

## Tiebreaker, Division B

### Division B, 15 Minutes, Individual

1. Define  $\text{ord}_n(x)$  as the minimum integer  $k$  such that  $x^k \equiv 1 \pmod{n}$ . Compute

$$\sum_{x=1}^6 \text{ord}_7(x).$$

**Answer:** 21 (*Proposed by: Neil Dixit*)

2. A sphere of radius 1 with center  $O$  is inscribed in a cone. Let  $P$  be a point of tangency not on the base. Suppose that the line  $OP$  intersects the base of the cone on its circumference. Let  $V$  be the volume of the cone. Compute

$$\lfloor 100V \rfloor.$$

**Answer:** 942 (*Proposed by: Neil Dixit*)

3. Compute

$$\left\lfloor 100 \sum_{n=0}^{\infty} \arctan \left( \frac{1}{n^2 + n + 1} \right) \right\rfloor.$$

**Answer:** 157 (*Proposed by: Neil Dixit*)

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