MBMT Algebra Round — Dedekind

May 21, 2022

Full Name _____

Student ID Number _____

DO NOT BEGIN UNTIL YOU ARE INSTRUCTED TO DO SO.

This round consists of **8** questions. You will have **30** minutes to complete the round. Each question is *not* worth the same number of points. Questions answered correctly by fewer competitors will be weighted more heavily. Please write your answers in a reasonably simplified form.

_____ **1** Bradley loves to eat bread. Every day he cuts a 1 centimeter wide slice of bread for breakfast. If a single loaf of bread is 25 centimeters long, how many weeks would 7 loafs of bread last him?

_____ **2** Jon is on an escalator. He is currently two thirds of the way up. If the escalator is 15 feet tall, how many feet are between him and the ground?

_____ **3** Michelle finds a website which gives her a free textbook every day. After gaining 10 textbooks in 10 days, she has tripled her textbook collection. How many textbooks does Michelle have 20 days after she found the website?

_____ **4** Steven really likes palindromes. Palindromes are numbers that read the same backwards and forwards, like 55 or 969. He's thinking of a 3 digit palindrome where the sum of digits is 16 and the ones digit is 5 more than the tens digit. What is the number?

_____ **5** Bob has a magic trick. He claims that you can give him any number. Then, if he adds 2, multiplies by n, subtracts 6, then divides by n, he gets the original number back. What is n?

_____ **6** Gablin and Babblin start with different amounts of grapes. If Gablin gives Babblin 1 grape, Gablin would have the number of grapes Babblin has, squared. If Babblin gave Gablin 1 grape instead, Gablin would have had the number of grapes Babblin has, cubed. How many grapes does Gablin have?

_____ **7** Suppose that x and y are nonzero real numbers that satisfy $3x^2 = 4y^2$. What is the product of all possible values of $\frac{x+y}{x-y}$?

_____ **8** Find the number of integers whose nearest perfect square is 264^2, including 264^2 itself.