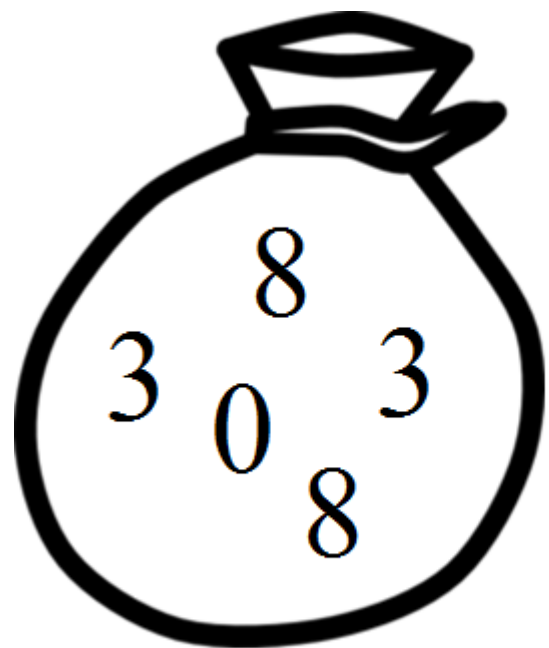
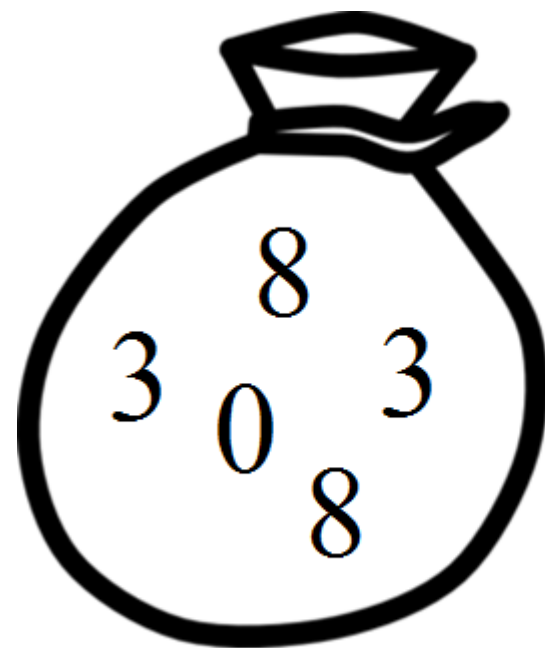
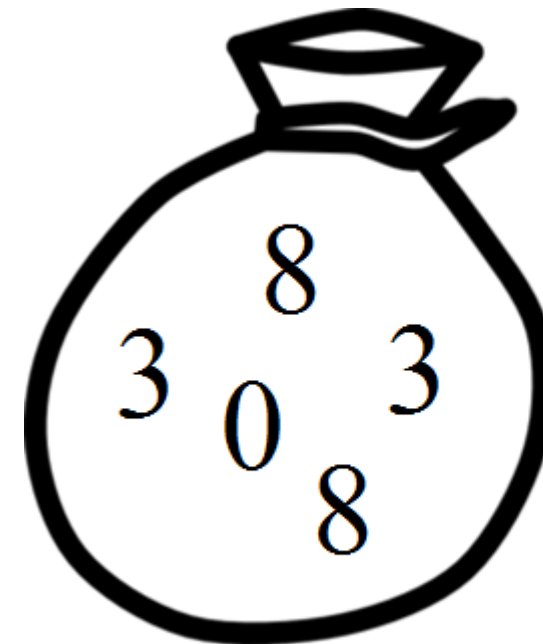
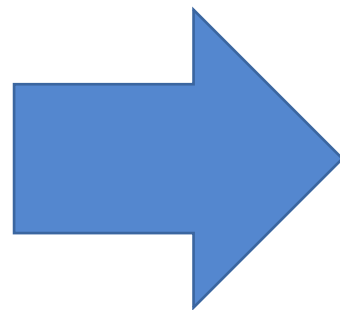


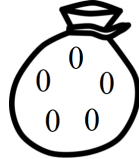

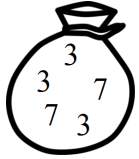
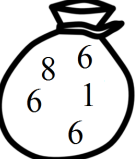

