

- 1 Alicia had two containers. The first was $\frac{5}{6}$ full of water and the second was empty. She poured all the water from the first container into the second container, at which point the second container was $\frac{3}{4}$ full of water. What is the ratio of the volume of the first container to the volume of the second container?
- (A) $\frac{5}{8}$ (B) $\frac{4}{5}$ (C) $\frac{7}{8}$ (D) $\frac{9}{10}$ (E) $\frac{11}{12}$
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- 2 Consider the statement, "If n is not prime, then $n - 2$ is prime." Which of the following values of n is a counterexample to this statement?
- (A) 11 (B) 15 (C) 19 (D) 21 (E) 27
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- 3 Which one of the following rigid transformations (isometries) maps the line segment \overline{AB} onto the line segment $\overline{A'B'}$ so that the image of $A(-2, 1)$ is $A'(2, -1)$ and the image of $B(-1, 4)$ is $B'(1, -4)$?
- (A) reflection in the y -axis (B) counterclockwise rotation around the origin by 90° (C) translation by 3 units to the right and 5 units down (D) reflection in the x -axis (E) clockwise rotation about the origin by 180°
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- 4 A positive integer n satisfies the equation $(n + 1)! + (n + 2)! = n! \cdot 440$. What is the sum of the digits of n ?
- (A) 2 (B) 5 (C) 10 (D) 12 (E) 15
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- 5 Each piece of candy in a store costs a whole number of cents. Casper has exactly enough money to buy either 12 pieces of red candy, 14 pieces of green candy, 15 pieces of blue candy, or n pieces of purple candy. A piece of purple candy costs 20 cents. What is the smallest possible value of n ?
- (A) 18 (B) 21 (C) 24 (D) 25 (E) 28
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- 6 In a given plane, points A and B are 10 units apart. How many points C are there in the plane such that the perimeter of $\triangle ABC$ is 50 units and the area of $\triangle ABC$ is 100 square units?
- (A) 0 (B) 2 (C) 4 (D) 8 (E) infinitely many
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- 7 What is the sum of all real numbers x for which the median of the numbers 4, 6, 8, 17, and x is equal to the mean of those five numbers?
- (A) -5 (B) 0 (C) 5 (D) $\frac{15}{4}$ (E) $\frac{35}{4}$

- 8 Let $f(x) = x^2(1 - x)^2$. What is the value of the sum

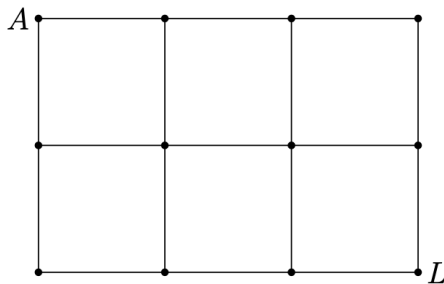
$$f\left(\frac{1}{2019}\right) - f\left(\frac{2}{2019}\right) + f\left(\frac{3}{2019}\right) - f\left(\frac{4}{2019}\right) + \cdots \\ + f\left(\frac{2017}{2019}\right) - f\left(\frac{2018}{2019}\right)?$$

- (A) 0 (B) $\frac{1}{2019^4}$ (C) $\frac{2018^2}{2019^4}$ (D) $\frac{2020^2}{2019^4}$ (E) 1
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- 9 For how many integral values of x can a triangle of positive area be formed having side lengths $\log_2 x$, $\log_4 x$, 3?

- (A) 57 (B) 59 (C) 61 (D) 62 (E) 63
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- 10 The figure below is a map showing 12 cities and 17 roads connecting certain pairs of cities. Paula wishes to travel along exactly 13 of those roads, starting at city A and ending at city L , without traveling along any portion of a road more than once. (Paula is allowed to visit a city more than once.) How many different routes can Paula take?



- (A) 0 (B) 1 (C) 2 (D) 3 (E) 4