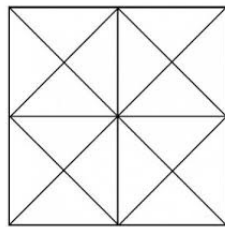


All answers must be exact and not decimal approximations. Radicals must be expressed in simplest radical form, and fractions should be expressed in lowest terms.

1. \_\_\_\_\_ Using only the arithmetical operations of subtraction,  $(x - y)$ , and division,  $(\frac{x}{y})$ ; the numbers 1, 3 and 7; and parentheses for grouping create an expression that equals 21.
2. \_\_\_\_\_ Suppose the only bills denominations available are \$5 and \$9, what is the largest purchase price that **cannot** be purchased with exact change?
3. \_\_\_\_\_ What number logically comes next in the series 4, 5, 14, 15, 40, 41, \_\_\_ ?
4. \_\_\_\_\_ Find the sum of all the numbers between 1 and 99 whose digits contain at least one 3.
5. \_\_\_\_\_ How many 2 digit numbers are divisible by 3?
6. \_\_\_\_\_ How many factors of 2 are in  $100!$ ?
7. \_\_\_\_\_ Simplify  $(x + 1)^5 - 5(x + 1)^4 + 10(x + 1)^3 - 10(x + 1)^2 + 5(x + 1) - 1$ .
8. \_\_\_\_\_ Determine the unit digit of  $17^{2016}$ .
9. \_\_\_\_\_ How many triangles are formed in the figure below?



10. \_\_\_\_\_ Let  $D(m)$  denote the greatest prime factor of a positive integer  $m$ . For how many positive integers  $n$  is it true that  $D(n) = \sqrt{n}$  and  $D(n + 16) = \sqrt{n + 16}$ ?