



# THE WILLIAM LOWELL PUTNAM MATHEMATICAL COMPETITION

## ANNOUNCEMENT OF WINNERS

of the forty-seventh annual competition held on December 6, 1986

### WINNING TEAMS

<i>Rank</i>	<i>School</i>	<i>Team Members (in alphabetical order)</i>
1	HARVARD UNIVERSITY	Douglas S. Jungreis, Bjorn M. Poonen, David J. Zuckerman
2	WASHINGTON UNIVERSITY, ST. LOUIS	Daniel N. Ropp, Dougin A. Walker, Japheth L. M. Wood
3	UNIVERSITY OF CALIFORNIA, BERKELEY	Michael J. McGrath, David P. Moulton, Christopher S. Welty
4	YALE UNIVERSITY	Thomas O. Andrews, Kamal F. Khuri-Makdisi, David R. Steinsaltz
5	MASSACHUSETTS INSTITUTE OF TECHNOLOGY	David Blackston, Jim P. Ferry, Waldemar P. Horwat

The first place team receives an award of \$5,000 and each member of the team receives \$250. The awards for second place are \$2,500 and \$200; for third place \$1,500 and \$150; for fourth place \$1,000 and \$100; and for fifth place \$500 and \$50.

In each of the following categories, the listing is in alphabetical order.

### THE PUTNAM FELLOWS — THE SIX HIGHEST RANKING INDIVIDUALS

Each receives an award of \$500.

DAVID J. GRABINER	Princeton University
WALDEMAR P. HORWAT	Massachusetts Institute of Technology
DOUGLAS S. JUNGREIS	Harvard University
DAVID J. MOEWS	Harvard University
BJORN M. POONEN	Harvard University
DAVID J. ZUCKERMAN	Harvard University

### THE NEXT FOUR HIGHEST RANKING INDIVIDUALS

Each receives an award of \$250.

YONG YAO DU	University of Waterloo
GREGORY J. KUPERBERG	Harvard University
N A. OVERDECK	Stanford University
MICHAEL REID	Harvard University

### HONORABLE MENTION — TEAMS

UNIVERSITY OF BRITISH COLUMBIA	Wayne J. Broughton, Marek J. Radzikowski, Russil Wvong
CALIFORNIA INSTITUTE OF TECHNOLOGY	Leland Brown, Stanley Chen, Darien G. Lefkowitz
PRINCETON UNIVERSITY	Douglas Davidson, David J. Grabiner, Randall G. Rose
RICE UNIVERSITY	Charles R. Ferenbaugh, Thomas Hyer, John M. Steinke
UNIVERSITY OF WATERLOO	Yong Yao Du, Eric Veech, Minh Tue Vo

### HONORABLE MENTION — INDIVIDUALS

THOMAS O. ANDREWS, Yale University	DAVID P. MOULTON, University of California, Berkeley
JOHN B. BOYLAND, University of California, Davis	MATTHEW D. MULLIN, Princeton University
WILLIAM CHEN, Auburn University	DU NGUYEN, University of Ottawa
CONSTANTINE N. COSTES, Harvard University	RAVI K. RAMAKRISHNA, Cornell University
WILLIAM P. CROSS, California Institute of Technology	DANIEL N. ROPP, Washington University, St. Louis
HENRI R. DARMON, McGill University	RANDALL G. ROSE, Princeton University
MICHAEL B. DAVIS, Case Western Reserve University	DAVID B. SECREST, University of Illinois, Champaign-Urbana
SAMUEL S. DOOLEY, Texas A. & M. University	KENNETH W. SHIRRIFF, University of Waterloo
GLENN D. ELLISON, Harvard University	STEPHEN A. SMITH, University of Waterloo
BRYAN K. FEIR, University of Waterloo	THERON W. STANFORD, California Institute of Technology
CHARLES R. FERENBAUGH, Rice University	JOHN M. STEINKE, Rice University
JAMES P. FERRY, Massachusetts Institute of Technology	DAVID R. STEINSALTZ, Yale University
PATRICK T. HEADLEY, Case Western Reserve University	CONSTANTIN T. TELEMANN, Indiana University, Bloomington
EARL A. HUBBELL, California Institute of Technology	DOUGIN A. WALKER, Washington University, St. Louis
WILLIAM J. JOCKUSCH, Carleton College	CHRISTOPHER S. WELTY, University of California, Berkeley
DANIEL W. JOHNSON, Rose-Hulman Institute of Technology	KARL M. WESTERBERG, Carnegie-Mellon University
KAMAL F. KHURI-MAKDISI, Yale University	JAPHETH L. M. WOOD, Washington University, St. Louis
DARIEN G. LEFKOWITZ, California Institute of Technology	JAMES C. YEH, Princeton University
MICHAEL J. McGRATH, University of California, Berkeley	

