# MBMT Sprint Round — Fermat

Full Name _____

Team Number _____

**DO NOT BEGIN UNTIL YOU ARE INSTRUCTED TO DO SO.**

This round consists of **25** questions. You will have **30** minutes to complete the round. Each question is worth the same number of points. Please write your answers in the simplest possible form.

_____  1. If $\frac{x+2}{3} = 9$, compute $x$.

_____  2. Compute $\sqrt{64} + \sqrt[3]{64}$.

_____  3. A square has perimeter 44. What is the area of the square?

_____  4. A bag contains 1 red ball, 4 yellow balls, and 5 blue balls. A ball is randomly drawn from the bag. What is the probability that the ball is *not* yellow?

_____  5. If $3\sqrt{7} = \sqrt{x}$, compute $x$.

_____  6. If $x \bigstar y = \frac{x \cdot y}{x+y}$, compute $4 \bigstar 6$.

_____  7. What is the area of a right triangle with one leg of length 15 and a hypotenuse of length 17?

_____ 8. A trapezoid has parallel sides of length 5 and 9 and an area of 42. Compute the height of the trapezoid.

_____ 9. Adam cuts a rectangular cake two times horizontally and three times vertically. How many pieces of cake does he end up with?

_____ 10. If $a = 2b$, $b = 2c$, and $c = 2d$, and $a \neq 0$, compute $\frac{d}{a}$.

_____ 11. What is the smallest positive integer that is divisible by 2, 3, 4, 5, and 6?

_____ 12. Three years ago, Alice was twice as old as Bob. Today, the sum of their ages is 30. Find Bob's age today.

_____ 13. If 64 wolves can devour 50 sheep in 2 weeks, how many sheep can 32 wolves devour in 50 weeks?

_____ 14. Johnny is at $(0,0)$ in Cartesian World and is faced with two choices. He can either go straight to his destination $(12,9)$, or go to buy a snack at $(12,5)$ and then go to his destination. How much longer is the path he would have to take if he were to buy the snack? Assume that he takes the shortest path possible in both cases.

_____ 15. Compute the product of all solutions to the equation $|x + 5| = 10$.

_____ 16. Let $a$ be the largest prime factor of 20! and $b$ be the second-largest prime factor of 20!. What is the ordered pair $(a, b)$?

_____ 17. A circle and a square have the same area. What is the ratio of the circumference of the circle to the perimeter of the square?

_____ 18. A cube has volume 20. If the lengths of the cube's edges are doubled, what is the volume of the new cube?

_____ 19. Point $M$ lies on line segment $AB$ such that $\frac{AM}{MB} = \frac{3}{4}$. If $AB = 35$, compute $MB - AM$.

20. In a football game, there are two types of scoring events: a touchdown (7 points) and a field goal (3 points). There are two teams in a football game. What is the minimum number of scoring events that must occur for the score difference between the two teams to be exactly 5 points?

21. If $x$ and $y$ are positive integers that add up to 2015, what is the smallest possible value of $\frac{x+y}{x-y}$?

22. Let $M$ be the region of points on the $xy$-plane satisfying $|x| + |y| \leq 9$. What is the area of $M$?

23. A teacher wants to seat three boys and three girls around a circular table so that no one sits next to a person of the same gender. In how many ways can the teacher do this? Remember that all of the students are distinguishable. (Note: two seatings, one of which is simply a rotation of the other, are nevertheless considered different.)

24. Mr. Pham rolls a fair 4-sided die (with the numbers 1, 2, 3, and 4) four times. What is the probability that the numbers he rolls are either all the same or all different?

25. The diagonals of a certain rectangle have length 2 and intersect at a 60° angle. What is the area of the rectangle?