1st Annual Math Quiz 2020

Finals

QMs: Salik Miskat Borbora & Dr. Manjil Saikia

Special Thanks

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Rules

- There are 29 questions in total which can be scored. There will be a warm-up question to get familiarised with the rules.
- The quiz will follow pounce+infinite bounce format (except for one round). This will be explained by the QM shortly.
- Each correct answer gets you 10 points (part questions will be divided equally for points).
- No negative marks on direct and pass questions.
- Negative points (-5) if you get any answer wrong on pounce.
- All parts required in pounce to get points, part answers will give you -5.

Pounce Format Explanation

Infinite Bounce Format Explanation

Warm-Up Question

Question 0

During the reign of William of Orange in England, X was the Warden of the Royal Mint. In 1696 he carried out The Great Recoinage and afterwards was appointed the Master of the Royal Mint.

He was famous for going hard after counterfeit coiners and took down serial counterfeit coiner and confidence trickster William Chaloner.

Following the 1707 union between the Kingdom of England and the Kingdom of Scotland, X used his experience to direct the 1707-1710 Scottish recoinage, resulting in a common currency for the new Kingdom of Great Britain.

Identify X.

Safety Slide

Another Safety Slide

Sir Issac Newton

Main Quiz Starts Now

Question 1

William Whiston followed in Sir Issac Newton’s footsteps in his later life. But even in his early age he attended Newton’s lectures and became interested in mathematics. He has several things to his credits, one of which was his 1696 book ‘A New Theory of Earth’ in which he claimed that the biblical stories of the creation, flood etc. could be explained scientifically as descriptions of events with historical bases. His religious views were in stark contrast to the prevailing notions at that time, and this led in 1710 to his being removed from a very significant position, which still exists.

Which position was Whiston removed from?

Safety Slide

Another Safety Slide

Lucasian Professor of Mathematics

Question 2

X was a prodigy who wrote a science fiction novel, "Sir Philip Robert’s Erolunar Collision.” At age 15, frustrated on learning that a classic book on number theory by IM Vinogradov existed only in Russian, he taught himself the language and wrote out a full translation.

As a mathematician, X published papers in disparate areas like number theory, analysis, and algebraic topology. X would help a trio A, B, C win the Nobel Prize in Physics whilst himself being denied a share due to the Swedish academy's three member rule. Probably, without X there'll be no Nobel to A, B, C.

Identify X.

Safety Slide

Another Safety Slide

Freeman Dyson

Question 3

X and Y were a pair of very well accomplished brothers who were equally well known for their academic and sporting exploits. X made foundational contributions to understanding atomic structure and quantum theory and Y pioneered the field of almost periodic functions. X would bag the Nobel Prize in Physics in 1922 while Y would lecture at the International Congress of Mathematicians in 1950.

X and Y played several matches for the legendary Akademisk Boldklub with X serving as the goalkeeper. Although X could never play an international match, Y represented the national football team in the 1908 Summer Olympics and ended up winning the silver medal.

Y's popularity as a footballer was such that when he defended his doctoral thesis, the audience was reported as having more football fans than mathematicians. But X's figure dawned high over 20th century science and Oppenheimer called him as a scientific father figure to the younger men of the Manhattan Project.

Identify X and Y. (No points for only surname, 5 points for each part)

Safety Slide

Another Safety Slide

X=Neils Bohr
Y=Harald Bohr

Question 4

X (1701 – 1744) was a Swedish astronomer, physicist and mathematician. X's uncle Olof, was a botanist and philologist who mentored the famous botanist and scientist, Carl Linnaeus who devised the binomial nomenclature. X's grandfather Magnus, was also an astronomer and mathematician who deciphered the staveless runes.

X himself was professor of astronomy at Uppsala University from 1730 to 1744. In 1730, X published the "Nova Methodus distantiam solis a terra determinandi" (New Method for Determining the Distance from the Earth to the Sun). Although X was most famous for doing something that forever etched the family's name in the annals of scientific history.

Identify X.

