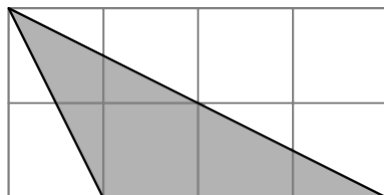


INTEGIRLS Houston: 2022 Fall Math Contest

Middle School Individual Round

1. I have a deck of cards numbered from 1 through 50. The probability of picking two cards that sum to 99 can be expressed as common fraction $\frac{a}{b}$. What is $a + b$?
2. What is $100 - 99 + 98 - 97 + 96 - 95 + \dots + 2 - 1$?
3. The image shows eight unit squares. How many square units make up the unshaded area?



4. The sum of the digits of the time shown on my 12-hour analog clock is 10. If the angle between the minute and hour hands is 73 degrees and it is between 5 and 6 PM, what is the time currently? Express your answer in the form of *hour:minute* (ex. 1:00, 2:43). Do not include "PM" in your answer.
5. The median of the following fractions $\frac{2}{3}, \frac{3}{5}, \frac{5}{7}, \frac{7}{11}, \frac{11}{13}$ is $\frac{a}{b}$. What is $a + b$?
6. Engineers at a company are building a glass case for a cube. The glass case must be 1 centimeter thick, and the cube is 6 centimeters long on all sides. How much, in cubic centimeters, glass do the engineers need to build the case?
7. Jack the Giant-Killer is 5 feet tall. The giants that he kills are 5 miles tall. How tall, in feet, are the giants that Jack kills?
8. A *five-super* number is a positive integer that consists of only the digits 5 and 0, repeated any number of times in any order. Of course, leading zeroes are not allowed. How many *five-super* numbers are less than 1000?
9. How many ways are there to rearrange three identical red shirts and three identical green shirts in a row?
10. Dave has some money in his wallet. On five separate occasions, he spends $\frac{1}{3}$ of his money. If he ends up with 32, how much money did he spend in total?
11. I drove 90 miles to my grandmother's house, and 90 miles back. My average speed on the way there was twice my average speed on the way back. If the entire journey took three hours, how fast in miles per hour was I driving on the way to my grandmother's house?
12. Enya, Celine, Sophia, and Harini sit in a circle. The probability that Enya does not sit directly between Harini and Celine can be expressed as common fraction $\frac{a}{b}$. What is $a + b$?
13. A right triangle is inscribed in a circle. If the length of the hypotenuse of the triangle is 10, the area of the circle can be denoted as $k\pi$. What is k ?

14. Compute the next term of the sequence.

$$1, 9, 36, 100, 225, ?$$

15. Camilla walks around a square field, staying exactly 1 foot from the border of the field at all times. If the field has a side length of 2 feet, Camilla traverses $a + b\pi$ feet in total. Find $a + b$.
16. How many solutions are there to the equation $(4 - x^2)^{x^2-19} = 1$?
17. A turtle travels at a speed of 1 m/s towards a tree. A hare travels in the opposite direction towards the same tree at a speed of 5 m/s. If the turtle is 20 m away from the tree, and the turtle and the hare will reach the tree at the same time, how far are the turtle and the hare from each other?
18. Let $N = \frac{2022!2019!}{2020!2021!}$, where N is a fraction in simplest form. Calculate the sum of the numerator and denominator of N .
19. If $a + b + c = 30$, compute the largest possible product abc .
20. If $1000! \div 2^k$ is equal to an odd integer, what is the value of k ?