

General Test

- (3) How many 2-digit numbers have digits whose sum is a perfect square?
- (3) In the video game BMX-Treme, you earn points for performing stunts and you earn multipliers for scoring combos. There are 4 possible tricks (A,B,C, and D), which earn you 100, 200, 300, and 400 points respectively, give you combo multipliers of x2, x4, x6, and x8 respectively for doing them immediately after another trick, and a final multiplier is given at the end equal to the number of tricks performed, factorial. You can perform a trick more than once, but you can't perform the same trick twice in a row. If you can perform 3 tricks on a single jump, what is the highest number of points you can get in a combo? (As an example, if you perform stunts in the order D, B, C, you will get $(400 + 200 + 300)(4)(6)(3!) = 129,600$ points.)
- (4) A sequence of natural numbers follows such that the next number is equal to the number of letters in the previous number. For instance, the sequence starting with 6 goes 6 (six), 3 (three), 5 (five), 4 (four). What is the largest number of terms in such a sequence if the starting number is less than 20?
- (4) Joe is thinking of a number which is equal to the sum of the lowest natural numbers that leave a remainder of 4 when divided by 6 and a remainder of 5 when divided by 7. What is Joe's number?
- (4) Each of the letters M, E, S, and A represents a different even integer between 1 and 9. What is the least possible value of $\left| \frac{M - (E \times S)}{A} \right|$?
- (5) What is the sum $\frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \frac{1}{4 \times 5} + \dots + \frac{1}{19 \times 20}$? The sum can be expressed as a fraction in the form $\frac{a}{b}$. What is $a + b$?
- (5) A deck of 8 cards - 2 aces, 2 kings, 2 queens, and 2 jacks, all diamonds and clubs - are arranged by suit from highest to lowest value, with the ace of clubs being at the top of the deck and the jack of diamonds being at the bottom. The top card is flipped over into a separate pile and separate actions are taken based on what card it is. If the flipped card is an ace or king, the next two cards are placed immediately on the bottom. If the flipped card is a queen or jack, the next card is placed immediately into the pile. Afterwards, another card is flipped and the process repeats. What is the order of cards in the pile, starting from first to last? Express your answer as an 8-digit number with each card representing a distinct digit, as follows: Clubs -> A=1, K=2, Q=3, J=4 ; Diamonds -> A=5, K=6, Q=7, J=8.

- 8.** (5) The sum of the last 4 digits of Seth's phone number is 32. How many such 4-digit sequences are there?
- 9.** (6) Each of 10 houses on a street is painted red, green, or blue. Each house is painted only one color and each color is used on at least one house. No two colors are used to paint the same number of houses. In how many ways could the eight houses on the street be painted?
- 10.** (6) The Fibonacci sequence is the sequence 1, 1, 2, 3, 5... where each term is the sum of the previous two terms. What is the remainder when the 2015th term of the sequence is divided by 4?