Instructions:
There are ten multiple choice questions. Select one of A, B, C, or D for each question. Check your answers carefully before submitting them online. You will only be able to submit your answers once. Non-programmable, non-graphing calculators are permitted. You may not use any other resources including web-based ones.

Good luck!

1. Two towns, A and B, are located on the Croatian coast. At sunrise, Jakov begins walking south from A to B along the coast, while simultaneously Diana begins walking north from B to A. Each person walks at a constant speed, and they cross paths at noon. Jakov arrives in B at 5 pm while Diana reaches A at 11:15 pm. When was the sunrise?

   (A) 4:30 am
   (B) 5:30 am
   (C) 5:45 am
   (D) 6:15 am

2. There are three positive integers, A, B, and C. The following operations are performed:
   - Begin with the value of A
   - Square it
   - Multiply the value you obtained by 35
   - Add to that the value of 5 times B
   - Add to that the value of C squared

Which one of the following numbers could be the result of such a calculation?

   (A) 664502
   (B) 664503
   (C) 664508
   (D) 664509
3. In the 4x4 grid below, a path starts at S and proceeds through adjacent squares (horizontally or vertically, not diagonally) visiting each square exactly once and finishing at F. Consider the 100x100 grid whose top left corner is pictured below. If one were to create such a path starting at S, only one of the lettered squares, A, B, C, or D, could be the end of such a path through adjacent squares visiting each of the 10,000 squares exactly once. Which lettered square could it be?

(A) square A  
(B) square B  
(C) square C  
(D) square D

4. Let \( M = 124567891011121415 \ldots 282940414244 \ldots 9992999499959996999799989999 \) (i.e., \( M \) is obtained by writing all numbers from 1 to 9999 that do not contain digit 3). Which statement is true for \( M \)?

(A) \( M \) has 25,422 digits and is divisible by 3  
(B) \( M \) has 25,422 digits and is not divisible by 3  
(C) \( M \) has 25,424 digits and is not divisible by 3  
(D) \( M \) has 25,424 digits and is divisible by 3
5. Positive integers from 1 to 1000000 are arranged around a circle, as shown below. Start at number 1, and as you move clockwise, cross every fifteenth number (1, 16, 31, 46, and so on). Keep moving around the circle, crossing every fifteenth number until you realize that no new numbers are crossed. The numbers that you crossed are counted again - so if you cross number 111, then the next number you cross is 126, even though some numbers between 111 and 126 might already be crossed. How many numbers are left uncrossed?

(A) 520,000  
(B) 660,000  
(C) 800,000  
(D) 824,000

6. What is the probability that in drawing three cards, without replacement, from a deck of 52 cards that one will draw a spade, a queen, and a diamond in that order?

(A) 1/510  
(B) 13/2550  
(C) 1/208  
(D) 1/204
7. Consider two concentric circles with radii \( x \) and 1 where \( x < 1 \). In the annulus, the region between the concentric circles, 6 circles are constructed in the following way. Each of these circles is tangent to the inner circle, the outer circle, and the two adjacent circles. For which value of \( x \) is this construction possible?

(A) \( \frac{1}{6} \)
(B) \( \frac{1}{4} \)
(C) \( \frac{1}{3} \)
(D) \( \frac{1}{2} \)

8. Consider the following table of numbers. Though not obvious, there is a definite pattern.

\[
\begin{array}{cccccccccc}
1 & 3 & 7 & 3 & 11 & 13 & 13 & 19 & 19 & 55 \\
2 & 5 & 2 & 7 & 11 & 8 & 17 & 17 & 34 & 29 \\
3 & 1 & 5 & 9 & 5 & 13 & 15 & 21 & 23 & 21 \\
\end{array}
\]

What are the numbers in the last column (from top to bottom) that complete the pattern?

(A) 33, 21, 75
(B) 21, 37, 39
(C) 31, 23, 89
(D) 37, 47, 59
9. In a convex pentagon of perimeter 10, each diagonal is parallel to one of the sides. Find the sum of the lengths of the diagonals.

(A) \(5 \left(1 + \sqrt{5}\right)\)

(B) \(\frac{5}{2} \left(1 + \sqrt{5}\right)\)

(C) \(\frac{5}{2} \left(2\sqrt{5} - 1\right)\)

(D) \(5 \left(2\sqrt{5} - 1\right)\)

10. A total of 100,000 raffle tickets have been printed for a fundraiser, each one with a distinct 5-digit number ranging from 00000 to 99999. But some tickets are ambiguous. An ambiguous ticket is defined to be one that shows two different numbers depending on the ticket’s orientation. For example, the ticket below is ambiguous since it could be either 09081 or 18060, depending on its orientation. On the other hand, the ticket number 80008 is not ambiguous.

How many of the 100,000 tickets are ambiguous? Ticket number 09081 and its rotated pair 18060 count as two tickets.

Note: Digits used on the tickets appear as shown:

0, 1, 2, 3, 4, 5, 6, 7, 8, 9

(A) less than 2800

(B) between 2800 and 3000

(C) between 3001 and 3200

(D) more than 3200