

MNYMO
August 22, 2026
Mastery

You have 30 minutes to complete 8 problems. There is no penalty for guessing. Answers are only valid if they are written in the below table.

First and last name			
p	Answer	p	Answer
1		5	
2		6	
3		7	
4		8	

1. Jeff has a real number L for which

$$L + \phi = \phi^2,$$

where $\phi = \frac{1+\sqrt{5}}{2}$ is the golden ratio. What is L ?

2. Austin is trying to remember his favorite basketball player's jersey number, which is an integer n between 0 and 99, inclusive. However, he can only remember the following information about it:
- a) n leaves a remainder of 1 when divided by 4.
 - b) n leaves a remainder of 3 when divided by 5.
 - c) n leaves a remainder of 3 when divided by 7.

What is n ?

3. Jeff is trying to arrive to lunch at precisely noon. However, because he is terrible with times, he will arrive uniformly at random between 11:30 AM and 12:30 PM. What is the probability that, when he arrives at lunch, the smaller angle between the hour and minute hands of a clock set to the local time is less than 30° ?
4. Let ω be a circle of radius 6 centered at a point A , and let point B lie on ω . Point C lies outside ω so that BC is tangent to ω . Point D is the intersection of ω with AC such that A is between C and D . Given that $\frac{BC}{AC} = \frac{4}{5}$, determine BD^2 .
5. A 45–45–90 right triangle has legs of length 1. The triangle is rotated 45° about its right-angle vertex. What is the area of the region swept out by the triangle?
6. Let a and b be the roots of the quadratic equation $x^2 - 20x + 26 = 0$. Let $f(x) = px^2 + qx + r$ be a quadratic function such that $f(a) = b$, $f(b) = a$, and $f(1) = 5$. Find the value of $f(0)$.
7. Alice and Bob are playing a game with a penny. Alice starts by flipping the penny; if it lands heads, she flips it again, but if it's tails, she gives the coin to Bob. She continues until she flips tails, at which point Bob does the same process, giving the penny to Alice once he flips tails, and so on indefinitely. What is the probability that Alice flips two heads (total) first?
8. For all positive integers n , let $\tau(n)$ denote the number of positive divisors of n . Compute the sum of all positive integers n for which the nine numbers

$$\tau(n), \tau(n+2), \tau(n+4), \dots, \tau(n+16)$$

are all less than 6.