

Solutions

1. 55. This can be derived either by subtracting the number of 8-bit strings of weight 4 that *do not* have any 1s in the first two bits (15) from the total number of 8-bit strings of weight 4 (70), so by summing the number of 8-bit strings of weight 4 with exactly 1 bit in the first two bits (40) with the number containing two 1s in the first two bits (15).
2. $26^3 \times 10^3 = 17,576,000$ license plates. We use the product principle because we're making an ordered selection where:
 - First position: 26 choices (any letter)
 - Second position: 26 choices (any letter)
 - Third position: 26 choices (any letter)
 - Fourth position: 10 choices (any digit)
 - Fifth position: 10 choices (any digit)
 - Sixth position: 10 choices (any digit) So we multiply: $26 \times 26 \times 26 \times 10 \times 10 \times 10 = 17,576,000$
3. Rolling a die and flipping a coin: $6 \times 2 = 12$ outcomes (product principle) Rolling a die only if the coin shows heads: 1 (tails) + 6 (heads followed by die roll) = 7 outcomes (sum principle) The difference is that in the first scenario, both events always occur, while in the second, the die roll is conditional.