

1. Write down a whole number between 1 and 1000. The team whose number is the second largest, and the team whose number is the second smallest, will receive 2 points each.

2. Every hour, the clock chimes a number of times corresponding to the hour. In addition, the clock chimes once every 30 minutes past the hour. (For example, at 4 p.m. the clock chimes 4 times, and at 4:30 p.m. it chimes once.) How many times does the clock chime in a 24-hour period (say from 12am to 11:59pm)?

3. (a) Write the number 2 using three 5s and arithmetic operations. (Addition, subtraction, multiplication, and division.)
 (b) Write the number 4 using three 5s (same rules).
 (c) Write the number 5 using three 5s (same rules).

4. Write 25 using seven 2s. (Same rules as before.)

5. Fill in the table so that the sum of every three consecutive squares is 15:

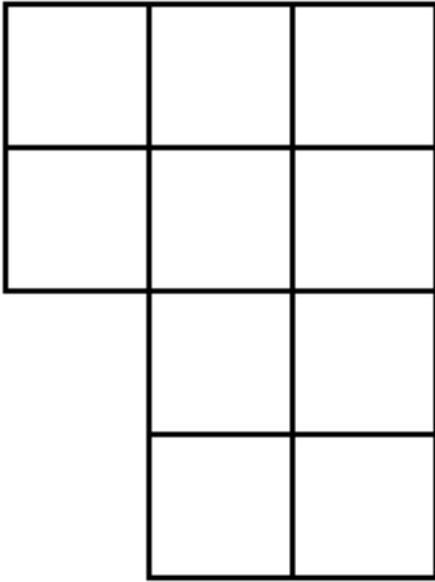
6								4				
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6. How many multiples of 5 are there between 197 and 1007?

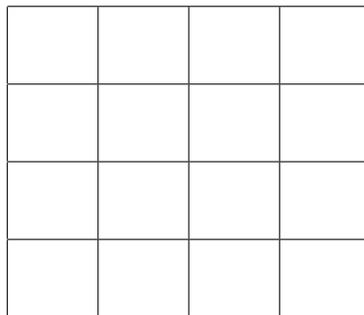
7. Have at least two team members sing a song for your judge that has some mathematical content.

8. The difference between a 2-digit number and that number written backwards is a 2-digit number with last digit 3. What is its first digit?

9. Cut the following figure into two two pieces which are identical (possibly after rotating or flipping). You do NOT have to cut along the lines.



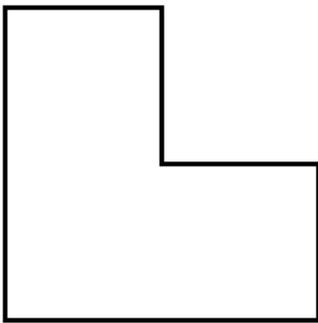
10. (ONE TRY ONLY!) Mary grows apples and wants to sell them at the market. The salesperson will take 20% from the proceeds. Mary wants to make one dollar per pound. How much should she sell the apples for? (ONE TRY ONLY)
11. A chess knight is somewhere on a 4x4 chessboard. Can he visit each square exactly once and then return to his starting point? If yes, show a path that works. If no, prove it is impossible.



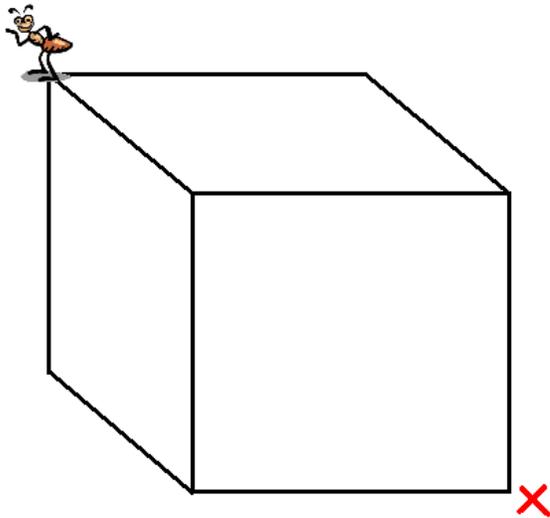
12. If December 31 in year X is a Tuesday, what are all possible days of the week for January 1 in year $X + 4$?

