Alberta High School Mathematics Competition Newsletter

Volume 17, Number 2 **January 1, 2008**

The first part of the 52nd Alberta High School Mathematics Competition was written on November 20, 2007 by 713 students representing 34 schools. Here is the list of prize winners.

Major Individual Prizes

First Prize:

Linda Zhang, Western Canada High School, Calgary,
accorded the title of the 2007/2008 **A K Peters Scholar**.

Second Prizes:

Danny Shi, Sir Winston Churchill High School, Calgary (Grade XI), and
Jarno Sun, Western Canada High School, Calgary (Grade XI).

Grade XI Prizes:

Jacky Tian, Western Canada High School, Calgary.

Grade X Prize:

Jaclyn Chang, Western Canada High School, Calgary.

Robert Barrington Leigh Memorial Prizes:

Hunter Spink, Calgary Science School, Calgary (Grade IX) and
Mariya Sardarli, McKernan Junior High School, Edmonton (Grade VIII).

Major Team Prizes

First Team Prize:

Western Canada High School, Calgary,
with **Linda Zhang, Jarno Sun** and **Jacky Tian**,
managed by **Ms. Renata Delisle**,
awarded the 2007/2008 **P. H. Denham Memorial Plaque**.

Second Team Prize:

Sir Winston Churchill High School, Calgary,
with **Danny Shi, Kevin Tan** and **Darren Xu**,
managed by **Mr. Neil Hamel**.

Third Team Prizes:

Harry Ainlay High School, Edmonton,
with **David Szepesvari, Alex Huang** and **Yuri Delanghe**,
managed by **Ms. Jacqueline Coulas**.

Other Prizes

Zone I First Prizes:
Spencer Boone, Western Canada High School, Calgary (Grade XI), and
Wen Wang, Western Canada High School, Calgary.

Zone II First Prize:
Naheed Jivraj, Strathcona Tweedsmuir School, Okotoks.
Zone II Second Prize:
Stephen Reimer, Prairie Christian Academy, Three Hills.

Zone III First Prize:
Michael Wong, Tempo School, Edmonton.
Zone III Second Prize:
David Szepesvari, Harry Ainlay High School, Edmonton (Grade XI).

Zone IV First Prize:
Sarah Prior, Ardrossan Jr/Sr High School, Ardrossan.
Zone IV Second Prize:
Brenna Pickell, Archbishop Jordan High School, Sherwood Park.

Zone I Team Prize:
Henry Wise Wood High School, Calgary,
with **Carolyn Gray, Edward Xu** and **Javier Romualdez**,
managed by **Mr. Michael Retallack**.

Zone II Team Prize:
Strathcona Tweedsmuir School, Okotoks,
with **Naheed Jivraj, Eric Kim** and **Andrew Halls**,
managed by **Ms. Nola Adam**.

Zone III Team Prize:
Old Scona Academic High School, Edmonton,
with **Annie Xu, Jessica Jiang** and **Douglas Cheung**,
managed by **Mr. Ihor Lytviak**.

Zone IV Team Prize:
Archbishop Jordan High School, Sherwood Park,
with **Brenna Pickell, Colin MacKinnon** and **Erin Dockery**,
managed by **Ms. Marge Hallonquist**.

Geoff Butler Memorial Team Prize:
Vimy Ridge Academy, Edmonton,
with **Alex Frost, Elizabeth Hillier** and **Scott Ritchie**,
managed by **Ms. Delcy Rolheiser**.

Alberta High School Mathematics Competition

Part II - 2006/2007

Problem 1.
Determine all positive integers n such that n is divisible by any positive integer m which satisfies $m^2 + 4 \leq n$.

Problem 2.
The numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 and 15 are arranged to form a 5×3 table in each of the 15! possible ways. For each table, we compute the sum of the three numbers in each row, and record in a list the largest and the smallest of these sums. Determine the sum of the $2 \times 15!$ numbers on our list.

Problem 3.
One angle of a triangle is 36° while each of the other two angles is also an integral number of degrees. The triangle can be divided into two isosceles triangles by a straight cut. Determine all possible values of the largest angle of this triangle.

Problem 4.
Let a, b and c be distinct non-zero real numbers such that $\dfrac{1-a^3}{a} = \dfrac{1-b^3}{b} = \dfrac{1-c^3}{c}$. Determine all possible values of $a^3 + b^3 + c^3$.

Problem 5.
A survey in Alberta was sent to some teachers and students, a total of $2006 = 2 \times 17 \times 59$ people. Exactly a% of the teachers and exactly b% of the students responded, yielding an overall response rate of exactly c%, where a, b and c are integers satisfying $0 < a < c < b < 100$. For each possible combination of values of a, b and c, determine the total number of teachers and the total number of students who responded to the survey.

Answers:

1. 1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 18 and 24.
2. $48 \times 15!$.
3. 72°, 90°, 108°, 126° and 132°.
4. 3.
5. For $(a, b, c) = (16, 75, 50)$, 867 students and 136 teachers responded to the survey. For $(a, b, c) = (25, 84, 50)$, 714 students and 289 teachers responded to the survey.

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In addition to the $1500 for the top prize in the Final Round of the Alberta High School Mathematics Competition, **ConocoPhillips Canada** has contributed $500 towards our operating cost. This generosity is most appreciated.