Assignment 8 Part 2

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9.6 -4 A camera shop stocks 8 different types of batteries, one of which is type A76. Assume there are at least 30 types

a) How many ways can a total inventory of 30 batteries be distributed among the 8 diffent types

$n = 8 \quad r = 30 \quad \binom{r+n-1}{r} = \binom{37}{30} = \frac{37!}{30!7!} = \frac{37 \cdot 36 \cdot 35 \cdot 34 \cdot 33 \cdot 32 \cdot 31 \cdot 30!}{30!\ 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2} = 10{,}295{,}474$

b) How many ways can a total inventory of 30 batteries be distributed among 8 types if the inventory must include at least 4 A76 batteries

$\binom{(30-4)+7}{30-4} = \binom{31}{26} \quad \frac{31!}{26!5!} \quad \frac{31 \cdot 30 \cdot 29 \cdot 28 \cdot 27 \cdot 26!}{26!\ 2 \cdot 3 \cdot 4 \cdot 5} = 169{,}911$

c) How many can a total inventory of 30 be distributed if the inventory had at most three A76 batteries

$10{,}295{,}474 - 169{,}911 = 10{,}125{,}563$

9.6 -12 $y_1 + y_2 + y_3 + y_4 = 30$ each y_i is a nonnegative integer

$n = 4 \quad r = 30 \quad = \binom{30+4-1}{30} = \binom{33}{30} = \frac{33!}{30!\ 3!} \quad \frac{33 \cdot 32 \cdot 31 \cdot 30!}{30!\ 3 \cdot 2} = 5456$

9.6 - 18 A large pile of coins consists of p, n, d, and q

a) How many different collection of 30 coins can be chosen

$n = 4 \quad r = 30$ see 9.6-12 5456

b) If a pile only had 15q and 30 of the other coins how many collections can be choosen

total - selections that contain 15q

$5456 - \binom{15+4-1}{15} \quad \frac{18!}{15!\ 3!} \quad \frac{18 \cdot 17 \cdot 16 \cdot 15!}{15!\ 3 \cdot 2} = 816$

4 640

c) If a pile only contained 20 d and 80 of the other coins how many collections can be choosen

total - selection that contain 20 d

$5456 - \binom{20+3}{20} \quad \frac{23!}{20!\ 3!} \quad \frac{23 \cdot 22 \cdot 21 \cdot 20!}{20!\ 3 \cdot 2} = 1771$

3685

d) If a pile only contained 15q and 20d ...

total - (b) - (c) =

$5456 - 816 - 1771 = 2869$