RAMC 2020 Answer Key

Individual			
E1	E2	MS	HS
1. 1300 2. 112 3. 23 4. 10 5. 345 6. 26 7. 34 8. 4 9. 48 10. 45 11. 6 12. 36 13. 9 14. 6 15. 77	1. 9 2. 12 3. 3 4. 10 5. 4 6. 63 or 72 7. 325 8. 112 9. 24 10. 21 11. 143 12. 6 13. 120 14. 6 15. 45	1. 1210 2. 7 3. 180 4. 4 5. 20 6. 45 7. 60 8. 16 9. 43 10. 31 11. 29 12. 2400 13. 60 14. 385 15. 7	1. 7 2. 45 3. 43 4. 6 5. 60 6. 28 7. 60 8. 1006 9. 7 10. 37 11. 144 12. 6 13. 94 14. 7 15. 5

Team			
E1	E2	MS	HS
1. 20 2. 103 3. 78 4. 20 5. 38 6. 3478 7. 6015 8. 8 9. 720 10. 8	1. 10 2. 60 3. 14 4. 4 5. 125 6. 20 7. 44 8. 200 9. 50 10. 512	1. 5000 2. 10 3. 8 4. 25 5. 22 6. 30 7. 293 8. 1734 9. 7 10. 11	1. 1251 2. 25 3. 59 4. 293 5. 11 6. 2106 7. 5 8. 1734 9. 2667 10. 11

Note on E2 Individual #14: The third sentence should read: “From her three candies, she randomly picks one.”

Note on HS Individual #14:

The first equation rearranges into $(log_{17}x - a)^2 + (log_{13}y - a)^2 = 0 \Rightarrow x = 17^a, y = 13^a$. The original solution for this problem concludes that $xy = 17^a \cdot 13^a = 221^a = x^2 + y^2 - 13 \Rightarrow x^2 - xy + y^2 = 13$ which would yield $(3,4)$ and $(4,3)$ as solutions. This does not take into account that $x = 17^a, y = 13^a \Rightarrow log_{17}x = log_{13}y$, and there are, in fact, no integer values (x,y) that satisfy the system. There is a solution, however, which cannot be expressed exactly (succinctly, anyways), and is around $(x,y) \approx (3.8108097156, 3.3574024417)$.

Since problems in the RAMC accept only integers, and the true solution to the system given produces an answer of $x + y \approx 7.1682121573 \approx 7$, our problem-writing committee maintains that 7 is the most accurate answer to the problem.