Math Challenge #6

Odd, Even, and Prime

Kinder & First Grade: solve <u>at least</u> 3 problems.
Second & Third Grade: solve <u>at least</u> 7 problems.
Fourth Grade and above: solve <u>at least</u> 12 problems.

		Answer
1.	How many odd numbers are from 0 to 10?	*5 [odd numbers]*
2.	Which of the following numbers are even numbers? 11 8 7 15 10	*8 and 10*
3.	When Mia counts by 3, starting at 0 and ending at 15, how many times would she say the numbers that are odd numbers? 0, **3**, 6, **9**, 12, **15**	*3 [times]*
4.	When Leonard adds 3 odd numbers, will it result in an odd number as well? Prove your answer by giving two examples. Some examples: *1+1+1 = 3, 5+7+1 = 13, 3+7+101=111*	*Yes. Examples are varied.*
5.	Tina colored her coloring book from the top of page 10 to the bottom of page 20. If she only colored even page numbers, how many pages did she color? Page 10, 12, 14, 16, 18, 20 → 6 pages	*6 [pages]*
6.	What is the sum of all even numbers between 1 and 15? 2+4+6+8+10+12+14 = 56	*56*
7.	 Tom practices on his piano recital song for one hour on every even number date throughout the month of July and August. He practiced on July 2, July 4, July 6, and so on. How many hours did he practice in total? Months of July and August have 31 days, 15 of them are even and 16 of them are odd. Which means Tom was practicing 30 days for 1 hour each day, or 30 hours in total.	*30 [hours]*
8.	Students in Mrs. Thome's class are discussing products of odd numbers. These are what 5 students said: • Al said, "When you multiply two odd numbers, the result is always odd." • Bill said, "When you multiply four odd numbers, the result is always odd." • Cam said, "When you multiply four odd numbers, the result is always greater than 20." • Ditya said, "When you multiply two odd numbers, then add another odd number, the result is always odd." • Emma said. "Ony two of you have the correct statements." Which students are correct? Try to do few examples to prove whether each student is correct. Al's examples: $1 \times 5 = 5\ (odd), 3 \times 5 = 15\ (odd), 7 \times 3 = 21\ (odd)$ → Al is correct. Bill's examples: $1 \times 3 \times 5 \times 3 = 45\ (odd), 3 \times 3 \times 3 \times 3 = 81\ (odd), 3 \times 1 \times 5 \times 5 = 75 (odd)$. Bill is correct. Cam's examples: $1 \times 1 \times 1 \times 3 = 3\ , 1 \times 3 \times 3 \times 1 = 9\ (these\ are\ not\ greater\ than\ 20)$→ Cam is incorrect. Ditya's examples: $(1 \times 3) + 1 = 4\ (even)$ → Ditya is incorrect Emma's: since only Al and Bill gave correct statements, then Emma's statement is correct.	*Al, Bill, and Emma [are correct]*

9.	Becca is listing all the odd numbers greater than 10 and less than 20 in order. She then creates another list by adding 1 to the first number, adding 2 to the second number 2, adding 3 to the third number, and so on. What will be the sum of the second list that Becca created? First list: 11, 13, 15, 17, 19 Second list: 11+1, 13+2, 15+3, 17+4, 19+5. The sum: 12 + 15 + 18 + 21 + 24 = 90	*90*
10.	Kevin's favorite prime number is 6 less than another prime number. Francine's favorite prime number is the only even prime number. If both their favorite prime numbers are less than 50, what is the greatest possible sum of Kevin's and Francine's favorite prime numbers? Kevin's favorite numbers could be 5, 17, 31, 37 and 47. Fancine's favorite number is 2. The greatest possible sum: 47 + 2 = 49	*49*
11.	Boris is thinking of a prime number between 40 and 50. Josh is thinking of a prime number between 10 and 20. The difference between the two numbers is 26. What are the two numbers? Boris is possibly thinking of 41, 43, or 47; Josh is possibly thinking of 11, 13, 17 or 19. Subtract 26 from Boris' list to find what Josh is possibly thinking. 47 – 26 = 21 (composite) – Boris is not thinking of 47. 43 – 26 = 17 (prime) – Boris is thinking of 43 and Josh is thinking of 17.	*43 and 17*
12.	Both 4 and 8 can be written as the sum of two prime numbers (4 = 2+2 and 8 = 5+3). How many numbers from 1 to 20 are there that can be written as the sum of two primes? 4=2+2, 5=2+3, 6=3+3, 7=2+5, 8=3+5, 9=2+7, 10=5+5, 12=5+7, 13=2+11, 14=3+11, 15=2+13, 16=3+13, 18=5+13, 19=2+17, 20=3+17	*15 [numbers]*
13.	How many two-digit primes are there between 10 and 99 that are also primes when reversed? For example, the number 17 is prime, and its reverse, 71 is also a prime. We won't be listing any number start with 2, 4, 6, or 8 because when we reverse it, it will be an even number. We won't list any number start with 5, since it will be a multiple of 5 when reversed. List the rest: 11 → 11 yes 13 → 31 yes 17 → 71 yes 19 → 91 not prime, 91 = 7x13 31 → already counted 37 → 73 yes 79 → 97 yes None on 9_ → already counted (19) Total: 4 pairs, plus 1 = (13, 31, 17, 71, 37, 73, 79, 97, and 11) = 9	*9 [two-digit primes]*
14.	How many square numbers less than 101 are there that can be formed by adding two prime numbers together? Square numbers: 4, 9, 16, 25, 36, 49, 64, 81, 100 2 + 2 = 4 11 + 5 = 16 13 + 23 = 36 51 + 13 = 64 89 + 11 =100 2 + 7 = 9 23 + 2 = 25 2 + 47 = 49 2 + 79 = 81	*9 [square numbers]*
15.	What is the largest 3-digit prime number? We can start by checking the largest 3-digit number, 999; it is not a prime number because it's divisible by 3, 9, and 37). 998 is not a prime number because it's an even number. 997 is only divisible by 1 and 997, so it's a prime number.	*997*
16.	How many numbers between 1 and 99 are the product of two even numbers? For a number to be a product of 2 even numbers, it must have 4 as a factor. 4, 8, 12, 16, …, 96 To find how many numbers in the above list, we can divide each number by 4: 4, 8, 12, 16, …, 96 *Divide each number by 4*: 1, 2, 3, 4, …, 24 → 24 numbers	*24*

17.	What is the difference between the sum of all the even counting numbers up to 2020 and the sum of all the odd counting numbers up to 2020? 2+4+6+…+2020 → 1010 numbers – (1+3+5+…+2019) 2+4+6+…+2020 -1- 3 -5-…-2019 1+1+1+…+1 = 1010	*1010*
18.	Thomas is making a list of all the numbers greater than 200 and less than 300, that can be formed by changing one digit (units or tens place) of the number 200. How many numbers on Thomas's list are prime numbers? Changing units' digit: 2 0 _? 201 (multiple of 3), 203 (divisible by 7), 207 (multiple of 3), 209 (divisible by 11) Changing tens digit: 2__0 none are prime, since it's ending in zero.	*None*

Solution is available on January 10, 2020 at www.mathinaction.org