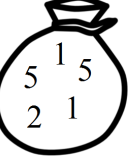

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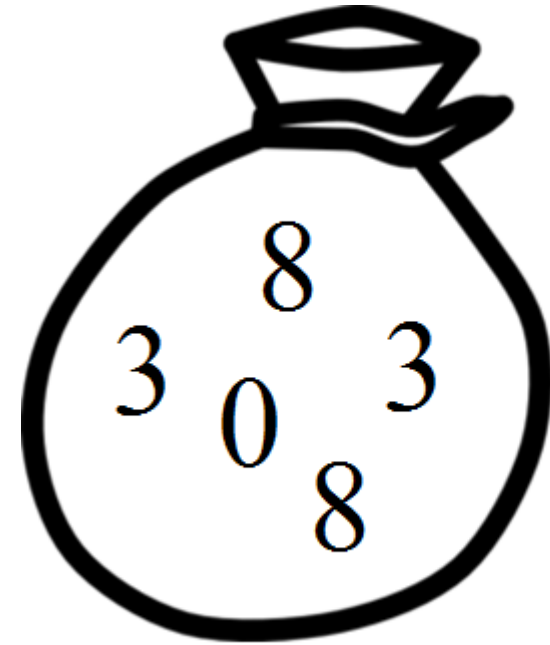
| | | |
|-------|-------|-------|
| | 30388 | 80338 |
| | 30838 | 80383 |
| | 30883 | 80833 |
| 03388 | 33088 | 83038 |
| 03838 | 33808 | 83083 |
| 03883 | 33880 | 83308 |
| 08338 | 38038 | 83380 |
| 08383 | 38083 | 83803 |
| 08833 | 38308 | 83830 |
| | 38380 | 88033 |
| | 38803 | 88303 |
| | 38830 | 88330 |



| Description | Palindromic? | Mathematical Representation | Count | Example |
|-----------------|--------------|--|-------|---|
| Five of a kind | ✓ | $\{\{a, a, a, a, a\} \mid a \in [0, 9]\}$ | 10 |  |
| Four of a kind | ✓ | $\{\{a, a, a, a, b\} \mid a, b \in [0, 9], a \neq b\}$ | 90 |  |
| Full House | ✓ | $\{\{a, a, a, b, b\} \mid a, b \in [0, 9], a \neq b\}$ | 90 |  |
| Three of a kind | ✗ | $\{\{a, a, a, b, c\} \mid a, b, c \in [0, 9], a \neq b \neq c\}$ | 360 |  |
| Two pair | ✓ | $\{\{a, a, b, b, c\} \mid a, b, c \in [0, 9], a \neq b \neq c\}$ | 360 |  |
| Pair | ✗ | $\{\{a, a, b, c, d\} \mid a, b, c, d \in [0, 9], a \neq b \neq c \neq d\}$ | 840 |  |
| Nothing | ✗ | $\{\{a, b, c, d, e\} \mid a, b, c, d, e \in [0, 9], a \neq b \neq c \neq d \neq e\}$ | 252 |  |

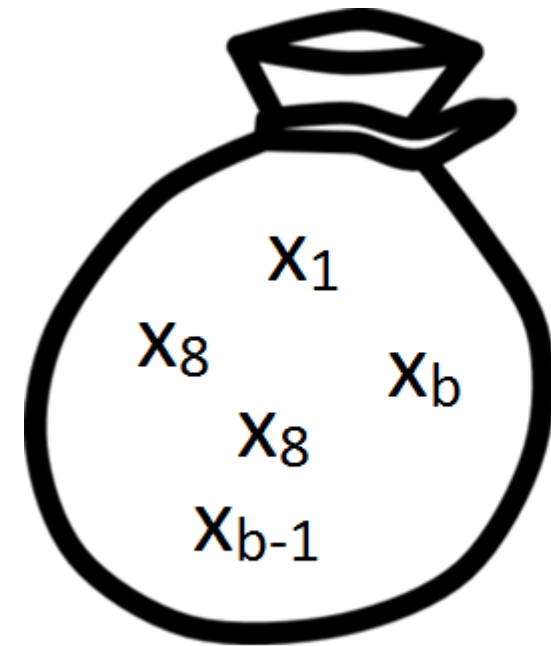
Alphabet: {0, 1, 2, 3, 4, 5, 6, 7, 8, 9}

Bag Size: 5



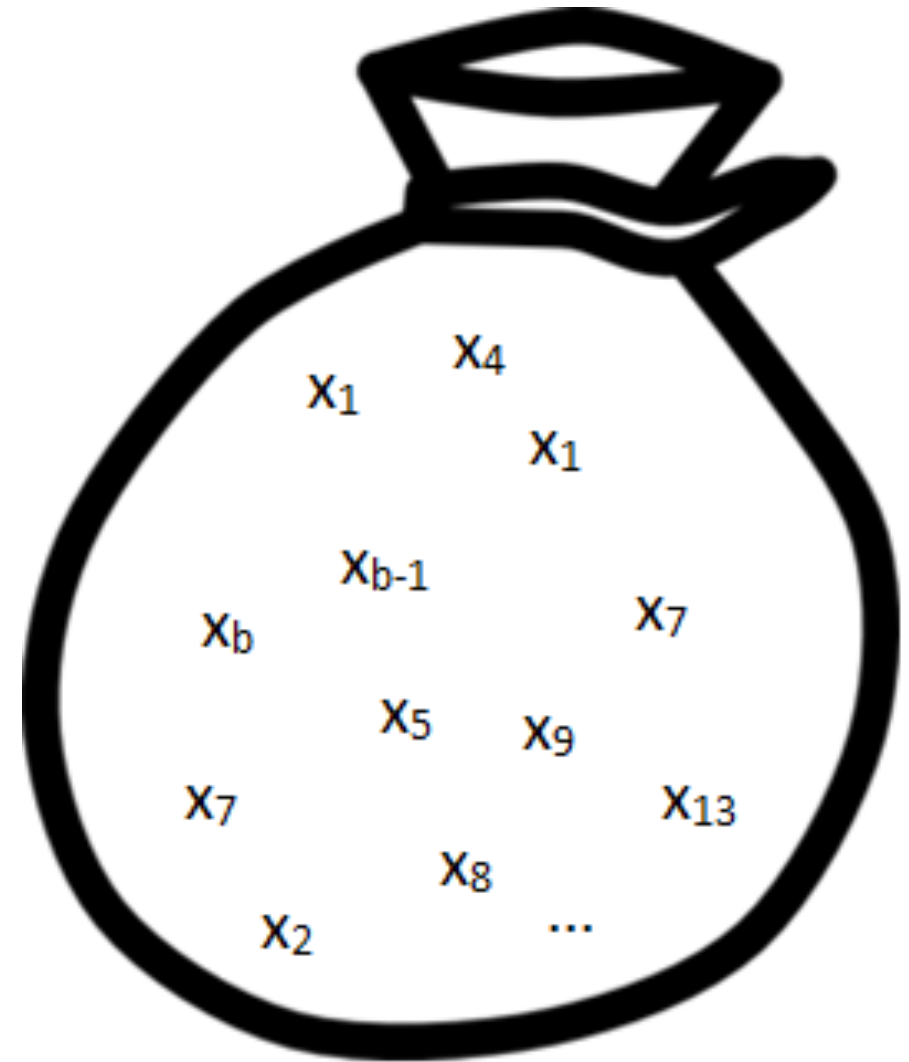
Alphabet: $X_b := \{x_1, x_2, \dots, x_b\}$

