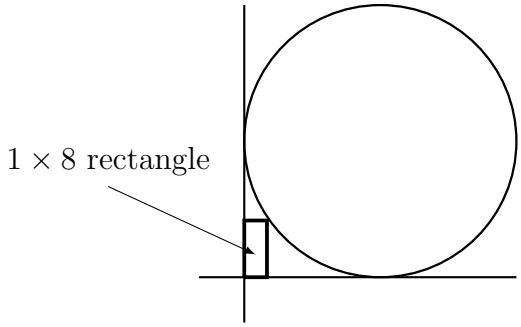
CALIFORNIA STATE UNIVERSITY, BAKERSFIELD
53rd Lee Webb Math Field Day 2026
Team Medley, Junior-Senior Level

- Each correct answer is worth ten points. Answers require justification. Partial credit may be given. Unanswered questions are given zero points.
- You have 50 minutes to complete the Exam. When the exam is over, give only one set of answers per team to the proctor. Multiple solutions to the same problem will invalidate each other.
- Elegance of solutions may affect score and may be used to break ties.
- All calculators, cell phones, music players, and other electronic devices should be put away in backpacks, purses, pockets, etc. Leaving early or otherwise disrupting other contestants may be cause for disqualification.

1. In the figure below, a circle is tangent to both a vertical line and a horizontal line. A rectangle with dimensions 1×8 is positioned with one vertex at the intersection of the lines and the opposite vertex touches the circumference of the circle. Determine the radius of the circle.



2. An athlete is practicing on a staircase with 15 steps. Each time he moves, he can climb 1 step, 2 steps, or 3 steps at once. To keep the workout challenging, there is one rule: he cannot take a 3-step move twice in a row. If he climbs 3 steps at one point, his next move must be either 1 step or 2 steps. How many different ways can the athlete climb from the bottom to the top of the staircase while following this rule?

3. Let $f(x) = \cos x + \log_2 x$, where $x > 0$. If a positive number a satisfies $f(a) = f(2a)$, determine the value of $f(2a) - f(4a)$.

4. Three standard, fair, dice are rolled, with outcomes a_1, a_2, and a_3. What is the probability of the event:
$$|a_1 - a_2| + |a_2 - a_3| + |a_3 - a_1| = 6?$$