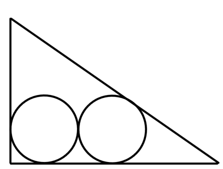
Time Limit: 45 minutes.
Instructions: This test contains 20 short answer questions. All answers must be expressed in simplest form unless specified otherwise. Only answers written inside their appropriate space on the answer sheet will be graded.
No calculators.

1. What is $\frac{2^4+2^4}{2^{-4}+2^{-4}}$?
2. What is the sum of the solutions of $|x^2-9x+17|=3$?
3. How many different ways can Ryan choose exactly 6 balls from a bag containing 3 red, 3 blue, and 5 green, where balls of each color are indistinguishable?
4. Compute $3+10+17-24+31+38+45-52+\cdots+311+318+325-332$.
5. In a pile of 70 M&Ms, there are 28 blue M&Ms. Jill chooses 3 M&Ms at random one at a time. Let $\frac{a}{b}$ be the probability that she chose 3 blue M&Ms, where a and b are relatively prime integers. What is a?
6. Find the integer closest to $(3+2\sqrt{2})^4$.
7. How many positive integers less than or equal to 1000 are divisible by exactly one of 2, 3, or 5?
8. Let x and y be real numbers that satisfy $x+y=4$ and $xy=2$. What is the value of x^4+y^4?
9. Find the number of subsets of $\{1,2,3,4,5\}$ whose elements add up to 8.
10. The sides of a triangle have lengths 10, 24, and 26. Let R be the radius of the circumcircle of this triangle and r be the radius of the incircle of this triangle. Find $R-r$.
11. A regular hexagon is inscribed in a circle of radius 1. Find the sum of the squares of all sides and diagonals of this hexagon.
12. Let $f(x)=x^3-24x^2+188x-480$. Find the sum of all possible $af(a)$ such that $f(a)$ is a positive, prime number.
13. Evaluate $\sqrt{100\cdot 102\cdot 104\cdot 106+16}$.
14. Connor is a member of the Nueva Math Club, which meets once every 7 days, Student Council, which meets once every 3 days, and Physics Club, which meets once every 5 days. Assume that Math Club, Student Council, and Physics Club all meet today. In 315 days, how many days will Connor not attend a meeting?
15. Let ABC be a triangle such that $\overline{AB}=3$, $\overline{BC}=4$, and $\overline{AC}=5$. Circles r_1 and r_2, each with radius r, are drawn such that r_1 and r_2 are internally tangent to $\overline{BC}$, r_1 is internally tangent to $\overline{AB}$, and r_2 is internally tangent to $\overline{AC}$. If r can be written in the form $\frac{a}{b}$, where a and b are relatively prime integers, find $a+b$.



16. Let n be a positive integer greater than 1 and less than 100. For how many values of n is $7^0+7^1+\ldots+7^n$ divisible by 100?
17. Let a, b, c, and d be positive integers with $a+64c=8b+512d$, $16a+36c=24b+54d$, and $a+9c=3b+27d$. Find the least possible value of $a+b+c+d$.

18. Jack and Bob are preparing for a cross country meet. To do this, they will practice running on an empty road which has an infinite amount of light poles, each spaced 10 meters apart, and numbered $0, 1, 2, 3, 4, 5, \dots$ Jack and Bob start at lightpole a, and they begin running to lightpole 47, with $a < 47$. The ratio of Jack to Bob's speed is $5 : 6$, and whenever one of them encounters lightpole a or 47, they immediately start running in the opposite direction, never stopping. In addition, Jack and Bob always maintain their speeds, never slowing down or speeding up. After they take off, they cross each other for the 1st and 2nd time at lightpoles p and 20, respectively. Find the value of p.

19. The Nueva Pizzeria offers 4 toppings: pepperoni, sausage, onions, and mushrooms. Hans orders a large circular pizza which has 8 slices, in which each slice is a sector of the pizza. However, he insists that every slice must have exactly 1 topping and any adjacent slices must have different toppings. How many different pizzas can be ordered? Rotations and reflections are considered distinct.

20. Let $ABCD$ be a parallelogram with angle $\angle A < 90°$, let E be the center of a circle tangent to $\overline{AB}$, $\overline{BC}$, and $\overline{DA}$, and let F be a point on the circumference of the circle centered at E. The distances from F to lines $\overline{AB}$, $\overline{BC}$, $\overline{CD}$, and $\overline{DA}$ are 5, 14, 15, and 6, respectively. The perimeter of $ABCD$ can be written as $\frac{a\sqrt{b}(\sqrt{c}-d)}{e}$, where a, b, c, d, and e are positive integers, a and e do not share any common factors greater than 1, and b and c are not divisible by any perfect square greater than 1. Find $a + b + c + d + e$.