A total of 2,094 students from 358 colleges and universities in Canada and the United States participated in the Competition. There were teams from 270 institutions. More complete details will appear in the American Mathematical Monthly.

March 1, 1987

Leonard F. Klosinski, Director; Gerald L. Alexanderson and Loren C. Larson, Associate Directors

Leonard F. Klosinski, Director

THE WILLIAM LOWELL PUTNAM MATHEMATICAL COMPETITION

University of Santa Clara

Santa Clara, California 95053



Telephone: (408)554-4526  
March 1, 1987

Dear Professor:

Enclosed is a report on your contestants in the 47th Competition and your team rank (if it was in the range 1-150), a list of the top 497 contestants (which you may wish to share with your committee on graduate students), an announcement of winners, and a list of participating schools. Some tables are given below. Your contributions to the Competition are greatly appreciated.

Sincerely yours,

Leonard F. Klosinski, Director  
Gerald L. Alexanderson, Associate Director  
Loren C. Larson, Associate Director

Score	Rank	Score	Rank	Score	Rank	Score	Rank
90	1	56	37	36	181.5	21	596
89	2	55	38.5	35	186.5	20	796.5
86	3	54	40	34	189.5	19	1125.5
82	4	53	41.5	33.9	191.5	18	1155.5
81	5.5	52	43	33.8	194	17	1227
78	7	51	45.5	33.7	197.5	16	1236.5
75	8.5	50	54	33.6	200	15	1240.5
74	10	49	63	33.5	201	14	1245
72	11	48	67.5	33	204.5	13	1263
71	12	47	73	32	222	12	1362
70	13.5	46	78	31	244	11	1511.5
68	16.5	45	81.5	30	315.5	10	1691
67	19.5	44	84.5	29	401	9	1821.5
64	21.5	43	86.5	28	439.5	8	1852.5
63	23.5	42	92	27	463.5	7	1868.5
61	25	41	101	26	473	4	1872
60	27.5	40	127	25	476	3	1882
59	30.5	39	156	24	480.5	2	1917
58	32.5	38	168.5	23	491	1	1971
57	35	37	176	22	528.5	0	2046

FREQUENCY DISTRIBUTION OF PROBLEM SCORES OF THE TOP 201 CONTESTANTS

	A-1	A-2	A-3	A-4	A-5	A-6	B-1	B-2	B-3	B-4	B-5	B-6	Total
10	152	155	53	21	13	1	183	123	26	22	10	3	762
9	23	0	6	3	4	4	3	31	5	8	0	0	87
8	10	0	15	4	0	1	7	16	4	6	0	0	63
7	7	0	1	4	0	1	0	3	1	6	0	0	23
6	0	0	0	5	0	0	0	0	0	0	0	0	5
5	0	0	0	7	0	1	0	0	1	0	0	0	9
4	0	0	0	0	0	0	0	0	0	0	0	0	0
3	2	0	1	6	1	0	0	0	4	0	0	0	14
2	2	0	12	3	0	6	4	16	3	4	0	0	50
1	3	0	1	7	2	4	2	5	5	7	0	0	36
0	1	33	26	23	39	64	1	2	33	59	58	32	371
-	1	13	86	118	142	119	1	5	119	89	133	166	992