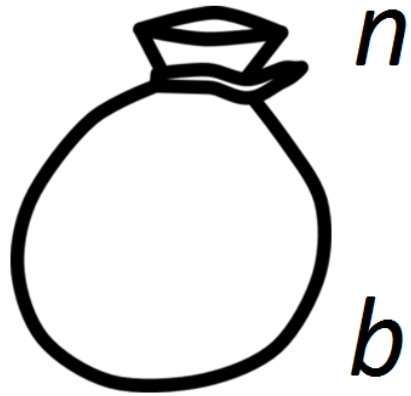
Bag Size: 5



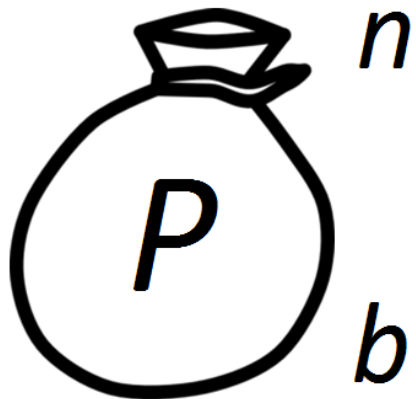
Alphabet: $X_b := \{x_1, x_2, \dots, x_b\}$

Bag Size: n





$:= \{\text{All } \textit{bags} \text{ of size } n \text{ over an alphabet of } b \text{ letters}\}$



$:= \{\text{All } \textit{bags} \text{ from the above space which are } \textit{palindromic}\}$

Multinomial Coefficient

$$\left| \begin{array}{c} \text{ring} \\ n \\ b \end{array} \right| = \binom{n+b-1}{b-1} = \frac{(n+b-1)!}{n!(b-1)!}$$

$$\left| \begin{array}{c} \text{bag with } P \\ n \\ b \end{array} \right| = ?$$

Odd / Even relationship

Results for $b = 10$

| n | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|--------------------|----|-----|----|-----|-----|------|-----|------|
| # Palindromic sets | 10 | 100 | 55 | 550 | 220 | 2200 | 715 | 7150 |

Odd / Even relationship

Results for $b = 10$

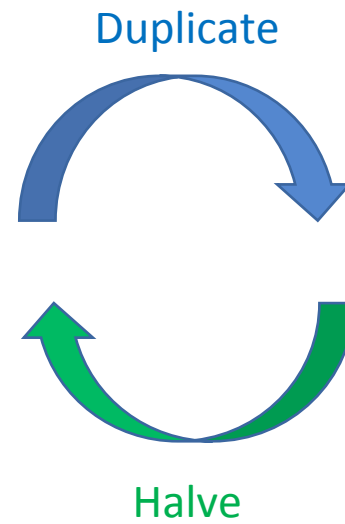
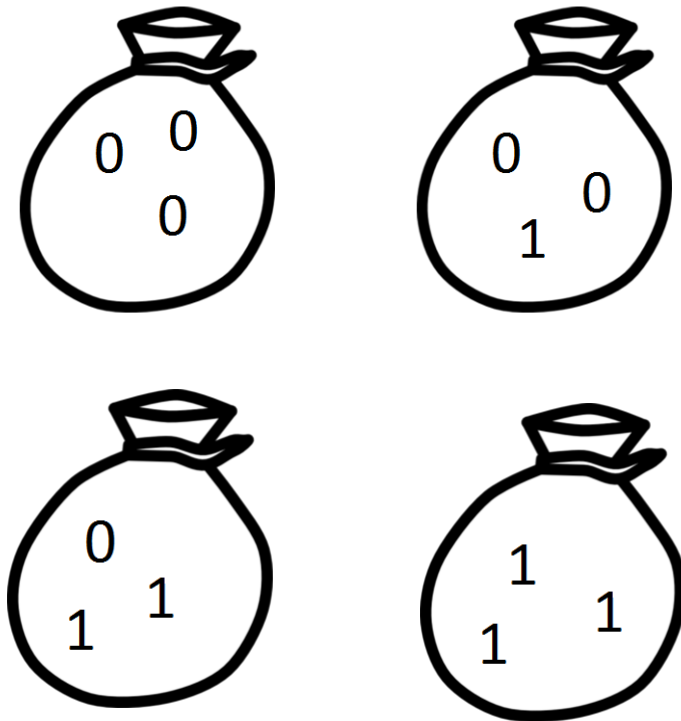
| n | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|--------------------|----|-----|----|-----|-----|------|-----|------|
| # Palindromic sets | 10 | 100 | 55 | 550 | 220 | 2200 | 715 | 7150 |



Even Case

Let $b = 2$

All bags for $n = 3$



All *palindromic* bags for $n = 6$

