Assignment 14, Discrete Mathematics

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1 Problems

1.1 Problem 1

1. Develop the identity $(3-2)^n = 1$ using binom of Newton formula:

$$\sum_{i=0}^{n} \binom{?}{?} 3^? \cdot (??)^? = 1$$

And verify the identity for the case $n = 4$.

2. Let number of ways to distribute k identical balls between 10 boxes is $D(10, k)$. Paint three boxes green and the remaining seven—red. Derive:

$$D(10, k) = \sum_{i=0}^{k} ???,$$

and verify for the case $k = 3$.

1.1.1 Answer 1

$$\sum_{i=0}^{n} \binom{i}{n} 3^i \cdot (-2)^{n-i} = 1.$$

Solution: *(using Maxima)*

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n: 4$
tex(sum(binomial(n, i) * 3^i * (-2)^(n - i), i, 0, n));
```

(hand-made)

$$\sum_{i=0}^{4} \binom{i}{4} 3^i \cdot (-2)^{4-i}$$

$$= 1 \cdot 3^0 \cdot (-2)^4 + 4 \cdot 3^1 \cdot (-2)^3 + 6 \cdot 3^2 \cdot (-2)^2 + 4 \cdot 3^3 \cdot (-2)^1 + 1 \cdot 3^4 \cdot (-2)^0$$

$$= 16 - 96 + 216 - 216 + 81$$

$$= 1$$

1.1.2 Answer 2