RESEARCH CORNER

Because of the fact that the last issue of Parabola was so late, we only have one entry as yet to the questions you were left with in that issue. Peter Gould of Chester Hill High has said (without any proofs) that all primes of the form $4n + 1$ are the sum of two squares in only one way and that all numbers of the form $8k + 3$ are the sum of three odd squares and numbers of the form $8k + 7$ are the sum of four squares. Can anyone supply him with proofs?

Some later entries in the original question are Barry Quinn of St Joseph's College, Hunters Hill (who reached 400) and Peter Cousins of Gymea High (who reached 100). Although he did not go very far, Peter has suggested a way in which a computer could help solve our problem. He writes:

"It seems to me that this method would be effective on a computer, by substracting all the perfect squares less than a number, and seeing how the differences can be written as sums of squares, e.g.

$22 - 16 = 6 = 4 + 1 + 1$ (where 6 is stored from a previous result)

So $22 = 16 + 4 + 1 + 1$

$22 - 9 = 13 = 9 + 4$

So $22 = 9 + 9 + 4$

The results for each number would be stored and used again.

I tried to write a FORTRAN program myself but my elementary knowledge was insufficient."

Some of our readers might like to take up Peter's challenge and write a program as he suggested.

We recently also received another solution to the four 4's problem from David Paterson (14 years) of South Sydney Boys' High which extended the list to 328 by using the symbol Γ (called Gamma) where $\Gamma(x) = (x - 1)!$

R. James

☆ ☆ ☆

The Power of Digits

What is the largest n-digit number which is an n'th power?

Answer on page 36