

9.3a Using modulus to map a 32-bit hash value down to a value between $0, \dots, M - 1$ may result in problems whereby the original hash values are equally distributed in the range 0 to $2^{32} - 1$, but where the values on that range are multiples of M (in the most benign case, all the hash values may be either even or odd; however, in other cases (such as memory addresses), all the hash values could be multiples of 4, 8, 16, or other factors). Demonstrate how this will result in a sub-optimal distribution in the range $0, \dots, M - 1$.

9.3b What does the bitwise operation `v = (v >> k) << k;` do?

9.3c What does the bitwise operation `val = 1 << n;` calculate?

9.3d What does the bitwise operation `val = val & (1 | 4 | 8 | 16 | 64);` generate?