1a. 4 x 4 x 3 x 3 x 2 x 2 x 1 x 1 = 576

1b.

Could seat as: bbbbgggg or ggggbbbb, so $n_1 = 2$

n_2 = arrangements of boys: P(4,4)

n_3 = arrangements of girls: P(4,4)

Total possible arrangements = 2 x P(4,4) x P(4, 4) = 2 x 24 x 24 = 1152

2.

n_1 = choices for first urn = 5

n_2 = choices for second urn = 5

n_3 = choices for third urn = 5

n_4 = choices for fourth urn = 5

5 x 5 x 5 x 5 = 625

3. Partition the 52 cards into 13 piles. Each pile will have all 4 of the cards of a rank, i.e. 4 aces, 4 kings, 4 queens, etc.

n_1 = choices for the rank of the 3-of-a-kind: = 13

n_2 = which 3 cards will make up our 3-of-a-kind = C(4,3)

n_3 = still need 2 more cards. there are 12 rank left and we need 2 = C(12, 2)

n_4 = take one card of the four available = C(4,1)

n_5 = take one card of the four available = C(4,1)

hands = 13x C(4, 3) x C(12, 2) x C(4,1) x C(4,1) = 13 x 4 x 66 x 4 x 4 = 54,912

4.

n_1 = choices for 1st toy = 4

n_2 = choices for 2nd toy = 4

n_3 = choices for 3rd toy = 4

n_4 = choices for 4th toy = 4

n_5 = choices for police car = 1

n_6 = choices for dump car = 1

4 x 4 x 4 x 4 x 1 x 1 = 256

5a.

C(4,3) x C(16, 2) = 4 x 120 = 480

5b.

C(16, 5) = 4368

6a. There are 4 positions to fill

n_1 = choices for the leftmost position = 5

n_2 = choices for the next to the leftmost position = 6

n_3 = choices for the next position = 6

n_4 = choices for the rightmost position = 1

total = 5 x 6 x 6 x 1 = 180

6b

n1 = number could be *00* or **00 or *0*0= 3

assume we're creating this number: * 0 0 *

n2 = choices for leftmost digit = 5

n3 = choices for next to leftmost position (it must be a zero) = 1

n4 = choices for next position (it must be a zero) = 1

n5 = choices for rightmost position (can't be a zero and can't match leftmost position = 4

total = 3 x 5 x 1 x 1 x 4 = 60