Joe Holbrook Memorial Math Competition

6th 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. Alice has 6 donuts and Bob has a dozen donuts. Together, how many donuts do they have?
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. A fruit store has a patch of 5 grape vines, each containing 7 grapes. How many grapes does the fruit store have in total?
4. Devin is so excited to play his favorite video game today! In the morning, he is not allowed to play video games, so he will study for two hours. In the afternoon, he will play his favorite video game for half an hour. In the evening, he will play his favorite video game for another half an hour. In total, how many minutes will Devin play his favorite video game for?
5. What is the perimeter of a regular pentagon with side length 3?
6. Abraham arranges apples in a triangular formation which has five rows. The first row has 1 apple, the second row has 2 apples, the third row has 3 apples, the fourth row has 4 apples, and the fifth row has 5 apples. How many apples are there in total in the formation?
7. I love eating Hershey's chocolate, and I can eat 2 pieces every 5 minutes. How many pieces will he have eaten in an hour?
8. There are 30 people in a line, and Bob is the 22nd person in the line. What is the difference between the number of people in front of Bob and the number of people behind Bob?
9. How many integers between 1 and 100 (inclusive) are divisible by both 2 and 5?
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. 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)?
13. 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?
14. What is the units digit of $9^{512^{2025}}$?
15. Saitama does 2000 push-ups every day. He wants to divide them into sets so that each set consists of at least 5 push-ups and each set has the same number of push-ups. How many ways can he do this?
16. How many integers between 1 and 1000 (inclusive) are divisible by neither 3 nor 5?
17. How many distinct orderings of letters can be created by rearranging the letters of 'JHMMC'?
18. Alice and Bob are walking from one corner of a 5ft $\times$ 12ft rectangle to the opposite corner. Alice walks along the diagonal connecting the two corners while Bob walks along the sides of the rectangle. How many more feet does Bob walk compared to Alice?
19. A rectangle has integer side lengths, area 36, and perimeter 26. What is the length of the longer side?
20. Freddy the farmer grows tomatoes on a patch of land in the shape of an right isosceles triangle. Its hypotenuse is 8 feet long. What is the area of his tomato patch?
21. Every contestant in Ridgewood's yearly cornwalk has to travel in a distinct path on lattice points from the bottom left corner to the top right corner of a rectangular cornfield grid. Their path cannot be the exact same as any other contestant, and they can only move right and up by one unit. The cornfield is 48 units long and 2 units wide. How many contestants can compete in the cornwalk?
22. An equilateral triangle, square, pentagon, and hexagon all have the same perimeter. Given that their side lengths have to be integers, what is the minimum possible side length of the triangle?

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. My friend and I are going to a meeting that consists of 6 people, including my friend and I. If we randomly take seats at a round table, what is the percentage chance that I will sit next to my friend? (Do not include a percent sign in your answer.)

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 $\frac{p}{q}$, what is the value of $p+q$?.

26. In a right triangle with legs of lengths 6 and 8, an inscribed circle (incircle) is tangent to all three sides. What is the radius of this incircle?

27. What is the minimum n such that $n!$ is divisible by $(6!)^2$?

28. Tommy is stuck in a dungeon and needs to find a three letter code to escape. Inside, he finds a scroll giving him two clues:

    (a) When the letters of the code are converted to numbers using a cipher in which the letters correspond to numbers in backwards order ($a = 26, b = 25, \ldots, z = 1$), the sequence of numbers corresponding to the code form an increasing geometric sequence.

    (b) Tommy's code contains the letter R.

    Find Tommy's three letter code.

29. 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 $k\pi$. Find k. (**Note:** the cow must be outside of the pen)

30. Quadrilateral $ABCD$ is inscribed inside of a circle. $AB = 3, BC = 4, AC = 5, AD = 2$, and $\overline{AC}$ is the diameter. Given that $CD = \sqrt{x}$, find x.

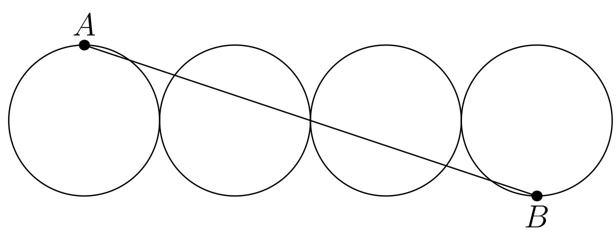
31. I own an analog clock with a special quirk: the minute hand moves twice as fast as normal. The hour hand moves just like a normal clock. Suppose that at midnight, my special clock correctly displays that the time is midnight. In the next 24 hours (including the next midnight but not including the current midnight), how many times will my special clock display the correct time?

32. 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?

33. Each square in an 5×5 grid of unit square is to be painted either red or blue, under the following condition: the distance between the centers of any two unique red squares must be at least $\frac{17}{8}$ units. What is the maximum number of red squares possible?

34. Aalok has a monic quartic polynomial $p(x)$ whose roots are a, b, c, d. He knows that $a + b = 1$, $ab = 2$, $c + d = 3$, and $cd = 4$. Find $p(2)$.

35. 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.



36. Let $S = \frac{1}{2^2-1} + \frac{1}{4^2-1} + \frac{1}{6^2-1} + \cdots + \frac{1}{100^2-1}$. If S can be written as $\frac{m}{n}$ where m and n are relatively prime positive integers, find $m+n$.

37. Noel M.'s favorite numbers are numbers that have exactly three digits in both base 10 and base 7, and that end in the digit 5 in both bases. Find the sum of all such numbers (expressed in base 10).

38. Aalok rolls 7 four-sided dice, 6 five-sided dice, $\ldots$, 2 nine-sided dice, and 1 ten-sided die, and sums the value on each die to get a total. If all n-sided dice have the numbers 1–n written on them, the probability that his total ends in the digit 7 can be represented in the form $\frac{m}{n}$, where m and n are relatively prime positive integers. Find $m+n$.

39. I have an infinite geometric series whose sum is $\frac{143}{4}$, where the first term is a whole number and the common ratio is the quotient of two primes. Find the sum of all possible first terms.

40. Consider triangle $\triangle ABC$ where $AB = 13, BC = 14, AC = 15$. Let D be the foot of the angle bisector from A to $\overline{BC}$, and E be the intersection of $\overline{AD}$ and the line bisecting $\angle ABC$. The ratio $\frac{[BED]}{[ABC]}$ is equal to $\frac{m}{n}$, where m and n are relatively prime positive integers and $[ABC]$ represents the area of $\triangle ABC$. Find $m+n$.