$\sqrt{CCML}$ Video Contest – Meet 4 2018-2019

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 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.

Submission

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

- 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, February 26, 2019.**

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:**

(a) If x is a real number, determine the minimum value of $||\,x+1\,|+|\,x-1\,||$.

(b) If x and y are real numbers such that $x^2 + y^2 = 1$, determine the minimum value of $|\,x^3 + 3x^2 y + 3xy^2 + y^3\,|$.

(c) Determine the length of the shortest path that starts at (2, 1), then touches the x-axis, then touches the y-axis, and then ends at (1,2).

- **Junior/Senior Problems:**

Note: these problems are based upon the topic of game theory, which not part of the usual CCML topic list. This topic was selected because it matches the ICTM orals topic. You may need to do additional research before doing these problems.

(a) You (Y) and a prospective spouse (F) are trying to arrange your own nuptials. You're both ready for marital bliss, but you can't agree on the kind of band to book, or the time frame in which the wedding will occur. You want to minimize the band's cost (given below in hundreds of dollars); F wants to maximize it, on the theory that more money will lead to a better experience.

	Music Genre		
Times	Classical	Heavy metal	Jazz
12 PM – 4 PM	85	49	58
4 PM – 8 PM	72	60	91
8 PM – 12 AM	64	88	73

You will pick the time. F will pick the genre. What's the best guaranteed outcome? Provide both the wedding time and music genre.

(b) You're ordering food at a fast-food restaurant. Bizarrely, you're incentivized to order a dish they may not have in stock, because if you're right, you get a sizable gift card to the restaurant. Row options indicate what you choose; column options indicate what the restaurant ends up providing you; payoffs represent your utility for the given scenario. (Yes, you get a larger gift card if the restaurant can't provide you a hamburger than if they can't provide you chicken nuggets. That said, you enjoy eating chicken nuggets a little more.)

	Chicken Nuggets	Hamburger
Chicken Nuggets	11	50
Hamburger	55	7

What's your optimal mixed strategy for ordering?

(c) In Matching Pennies, you and an opponent simultaneously flip coins and show each other the result, either heads H or a tails T. If the two coins are both heads, then you pay $2 to your opponent. If they're both tails, then you pay $5. If the two coins don't match, then you receive $3.

Unbeknownst to your opponent, you have in your possession both a fair coin, i.e. one that turns up heads 50% of the time, on average, *and* a bent coin, one that turns up heads 75% of the time, on average. Your opponent has only a fair coin.

You don't want to tip off your opponent, so you're going to use both the fair coin and the bent coin.

How much can you expect to win or lose if:

   i. you play a total of 50 times with the bent coin and 50 times with the fair coin?
   ii. you play a total of 74 times with the bent coin and 26 times with the fair coin?

CCML Video Contest Rubric

Team Name: _____ Contest:_____ Year:_____

Part (a)	0	1	2	
	• 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.	

Part (b)	0	1	2	3
	• 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.

Part (c)	0	1	2	3
	• 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.

Presentation	0	1	2	
	• 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: