$\sqrt{CCML}$ Video Contest – Meet 5 2023-2024

Guidelines

- Students from each half of your team (frosh/sophomore or junior/senior) from your school may submit up to two videos on the given problem. Each video submitted must be produced by different students, but must all be from the appropriate grade band. If your school decides to submit two f/s videos, there should be different students in each video.

- Each video should be no more than SIX minutes in length. Note that this does not mean that you have to fill the entire six minutes.

- The problems are to be solved and the videos produced by student groups. The bulk of the work should be done by students. A parent or teacher holding a camera is fine, but solving a problem for the students is not.

- Videos must be produced by a group of at least two students, and at most five students. Each participating student's contribution should be made evident either from an appearance in the video or a credit at the beginning or end of the video. Indicate names of all students involved (maximum of 5) in credits or introductions at the beginning or end of the video.

- The top f/s video and j/s video from your school with earn points for your overall team score according to the attached rubric.

- Creative solutions and presentations are encouraged, but correct math is paramount. Please make the focus of your video the mathematics. If you have a creative context, great, but it should not be the focus of your video. Soundtracks should not distract or interfere with the explanation of the solution.

- Note that calculators can generally be used for exploration and conjecture, but rigorous solutions are required to earn full credit. It is generally not sufficient simply to refer to a graph or use a solver when completing a problem.

Submission

- Coaches should ensure that no more than two videos per grade band are submitted.

- **Make sure that videos are viewable by anyone with the link!**

- Coaches should upload videos to Google drive and share access with Michael Caines (macaines@cps.edu). Please use the following naming conventions for the videos: **school_level_teamnumber_contestnumber_year**. For example, a submission for CCML 3 for a f/s team from Kelly in the 2015−2016 school year should be named as follows, **kelly_fs_team1_contest3_1516**. A submission from a j/s team from Lakeview should be named **lakeview_js_team1_contest3_1516**

- **All submissions must be shared by 5pm on Tuesday, April 9, 2024.**

Please direct any questions about the contest to Michael Caines (macaines@cps.edu). Coaches who are interested in helping judge the submissions should email Michael Caines by the submission deadline.
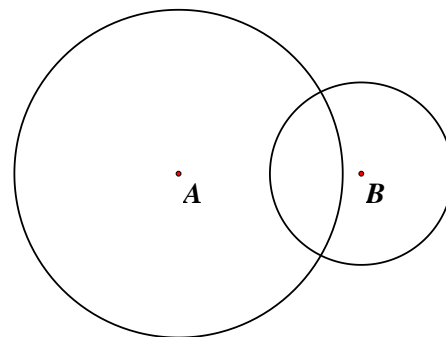
Problems:

- **Frosh/Sophomore Problems:**

(a) The shaded portion of the square region shown at right is bounded by two quarter-circular arcs. Give the fraction of the square region that is shaded.
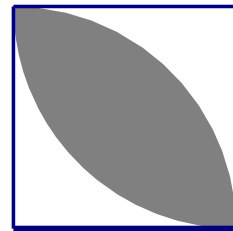
(b) Four congruent circles are internally tangent to a large circle and externally tangent to a small, concentric circle as shown at right. Give the ratio of the area of the largest circle in the diagram to that of the smallest circle in the diagram.
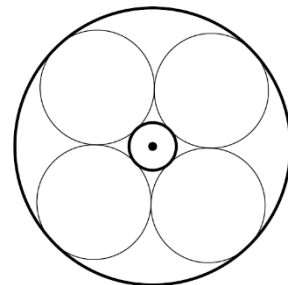
(c) Circle A and circle B shown at right are *orthogonal*, meaning that they intersect at right angles. Given that the distance between the centers of the circles is twice the radius of circle B, compute the fraction of the area of circle B that is also within circle A.

- **Junior/Senior Problems:**

(a) A geometric sequence, $\{g_n\}$ has $g_1 = 1$ and $g_5 = 1/16$. Let S be the sum of all terms of $\{g_n\}$. Give the sum of all possible values of S.

(b) Compute $\displaystyle\sum_{k=0}^{\infty} \frac{5+2k}{3(4)^k}$.

(c) Compute $\displaystyle\sum_{k=3}^{\infty} \frac{k+1}{k^3 - 4k}$.

CCML Video Contest Rubric

Team Name: _____ Contest:_____ Year:_____

	0	1	2	
Part (a)	• No attempt is made, or the work contains profound errors.	• Problem contains some good work, but also nontrivial errors. • Explanation of work is unclear.	• Problem contains only trivial errors or no errors. • Explanation of work is clear.	

	0	1	2	3
Part (b)	• No attempt is made, or the work contains profound errors.	• Problem contains some good work, but also multiple nontrivial errors. • Explanation of work is unclear.	• Problem contains no more than one nontrivial error. • Explanation of work is generally clear.	• Problem contains only trivial errors or no errors. • Explanation of work is clear.

	0	1	2	3
Part (c)	• No attempt is made, or the work contains profound errors.	• Problem contains some good work, but also multiple nontrivial errors. • Explanation of work is unclear.	• Problem contains no more than one nontrivial error. • Explanation of work is generally clear.	• Problem contains only trivial errors or no errors. • Explanation of work is clear.

	0	1	2	
Presentation	• Images are sloppy or out of focus. • Audio is difficult to hear.	• Audio/video are clear. • Presentation is organized well	• Presentation is truly creative and engaging.	

Score: _____ / 10

Notes: