

Bergen County Math League

NO Calculators Permitted

Good Luck to You



Good Luck to All

Contest #4

2023-2024 12 minutes

Questions 1 & 2

- 4-1. I'm thinking of a four-digit number, where none of the digits is zero, and the sum of the digits equals six. You get one random guess from among all possible numbers. What is the probability your guess is correct?
- 4-2. An unopened beverage expires after $10! = 10 \times 9 \times 8 \times \dots \times 3 \times 2 \times 1$ seconds. If it is bottled on September 1, on what date will it expire?

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Questions 3 & 4

4-3. On day 1, a cat begins to climb a 63-foot tree. Every day she climbs up 11 feet, but every night she climbs back down 7 feet. At this rate, on what day will she first reach the top of the tree?

4-4. Solve for x : $8^{\frac{1}{6}} + x^{\frac{1}{3}} = \frac{7}{3-\sqrt{2}}$.

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Questions 5 & 6

4-5. Express, *in simplest form*, the value of P , if

$$P = \left(1 + \frac{1}{1}\right) \left(1 + \frac{1}{2}\right) \left(1 + \frac{1}{3}\right) \cdots \left(1 + \frac{1}{n}\right) \cdots \left(1 + \frac{1}{100}\right).$$

4-6. Find all real numbers x which satisfy

$$\frac{x^2+2x+3}{x^2-2x+1} + \frac{x^2-2x+1}{x^2+2x+3} = 2.$$