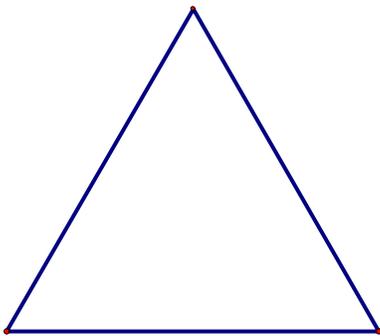


ROUND I

- Solve the equation $\frac{x}{x-3} + \frac{x}{x+3} = \frac{2x+12}{x^2-9}$. ANSWER. $x = -2$
- Which of the numbers 2^{100} , 9^{50} , $\log_4 16^{100}$, and $(\sqrt{5})^{100}$ has the largest value? ANSWER. 9^{50}
- What digit is in the 2005th place in the decimal expansion of $2/7$? ANSWER. 2
- If you select at random a two digit number from 10 to 99, both included, what is the probability that the number is a perfect square or a perfect cube. ANSWER. $\frac{7}{90}$
- How many permutations of the letters ABCDEF contain the letters A, B, D adjacent to each other in any order? ANSWER. 144
- Let f be a function defined on the set of natural numbers given recursively by $f(1) = 1$ and $f(n+1) = f(n) + 2^n$ for all $n \geq 1$. Find $f(10)$. ANSWER. $2^{10} - 1 = 1023$
- The area of the equilateral triangle shown in the figure is $\sqrt{3}$ square feet. Find the length of one side.



ANSWER. 2

- If $\sin \alpha = \frac{1}{2}$ what is the numerical value of $1 + \tan^2 \alpha$? ANSWER. $\frac{4}{3}$

ROUND II

1. Solve the equation $\sqrt{2x+7} - x = 2$. ANSWER. 1

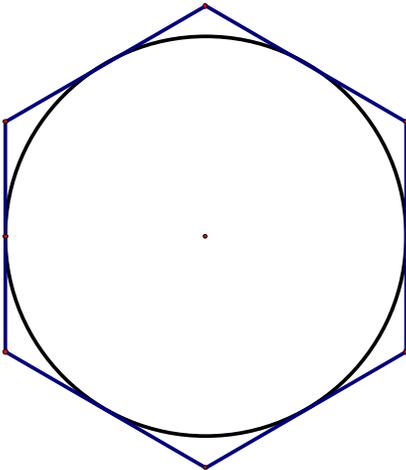
2. Which of the numbers $\frac{3}{2}$, $\frac{\pi}{2}$, and $\log_4 10$ has the smallest value? ANSWER. $\frac{3}{2}$

3. If you select a number at random from the first 100 positive integers, what is the probability that the number is divisible by 3 or 4? ANSWER. $\frac{1}{2}$

4. When you write the numbers from 100 to 1000, how many times do you write the digit 5?

ANSWER. 280

5. The area of the regular hexagon shown in the figure is 12 square feet. Find the area of the circle inscribed in the hexagon.



ANSWER. $2\pi\sqrt{3}$

6. Let f be a function defined for all positive real numbers with the properties that $f(2) = 1$ and $f(xy) = f(x) + f(y)$ for all x, y . Find $f(8)$. ANSWER. 3

7. A set of fifty numbers has an average of 65. Twenty numbers are discarded from the set so that the average of the remaining numbers is 35. Find the average of the twenty discarded numbers.

ANSWER. 110

8. Find all values of α such that $0 \leq \alpha \leq \pi$ and $\sin \alpha \cos \alpha = \frac{1}{2}$. ANSWER. $\frac{\pi}{4}$