

## MATH 100 - WORKSHEET 10 SOLUTIONS

Define the following terms and give an example.

- (1) coding - a method for detecting and correcting errors in digital communication
- (2) bitstring - a sequence of 0's and 1's, e.g., 100101
- (3) a  $(5, 3)$  linear block code - a code consisting of bitstrings of length 5, with 3 information bits and 2 parity check bits. A crucial property is that the sum of any two codewords is again a codeword. (Put in your favorite example here.)
- (4) information bits - the bits of the codeword that contain the message
- (5) parity check bits - the extra bits added to detect and correct errors in transmission
- (6) the equations for a linear code - the equations that determine the parity check bits, as in  $x_1 = x_4 + x_5 + x_6$ .
- (7) codeword - a bitstring that satisfies the defining equations for the code. These are the messages that are sent.
- (8) syndrome - the values calculated to detect errors in the received message. The syndrome corresponding to the above equation is  $s_1 = x_1 + x_4 + x_5 + x_6$ .
- (9) error detection - determining whether the message has been correctly sent
- (10) error correction - fixing errors that have occurred.
- (11) Hamming weight - the number of 1's in a bitstring. For example,  $w(001011) = 3$ .
- (12) Hamming distance - the number of places where two bitstrings differ. This is the Hamming weight of their sum.
- (13) minimum distance of a code - the minimum weight of a non-zero code word, or equivalently, the minimum distance between two distinct codewords.