

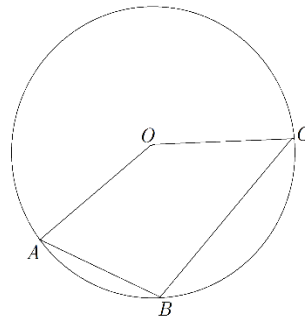
Record your answers in the answer spaces to the right side of the questions. Good luck!

1. Evaluate $2 + 0 \times 1 - 6$. _____
2. If $x : y = (x - 2)(y + 7)$, then what is $5 : (-4)$? _____
3. The ages, in years, of five trees are consecutive odd integers that sum to 365 years. What is the smallest age of the five trees, in years? _____
4. Bob has a certain amount of marbles to distribute among his 5 friends. If the ratio of the number of marbles each friend received is $1 : 2 : 3 : 4 : 5$. If the average of the number of marbles each friend got is 87, then how many marbles did Bob have to distribute in the beginning? _____
5. The sum of two numbers is 9. Their difference is 6. What is the product of the two numbers? Express your answer as a common fraction. _____
6. What is the value of a , if the equation $x^3 - ax^2 + ax - 1 = 0$ has only one solution? _____
7. What is the area of a circle, in square units, circumscribed about a hexagon with side length $\frac{\sqrt{\pi}}{\pi}$ units? _____
8. If $f(f(x)) = \sqrt{x}$, then what is the simplified value of $f\left(f\left(f\left(f\left(f\left(f(65536)\right)\right)\right)\right)\right)\right)$? _____
9. Justin rolls two fair 6-sided dice. What is the percent probability that the sum of the two numbers facing up is odd? _____
10. In a parallel universe, where each chicken has three legs and two heads, and each cow has five legs and three heads. On a farm in that universe, there are either chickens and cows. In total, there are 116 legs and 73 heads. Assuming all of the farm animals have all of their body parts, how many farm animals are there in total? _____
11. The word ITMC is written over and over again, forming a sequence. What is the 2017th letter that appears in the sequence? _____
12. What is the altitude to the hypotenuse, in units, of a right triangle with leg lengths 15 units and 20 units? _____

13. A segment that bisects a side of a scalene triangle and has one endpoint on a vertex of the triangle is known as a _____.
14. The point of concurrency when all of the possible segments defined in the previous question are drawn is known as the _____.
15. Given $i = \sqrt{-1}$, rationalize the denominator of $\frac{5}{4+i}$. Express your answer in terms of i .
16. Sean bikes to school at an average speed of 22 mph on Monday, making him 30 minutes late. The next day, he bikes to school at an average speed of 30 mph, making him 30 minutes early. School starts at the same exact time each day and Sean takes the same route each day. At what speed, in miles per hour, must Sean average on Wednesday in order to get to school on time? Express your answer as a decimal to the nearest tenth.
17. What is the area of a triangle with coordinates (0,0), (2,4), and (6, 7)?
18. After what mathematician was the number e named after? (Include first and last name.)
19. Evaluate $\log_6 9 + \log_6 4$.
20. If $x + \frac{1}{x} = 4$, then what is $x^{12} + \frac{1}{x^{12}}$?
21. Two sides of a triangle with integral side lengths have lengths 1 unit and 2 units. The median of this triangle has length $\frac{\sqrt{a}}{b}$ units, where a has no perfect square factors greater than 1. What is the value of $a + b$?
22. Evaluate $\ln 2016 + 2 \ln \frac{e}{\sqrt{2016}}$.
23. Mr. Hu is running up a staircase. If he can take one, two, or three steps at a time, then in how many distinct ways can he run up eleven steps of the staircase? (Note: Running up one stair then two stairs is considered different from running up two stairs then one stair.)

24. Trevor has two jars of identically shaped marbles. One jar contains three blue marbles and five red marbles, while the other jar contains seven blue marbles and four red marbles. He chooses a jar and picks two marbles randomly, without replacement. The probability that Trevor picks one of each type of marble can be expressed as the fraction $\frac{m}{n}$, where m and n are relatively prime. What is $m + n$?

25. Minor arc AB of a circle, shown to the right, measures 40° , minor arc BC of this circle measures 88° , and point O is the center of this circle. What is the measure of $\angle OCB$? Express your answer in degrees.



26. Evaluate $2\cos^2 \theta$, if $\theta = 22.5^\circ$. Express your answer as a common fraction in simplest radical form.
27. The real numbers x and y are each randomly selected from the interval $(9, 20)$. What is the probability that $x + y > 25$? Express your answer as a common fraction.
28. Pablo cuts a string off a ball of yarn, and it somehow perfectly coils around a cylinder exactly once. The endpoints of the string when coiled around the cylinder are opposite each other. What is the smallest possible length of this string, given the radius of the cylinder is 3 and the height of the cylinder is 8π ? Express your answer in terms of π .
29. Evaluate $\sum_{i=2}^{10} i^2$.

30. $ABCDEFGHIJKL$ is a regular dodecagon with side length 7 units. The area of the circumscribed circle of $ABCDEFGHIJKL$ has an area of $a\pi\sqrt{b} + c\pi$ square units, where b has no perfect square factors greater than 1. What is $a + b + c$?
