
CHALLENGE ROUND

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Good luck. You'll need it.

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6. Bowser is playing Etselec, a game in which he dies a lot. Each time he dies in the game, his fury grows. Suppose that his fury level starts at 0, and with each death his fury increases an amount proportional to the number of times he has died up to (and including) that death. (For example, his 10th death will increase his fury level by twice the amount of his 5th death.) Suppose that Bowser's 11th through 20th deaths (inclusive) increases his fury level by a total of 93. How much will his 21st through 40th deaths increase his fury level by?

7. Matt and Jared are playing with a garbage bin. First, Matt plays for a random amount of time between 0 and 1 minutes, then Jared plays for a random amount of time between 0 and 1 minutes, and then Matt plays for a random amount of time between 0 and 1 minutes again. What is the probability that between the two of them, Matt gets more bin time? Express your answer as a common fraction.
8. Suppose m is a positive number which has 120 positive integer divisors. What is the greatest number of positive integer divisors m^3 can have?
9. Motthew is watching the hit show “Breaking Brad’s Bones”. Suppose that the show has 8 episodes, and that the number of bones broken in each episode is a positive integer. Motthew notices that the number of bones broken in the first four episodes form an arithmetic sequence, the number of bones broken in the middle four episodes (episodes 3 to 6) form a geometric sequence, and the number of bones broken in the last four episodes form an arithmetic sequence. If the sum of the number of bones broken in episodes 3 and 6 equals 378, what is the maximum total number of bones broken across all 8 episodes?
10. Math Minder has built 4 rovers that will explore the surface of Mars. Each rover weighs a positive integer number of pounds, and the sum of the reciprocals of the rovers’ weights is exactly 1. Given that the largest of the rovers weighed n pounds, what is the largest possible value of n ?
11. A sphere is divided into pieces using five planes. What is the maximum possible number of pieces produced by the planes?
12. Given a fixed 1:2:3 rectangular prism, in how many ways can three planes be placed so that each of the 12 midpoints of the sides of the prism is on at least one plane, and each plane contains at least three midpoints?

