

Joe Holbrook Memorial Math Competition

5th Grade

October 11, 2025

General Rules

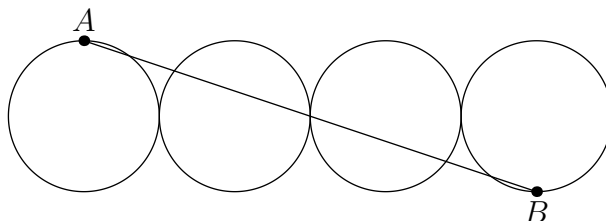
- You will have **75 minutes** to solve **40 questions**. Your score is the number of correct answers.
- Only answers recorded on the answer sheet will be graded.
- This is an individual test. Anyone caught communicating with another student will be removed from the exam and their score will be disqualified.
- Scores will be posted on the website. Please do not forget your ID number, as that will be the sole means of identification for the scores.
- You may use the following aids:
 - Pencil or other writing utensil
 - Eraser
 - Blank scrap paper
- You may not use the following aids:
 - The Internet
 - Books or other written sources
 - Other people
 - Calculator or other computing device
 - Compass
 - Protractor
 - Ruler or straightedge

Other Notes

- All answers are either integers or strings of letters. Make sure you do not make any mistakes when writing your answers, as you will not be given credit if you do so.
- You do not need to write units in your answers.
- Ties will be broken by the number of correct responses to questions 31 through 40. Further ties will be broken by the number of correct responses in the last five questions.

1. Compute $5 \times 4 \times 3 \times 2 \times 1 \times 0$.
2. Michael said all letters in the alphabet 200 times. How many times did he say a vowel (a, e, i, o, or u)?
3. David buys 11 pencils for school. Throughout the first day, he gives 5 pencils to his friends and picks up 2 from the floor. How many pencils is David left with?
4. A bush has 43 leaves. After 17 fall off, how many leaves are left on the bush?
5. What is the perimeter of a regular pentagon with side length 3?
6. I love eating Hershey's chocolate, and I can eat 2 pieces every 5 minutes. How many pieces will I have eaten in an hour?
7. What is the third letter of the third prime number?
8. What is 50% of 20% of 670?
9. Bob's pumpkin patch has a 99% fail rate. Suppose that he attempts to grow 2025 pumpkins. To the closest integer, what is the expected number of pumpkins that grow?
10. I have 20 diamonds. I want to give some away! What is the minimum number of diamonds I need to give away such that I end up with a prime number of diamonds, and I have less than half of what I started with?
11. Kris has 60 dollars for the amusement park. A large ride costs 12 dollars, while a small ride costs 7 dollars. What is the maximum number of rides Kris can ride, given that she wants to go on at least 3 large rides?
12. Michael needs 1800 experience points (XP) to level up his weapon! Each book of wisdom grants 400 XP, and an entire book must be used at a time (you cannot use part of a book). What is the minimum number of whole books he must use to level up his weapon?
13. A rectangle has side lengths of 4 feet and 10 feet. In square inches, what is the area of this rectangle (given that a foot equals 12 inches)?
14. A number is an *octave* above another if it is twice the other. Compute the number that is 3 octaves above 55.
15. On Monday, Tom slept from 10:00 PM to 8:00 AM on Tuesday, then from 11:30 PM that night to an unknown time on Wednesday. His average sleep over the two nights was 9 hours and 30 minutes. The time that he woke up on Wednesday can be expressed as a hours and b minutes past midnight, with $0 \leq a < 24$, and $0 \leq b < 60$. Find $a + b$.
16. If the sum of n numbers in a list is 28, and adding the number 4 to the list makes the average of the list 4, what is the value of n ?
17. Alice has 3 friends who each have the same number of candies. Alice does not have any candies at the beginning. However, each of her friends gives Alice 2 candies. In the end, Alice and all her friends have the same number of candies. How many candies did each of her friends have at the start?
18. Robert the lumberjack cuts wood! A cut splits a single piece of wood into two. After he has made 46 cuts, he finds he has 84 pieces of wood. How many pieces of wood did he start with?
19. Josh the Otter does 8 push-ups in 10 seconds, and for every 6th push-up, he does a clap push-up. How many clap push-ups does he do in 55 seconds?
20. Alex lives at $(-1, -3)$ on a coordinate grid where each unit is one meter long. He recently learned of treasure at $(4, 2)$. If Alex can only move parallel to the axes, find the shortest path from Alex's home to the treasure in meters.
21. Aalok is new to learning the numbers from 1 through 26 and is reciting them for practice. He sings: "1, 2, 3, ..., 25, 26, 1, 2, 3, ..., 25, 26, 1, ...", cycling through them repeatedly. What is the 2025th number he recites?
22. Freddy the farmer grows tomatoes on a patch of land in the shape of a right isosceles triangle. Its hypotenuse is 8 feet long. What is the area of his tomato patch?