Safety Slide

Another Safety Slide

Anders Celsius

Question 5

Now known principally as one of the people associated with the slide rule, William Oughtred's legacy also includes several other accomplishments. His Wikipedia page mentions "He also introduced the "×" symbol for multiplication and the abbreviations "sin" and "cos" for the sine and cosine functions." But it fails to mention that Oughtred also introduced another very widely used symbol in all of the sciences.

Which other symbol did Oughtred introduce?

Safety Slide

Another Safety Slide

± (Plus or Minus)

Question 6

This a photo of the current CTO of Cloudfare, John Graham-Cumming. He has been involved with several open source projects. He is the writer of POPFile, which is a program that filters email spam. He is also the author of The GNU Make book, a manual for the GNU make software.

However, he is best known for something in the legal world and human rights. What?

Safety Slide

Another Safety Slide

Petition seeking apology for persecution of Alan Turing.

Question 7

X is a term that is used in several fields including mathematics, debating, literary criticism, logic, science and engineering.

The action which X implies has been popularised by the Star Wars Franchise, in particular of the Jedi Mind Trick which involves a certain hand gesture along with the powers of the Force, that leads to the weak minded get deluded. The Jedi Mind trick is used to weaken the opponents' perceptions and willpower.

Give me X which is a term familiar to mathematicians.

Safety Slide

Another Safety Slide

Hand waving

Question 8

The historian of mathematics Victor Katz writes in A History of Mathematics (3rd edition, 2008) : "The English word X comes from a series of mistranslations of the Sanskrit jya-ardha. Aryabhata frequently abbreviated this term to jya or its synonym jiva. When some of the Hindu works were later translated into Arabic, the word was simply transcribed phonetically into an otherwise meaningless Arabic word jiba. But since Arabic is written without vowels, later writers interpreted the consonants jb as jaib, which means bosom or breast.

In the twelfth century, when an Arabic trigonometry work was translated into Latin, the translator used the equivalent Latin word Y, which also meant bosom, and by extension, fold (as in a toga over a breast), or a bay or gulf. This Latin word has now become our English X."

Give me X or Y.

Safety Slide

Another Safety Slide

X=sine, Y=sinus

Question 9

Paul Mongré was quite a famous writer, philosopher and critical essayist in the late 19th century Germany. He published until 1910s a selection of works which were well received. Although he lived on till 1942, during the later part of his life Mongré did not publish much under this name. He committed suicide along with his wife and sister-in-alw in 1942 rather than obeying orders to go to a concentration camp.

Why is he in a mathematics quiz?

Safety Slide

Another Safety Slide

Mongré was the pseudonym of the famous mathematician Felix Hausdorff, one of the founders of modern topology.

Question 10

For many years Paul Wittich lay in obscurity, until recently when his fame was sealed. He had a rule for sines and cosines of the sums and differences of angles which enabled him to reduce multiplication of angles into addition. This was very useful for his work in astronomy which anticipated Tycho Brahe's planetary theory. In fact it has surfaced that John Craig, a student of Wittich may have shown this rule of Wittich to X, who then went on to formulate Y which is one of the most widely used tools in mathematics.

Who is X and what is Y? (Half points for each part)

