

Results: Calculus Challenge Problem # 3

Students who persisted did well on this problem. One of the goals of the problem was to have students think hard about why and in what way the patterns seen are created. Once they understood the mechanism of creation, they didn't need to do as much calculation to determine the results. Seaholm High School had a particularly nice explanation for the appearance of the terms in Pascal's triangle and Rockford High School had a wonderful presentation of the multinomial coefficients in part 3 and ended their solution with

The n^{th} derivative of the product of k functions of x , where n is a nonnegative integer and k is a whole number, will be the sum of $\frac{(n+k-1)!}{(n!)(k-1)!}$ terms in the form $f_1^\alpha \cdot f_2^\beta \cdot f_3^\delta \cdots f_k^\kappa$ whose coefficients will be $\frac{n!}{(\alpha!)(\beta!)(\delta!) \cdots (\kappa!)}$ where $\alpha, \beta, \delta, \dots, \kappa$, are nonnegative integers and $\alpha + \beta + \delta + \cdots + \kappa = n$.

Walton High School went further and included proofs by mathematical induction for parts 1 and 2. Very nice work. Land O'Lakes also included a proof by induction for part 1.

School	Location	Teacher	Score
Diamond Bar High School	Diamond Bar, CA	Howard Alcosser	5
Farmington High	Farmington CT	Chris Lepi	4
La Habra High School (B)	La Habra, CA	Barbara De Roes	5
Hickman High School	Columbia, MO	Deanna Wasman	5
Land O'Lakes High School	Land O'Lakes, FL	Patrick Connolly	5
Rockford High School		Fred Reusch	5
Seaholm High School	Birmingham, MI	Eric Bruns	4
Walton High School	Marietta, GA	Tom Fulton	5
The Westminster Schools	Atlanta, GA	Ellen Vesey	5

Cumulative Summary

School	Location	Teacher	Score
Brookwood High School	Snellville, GA	Chris Michael	10
Diamond Bar High School	Diamond Bar, CA	Howard Alcosser	12
Farmington High	Farmington CT	Chris Lepi	7
James River High School	Midlothian, VA	Jan Nelson	4
La Habra High School (A)	La Habra, CA	Barbara De Roes	5
La Habra High School (B)	La Habra, CA	Barbara De Roes	15
Hickman High School	Columbia, MO	Deanna Wasman	12
Land O'Lakes High School	Land O'Lakes, FL	Patrick Connolly	13
Rockford High School		Fred Reusch	14
Shawnee Mission South High School	Overland Park, KS	Vince Lavergne	5
Seaholm High School	Birmingham, MI	Eric Bruns	12
Walton High School	Marietta, GA	Tom Fulton	13
West Lafayette Jr. Sr. High School	West Lafayette, IN	Joyce Gates	5
The Westminster Schools	Atlanta, GA	Ellen Vesey	13