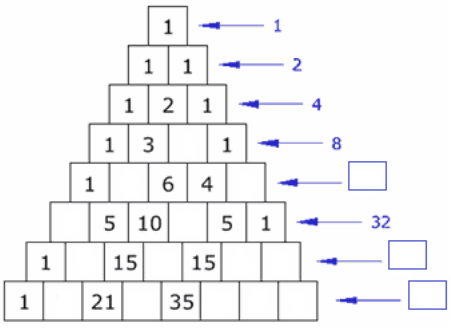
Students are encouraged to work together! However, don't swap answers with one another.

1 Fill in the Blanks!

Identify the pattern in each set of numbers and fill in the blanks. Hint: the patterns might not only use addition, subtraction, multiplication, and division. They might be about a category that each number is included in or on how the numbers are written.

1. $1, 3, 5, 7, 9, 11, 13$
2. $1, 2, 4, 8, 16, 32, 64, 128, 256$
3. $1, 4, 9, 16, 25, 36, 49, 64, 81$
4. $2, 3, 5, 7, 11, 13, 17, 19, 23, 29$
5. $1, 121, 12321, 1234321, 123454321, 12345654321$
6. $31, 25, 19, 13, 7, 1$
7. $3, 9, 27, 81, 243, 729$
8. $298, 253, 208, 163, 118, 73, 28$
9. $1, 3, 6, 10, 15, 21, 28, 36$
10. $1, 11, 21, 1211, 111221, 312211, 13112221, 1113213211 (look-and-say sequence) O, T, T, F, F, S, S, E, N, T, E$
11. 
12. 
13. 
14. The following figure is called Pascal's Triangle. Find the pattern and fill in the missing boxes.



15. Bonus: $1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89$
16. Bonus: $1, 1, 2, 4, 3, 9, 4, 16, 5, 25, 6, 36, 7$ *Hint: This pattern is similar to one of the previous patterns.

2 Finding Patterns

1. John has a matHENatical chicken. When he feeds her 3 handfuls of corn, she lays 12 eggs. When he feeds her 4 handfuls of corn, she lays 16 eggs. When he feeds her 6 handfuls of corn, she lays 24 eggs. How many eggs will she lay if he feeds her 10 handfuls of corn? 40

2. In Tejiville (Tay-jee-vil), there is a tradition to plant a certain number of trees each week. During the first week, 9 trees are planted. 13 trees are planted in week 2. 16 trees are planted in week 3. In week 4, 10 trees are planted. For week 5, 14 trees are planted. 17 trees are planted in week 6. 11 trees are planted in week 7. If this pattern continues, how many trees will be planted in week 12? 19 trees

3. Kelly, Veronica, Brittney, and Jiho can altogether draw 4 cats in 4 minutes. If they all draw at the same rate, how many cats can they draw in 12 minutes? 12 cats

4. Mr. Lomas uses Bluetooth for his writing tablet. On the first day of school, his Bluetooth connection breaks three times. The next day, it breaks seven times. The third day, it breaks eleven times. How many times does his connection break on the seventh day of school? f(x) = 4x - 1; f(7) = 27

3 Exercises

1. What is the last digit in 9^{123}? (This means $9 \times 9 \times \ldots 9 \times 9$ where there are 123 9's.) 9

2. What is the last digit in 5^{11}? 5

3. What is the last digit in 7^{2013}? 7

4. Find the sum of
   a) the first 10 multiples of 2 110
   b) the first 10 multiples of 3 165
   c) the first 10 multiples of 5 275

4 Just for Fun

A man wanted to get into a members-only party so he hid and watched the guard at the door of the party. The guard said a number to each member as they approached, and the member would respond with a number of their own. If the member responded with the correct number they were let in. If they responded incorrectly they were thrown out. One member came up to the door, the guard said twelve, and the member responded with six and was let in. Another member came to the door, the guard said six and the member responded with three and was let in. Believing he had heard enough, the reject went up to the guard . The guard said ten, and the reject said five, but was not let in. What should the reject have said? *Hint: focus on the letters . . . 3

5 References

"Braingle: 'The Club' Brain Teaser." Braingle: 'The Club' Brain Teaser. N.p., n.d. Web. 05 Oct. 2013.