Safety Slide

Another Safety Slide

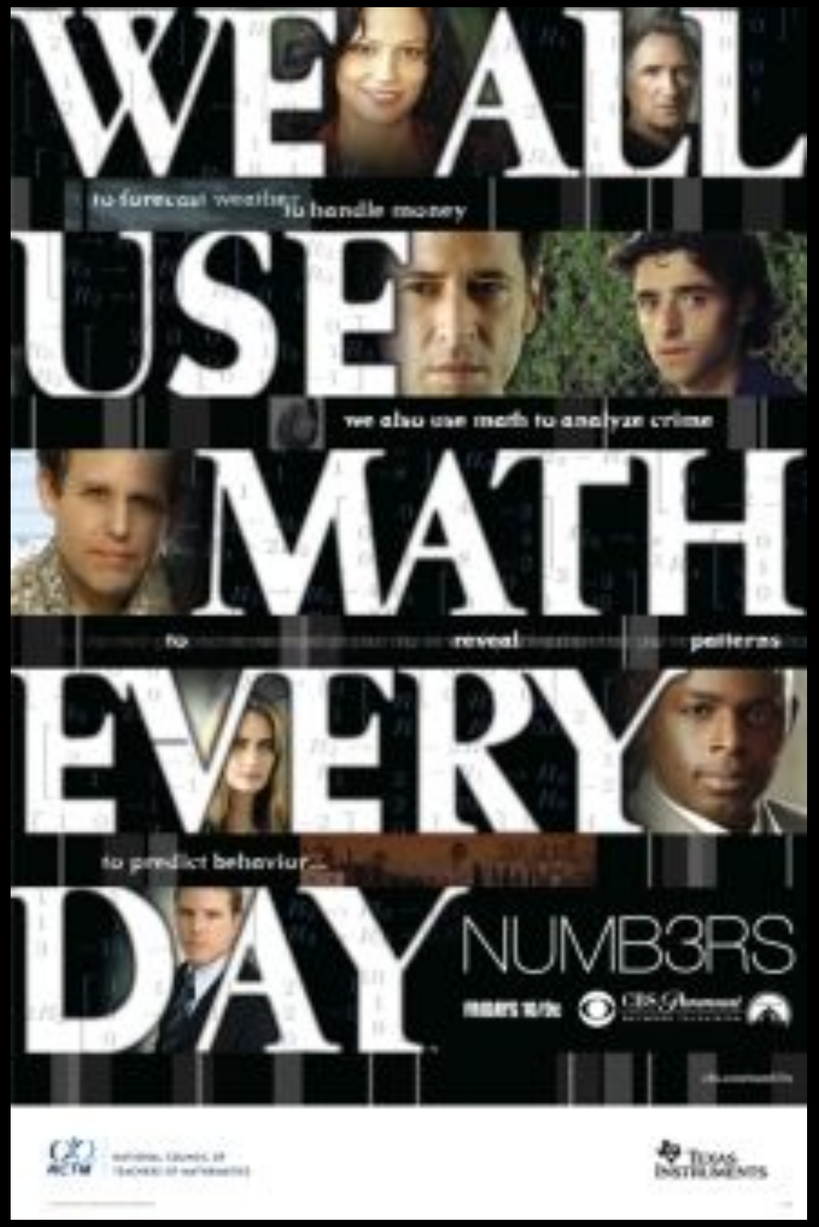
John Napier and Logarithms

Scores?

Question 11

One of the earliest theories explaining the origin of X attributed it to have been developed to defeat text filters created by certain fora in the web world to discourage the discussion of forbidden topics, like cracking and hacking. The term X is derived from the word *elite*, which is used as an adjective to describe formidable prowess or accomplishment. While practicing “X”, often creative misspellings and derived words were used to attempt to indicate one was knowledgeable about the culture of computer users.

A certain usage of X can be observed in the poster attached herewith. What is X?



Safety Slide

Another Safety Slide

Leet

It is a system of modified spellings used primarily on the Internet. It often uses character replacements in ways that play on the similarity of their glyphs via reflection or other resemblance

Question 12

X was the first to express the proportion of susceptible individuals of an endemic infection in terms of the force of infection and life expectancy. X's main objective was to calculate the adjusted life table if smallpox were to be eliminated as a cause of death. He clearly defined the two epidemiological parameters, which nowadays are called the force of infection λ (the annual rate of acquiring an infection) and the case fatality *c.*

He is however primarily remembered for his work in mathematics, and X’s principle is an important physical principle which explains the underlying mechanism of such 20th century inventions as the carburetor and airplane wings.

Who is X?

