In this lesson, you will use clues to find unknown values. Unknown values are often represented by **variables**. Finding unknown values is one of the most important parts of algebra. Today's work will give you the background you will need for your upcoming work with variables. As you work with your team today, keep these questions in mind:

How can I represent or visualize this situation?

What information *do* I know?

What information do I need to find?

4-1.
CROAKIE THE TALENTED FROG

Croakie is a very talented frog. He does tricks for the audiences at the Calaveras County Fair contest every year. Some of his tricks are quickly making him famous. He not only hops, but he can also do a "hip hop" jump, along with other exciting tricks. Just how long is his "hip hop" jump, assuming he travels the exact same distance each time? Read the description of his special routine below. Then complete parts (a) through (d) that follow.

- Croakie starts at point A. He hops 12 feet to the right, toward point B.
- Then he does two "hip hop" jumps in a row, still traveling to the right.
- He turns and makes a 3-foot hop to the left.
- He stops to regain his balance and then, still traveling to the left, repeats his 3-foot hop three more times.
- He turns and makes 16 spinning hops that are 1 foot each to the right, ending exactly at point B.

a. Draw a diagram to show Croakie's entire routine as described above.

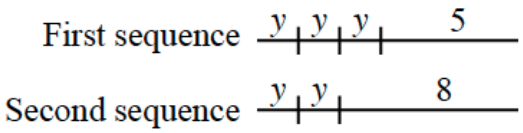
b. Work with your team to write an expression that represents the distance from point A to point B based on Croakie's moves.

c. Jill is one of Croakie's biggest fans. From watching his act, she estimates that his "hip hop" jumps are each 5 feet long. If Jill is correct, how far is it from point A to point B? Explain.

d. Croakie's manager measured the distance from point A to point B and found that it was actually 24 feet. How far does Croakie really travel each time he does his "hip hop" jump? Use pictures to help explain your thinking. Be prepared to share your thinking with the class.

4-2.

Now Croakie has a new special jump length. He moved between two fixed points, each time with a different sequence. His trainer, Thom, drew the diagram below to represent his two sequences, using y to represent the length of Croakie's new special jump.



a. Describe each of Croakie's two sequences.

b. Work with your team to figure out how far Croakie travels in each special jump. Be prepared to explain your thinking to the class.

c. What is the distance between the start and end of his sequence of jumps?

4-3.

Croakie has a new set of moves. The sequence involves three special high hops. The expression $x + x + x + 5$ represents the whole sequence, with x representing the distance he moves with each high hop.

a. In your own words, describe what you know about Croakie's new sequence.

b. If Croakie's new sequence is a total of 11 feet, draw a diagram to represent Croakie's new sequence.

c. How far does Croakie jump with each high hop? How can you tell?

4-5.

Croakie is certainly a remarkable frog. Now he has developed even more amazing tricks! This time, he starts at point A, slides 2 feet to the right, and then completes two flips in a row, landing at point B. From point B, he turns around and goes back by doing one flip and sliding 8 feet to the left, ending up back at point A.

a. How far does Croakie move during each flip, assuming each flip is exactly the same length? Explain how you got your answer.

b. What is the distance between points A and B?

4-6.

Additional Challenge: Create a new problem to challenge your teammates.

- Make up a new trick for Croakie, but do not tell anyone how much distance it covers.
- Design two or more different sequences that Croakie can do with his new trick while performing routines that are *the same length*. (You get to use any length you want, but again, do not tell anyone.)
- Write down all of the necessary clues and be ready to trade problems with a team member.

Reflection

1. What was the main mathematical focus of the lesson? What steps did we take to accomplish our I can statement?

2. What questions do you have about the work today? If you have no questions, please write a question you can ask someone to help further his/her learning.

3. Read the Math Notes box on the bottom. Then complete the following division problems.

   a. $\mathbf{683 \div 4}$ b. $\mathbf{212 \div 9}$

4. Croakie now has a new routine that is 59 feet long. Keep this distance in mind as you complete parts (a) and (b) below.

   a. In his new routine, Croakie makes seven super jumps, all the same length, and then hops 3 feet. How long is each super jump?

   b. If *x* represents the length of one super jump and 2x represents the length of two super jumps, write an expression that represents Croakie's routine.

5. Rewrite each decimal as a fraction or fraction as a decimal.

a. 0.007	b. 0.103	c. 1.21
d. $\frac{505}{1000}$	e. $\frac{505}{100}$	f. $\frac{2}{100000}$

Methods and Meanings Math Notes — Dividing

When using long division to divide one number by another, it is important to be sure that you know the place value of each digit in your result.

$$\begin{array}{r} 37 \\ 6\overline{)225} \\ -180 \\ \hline 45 \\ -42 \\ \hline 3 \end{array}$$

In the example of dividing 225 by 6 at right, people often begin by saying, *"6 goes into 22 three times."* If they were paying attention to place value, they would instead say *"6 goes into 220 thirty-something times."* The 3 of the quotient is written in the tens place to indicate that 6 goes into 225 at least 30 times, but less than 40. The 3 represents 3 tens.

It may seem like the divisor is then multiplied by the 3, and the product, 18, is placed below a 22. However, you are really multiplying 30 by 6 and the product is 180, which is placed below 225. You would then subtract, getting what looks like 4. But then you would "bring down" the 5, and get 45. Notice that if you subtract 180 from 225, as in the top example at right, you get 45 directly. You then repeat the same process. In the past, you may have stopped at this point and written that the quotient is 37 with a remainder of 3.

$$\begin{array}{r} 37.5 \\ 6\overline{)225.0} \\ -180 \downarrow \\ \hline 45 \downarrow \\ -42 \downarrow \\ \hline 30 \\ -30 \\ \hline 0 \end{array}$$

The same method works for dividing decimals. The bottom example at right is essentially the same as the top one, except that it shows what happens if you keep dividing past the decimal point, while still keeping place value in mind.