23. One day, a single mushroom spawns on BCA's field. Every day, each already existing mushroom creates a spore; each existing spore becomes a mushroom and ceases being a spore. For example, on the 2nd day, there is 1 mushroom and 1 spore, and on the 3rd day, there are 2 mushrooms and 1 spore. How many mushrooms are there on the 10th day?
24. A spherical balloon of radius 1 inch is released into the air. Every 20 feet it rises in the air, its radius increases by 1 inch, remaining in a spherical shape. If the balloon explodes when it reaches 2304π cubic inches in volume, at what height (relative to the release point) does the balloon explode?
25. In a regular 14-gon, Elena picks two vertices at random. If the probability that the chord determined by these vertices passes through the center of the polygon is $\frac{a}{b}$ in simplest terms, find $a + b$.
26. A number is called n -divisible if it has n digits and each subsequent digit is divisible by the previous digit. Additionally, no digits can be repeated. For example, 124 is 3-divisible, but 356 is not. How many 3-divisible numbers are there?
27. How many ways can Al, Amber, and Apollo share 17 yellow pigs such that the number of yellow pigs Al has is a power of 2, the number of yellow pigs Amber has is a power of 3, and the number of yellow pigs Apollo has is a multiple of 6, given that it is possible to have no pigs?
28. Let $P(x) = x^2 - 4$ and $Q(x) = P(P(x))$. The sum of the positive roots of $Q(x)$ is $\sqrt{m} + \sqrt{n}$. Find $m + n$.
29. Aalok is just beginning to learn the alphabet, and is training by reciting it repeatedly. However, on his n -th repetition, he forgets the n -th letter of the alphabet (on the 27th cycle, he skips A again, and the cycle repeats). He recites: "B, C, ..., Y, Z, A, C, ..." If he continues in this fashion, what is the 651st letter he recites?
30. A number is *super divisible* if it has more factors than digits. For example, 6 is super divisible: it has four factors and one digit. How many numbers from 2 to 99 are super divisible?
31. Let $f(n)$ return the sum of the even factors of n . What is $f(504)$?
32. Let X be the number of six-digit palindromes, and Y the number of six-digit palindromes that are divisible by 11. Compute $11Y - X$.
33. A cow is tied by a rope of length 4 to one vertex of a pen in the shape of a regular octagon with side length 2. The region that contains all the points that the cow can reach has an area $k\pi$. Note that the area of a circle with radius r is πr^2 . Find k .
34. Let $f(x) = x^2 + x + 1$. Unique primes p and q satisfy $f(p) = f(q) + 242$. Find $p + q$.
35. Jerry and Vaishnavi each hold a distinct number from 1 to 12 and are trying to guess each other's number, and both are telling the truth. Jerry says, "My number is composite." Next, Vaishnavi replies, "If that's true, then our numbers are not relatively prime." Jerry then says, "Now I know your number." What is the sum of their numbers?
36. In the diagram below, 4 distinct circles of radii 10 are aligned horizontally. Let A be the point on the leftmost circle directly above its center, and let B be the point on the rightmost circle directly below its center. Let ℓ be the length of segment AB contained within the 2nd circle from the left. Compute ℓ^2 .



37. Chris plays a game. He keeps on removing numbers from the set $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. If he removes a number which makes the average of the remaining set a non-integer, he loses. What is the maximum number of turns he can take before he is guaranteed to lose (including the turn where he loses)?
38. Two functions are graphed on the cartesian plane, namely $|x| + |y| = 3$ and $|x - 3| + |y| = 3$. The area of their intersection is $\frac{a}{b}$, where a and b are relatively prime. What is $a + b$?

39. A committee of 10 people sits around a circular table. They want to form subcommittees of 3 people each. No subcommittee is allowed to consist of any people sitting next to each other. For example, if two people sit adjacent to each other, this subcommittee is invalid, even if the third person sits separately. How many valid 3-person subcommittees can be formed?
40. Let $ABCD$ be a square of side length 4. Points E and F are located on $\overline{BC}$ and $\overline{CD}$ respectively so that $CE = CF = 1$. Let the intersections of $\overline{AE}$ and $\overline{AF}$ with $\overline{BD}$ be P and Q respectively. If $PQ^2 = \frac{a}{b}$ with $\frac{a}{b}$ in simplest form, find $a + b$.