IMPORTANT NOTE: On **all** problems, the graders have the discretion to deduct 1 additional point for a solution that is poorly written.

Problem 1/2/24:

5 points for a correct configuration. Award 1 total point if at least one number is correctly filled in. Award 4 total points if the entire configuration is right save for one or two errors.

If a configuration is not fully correct, you should specifically point out at least one error in your comments. A correct proof of uniqueness should be commended in the comments.

Problem 2/2/24:

Correctly stating all three solutions $(1,3,8)$, $(1,4,5)$, $(2,2,3)$ to the equation is worth 3 points. Give 1 point of partial credit if they missed some solutions or made some other minor mistake.

Showing that there can be no other solutions is worth 2 points. Using computer programs to do this is acceptable, if they follow the usual guidelines for the use of software.

Problem 3/2/24:

The solution to this problem has three parts:

1. Finding a recurrence for p_n and q_n. Worth 1 point in total.

2. Showing that the polynomials p_n and q_n are relatively prime. Worth 2 points in total.

3. Finding the degree of q_n. Worth 2 points in total. Give 1/2 points if the correct answer is given without proof.

As usual, a correct solution with a method that does not neatly divide in this way is worth 5 points.

Problem 4/2/24:

The solution to this problem has three parts:

1. Obtaining the correct answer $(n+1)!$. Worth 1 point in total.

2. Making the observation that exactly one vertex in each row and column is unused. Worth 1 point in total.

3. Establishing the 1-1 correspondence. Worth 3 points in total. Give 1/3 points if the correspondence is only shown in one direction. Give 1/3 points if they handwave the bijection, e.g. "clearly, the only way to match the segments in this row/column is ...".

As usual, a correct solution with a method that does not neatly divide in this way is worth 5 points.

Problem 5/2/24:

The solution to this problem has three parts:

1. Obtaining the correct answer $\sqrt{\frac{2}{3}}$ or $\frac{\sqrt{6}}{3}$ (accept both). Worth 1 point in total. Inexact numerical answers should not receive credit.

2. Setting up an algebraic expression to minimize/maximize. Worth 2 points in total.

3. Minimizing/maximizing the expression correctly. Worth 2 points in total. Give no credit if this is done magically, e.g. if plugged into a CAS with no explanation, or handwaving that minimizing/maximizing the whole expression requires minimizing/maximizing a certain part.

As usual, a correct solution with a method that does not neatly divide in this way is worth 5 points.