M 362K Post-Class Homework 2

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1-48

This question can be considered as distributing 10 balls into 5 urns where the urns are non-exclusive and the balls are not distinguishable. Therefore the total number of ways is ${}_{10+5-1}C_4 = 1001$

1-51

We have to consider this question in several cases:

Case 1:

When no chicken sandwiches are ordered, the order is indeed select 5 products out of the 5 categories. Since we can order the same product more than once, the total number of ways to order in this case is $5^5 = 3125$

Case 2:

When 1 chicken sandwich is ordered, we have \$3 left. Similarly, the total number of ways to order is $5^3 = 125$

Case 3:

When 2 chicken sandwiches are ordered, we have only \$1 left. Therefore the total number of ways is $5^1 = 5$

1-53

(c)

$(4x-5y)^3 = {}_3C_0(4x)^3 + {}_3C_1(4x)^2(-5y) + {}_3C_2(4x)(-5y)^2 + {}_3C_3(-5y)^3 = 64x^3 - 240x^2y + 300xy^2 - 125y^3$

Sample Exam 9

For the white balls, we have to select 5 and 1 for power ball. Therefore the total number of ways is ${}_{49}C_5 * {}_{42}C_1 = 80089128$

Sample Exam 11

Using the multinomial theorem, we can expand $(x-2y+5z)^4$ as follows:

$(x-2y+5z)^4 = \begin{pmatrix} & 4 & \\ 4 & 0 & 0 \end{pmatrix} x^4 - \begin{pmatrix} & 4 & \\ 3 & 1 & 0 \end{pmatrix} 2x^3y + \begin{pmatrix} & 4 & \\ 3 & 0 & 1 \end{pmatrix} 5x^3z + \begin{pmatrix} & 4 & \\ 2 & 2 & 0 \end{pmatrix} 4x^2y^2 + \begin{pmatrix} & 4 & \\ 2 & 0 & 2 \end{pmatrix} 25x^2z^2 - \begin{pmatrix} & 4 & \\ 2 & 1 & 1 \end{pmatrix} 10x^2yz - \begin{pmatrix} & 4 & \\ 1 & 3 & 0 \end{pmatrix} 8xy^3 + \begin{pmatrix} & 4 & \\ 1 & 0 & 3 \end{pmatrix} 125xz^3 + \begin{pmatrix} & 4 & \\ 1 & 2 & 1 \end{pmatrix} 20xy^2z - \begin{pmatrix} & 4 & \\ 1 & 1 & 2 \end{pmatrix} 50xyz^2 + \begin{pmatrix} & 4 & \\ 0 & 4 & 0 \end{pmatrix} 16y^4 + \begin{pmatrix} & 4 & \\ 0 & 0 & 4 \end{pmatrix} 625z^4 -$

$$\begin{pmatrix} & 4 & \\ 0 & 3 & 1 \end{pmatrix} 40y^3z - \begin{pmatrix} & 4 & \\ 0 & 1 & 3 \end{pmatrix} 250yz^3 + \begin{pmatrix} & 4 & \\ 0 & 2 & 2 \end{pmatrix} 100y^2z^2 = x^4 - 8x^3y + 20x^3z + 24x^2y^2 - 120x^2yz + 150x^2z^2 - 32xy^3 + 240xy^2z - 600xyz^2 + 500xz^3 + 16y^4 - 160y^3z + 600y^2z^2 - 1000yz^3 + 625z^4$$

Sample Exam 12

The sample space contains ${}_{52}C_3$ possibilities since we choose 3 cards from the 52 cards

However, if we have to make all three cards have faces. We have to choose 3 cards among 12 cards

Let $Pr(faces)$ be the probability that all three cards have faces

$$Pr(faces) = \frac{{}_{12}C_3}{{}_{52}C_3} = \frac{11}{1105}$$