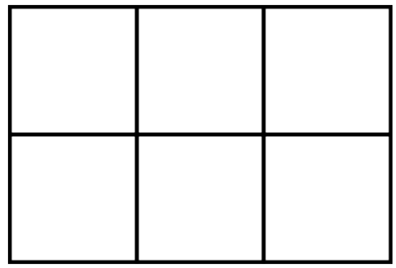
Name: ______________________________ **Score:** ________/________/50 **Grade:** _____

The speed round is 30 minutes long. Questions are weighted by difficulty.

1. ________	6. ________	11. ________	16. ________	21. ________
2. ________	7. ________	12. ________	17. ________	22. ________
3. ________	8. ________	13. ________	18. ________	23. ________
4. ________	9. ________	14. ________	19. ________	24. ________
5. ________	10. ________	15. ________	20. ________	25. ________

Special Thanks to:

1. Today is Saturday, April 25, 2020. What is the value of $6 + 4 + 25 + 2020$?
2. The figure below consists of a 2 by 3 grid of squares. How many squares of any size are in the grid?



3. James is playing a game. He first rolls a six-sided dice which contains a different number on each side, then randomly picks one of twelve different colors, and finally flips a quarter. How many different possible combinations of a number, a color and a flip are there in this game?
4. What is the sum of the number of diagonals and sides in a regular hexagon?
5. Mickey Mouse and Minnie Mouse are best friends but they often fight. Each of their fights take up exactly one hour, and they always fight on prime days. For example, they fight on January 2nd, 3rd, but not the 4th. Knowing this, how many total times do Mickey and Minnie fight in the months of April, May and June?
6. Apple always loved eating watermelons. Normal watermelons have around 13 black seeds and 25 brown seeds, whereas strange watermelons had 45 black seeds and 2 brown seeds. If Apple bought 14 normal watermelons and 7 strange watermelons, then let a be the total number of black seeds and b be the total number of brown seeds. What is $a - b$?
7. Jerry and Justin both roll a die once. The probability that Jerry's roll is greater than Justin's can be expressed as a fraction in the form $\frac{m}{n}$ in simplified terms. What is $m + n$?
8. Taylor wants to color the sides of an octagon. What is the minimum number of colors Taylor will need so that no adjacent sides of the octagon will be filled in with the same color?
9. The point $\frac{2}{3}$ of the way from $(-6, 8)$ to $(-3, 5)$ can be expressed as an ordered pair (a, b). What is $|a - b|$?
10. Mary Price Maddox laughs 7 times per class. If she teaches 4 classes a day for the 5 weekdays every week but doesn't laugh on Wednesdays, then how many times does she laugh after 5 weeks of teaching?
11. Let $ABCD$ be a unit square. If E is the midpoint of AB and F lies inside $ABCD$ such that CFD is an equilateral triangle, the positive difference between the area of CED and CFD can be expressed in the form $\frac{a-\sqrt{b}}{c}$, where a, b, c are in lowest simplified terms. What is $a + b + c$?
12. Eddie has musician's syndrome. Whenever a song is a C, A, or F minor, he begins to cry and his body becomes very stiff. On the other hand, if the song is in G minor, A flat major, or E flat major, his eyes open wide and he feels like the happiest human being ever alive. There are a total of 24 keys. How many different possibilities are there in which he cries while playing one song with two distinct keys?
13. What positive integer must be added to both the numerator and denominator of $\frac{12}{40}$ to make a fraction that is equivalent to $\frac{4}{11}$?
14. The number 0 is written on the board. Each minute, Gene the genie either multiplies the number on the board by 3 or 9, each with equal probability, and then adds either 1,2, or 3, each with equal probability. Find the expected value of the number after 3 minutes.

15. x satisfies $\frac{1}{x+\frac{1}{1+\frac{1}{2}}} = \frac{1}{2+\frac{1}{1-\frac{1}{2+\frac{1}{2}}}}$ Find x.

16. How many different points in a coordinate plane can a bug end up on if the bug starts at the origin and moves one unit to the right, left, up or down every minute for 8 minutes?

17. The triplets Addie, Allie, and Annie, are racing against the triplets Bobby, Billy, and Bonnie in a relay race on a track that is 100 feet long. The first person of each team must run around the entire track twice and tag the second person for the second person to start running. Then, the second person must run once around the entire track and tag the third person, and finally, the third person would only have to run around half the track. Addie and Bob run first; Allie and Billy second; Annie and Bonnie third. Addie, Allie, and Annie run at 50 feet per minute (ft/m), 25 ft/m, and 20 ft/m, respectively. If Bob, Billy, and Bonnie run half as fast as Addie, Allie, and Annie, respectively, then how many minutes will it take Bob, Billy, and Bonnie to finish the race. Assume that everyone runs at a constant rate.

18. James likes to play with Jane and Jason. If the probability that Jason and Jane play together is $1/3$, while the probability that James and Jason is $1/4$ and the probability that James and Jane play together is $1/5$, then the probability that they all play together is $\frac{\sqrt{p}}{q}$ for positive integers p, q where p is not divisible by the square of any prime. Find $p + q$.

19. Call an integer a *near-prime* if it is one more than a prime number. Find the sum of all *near-primes* less than 1000 that are perfect powers. (Note: a perfect power is an integer of the form n^k where $n, k \geq 2$ are integers.)

20. What is the integer solution to $\sqrt{\frac{2x-6}{x-11}} = \frac{3x-7}{x+6}$?

21. Consider rectangle $ABCD$ with $AB = 12$ and $BC = 4$ with F, G trisecting DC so that F is closer to D. Then E is on AB. We call the intersection of EF and DB X, and the intersection of EG and DB is Y. If the area of $\triangle XYE$ is $\frac{8}{15}$, then what is the length of EB?

22. The sum
$$\sum_{n=2}^{\infty} \frac{1}{4n^2 - 1}$$
can be expressed as a common fraction $\frac{a}{b}$ in lowest terms. Find $a + b$.

23. In square $ABCD$, M, N, O, P are points on sides $\overline{AB}, \overline{BC}, \overline{CD}$ and $\overline{DA}$, respectively. If $AB = 4$, $AM = BM$ and $DP = 3AP$, the least possible value of $MN + NO + OP$ can be expressed as $\sqrt{x}$ for some integer x. Find x.

24. Grand-Ovich the ant is at a vertex of a regular hexagon and he moves to one of the adjacent vertices every minute with equal probability. Let the probability that after 8 minutes he will have returned to the starting vertex at least once be the common fraction $\frac{a}{b}$ in lowest terms. What is $a + b$?

25. Find the last two non-zero digits at the end of 2020! written as a two digit number.