Name ________________________

Class ________________________

Problem 1 – Divisible by 7, 11, and 13?

To begin, pick any 3-digit number and repeat it to create a 6-digit number. (459,495 is used here as an example)

1. Write down your number. Make sure everyone in your group has a different number.

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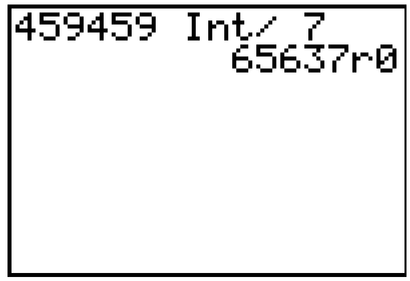

2. Enter your number on the Home screen and then divide by 7 to see if you get a remainder of 0. (Enter the number then press [2nd] [÷] [7] [ENTER].)

Is your number divisible by 7? _________________

3. Next, divide the previous quotient by 11. Press [2nd] [÷] [1][1] [ENTER].

Is your number divisible by 11? ________________

4. Next, divide the previous quotient by 13. Press [2nd] [÷] [1][3] [ENTER].

Is your number divisible by 13? ________________

What do you notice about the new quotient? __________________________________

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Would the order that you divided by 7, 11, or 13 affect your result? Try dividing your original number by these divisors in different orders. Write a sentence on your findings.

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5. Did everyone in your group pick a number that was divisible by 7, 11, and 13? ______

6. If so, discuss within your group why you think everyone's number was divisible by 7, 11, and 13. Write a sentence or two explaining why you think these special six digit numbers are divisible by 7, 11, and 13. ______________________________________

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Problem 2 – Justify Divisibility

Now you will justify the findings from Problem 1 on divisibility.

7. Create another six-digit number by picking a 3-digit number and repeating it. Write down your number. Make sure everyone in your group has a different number.

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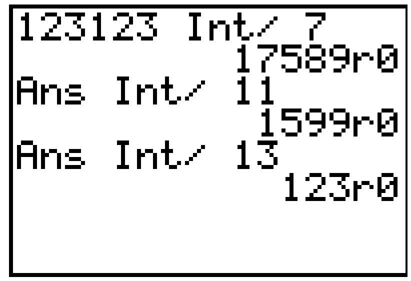
8. Test your number for divisibility by 7, 11, and 13 like you did in Steps 2-4 above. (Enter your number then press [2nd] [÷] [7] [ENTER] [2nd] [÷] [1][1] [ENTER].[2nd] [÷] [1][3] [ENTER].)

Is your number divisible by all three? __________



9. Write a sentence explaining your findings from Step 8.

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10. Multiply 7 × 11 × 13. What is the product? ______________

Divide your number in Step 7 by this product. Answer: ______________

11. Multiply your 3-digit number in Step 7 by this product. Answer: ______________

Describe the relationship between this product and the special six-digit numbers you created in Step 1 and Step 8. ____

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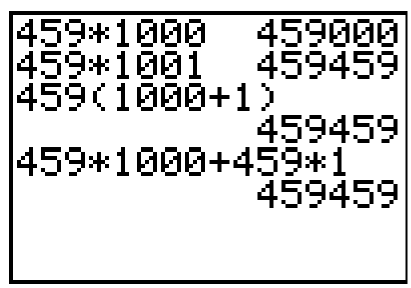
12. Examine the screen shot at the right. Multiplying by 1000 is easy to do mentally because you just move the decimal point 3 places to the right.

Multiplying by 1001 is also easy when you think of 1001 as 1000 + 1 and then multiply 459 x 1000 and add 459 x 1. This is known as the **distributive property**.



13. Rewrite your three-digit number as the product of the number and 1001. Then write it using the distributive property as shown in Step 12. ________________________

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14. Explain how you know 468,468 is divisible by 7, 11, and 13. __________________

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Problem 3 – Divisibility Tests

Next you'll look at divisibility tests for other prime numbers.

15. Write the divisibility tests for 2, 3, and 5.____________________________________

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16. There's also a divisibility test to tell if a number is divisible by 7. Here is how it works:

- Take all but the last digit (the ones digit) and form a number.
- Subtract twice the ones digit from the number you formed. Now you have a new number.
- Again, take all the digits but the ones digit and form a new number.
- Subtract twice the ones digit from this number.
- Continue this process until you are able to recognize whether the number is divisible by 7. See the screen to the right.

459459	459459
45945-18	45927
4592-14	4578
457-16	441
44-2	42

17. Apply this divisibility rule to your original number in Step 1. Did the test show that your number is divisible by7? ________________

18. There is a divisibility test for 11. For example, **6**<u>5</u>,**6**<u>3</u>**7** is divisible by 11. To use the test, sum every other digit, and then take the difference in the two sums.

- The sum of the digits in bold is 6 + 6 + 7 = 19.
- The sum of the underlined digits is 5 + 3 = 8.
- Now take the positive difference in the two sums and see if the result is divisible by 11. Since 19 – 8 = 11 and 11 is divisible by 11, then 65,637 is divisible by 11.

19. In the example at the right, since 18 – 18 = 0, and 0 is divisible by 11, the original number is divisible by 11.

459459	459459
4+9+5	18
5+4+9	18
18-18	0

20. Show how to use the divisibility test for 11 on your original number in Step 1? Does the divisibility test show what you previously found? __________

21. Use the divisibility test for 11 to show if 852,345 is or is not divisible by 11.

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22. Number theorists have developed divisibility rules or test for many different numbers. Can you write a divisibility test for a six-digit number to be divisible by 1001?

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