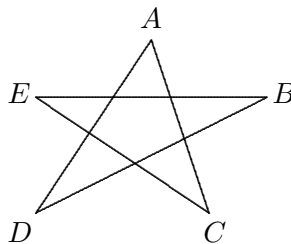


THE TWENTY FIRST W.J. BLUNDON MATHEMATICS CONTEST*

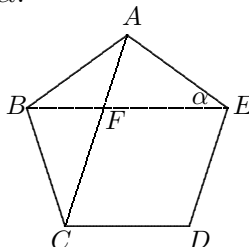
Sponsored by
The Canadian Mathematical Society
in cooperation with
The Department of Mathematics and Statistics
Memorial University of Newfoundland

February 18, 2004

1. A farmer spent exactly \$100 to buy 100 animals. Cows cost \$10, sheep \$3 and pigs 50 cents each. How many of each did he buy?
2. Show that if a three digit number is divisible by 3, then the sum of its digits is divisible by 3.
3. Consider the points $A(1,0)$, $B(3,0)$, $C(3,5)$ and $D(1,4)$. Find an equation of the line through the origin that divides the quadrilateral $ABCD$ into two parts of equal area.
4. Find all real solutions to the equation $1 + x + x^2 + x^3 = x^4 + x^5$.
5. Find the exact area of the regular octagon formed by cutting equal isosceles right triangles from the corners of a square with sides of length one unit.
6. If A , B and C are angles of a triangle, prove that $\cos C = \sin A \sin B - \cos A \cos B$.
7. If $a + b + c = 0$ and $abc = 4$, find $a^3 + b^3 + c^3$.
8. (a) If $\log_{10} 2 = a$ and $\log_{10} 3 = b$, find $\log_5 12$.
(b) Solve $x^{\log_{10} x} = 100x$.
9. In the figure below, find the sum of the angles A , B , C , D and E .



10. Let $ABCDE$ be a regular pentagon with each side of length 1. The length of BE is τ , and the angle FEA is α . Find τ and $\cos \alpha$.



*



*A grant in support of this activity was received from the Canadian Mathematical Society.
La Société mathématique du Canada a donné un appui financier à cette activité.*