**Nassau County Interscholastic Mathematics League**

**Solutions** **2003-2004**
**Contest # 3**

13. Change to base ten; it's $\frac{117}{13} = 9$, or 1001 in base two. Alternate solution: do long division in base two.

14. Tom(2) must be true so Tom(1) is false. Tom did it.
Alternate solution: Jim's are certainly one T, one F. Polly (1) is T, so Polly (2) is F. So it can't be Huck or Jim. If Polly did it, both Tom's statements are true, so it's not Polly. Tom did it.

15. radius = $2\sqrt{3}$, so the apothem is $\sqrt{3}$. That means half of each side is 3, and each side is 6. So the area of the equilateral triangle is $\frac{6^2\sqrt{3}}{4} = \mathbf{9\sqrt{3}}$.

16. It's a red and a blue or a red and a yellow or a blue and a yellow. So the probability is $\frac{{}_3C_1 \cdot {}_5C_1 + {}_3C_1 \cdot {}_7C_1 + {}_5C_1 \cdot {}_7C_1}{{}_{15}C_2} = \frac{\mathbf{71}}{\mathbf{105}}$.
Alternate solution: The only way they can be different colors is if they are not the same color.
$1 - \left(\left(\frac{3}{15}\right)\left(\frac{2}{14}\right) + \left(\frac{5}{15}\right)\left(\frac{4}{14}\right) + \left(\frac{7}{15}\right)\left(\frac{6}{14}\right)\right) = \frac{71}{105}$.

17. There are 6 from each of the eight midpoints, so **48**.

18. Let $l$ = ladder length. So $(4)^2 + \left(\frac{3}{4}l\right)^2 = l^2$. $So\, l = \frac{16}{\sqrt{7}} = \frac{\mathbf{16\sqrt{7}}}{\mathbf{7}}$.