$\sqrt{CCML}$ Video Contest – Meet 3 2020-2021

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). **You must set the permissions on the video so that anyone with the link can view.** 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 2, 2021.**

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:**

Usually, we use the Pythagorean Theorem to determine the distance between points in the plane. As such, the distance between the points (x_1, y_1) and (x_2, y_2) is given by $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$. However, we can also define the distance between the two points using what's called the *taxicab distance*, which would be given by $|x_1 - x_2| + |y_1 - y_2|$. (You may wish to think what such a measure would have to do with taxicabs anyway!)

(a) Compute the perimeter of the triangle with vertices (-1, 0), (1, 0), and (0, 2), according to the taxicab distance.

(b) Using the taxicab distance, an isosceles right triangle with legs of length 1 can have a hypotenuse of minimum length *m* and maximum length *M*. Determine *m* and *M*. (As a bonus, you may note that SAS no longer guarantees triangle congruence when using this measure!)

(c) Describe, with convincing explanation, the set of points in the plane whose taxicab distance to the origin is the same as their Pythagorean distance to the origin.

- **Junior/Senior Problems:**

For the following equations, assume that *x* is measured in radians, and give all real solutions (with explanation).

(a) $\sin^2 x = \frac{3}{4}$

(b) $\sin(\sin x) \cdot \sin(\cos x) \cdot \cos(\sin x) \cdot \cos(\cos x) = 0$

(c) $\cos x = \sin\left(x - \frac{3\pi}{4}\right)$

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: