

2017 John O'Bryan Mathematical Competition
Questions for the Two-Person Speed Event

*****Calculators may not be used on the first four questions*****

1. 120 students were provided a provided a choice of breakfast. They had three choices: fruit, cereal, and/or yogurt. 53 students had cereal, 47 students had yogurt, and 47 students had fruit. Also, 38 students had only cereal, 12 students had yogurt and fruit but no cereal, 27 students had only fruit, and 25 students had only yogurt. Find the number of students that chose each type of breakfast.

breakfast.

2. Given $9x - 4y = 7$, let k be the value of y when $x = -5$. Let w be the value of $p^2 - 11$ when $p = -3$. Find the sum $(k + w)$.
3. Two students make a New Year's resolution to get more exercise. One student decides to go to a health club aerobics class every other day, and the other decides to go every third day. They go together on January 2. **How many other** days in January (31 day month) will they be in aerobics class together?
4. Let $k = 3 + 1 + \frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \frac{1}{81} + \dots$ and let $w = 1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \frac{1}{16} - \dots$. Find the sum $(k + w)$. Express your answer as a common or improper fraction reduced to lowest terms.

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Answers for the Two-Person Speed Event

Note: All answers must be written legibly and in simplest form. Exact answers are to be given unless otherwise specified in the question. No units of measurement are required. Each problem has the same point-value; however ties for individual awards will be broken based on problem difficulty.

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This competition consists of eight competitive rounds. Correct answers will receive the following

3. 4

4. $31/6$ (must be reduced fraction)

$2/15$ (must be reduced fraction)

8. $35/128$ (must be reduced fraction)

T1. 414720

T2. 42_{nine} or 42