Competition B – Freshman-Sophomore 2 Person Team

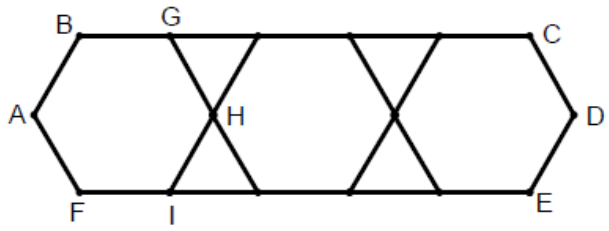
Team Make-up: maximum 2 students, freshmen and sophomores only in any combination
Questions: 10 (initial competition)
For regionals: additional questions are available for use in case of procedural issues with any of the initial questions
For state finals: additional questions are available for tie-breakers, to replace questions with upheld appeals or for use in case of procedural issues with any of the initial questions
Time: 3 minutes per question
Format: Team members work together and submit one answer sheet
Questions 1-5: NO Calculators permitted
Questions 6-10: All battery operated calculators permitted, including CAS-type
Questions 11-15 (if needed): All battery operated calculators permitted, including CAS-type
Answers must be legible
Answers must be **exact** unless otherwise indicated in the question
Scoring: Correct answers submitted in the 1st minute are worth 6 points; correct answers submitted in the 2nd minute are worth 4 points; correct answers submitted in the 3rd minute are worth 3 points; the first team with the correct answer to each question earns a 2 point bonus.

Sample Regional Questions (NO CALCULATOR Questions 1-3, Calculator Permitted Questions 4-6)

1. Let $f(x)=2x^2-5$. Determine the value of $f(6)-f(4)$.

   Answer: 40

2. The given diagram shows 3 congruent regular hexagons between parallel lines containing sides and pairwise sharing a vertex. $ABGHIF$ has numerical area 36. Find the area of hexagon $ABCDEF$.



   Answer: 132

3. k is a two-digit integer in which the ten's digit exceeds the unit's digit by 2 and the sum of the ten's digit and twice the unit's digit is 17. w is Jack's age now if five years ago Benny was 5 times as old as Jack was at that time and four years from now Benny will be twice as old as Jack will be. Find $(k+w)$.

   Answer: 83

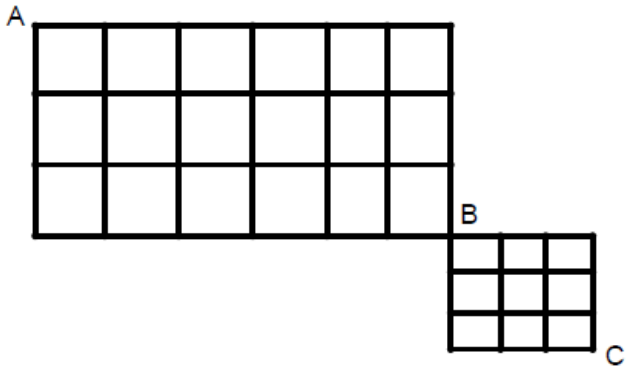
4. A cube is inscribed in a sphere with radius 5. Determine the numeric volume of the part of the sphere that is outside the cube. Report your answer as a decimal rounded to the nearest hundredth.

   Answer: 331.15

5. A number is selected at random from the set A, which consists of integers between -8 and 8, inclusive. Determine the probability that the number selected is BOTH a solution for x to $x^2 - 3x - 28 \leq 0$ and a possible length of the third side of a triangle with sides of 5 and 7. Express your answer as a common fraction reduced to lowest terms.

Answer: $\frac{5}{17}$

6. Determine the number of pathways starting from A and continuing to C and pass through point B moving only to the right or down along the grid lines.



Answer: 30