Mathematics

1. How many real solutions does the equation $e^{\cos x} - e^{-\cos x} - 4 = 0$ have?
   a. No real solutions
   b. One real solution
   c. Two real solution
   d. Impossible to determine

2. The average of 100 numbers is zero. Of them, *at the most*, how many numbers may be greater than zero?
   a. 0
   b. 1
   c. 99
   d. 50

3. **Statement 1**: The first derivative of a function $f(x)$ is zero at a certain point $x = c$.
   Statement 2: There must exist a local maxima of $f(x)$ at $x = c$.
   a. Statement 2 is always the correct conclusion when Statement 1 occurs
   b. Statement 2 is always the incorrect conclusion when Statement 1 occurs
   c. Statement 2 may or not be correct when Statement 1 occurs
   d. Statement 1 and Statement 2 have no correlation with each other

4. There are 12 points in a plane, out of which 7 are collinear. What is the maximum number of triangles that can be formed by joining these points?
   a. 185
   b. 220
   c. 35
   d. 210

5. Let us assume three students A, B and C appear for Aviakul Aviation Academy entrance exam and their respective probabilities of getting the scholarship is $\frac{1}{5}, \frac{1}{3}$ and $\frac{1}{2}$. What is the probability of all three getting the scholarship?
   a. $\frac{11}{15}$
   b. $\frac{13}{15}$
   c. $\frac{1}{2}$
   d. $\frac{3}{4}$

6. If the arithmetic mean of a, b and 2 is given as $\frac{1}{2}x$, then arithmetic mean of a and b in terms of x is:
    a. 3x -1
    b. 0.75x- 1
    c. 2x-3
    d. 0.25x- 2

7. The eccentricity of ellipse must lie between 0 and 1. What are the ranges of eccentricity to get a straight line?
    a. Between 1 and ∞
    b. Between -∞ and 1
    c. Between 0 to ∞
    d. None of the above

8. Successive discounts of 22% and 18% on a certain Commercial Pilot License course are equal to a single discount of:
    a. 37%
    b. 36.5%
    c. 36.04%
    d. 36.9%

9. Find the horizontal asymptote in the graph of the function $f(x) = \frac{3x^2+1}{x^2+1}$
    a. y=1
    b. y=3
    c. y=-1
    d. y=-3

10. The value of x in the equation: $2log_2 x - log_8 x = 10$ is:
    a. 64
    b. 32
    c. 128
    d. 56

Answer Key:

1. (A)
2. (C)
3. (C)
4. (A)
5. (A)
6. (B)
7. (D)
8. (C)
9. (B)
10. (A)