13. You flip a fair coin 6 times. What is the probability that tails happens at least twice?

14. Cut this L shape into pieces which you can rearrange to form a square with a square hole inside.

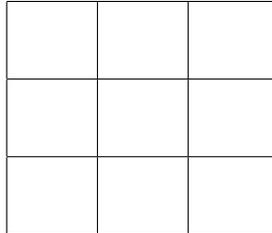


15. (ONE TRY ONLY!) An ant is at one corner of a cube, as shown. Draw a shortest path for the ant to get to the opposite corner.



16. Find a number N such that $N - 12$ is a power of a prime, $N - 1$ is prime, and the digits of N are powers of primes. (For this problem, a power of a prime means a prime number raised to a power greater than 1.)

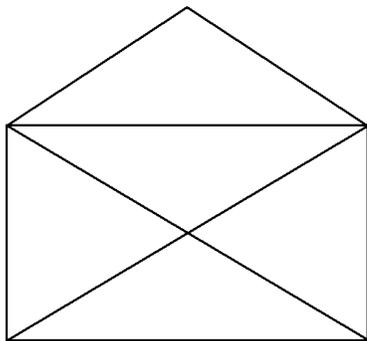
17. Arrange the digits $-4, -3, -2, -1, 0, 1, 2, 3, 4$ in the 3×3 grid below so that the sum of every row, column, and diagonal is 0.



18. Write an Egyptian fraction representation for $12/13$.

19. Horses cost \$10, pigs cost \$3, and rabbits are only \$0.50. If a farmer buys 100 animals for \$100, How many of each animal did he buy? Find ALL possible answers.

20. Demonstrate to your judge how to draw the envelope below without lifting your pencil from the page and without tracing a segment more than once.



21. It takes Joey 5 hours to paint a fence, and it takes Jimmy 7 hours. How long will it take them to paint a fence if they work together?

22. A school has 1000 students and 1000 lockers, all in a row. They all start out closed. The first student walks down the line and opens each one. The second student closes the even numbered lockers. The third student approaches every third locker and changes its state. If it was open he closes it; if it was closed he opens it. The fourth student then changes the state of every fourth locker, and so on through all 1000 students. (For example, the tenth locker is opened by the first student, closed by the second, reopened by the fifth, and then closed by the tenth. All the other students pass by the tenth locker, so it winds up being closed.) In the end, how many lockers are open?
23. What is the voting power of each player in a system where A has 4 votes, B has 3 votes, C has 2 votes, D has 1 vote, and 6 votes are required to win?
24. Altogether, how many letters does it take to spell out the numbers from one to ninety-nine?
25. (ONE TRY ONLY!) You are an archaeologist that has just unearthed a long-sought triplet of ancient treasure chests. One chest is plated with silver, one with gold, and one with bronze. According to legend, one of the three chests is filled with great treasure, whereas the other two chests both house man-eating pythons that can rip your head off. Faced with a dilemma, you then notice that there are inscriptions on the chests:
- Silver Chest: "The treasure is in this chest."
Gold Chest: "The treasure is not in this chest."
Bronze Chest: "The treasure is not in the gold chest."
- You recall from your studies of the legend that at least one of the inscriptions is true, and at least one of the inscriptions is false. Which chest should you open? (ONE TRY ONLY!)
26. A man is $\frac{3}{8}$ of the way across a train bridge, when he hears the whistle of an approaching train behind him. It turns out that he can run in either direction and just barely make it off the bridge before getting hit. If he is running at 15 mph, how fast is the train traveling? (Assume the train cannot slow down, so it moves at a constant speed.)

27. If it takes 3 lumberjacks 3 hours to saw 3 logs into a total of 9 smaller logs, how long does it take 2 lumberjacks to saw 6 logs into a total of 24 smaller logs?
28. At a certain bus stop, exactly $\frac{3}{4}$ of the passengers got out and 7 passengers got on. At the next stop, again $\frac{3}{4}$ of the passengers got out and 7 passengers got on. Once more at the third stop, $\frac{3}{4}$ of the passengers got out and 7 passengers got on. What is the smallest number of passengers that could be on the bus now?
29. How many different sequences are there, consisting only of 1s and 2s, that add up to 10? (For example, two such sequences are 22222 and 12111211.)
30. Cut the following figure into two two pieces which are identical (possibly after rotating or flipping). You do NOT have to cut along the lines.

