

**Problem session November 29, SF2736, fall 11.**

1. How many distinct necklaces with 10 beads can you form by using just black and white beads.
2. In how many ways can a cube be colored in three distinct colors, if the six squared sides shall be colored.
3. The matrix

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 & 1 & 1 \end{bmatrix}$$

is the parity check matrix of a 1-error correcting code  $C$ . Find all elements of  $C$ . Correct the word 011111. How many words cannot be corrected.

4. Find a linear 1-error correcting code  $C$  of length 9, size  $|C| = 32$  and containing the words 111100000 and 110000110.
5. Find a linear 1-error correcting code  $C$  of size  $|C| = 128$ .
6. Find the maximum size of a 2-error correcting code of length 8.
7. Show that

$$\binom{n}{1} + 2\binom{n}{2} + 3\binom{n}{3} + \dots + n\binom{n}{n} = 2^{n-1}n.$$

8. Solve the recursion

$$u_0 = 2, \quad u_1 = -6, \quad u_{n+2} + 8u_{n+1} - 9u_n = 8 \cdot 3^{n+1}, \quad n \geq 1.$$

9. Prove that the number of partitions of  $n$  in which each part is 1 or 2 is equal to the number of partitions of  $n + 3$  which have exactly two distinct parts.
10. Find the number of partitions of 16 in which each part is an odd prime.