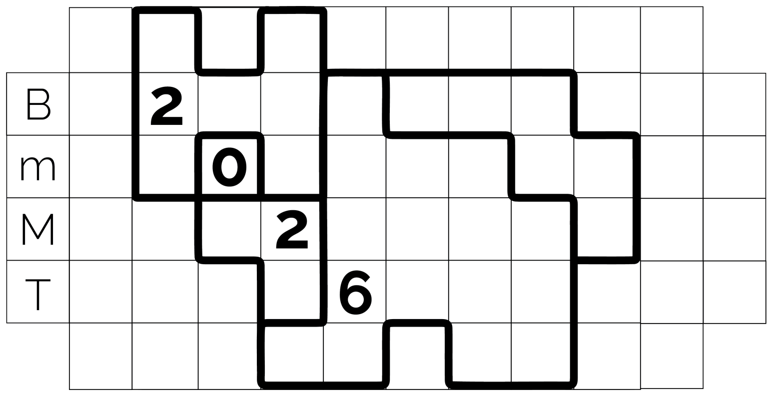
Berkeley mini Math Tournament 2026

Individual Tiebreaker Round



April 12, 2026

Time limit: 15 minutes.

Instructions: This tiebreaker contains 3 short answer questions. All answers must be expressed in simplest form unless specified otherwise. You will submit answers to the problem as you solve them and may solve problems in any order. You will not be informed whether your answer is correct until the end of the tiebreaker. You may submit multiple times for any of the problems, but **only the last submission for a given problem will be graded**. The participant who correctly answers the most problems wins the tiebreaker, with ties broken by the time of the last correct submission.

No calculators. Protractors, rulers, and compasses are permitted.

Answer format overview:

- Carry out any reasonable calculations. For instance, you should evaluate $\frac{1}{2} + \frac{1}{3}$, but you do not need to evaluate large powers such as 7^8.
- Write rational numbers in lowest terms. Decimals are also acceptable, provided they are exact. You may use constants such as π in your answers.
- Move all square factors outside radicals. For example, write $3\sqrt{7}$ instead of $\sqrt{63}$.
- Denominators do *not* need to be rationalized. Both $\frac{\sqrt{2}}{2}$ and $\frac{1}{\sqrt{2}}$ are acceptable.
- Do not express an answer using a repeated sum or product.
- Improper fractions and mixed numbers are both acceptable.
- Units are not necessary in any answer. Answers with incorrect units are worth 0 points.

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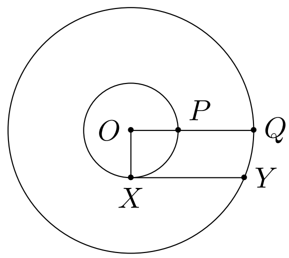
1. In the diagram below (not drawn to scale), O is the center of two circles. P and X lie on the inner circle and Q and Y lie on the outer circle. P lies on $\overline{OQ}$, $\overline{XY}$ is parallel to $\overline{PQ}$ and $\overline{OX}$ and $\overline{XY}$ are perpendicular. Given that $OP = 1$ and $PQ = 6$, find the length of $\overline{XY}$.



2. Arthur has a set of six blocks labeled `A`, `R`, `T`, `H`, `U`, and `R`. How many ways can he arrange the blocks such that the `A` and `U` blocks have exactly one other block between them, regardless of whether the `A` or the `U` comes first?

3. Find the number of positive integers $n \leq 2026$ for which $\sqrt{n}$ is irrational and there exist a nonnegative integer a and a positive integer b such that

$$\sqrt{n} = a + \cfrac{1}{b + \cfrac{1}{b + \cfrac{1}{b + \cdots}}}.$$

For example, $n = 2$ has this property because

$$\sqrt{2} = 1 + \cfrac{1}{2 + \cfrac{1}{2 + \cfrac{1}{2 + \cdots}}}.$$