Name:
Date:
Do Now

1. Find a number that equals the same quantity when added to itself as it does when multiplied by itself.

0 or 2

2. Find all such numbers that exist and, if possible, provide some justification as to why you believe you have listed them all.

0, 2

After 2, the difference between adding a number to itself and squaring it will continually get larger.

Name:
Date:

Adding LOGs

Required Materials: 3 x LOG 2, 2 x LOG 4, LOG 8, LOG 5, LOG 10, LOG 16 and LOG 20

Directions: *Using your FiCycle LOGS, explore what happens when you add LOGS by linking them end to end and seeing what LOGS have the same height. You can compare a sum of LOGS to another by placing two stacks of linked LOGS side by side.*

Part I: Discovering LOG Properties

1. What LOG has the same height as linking one LOG 2 with another LOG 2?
   This can be written this using the following notation: LOG 2 + LOG 2 = LOG *4*

2. What LOG has the same height as linking one LOG 4 and one LOG 4?
   This can be written this using the following notation: LOG 4 + LOG 4 = LOG *16*

3. What LOG has the same height as linking one LOG 5 and one LOG 2?
   This can be written this using the following notation: LOG 5 + LOG 2 = LOG *10*

4. Someone in class is confused and doesn't understand how LOG 2 + LOG 2+ LOG 2 = LOG 8. Describe how you could show that it is true using LOGS.
   Stack 3 LOG 2's on top of each other. Compare the height of that to the height of the LOG 8. They are congruent, therefore LOG 2 + LOG 2 + LOG 2 = LOG 8.

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

Part II: Applying knowledge

5. LOG 5+ LOG 4 = LOG 2 + LOG *10*
6. LOG 2+ LOG *8* = LOG 4 + LOG 4
7. LOG 2+ LOG 10 = LOG 2 + LOG *2* + LOG 5
8. LOG (2 × 4) = LOG 2 + LOG *4*
9. LOG 10 = LOG 2 + LOG *5*
10. Betsy incorrectly thinks that LOG 4 + LOG 2 = LOG 6. What is her mistake? How could you show her that she has made an error using LOGS?
    Stack a LOG 4 and a LOG 2 on top of each other. The height of this is congruent with the height of LOG 8, not LOG 6. Therefore, LOG 4 + LOG 2 = LOG 8.

Part III: Generalizing

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

Multiply the arguments of the LOGs you are adding together to get the argument of the new LOG.
(Not only one right answer for this question)

12. Use your rule to determine: LOG 2 + LOG 8 = LOG *16*

13. Describe the pattern using variables: **LOG A + LOG B =** *LOG (A·B)*

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

Part IV: Practice & Application

14. LOG 3 + LOG 4 = LOG *12*

15. LOG 5 + LOG 10 = LOG *50*

16. LOG 10 + LOG 20 = *LOG 200*

Please Note: You have to write the LOG part yourself here.

17. LOG 7 + LOG 8 = *LOG 56*

18. LOG 1 + LOG 2 + LOG 3 + LOG 4 = *LOG 24*

19. LOG 7 + LOG 10 = *LOG 70*

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 sum of two other LOGS:
For example: LOG 16 = LOG 4 + LOG 4 *(for some problems there is more than one correct response)*

20. LOG (2•2) = LOG *2* + LOG *2*

21. LOG (2•4) = LOG *2* + LOG *4*

22. LOG (5•4) = LOG *5* + LOG *4*

23. LOG 20 = LOG *5* + LOG *4*

24. LOG $2x$ = LOG *2* + LOG *x*

25. LOG $5x$ = LOG *5* + LOG *x*

26. LOG $(x \cdot x)$ = LOG *x* + LOG *x*

27. LOG xy = LOG *x* + LOG *y*

28. *Generalize*: Describe the pattern using variables: **LOG AB = LOG** *A* **+ LOG** *B*

Part VI: More Challenging Questions. Express each sum as one LOG.

29. LOG 0.5 + LOG 8 = *LOG 4*

30. LOG ½ + LOG ¼ = *LOG 1/8*

31. LOG 24 = LOG 6 + LOG_ *4* _

32. LOG 16 = LOG 2 + LOG_ *8* _

33. LOG 56 = LOG 8 + LOG _ *7* _

34. LOG 3^3 + LOG 3^5 = *LOG* $3^{(3+5)}$ = *LOG* 3^8 = *LOG 6,561*

35. LOG x^3 + LOG x^5 = *LOG* x^8