Name:
Date:

Do Now

1. How long is your writing utensil in inches?

(many possible answers)
5.75 in

2. How long is your writing utensil in centimeters?

(many possible answers)
14 cm

3. Did you get the same answer to #1 and #2? How is it possible that the length of a writing utensil can be represented using two different numbers?

No, I did not get the same answer to #1 and #2. This is because the same measurement can be represented with different units.

4. Can you give another example of how we can measure the same thing in two different ways and get different answers?

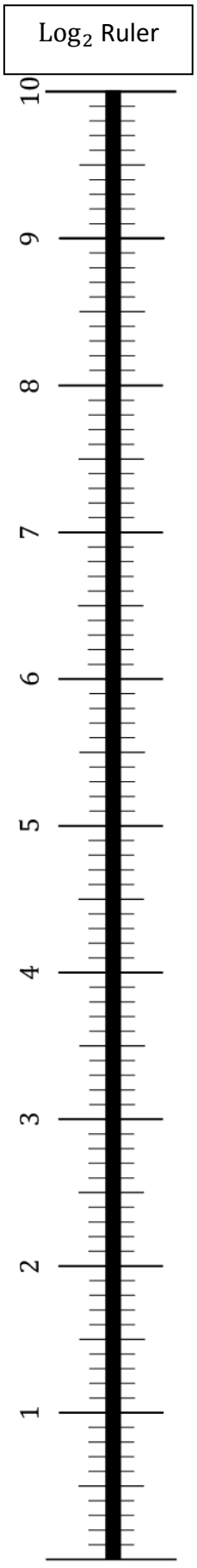
(many possible answers)
You can measure the weight of a rock using kilograms and pounds.
You can measure the volume of lemonade using gallons and liters.

Name:
Date:

LOGS & Scale

Required Materials: LOG 2, LOG 4, LOG 8, LOG 10, LOG 16, LOG32, LOG 40, LOG 64, and LOG 100

Part I: To right is what we call a "Log Base 2" ruler, typically written as "Log_2"ruler. We refer to the subscript (the small number) as the base. You use it just like a normal ruler: you line up the bottom of your LOG with the zero and measure the height by reading the number off the ruler.



1. What is the measure of a Log 2 on the Log_2 ruler? *1*
   (Ignore the nub that connects LOGs when measuring them.)

   This can be written this using the following notation: $\text{Log}_2 2 =$ *1*

2. What is the measure of a Log 4 on the Log_2 ruler? *2*

   This can be written this using the following notation: $\text{Log}_2 4 =$ *2*

3. What is the measure of a Log 8 on the Log_2 ruler? *3*

   This can be written this using the following notation: $\text{Log}_2 8 =$ *3*

4. What is the measure of a Log 16 on the Log_2 ruler? $\text{Log}_2 16 =$ *4*

5. What is the measure of a Log 32 on the Log_2 ruler? $\text{Log}_2 32 =$ *5*

6. What is the measure of a Log 10 on the Log_2 ruler? $\text{Log}_2 10 =$ *3.25*
   (It's okay to estimate if you have to)

7. What is the measure of a Log 40 on the Log_2 ruler? $\text{Log}_2 40 =$ *5.25*
   (It's okay to estimate if you have to)

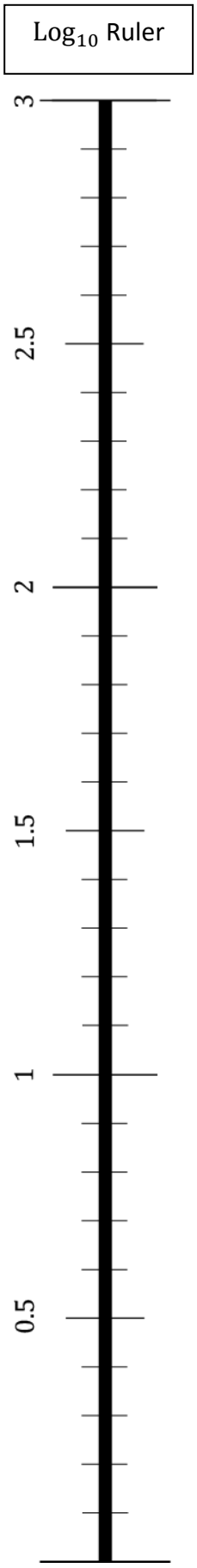
8. Which numbers measured out to whole numbers? Which numbers didn't? What kinds of numbers are easiest to measure using a Log_2 ruler?
   Numbers that are powers of 2 measured out to be whole numbers. Numbers that are not powers of 2 didn't. Powers of 2 are the easiest to measure using a Log_2 ruler.

