

## Mile Hi Amazing Spectacular Math Scavenger Hunt Entry Form

**Instructions:** Each of the following questions, activities, or items to find have points attached to them. Answer, do or find as many as you can. Submit this form (and any items found) on Thursday November 9<sup>th</sup> in room 470 CU-Denver Bldg. between 11:30 – 1.\* There will be free pizza and drinks in room 470 and an opportunity to get more points (including 5 points for handing in this form there). Winners will be announced and prizes given out from 1:30 – 2 in 470. First and second place winners in each of three categories will get awards (\$30 and \$10 gift certificates). The categories are 1) any undergraduate who has not taken Calculus I, 2) Non-math majors who have taken/are taking Calculus I and 3) Math Majors. In case of ties, winners will be determined by a random drawing from the top entries.

\* If you can not turn in the form during this time you may turn it in to the Math Department Office Front Desk (6<sup>th</sup> floor CU-Denver Bldg.) by 11AM.

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\_①\_ 1. Compute the following:

$$[3(2^0) + 4^{\frac{1}{2}} - 5 + \left(\frac{1}{3}\right)^{-1} + 2^2 + 5^1] \div \frac{1}{2}$$

Ans. \_\_\_\_\_

\_①\_ 2. A huge conical tank is to be made from a circular piece of sheet metal of radius 10 meters by cutting out a sector with vertex angle  $\theta$  and then welding together the straight edges of the remaining piece. Find  $\theta$  so that the resulting cone has the largest volume. Ans. \_\_\_\_\_

\_①\_ 3. Who is the chair of the Math Department? Ans. \_\_\_\_\_

\_②\_ 4. How many 0's are in the first million digits of Pi? Ans. \_\_\_\_\_

\_①\_ 5. In Escher's picture "Ascending and Descending", how many monks are on the stairs? Ans. \_\_\_\_\_

\_③\_ 6. Obtain a slide rule.

\_②\_ 7. Talk to Mike Kawai about the Putnam exam, and get his autograph.  
\_\_\_\_\_

\_①\_ 8. What is the probability of drawing (w/o replacement) a four of a kind poker hand (5 cards) from a standard deck of cards (nothing wild, no

jokers)?

Ans. \_\_\_\_\_

\_①\_ 9. Solve the inequality  $2 \cos x < 0.25x - 1$  on the interval  $[0, 4\pi]$ . Write your answers as decimals rounded to the nearest 0.01. Ans. \_\_\_\_\_

\_②\_ 10. Go to the office of the Math Department Chair. He has a problem for you.

\_①\_ 11. How many hours of computer time did Appel and Haken use for their final proof of the Four-Color Theorem? Ans. \_\_\_\_\_

\_①\_ 12. Besides Calculus I, II and III, how many classes do you need to complete a math minor? Ans. \_\_\_\_\_

\_①\_ 13. In the UCD Mathematical Sciences department, what does CCM stand for? Ans. \_\_\_\_\_

\_①\_ 14. What is the result of the following equation:  
(yob Newton) + (yob Riemann) – (yob Chebychev) – (yob Raphson)  
where yob = year of birth. Ans. \_\_\_\_\_

\_①\_ 15. How many people would you need to gather to have a 50% probability that at least two of the people share the same birthday? Ans. \_\_\_\_\_

\_①\_ 16. The equation  $y = \sin x + \cos x$  can be written in the form  $y = A \sin(x+C)$ . Find the values for A and C exactly (no decimals) and use a trigonometric identity to prove these two forms are equivalent.  
--- attach your solution.

\_②\_ 17. Talk to Mike Ferrara about the NSF Research Experience for Undergraduates Program and get his autograph. \_\_\_\_\_

\_③\_ 18. Obtain the signature of a student who has won the Math Major Newsletter's Problem of the Month Contest. \_\_\_\_\_

\_①\_ 19. In Escher's illustration "Still Life with Street", what is the topmost card? Ans. \_\_\_\_\_

\_①\_ 20. Write a short segment of Matlab code that computes  $n!$  using a recursive procedure call. (Other programming languages, even psuedo code, are ok). ---- attach your solution.



b) Signature of an attending Faculty Member \_\_\_\_\_ ②

\_①\_33. What do Professor Harvey Greenberg, truck rentals and graduate/undergraduate collaboration have in common?

Ans. \_\_\_\_\_

\_①\_34. A pH of 7 is how many more times as acidic than a pH of 10?

Ans. \_\_\_\_\_

\_\_\_35. Get the signature of a UCD Math Faculty member born in:

a) France \_\_\_\_\_ ①

b) Chile \_\_\_\_\_ ①

c) Russia \_\_\_\_\_ ①

d) Brazil \_\_\_\_\_ ①

\_③\_36. Obtain a "French curve".

\_②\_37. How can you construct 4 congruent triangles using 6 identical matches?

---- attach solution

\_②\_38. After registering for the University of Colorado at Denver CAREER SERVICES ONLINE (CSO) you can use CSO to do all of the following *except*

- (a) upload your resume
- (b) search for off-campus hourly positions
- (c) view upcoming on-campus interviews
- (d) get notified of upcoming career fairs
- (e) search for internships
- (f) search for jobs
- (g) have your resume critiqued.

Ans. \_\_\_\_\_

\_①\_39. Which faculty member was profiled in the most recent issue of the Math Majors Newsletter? Ans. \_\_\_\_\_

\_①\_40. Find a solution (a,b,c,d) for

$$a + b + c + d = 1$$

$$a + 4b + 3c + d = 1$$

$$a + 2b + 3c + d = 1$$

$$4a + 3b + 3c + d = 1$$

Ans. \_\_\_\_\_