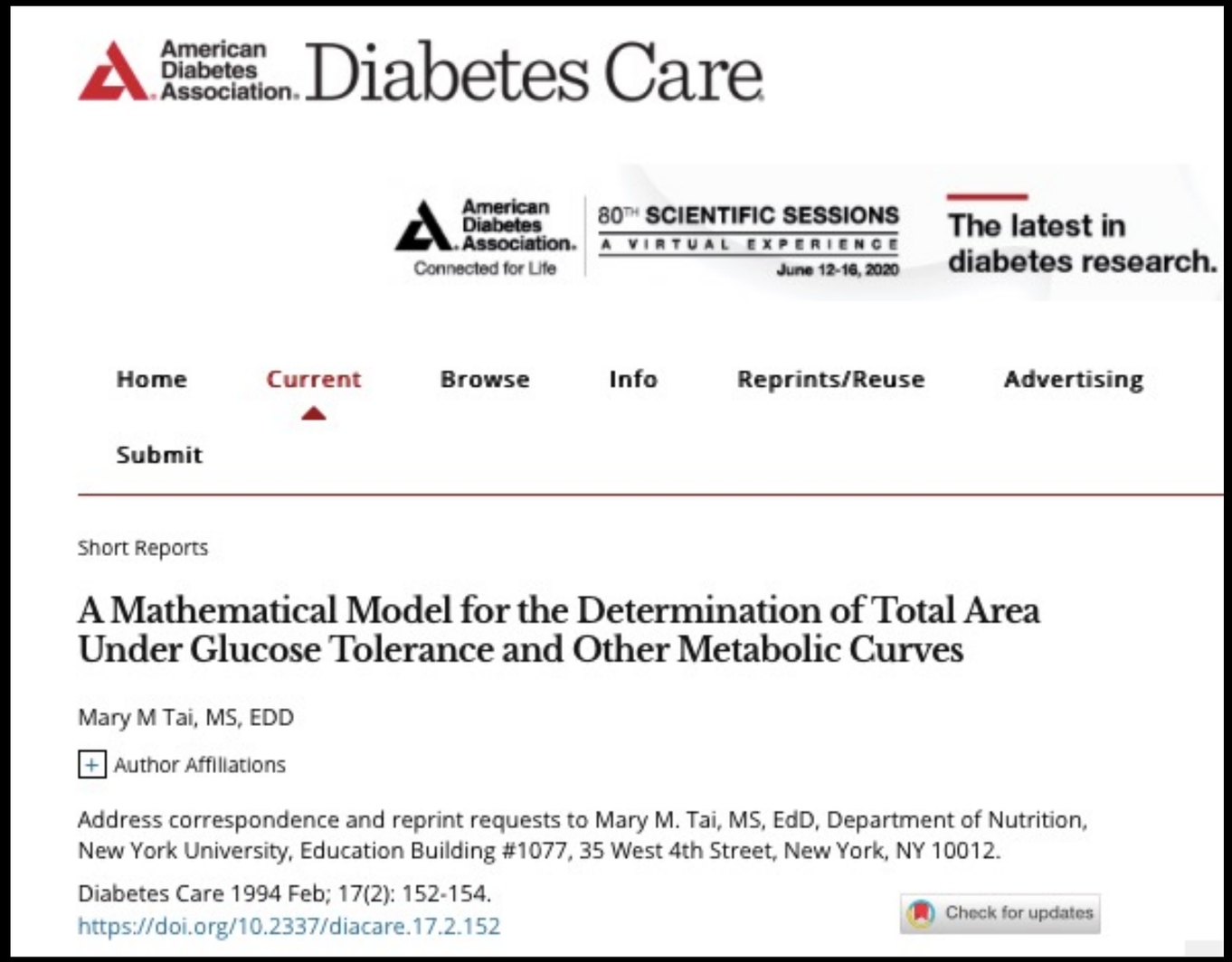
Safety Slide

Another Safety Slide

Daniel Bernoulli

Question 13

This paper published in 1994 has been made fun of, widely due to its subject matter. The author in fact named the model after herself calling it 'Tai's model'. What is 'wrong' about this paper?



American Diabetes Association. Diabetes Care

Short Reports

A Mathematical Model for the Determination of Total Area Under Glucose Tolerance and Other Metabolic Curves

Mary M Tai, MS, EDD

Author Affiliations

Address correspondence and reprint requests to Mary M. Tai, MS, EdD, Department of Nutrition, New York University, Education Building #1077, 35 West 4th Street, New York, NY 10012.

Diabetes Care 1994 Feb; 17(2): 152-154.
https://doi.org/10.2337/diacare.17.2.152

Safety Slide

Another Safety Slide

Trapezoidal rule was rediscovered here.

Question 14

Who is blanked out? What happened during the blanked out sessions?

(Half points for each part)

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L-FUNCTIONS AND ARITHMETIC

Programme for Workshop

P-adic Galois representations , Iwasawa theory, and the Tamagawa numbers of motives.

	Monday (June 21)	Tuesday (June 22)	Wednesday (June 23)	Thursday (June 24)	Friday (June 25)
10-11	[redacted]	[redacted]	[redacted]	K. Rubin	P. Schneider
11-11.30	Coffee	Coffee	Coffee	Coffee	Coffee
11.30-12.30	R. Taylor	Y. Ihara	K. Ribet	W. Messing	J. Tilouine
12.30-14.00	Lunch	Lunch	Lunch	Lunch	Lunch
14 -15	J-M Fontaine	P. Colmez	R. Greenberg	P. Berthelot	S. Bloch
15 - 15.30	Tea	Tea	Tea	Tea	Tea
15.30 -16.30	B. Perrin-Riou	U. de Shalit	U. Jannsen	M. Harrison	B. Mazur

Safety Slide

Another Safety Slide

Andrew Wiles, Proof of Fermat’s last theorem

Question 15

The Stefaneschi Triptych is a painting by the Italian painter Giotto. A particular element in the painting bears semblance to a practice that was evident in pieces of mediaeval art.

The basic idea behind the element can be associated with a specific function in logic and mathematics which is specified by a procedure that yields values or instances of that function by repeatedly applying a given relation or routine operation to known values of the function.

From a layman’s perspective, the effect in pieces of art creates a loop which theoretically could go on forever, but realistically only goes on as far as the image's quality allows.

Name the function or the common name by which such a depiction is known as.

Safety Slide

Another Safety Slide

Droste Effect (is the effect of a picture recursively appearing within itself), Recursive function

In the painting, the depiction of Stefaneschi holding the very painting is indicative of the use of a similar concept.

Theme Round

Rules

Question T1

This understanding of molecular chemistry was developed by Alfred Werner while illustrating about the stoichiometries and isomerism in coordination compounds. His insight allowed chemists to rationalize the number of isomers of coordination compounds.

With his explanation, Werner helps describe the shape of compounds with six atoms or groups of atoms or ligands symmetrically arranged around a central atom. Examples of such compounds are sulfur hexafluoride SF_6 and molybdenum hexacarbonyl $Mo(CO)_6$.

Colloquially referred to as Werner-type complexes, what is the common name of such class of compounds in coordination chemistry.
(+5)

Question T2

While he was down with fever, a certain Swedish engineer came upon a brilliant idea of using one single sheet of paper rolled into a cylinder and folded from two different sides to create the _____. This innovation necessarily minimized the amount of initial material required to create as well as minimized the material being wasted.

FITB which according to the Danish Nobel Prize winner and Physics professor Niels Bohr is “***a perfect practical application of a mathematical problem”.***

(+5)

Question T3

Viruses are unique organisms as they are dependent on a specific host for propagation. A typical virus consisting of its genetic element and protein is packaged into either of the two structures **α** or **β**.

What are the two specific structures into which a virus is assembled?

(5+5)

Question T4

In an interview with the CNN, this Hungarian professor of architecture was asked about the inspiration behind his invention in 1974. The professor candidly replied: “I was searching to find a good task for my students.”

He elaborated that when one is studying from a book, lots of people go straight to the end to look for the answers. However, the most enjoyable part for him was the process of solving and not the solution itself.

Identify this professor who has a famous invention named after him.
(+5)

Question T5

This masterpiece became the most popular piece of art upon its arrival at the National Gallery of Art in Washington, D.C.

It is often believed that this particular piece, amongst others that were painted after the World War II, was symbolic of the painter's increased interest in science, optical illusion and religion.

