The point value of each problem is in the left-hand margin. You must show your work to receive any credit for your answers, except on problems 1&2. Work neatly.

(6) 1. True or False.

( ) (a) The value of $\frac{6!}{2!} = (\frac{6}{2})! = 3! = 6$.

( ) (b) The value of $\gamma P_6$ is 7.

( ) (c) $\sum_{n=1}^{4}(n-1)^2 = \sum_{k=0}^{3} k^2$.

(6) 2. Fill in the blanks.

(a) The coefficient of the term $x^7y^3$ in the expansion of the expression $(x+y)^{10}$ is 3680.

(b) The probability of picking a red ball from a collection of five balls of which only one is red is $\frac{1}{5}$.

(c) The nonrecursive formula for the general term of the sequence 4, 7, 10, 13, $\cdots$ is $a_n = 4n - 1$, where the starting value of $n$ is one.

(10) 3. Use mathematical induction to prove that $1 + 3 + 5 + \cdots + (2n - 1) = n^2$ for $n = 1, 2, \cdots$. 
(8) 4. Evaluate $A(2B - C)$ where $A = \begin{bmatrix} 2 & -3 & 0 \\ 1 & 5 & -4 \end{bmatrix}$, $B = \begin{bmatrix} -4 & 1 \\ 0 & 7 \\ -3 & 2 \end{bmatrix}$, and $C = \begin{bmatrix} 0 & -3 \\ 6 & 2 \\ -4 & 0 \end{bmatrix}$.

(6) 5. Use the Cramer’s rule to solve the system $\begin{cases} 3x - y &= 7 \\ 6x + 5y &= 0 \end{cases}$.

(10) 6. Evaluate the determinant $\begin{vmatrix} 3 & 2 & 4 \\ 4 & -2 & 6 \\ 8 & 3 & 5 \end{vmatrix}$. 
(10) 7. Find the inverse of the matrix \( A = \begin{bmatrix} 2 & -3 \\ 4 & -5 \end{bmatrix} \) by using an augmented matrix and row operations. 
(Do not apply the formula for the inverse of a nonsingular \( 2 \times 2 \) matrix.)

(8) 8. Write out the terms in the sum \( \sum_{k=4}^{6} (k^2 - 3k + 8) \) and then find its value.

(10) 9. Consider the sequence \(-3.25, -1.5, 0.25, 2, \ldots\). Find its 101st term. Find the sum of its first 25 terms.
10. (a) How many 4-letter passwords can be constructed if letters can be repeated? Note: there are 26 letters in the English alphabet.

(b) How many 4-member committees can be picked from a group of the size 16?

(c) In how many ways can 4 suspects be arranged in a lineup?

11. What is the probability of getting a sum of 5 or a sum of 8, if two fair dice are rolled once?

12. A group of people consists of 15 male sophomores, 10 female sophomores, 5 male seniors, and 20 female seniors. If a person is selected at random from this group, what is the probability that the selected person is a man or a senior.