

**Team Round:**

- A. Decompose into 12 isos triangles with vertex  $30^\circ$  base  $w$  leg  $r$ . Each has area of  $0.5 r^2 \sin 30 = r^2/4 = (96 + 48\sqrt{3})/12$  so  $r^2 = 32 + 16\sqrt{3}$  Law Cosines gives  $w^2 = r^2 + r^2 - 2 r r \cos 30^\circ = 2(32 + 16\sqrt{3}) - 2 (32 + 16\sqrt{3})(\sqrt{3}/2) = 16$  so  $w=4$  and  $12w = 48$ .
- B. If  $n = 2k-1$  then  $9n^2+7=7(n+2)^2+9$  so  $2n^2 - 28n - 30 = 0$  so  $n=15$  or  $-1$  and  $k=8$  (or  $k=0$ , impossible) so  $3724_k = 2004$ .
- C. By symmetry the line must also pass through  $(4, 3-b)$  so its slope is  $(3-2b)/3$
- D. If  $\log_x 5 + 3 \log_5 x = 2 + 2$  then if  $\log_5 x = A$  we have  $1/A + 3A = 4$  or  $1 + 3A^2 = 4A$  yielding  $A=1$  or  $1/3$  so  $x = 5$  or  $\sqrt[3]{5}$ .
- E.  $(1 - t/9) = 2/3 (1 - t/12)$  gives  $t = 6$  so at 6:00 p.m.
- F. Turtle travels a 15-gon of side 10; rabbit a 12-gon of side 10. Rabbit covers 11 sides in 10 minutes while turtle covers one side in 10 minutes. They meet at B in  $k=10$  minutes. Turtle hits A every 150 minutes; rabbit every  $120/11$  minutes. First common multiple is  $11(5)(4)(30)$  so  $m = 6600$  minutes.

