

# KTH SFG Division Estimathon!

## Rules

### Overview

- Your team will have **30 minutes** to work on 12 estimation problems.
- The answer to each problem is a positive number.
- Your team will submit **intervals** for each problem.
- Intervals may not contain negative numbers or zero.
- You may not use the internet, or your calculator/smartphone, or any other type of external reference material.

### Scoring

An interval is good if it contains the correct answer. After the 30 minutes are over, the final score for your team will be calculated as:

$$\left(10 + \sum_{\text{good intervals}} \left\lfloor \frac{\max}{\min} \right\rfloor\right) \times 2^{12 - \# \text{ of good intervals}}$$

That is, for every problem you get wrong (or leave blank), your score doubles.

The winning team is the team with the **LOWEST SCORE**.

### Submitting Intervals

Every team can submit up to 18 total intervals. Your team will receive an answer sheet containing 18 slips. Use these to submit your intervals at any time throughout the game. Each slip must contain your team name, problem number, and interval (min and max value).

You can bring slips up at any time during the 30 minutes; I will attempt to grade entries in real time.

### Re-submitting

Since you have up to 18 submissions for 12 problems, you may submit intervals for a given problem more than once. Only the last submission for any given problem is the one that will count towards your final score.

### Notation

You may provide your final answers in scientific notation if you like, but nothing more complicated than that. E.g., the interval  $[3 \times 10^6, 10^7]$  or  $[6, 102]$  is fine, but  $[3^7, 4^8]$  or  $[2^8 + 112, (72 + 88)/2]$  is not.

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## Estimathon Problems

**Problem 1:** Number of members in the Department of mathematics at KTH (including Professors, Associate Professors, Professor Emeritus, Postdocs, Grad students, Lecturers, Adjunct Faculty, etc.).

**Problem 2:** What is the population of Sweden (as of August 2023)?

**Problem 3:** Assume  $Z \sim \text{Normal}(0, 1)$  estimate  $P(Z < 2)$ .

**Problem 4:** How many MAX restaurants are in Sweden?

**Problem 5:** What was the return speed (in seconds) when I google searched “KTH Numerical Analysis, Optimization, Systems Theory”?

**Problem 6:** How many search hits/results, when I Google searched “KTH Numerical Analysis, Optimization, Systems Theory”?

**Problem 7:** Estimate  $\pi^e$

**Problem 8:** How many bits are used to store the fractional (Significand/Mantissa) part of a number in quadruple precision?

**Problem 9:** In minutes how old is the year 2023 (assuming it started at 00:00 on January 1, 2023)?

**Problem 10:** How many standard sized yoga mats (60cm by 173cm) would cover the area of Sweden’s islands (island area according to SCB)?

**Problem 11:** If 23 people are in a room, what is the probability (as a decimal) that at least 2 people have the same birthday?

**Problem 12:**  $\int_0^{20000} \frac{1}{\sqrt{x}} dx$