

### Junior problems

J199. Prove that there are infinitely many pairs  $(p, q)$  of primes such that  $p^6 + q^4$  has two positive divisors whose difference is  $4pq$ .

*Proposed by Titu Andreescu, University of Texas at Dallas, USA*

*Solution by Arkady Alt, San Jose, USA*

Let  $p = 2$  and let  $q$  be odd prime number. Then

$$p^6 + q^4 = 64 + q^4 = (8 + 4q + q^2)(8 - 4q + q^2)$$

and we have

$$(8 + 4q + q^2) - (8 - 4q + q^2) = 8q = 4pq.$$

*Also solved by Daniel Lasaosa, Universidad Pública de Navarra, Spain; Prithwijit De, HBCSE, Mumbai, India; Roberto Bosch Cabrera, Havana, Cuba; Tigran Hakobyan, Armenia.*