Day 3 Brain Teasers - Week 2

Batch I - Vikings
Time Limit: 30 Minutes

June 19, 2019

1 Easy Mathematics

1. Frosty the Snowman wants to create a small snowman friend for himself. The new snowman needs a base, torso, and a head, all three of which should be spheres. The torso should be no larger than the base and the head should be no larger than the torso.
   For building material, Frosty uses a spherical snowball with a **6 inch** radius. Since Frosty likes to keep things simple, he also wants the radius of each of the three pieces to be a **positive integer**(The radius cannot be a decimal or a fraction).
   What is the radius of the base, torso and head of Frosty's friend ?
   Submit your answer separated by commas in descending order. eg: 3, 2, 1
   HINT: The formula for the volume of a sphere is $V = \frac{4}{3}\pi r^2$ where r is the radius of the sphere.
   Solution:
   Lets label the base 'a', the torso 'b' and the head 'c.'
   So we can equate the volume of our 6 inch ball, with the volumes of the other 3.
   $\frac{4}{3}\pi 6^3 = \frac{4}{3}\pi(a^3 + b^3 + c^3)$
   $216 = a^3 + b^3 + c^3$
   Since we know $6 \geq a \geq b \geq c$ and that a b and c are positive integers we can try $a = 5$.
   Thus,
   $91 = b^3 + c^3$
   Let $b = 4$
   $27 = c^3$
   $c = 3$
   Thus, **a = 5, b = 4, c = 3**

2. A snail is at the bottom of a 30 foot well. Every hour the snail is able to climb up 3 feet, then immediately slide back down 2 feet. How many hours does it take for the snail to get out of the well?
   Solution: 28 hours
   Why ? You might have guessed 30 hours but the snail reaches the top by the 28^{th} hour so it doesn't slide back!

3. 100 black and white socks are in a drawer. How many socks must you pull out before you are guaranteed to have a pair? (A pair means 2 socks of the same color)
   Solution: 3
   So lets think logically. If we pull out 1 sock that cannot be a pair. If we pull out two socks they could be different colours, they might not be of course, but we are interested in guaranteeing a pair.

   Which brings us to three socks, worst case thus far is we have one black and one white sock. When we draw the third sock it has to be either black or white, thus forming a pair with one we have already. There's your answer **3 socks**.