

\sqrt{CCML} Video Contest – Meet 4 2022-2023

Guidelines

- Students from each half of your team (freshman/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 will 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.

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, March 7, 2023.**

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:

- **Freshman/Sophomore Problems:**

For the problems below, let R be the closed region in the xy -plane that is bounded by the graph of $|x| + |y| = 5$.

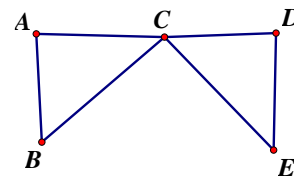
- Determine the area of R .
- Consider the set of points in the xy -plane that are within 1 unit of the boundary of R . What is the area of this set of points?
- Suppose that R is revolved around the line given by $x = 10$ to create a solid. Compute the volume of this solid.

- **Junior/Senior Problems:**

Note that these problems are inspired by the ICTM orals topic for this year, which is graph theory. However, it does not strictly adhere to the source used by ICTM, and no knowledge of the source is assumed or necessary.

In the following problems, the term “graph” refers to a set of vertices (points) and a set of edges (segments). If a given edge connects two vertices, the two vertices will be considered “adjacent.”

(a) Given the graph at right:



- Is it possible to make a continuous path along the edges, beginning and ending at the same vertex, so that each edge is visited exactly one time? If so, give an example. If not, explain why not.
 - Is it possible to make a continuous path along the edges, beginning and ending at the same vertex, so that each vertex except for the first is visited exactly one time, while the starting vertex is visited exactly two times? (Note that we are considering starting at a vertex as a visit.) If so, give an example. If not, explain why not.
- (b) In a certain graph consisting of n vertices, any pair of vertices may be connected by at most one edge, and it's possible to find a path from any vertex to any other vertex. Let M be the maximum number of edges that the graph could have, and let m be the minimum. Given that $M/m = 25$, determine n .
- (c) Consider the graph from problem (a). Suppose that we begin at vertex A , and we are allowed to take steps along an edge to reach an adjacent vertex. Also suppose that the move is randomly determined, with all adjacent vertices being equally likely to be chosen. What is the expected number of steps that it would take to reach vertex E ?

CCML Video Contest Rubric

Team Name: _____ Contest: _____ Year: _____

Part (a)	0	1		2
	<ul style="list-style-type: none"> No attempt is made, or the work contains profound errors. 	<ul style="list-style-type: none"> Problem contains some good work, but also nontrivial errors. Explanation of work is unclear. 	<ul style="list-style-type: none"> Problem contains only trivial errors or no errors. Explanation of work is clear. 	
Part (b)	0	1	2	3
	<ul style="list-style-type: none"> No attempt is made, or the work contains profound errors. 	<ul style="list-style-type: none"> Problem contains some good work, but also multiple nontrivial errors. Explanation of work is unclear. 	<ul style="list-style-type: none"> Problem contains no more than one nontrivial error. Explanation of work is generally clear. 	<ul style="list-style-type: none"> Problem contains only trivial errors or no errors. Explanation of work is clear.
Part (c)	0	1	2	3
	<ul style="list-style-type: none"> No attempt is made, or the work contains profound errors. 	<ul style="list-style-type: none"> Problem contains some good work, but also multiple nontrivial errors. Explanation of work is unclear. 	<ul style="list-style-type: none"> Problem contains no more than one nontrivial error. Explanation of work is generally clear. 	<ul style="list-style-type: none"> Problem contains only trivial errors or no errors. Explanation of work is clear.
Presentation	0		1	2
	<ul style="list-style-type: none"> Images are sloppy or out of focus. Audio is difficult to hear. 		<ul style="list-style-type: none"> Audio/video are clear. Presentation is organized well 	<ul style="list-style-type: none"> Presentation is truly creative and engaging.

Score: _____ / 10

Notes: