

**Bergen County Math League**

**NO Calculators**

**Good Luck to You**



**Good Luck to All**

**Contest #4**

**2022-2023 12 minutes**

**Questions 1 & 2**

4-1. Find the ordered pair of rational numbers  $(x, y)$  which satisfies

$$x^3 - 3x^2y - xy + 2x - 2 = 0 \text{ and}$$

$$x^3y - 3x^2y^2 - xy^2 + 2xy - 2y + x - 2 = 0.$$

4-2. Find, in degrees, all acute angles  $x$  for which  $\sin(3x) = \frac{1}{2}$ .

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**Questions 3 & 4**

- 4-3. Let  $f(x) = ax^5 + bx^3 + cx + 5$  define the function  $f$  for all real values of  $x$ . If  $f(3) = 9$ , find the value of  $f(-3)$ .
- 4-4. What are all ordered triples of distinct digits  $(A, B, C)$ , with  $A > C$ , such that the three-digit numbers  $ABC$  and  $CBA$  are both divisible by 7?

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**Questions 5 & 6**

- 4-5. There are two times between 5 AM and 6 AM when the minute hand and the hour hand of an accurate clock are perpendicular. Exactly how many minutes must elapse between these two times?
- 4-6. Three standard six-sided dice are tossed. What is the probability that the numbers shown will all be different?