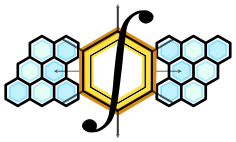


Report on
THE 1ST MWIT-KVIS INTEGRATION BEE

1 Overall Structure

This competition takes inspiration from the famed *MIT Integration Bee*. It consists of two rounds: qualifying exam and playoff. All MWIT and KVIS students are eligible to participate in the qualifying exam, with top 4 scorers from each school qualifying to the playoff round. The playoff round is conducted in a tournament format, whereby the contestants are paired and the loser of each pair is eliminated. The playoff consists of three sub-rounds: quarterfinals, semifinals, and final.

2 Scope

All question will be of the form of an integral

$$\int f(x)\,dx \qquad \text{or} \qquad \int_a^b f(x)\,dx$$

where $a \in [-\infty, \infty)$ and $b \in (-\infty, \infty]$ such that $a = -\infty$ or $b = \infty$ indicates improper integral.

The function f can be any *extended* elementary function, which is defined as a sum, product, root, and composition of (maybe infinitely many)

- elementary functions,
- floor functions $\lfloor \cdot \rfloor$,
- ceiling functions $\lceil \cdot \rceil$, and
- other extended elementary functions

or any of their equivalent forms, e.g., the fractional part $\{x\} = x - \lfloor x \rfloor$.

3 Answering

Any technique can be used to solve an integral. In fact, points in either round will be awarded solely on the correctness of the answer.

An answer $F(x)$ to a question $\int f(x)\,dx$ or $\int_a^b f(x)\,dx$ is *correct* if and only if

- in the case that the question is of the form $\int f(x)\,dx$, $F'(x) = f(x)$ for every x in the domain of the f, consequently, not including $+C$ will **not** be penalised,
- in the case that the question is of the form $\int_a^b f(x)\,dx$, $F(x) = \int_a^b f(x)\,dx$, and
- there exists a **finite** number of operations in the expression of $F(x)$.

For example, if question is $\int \cos x\,dx$, then the answer $x\prod_{k=1}^{\infty}\cos\left(\frac{x}{2^k}\right)$ is **not** correct, even though $\sin x = x\prod_{k=1}^{\infty}\cos\left(\frac{x}{2^k}\right)$ is an identity, because $\prod_{k=1}^{\infty}\cos\left(\frac{x}{2^k}\right)$ is an infinite product. However, the answer $\cos\left(\frac{\pi}{2}-x\right) - 14\left(\sin^2 x + \cos^2 x\right) - 2\left(7e^{i\pi}\right)$ is correct, even if it is not in the most 'simplified' form.

4 Qualifying Exam

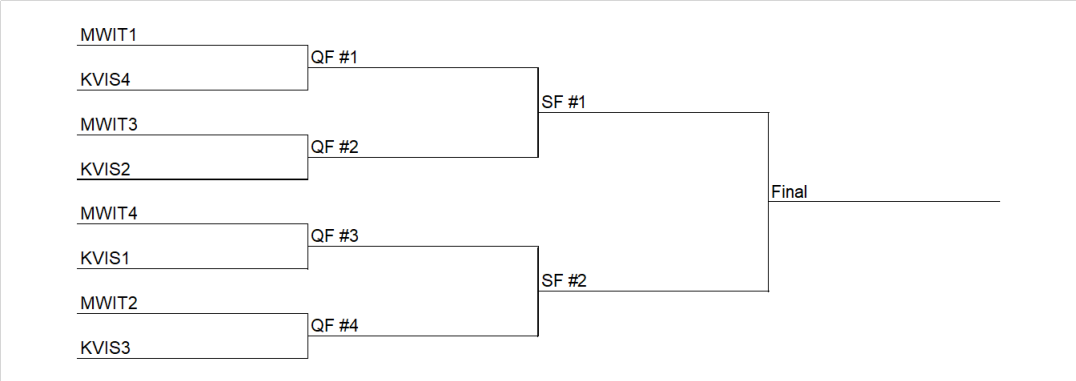
The following rules apply to the qualifying exam.

1. The qualifying exam will be held separately at MWIT and KVIS in September. The time and date of the qualifying exam will be informed by the organisers in each school.
2. No calculator, electronic device, or any communication is allowed. Violation of this rule will result in disqualification.
3. The qualifying exam consists of 15 questions to be completed within 20 minutes. A candidate may choose to stop and leave at any time, and their stopping time will be recorded.
4. A correct answer is worth one point. No point will be given or deducted for leaving blank or incorrect answer.
5. All candidates will be ranked firstly on points and secondly on time. Top 4 candidates from each school will advance to the playoff.
6. Each candidate's mark will be sent to them privately.

5 Playoff

The following rules apply to the playoff.

1. The playoff bracket is as follows. QF is quarterfinal and SF is semifinal. The number after school's name is the contestant's rank in the qualifying exam.



2. The playoff round will be held during MWIT-KVIS Sports Festival on Sunday, November 12, 2023 from 8.40 am to 10.30 am. The following table shows the schedule for each sub-round.

Time	Room 222	Room 224
8:40 - 9:00	QF#1	QF#3
9:00 - 9:20	QF#2	QF#4
9:20 - 9:40	SF#1	SF#2
9:40 - 10:10	Final	

3. There are 4 questions in the regular contest of each sub-round. The time limit for each question is 3 minutes in the quarterfinals and semifinals and 4 minutes in the final.

4. Each contestant will solve the integral on a whiteboard in front of an audience. No assistance from anyone is allowed.

5. After time limit is passed, the final answer of each contestant will be checked by a judge. A correct answer is worth one point. No point will be given or deducted for leaving blank or incorrect answer.

6. The person who gets the most points in the regular contest wins. If both contestants get an equal number of points, we will proceed to the sudden death.

7. In the sudden death, the contestant who solve an integral correctly with the least amount of time wins. The time limit is the same as in the regular contest, but the stopping time will be recorded after a contestant circles their final answer. The contestant may recheck their final answer, but if they alter their final answer, the stopping time will be re-recorded.

6 Results

- Winner: *Puttisan Korsettarat*, KVIS
- Runner-up: *Werawis Asawapiromz*, KVIS

- Semifinalists: *Dechatorn Pattasopon*, MWIT; *Nopparuj Sodsri*, KVIS
- Quarterfinalists: *Kasidet Joohong*, *Nattapat Kingkan*, *Preechakorn Yasamorn*, MWIT; *Thanwa Ruchakhom*, KVIS

7 Acknowledgements

The logo of MWIT-KVIS Integration Bee is designed by

Tisorn Na Phattalung.

The problems in the playoff round are proposed by

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