Name:
Date:

Subtracting LOGs

Required Materials: LOG 2, 2 x LOG 4, LOG 5, LOG 8, LOG 10, LOG 16, LOG 20, LOG 25, LOG 40, LOG 50, LOG 100

Directions: *Using your Ficycle LOGS, explore what happens when you subtract LOGS by comparing the relative heights of two LOGS and finding the LOG that makes up the difference.*

Part I: Discovering Log Properties

1. What is the difference between a LOG 20 and a LOG 4?
   Another way of asking this: What do you add to LOG 4 to make it the same height as LOG 20?

   This can be written this using the following notation: LOG 20 – LOG 4 = LOG____

   Check your answer: LOG ____ + LOG 4 = LOG 20

2. What is the difference between a LOG 16 and a LOG 4?
   This can be written this using the following notation: LOG 16 – LOG 4 = LOG ____

3. What is the difference between a LOG 10 and a LOG 2?
   This can be written this using the following notation: LOG 10 – LOG 2 = LOG ____

4. What is the difference between a LOG 100 and a LOG 4?
   This can be written this using the following notation: LOG 100 – LOG 4 = LOG ____

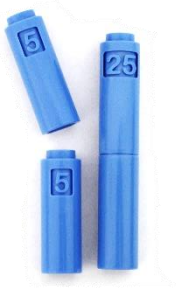
5. Someone in class is confused and doesn't understand how LOG 8 – LOG 2 = LOG 4. Describe how you could show that it is true using LOGS.

Before moving on to Part II make sure everyone in your group has the same answers to the above problems.

Part II: Applying knowledge

6. LOG 40 – LOG 10 = LOG ____
7. LOG 40 – LOG 5 = LOG ____
8. LOG 40 – LOG 4 = LOG ____
9. LOG 20 – LOG 5 = LOG____
10. LOG 20 – LOG 2 = LOG____
11. LOG 40 – LOG 20 = LOG ____
12. LOG 100 – LOG 50 = LOG ____

13. Barney incorrectly thinks that LOG 25 – LOG 5 = LOG 20. What is his mistake? How could you show him that he has made an error using LOGS?



Part III: Generalizing

14. Look back at your answers to Part I & Part II. What's the pattern? Is it possible to subtract LOGS even if you don't have them in front of you? In your own words, what is the rule or pattern for subtracting LOGS?

15. Use your rule to determine: LOG 50 – LOG 5 = LOG___

16. Describe the pattern using variables: **LOG A – LOG B = _____**

17. *Vocabulary*: The number that comes after the word LOG is referred to as *the argument*.
    a. What's the argument in "LOG 50"?
    b. What's the argument in "LOG 356"?

18. *Last time we learned that:* To add LOGS we multiply their arguments.

    Today we learned that: To subtract LOGS we _____ their arguments.

    Before moving on to Part IV make sure everyone in your group understands Part III.

Part IV: Practice & Application

19. LOG 50 – LOG 10 = LOG ____
20. LOG 100 – LOG 2 = LOG ____
21. LOG 200 – LOG 50 = LOG ____
22. LOG 144 – LOG 12 = LOG ____
23. LOG 35 – LOG7 = LOG ____
24. LOG 56 – LOG 8 = LOG ____
25. LOG 33 – LOG 3 = LOG ____
26. LOG 45 – LOG 9 = LOG ____

Part V: Working Backwards. You can use the same pattern you discovered to work backwards!

Use the pattern you discovered to work backwards and express each LOG as the difference of two other LOGS:

For example: LOG 5 = LOG $\frac{20}{4}$ = LOG 20 – LOG 4

27. LOG $\frac{20}{10}$ = LOG _____ – LOG _____

28. LOG $\frac{16}{4}$ = LOG _____ – LOG _____

For numbers 29 to 30:
Express LOG 10 in two different ways:

29. LOG 10 = LOG _____ – LOG _____

30. LOG 10 = LOG _____ – LOG _____

31. LOG $\frac{x}{10}$ = LOG _____ – LOG _____

32. LOG $\frac{x}{4}$ = LOG _____ – LOG _____

33. LOG $\frac{x}{y}$ = LOG _____ – LOG _____

34. LOG $\frac{2x}{5}$ = LOG _____ – LOG _____

35. LOG $\frac{2x}{4y}$ = LOG _____ – LOG _____

36. *Generalize*: Describe the pattern using variables: **LOG A/B = LOG _____ – LOG _____**

Part VI: More Challenging Questions

37. LOG 1 – LOG 10 = LOG _____

38. LOG ½ – LOG ¼ = LOG _____

39. LOG ¼ – LOG ½ = LOG _____

40. LOG 5 – LOG 2 = LOG _____

41. LOG 3^{12} – LOG 3^{7} = LOG _____

42. LOG x^{6} – LOG x^{4} = LOG _____