9. Give an example of at least two additional numbers that would measure out to a whole number using a Log_2 ruler:

   (many possible answers)
   64, 128

   Give an example of at least two numbers that would NOT measure out to a whole number using a Log_2 ruler:

   (many possible answers)
   25, 73



Part II: To right is what we call a "Log Base 10" ruler, typically written as "Log_{10}"ruler. We refer to the subscript (the small number) as the base. You use it just like a normal ruler: you line up the bottom of your LOG with the zero and measure the height by reading the number off the ruler.

10. What is the measure of a Log 10 on the Log_{10} ruler? *1*

    This can be written this using the following notation: $\text{Log}_{10}\,10 =$ *1*

11. What is the measure of a Log 100 on the Log_{10} ruler? *2*

    This can be written this using the following notation: $\text{Log}_{10}\,100 =$ *2*

    This can also be written as: $\text{Log}_{10}\,10^2 =$ *2*

12. Even though we don't have one, what would be the measure of LOG 1000 on the Log_{10} ruler? $\text{Log}_{10}\,1000 = \text{Log}_{10}\,10^3 =$ *3*

13. Even though we don't have one, what would be the measure of LOG 10000 on the Log_{10} ruler? $\text{Log}_{10}\,10000 =$ *4*

14. What is the measure of a Log 2 on the Log_{10} ruler? $\text{Log}_{10}\,2 =$ *4*
    (It's okay to estimate if you have to)

15. What is the measure of a Log 16 on the Log_{10} ruler? $\text{Log}_{10}\,16 =$ *1.2*

16. What is the measure of a Log 40 on the Log_{10} ruler? $\text{Log}_{10}\,40 =$ *1.6*

17. Which numbers measured out to whole numbers? Which numbers didn't? What kinds of numbers are easiest to measure using a Log_{10} ruler?

    Numbers that are powers of 10 measured out to be whole numbers. Numbers that are not powers of 10 didn't. Powers of 10 are the easiest to measure using a Log_{10} ruler.

18. Give an example of at least two additional numbers that would measure out to a whole number using a Log_{10} ruler:

    (many possible answers)
    100,000, 10,000,000

    Give an example of at least two numbers that would NOT measure out to a whole number using a Log_{10} ruler:

    (many possible answers)
    27, 5,463

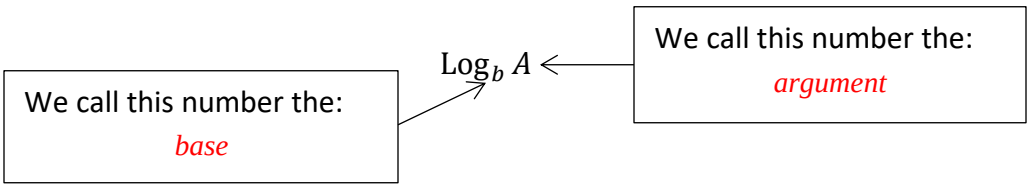
Part III: Generalizing

19. Arguments that are powers of __2__ will measure out to be whole numbers on a Log_2 ruler.

20. Arguments that are powers of __10__ will measure out to be whole numbers on a Log_{10} ruler.

21. Arguments that are powers of __n__ will measure out to be whole numbers on a Log_n ruler.

22. Vocabulary:



Part IV: Practice & Application

23. $\text{Log}_{10} 10 =$ __1__

24. $\text{Log}_{10} 10^5 =$ __5__

25. $\text{Log}_2 2^5 =$ __5__

26. $\text{Log}_2 2^{18} =$ __18__

27. $\text{Log}_{10} 100000 =$ __5__

28. $\text{Log}_2 128 =$ __7__

29. $\text{Log}_5 5 =$ __1__

30. $\text{Log}_5 5^8 =$ __8__

31. $\text{Log}_5 5^{458} =$ __8__

32. $\text{Log}_5 5^2 =$ __2__

33. $\text{Log}_5 25 =$ __2__

34. $\text{Log}_5 125 =$ __3__

35. $\text{Log}_3 9 =$ __2__

36. $\text{Log}_3 27 =$ __3__

37. $\text{Log}_7 49 =$ __2__

38. $\text{Log}_4 64 =$ __3__

Part V: More Challenging Questions

39. $\text{Log}_x x =$ __1__

40. $\text{Log}_{10} 10^{4.5} =$ __4.5__

41. $\text{Log}_Q Q^6 =$ __6__

42. $\text{Log}_2 4^3 =$ __5__

43. $\text{Log}_e e^{rt} =$ __rt__

44. $\text{Log}_{10} 10^{\text{Log}_{10} 10} =$ __1__

45. Describe in words how you would build or draw a Log_5 ruler if you were given a LOG 5 piece.

Mark each section of the ruler with integers from 0 to however long you want the ruler, break the ruler into equal segments, each the length of a LOG 5 piece. Label these segments 1, 2, 3, etc..