Identify the painting and the painter.
(5+5)
Theme: +5

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Theme: +5

Safety Slide

Another Safety Slide

Answers

T1=Octahedral complexes
T2=Tetra Pak
T3=Helical and Icosahedral
T4=Erno Rubik of the Rubik’s cube fame
T5=The Sacrament of Last Supper by Dali

Theme?

Safety Slide

Another Safety Slide

Octahedron/ Tetrahedron/ Icosahedron/ Cube/ Dodecahedron (depicted in the painting)

PLATONIC SOLIDS

Scores?

Question 16

In a recent video, Matt Parker (a stand-up comedian and recreational mathematician) talks about X, the earliest known human name that has survived through time in the form of a Sumerian clay tablet. The video focused on a dubious distinction that X made, who was an accountant of a warehouse which received, stored and distributed ingredients used in making beer.

Who is X and what is the dubious distinction? (Half points for each part)

Safety Slide

Another Safety Slide

Kushim, earliest known mathematics mistake

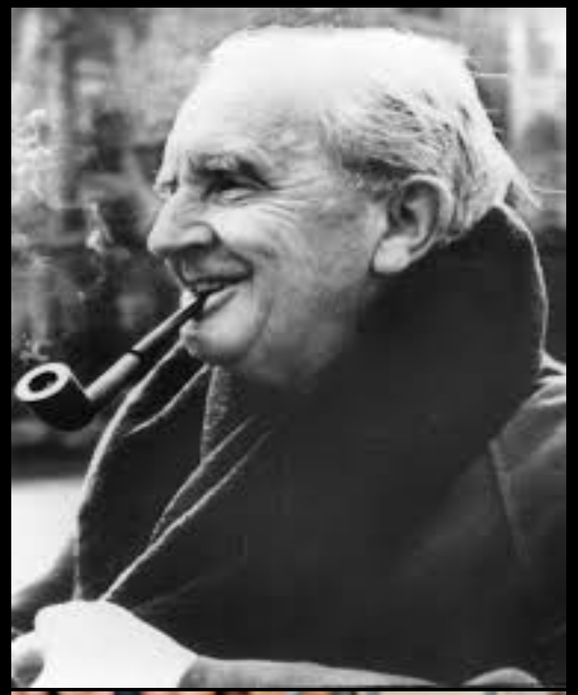
Question 17

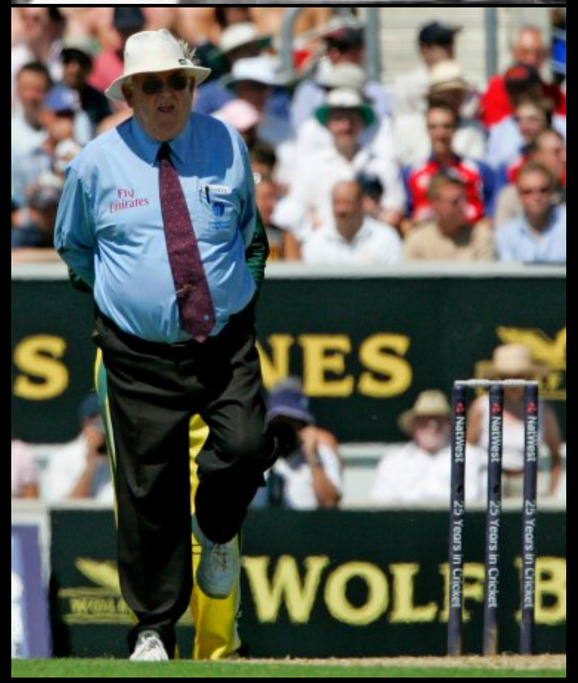
Arguably, one of the greatest in their own respective fields, the two (A- top; B- bottom) gentlemen in picture were separated by timelines, disciplines and practices in a way that was as different as night and day. The two breathed their last in two different English counties that bordered each other. In the opening lines of one of his most loved works, A popularizes a certain term which could be attributed as the basis of B's antics on the field that can be at best described as irrational, yet funny.

In recreational mathematics, the smallest magic square using only 1 and prime numbers would have a magic constant which could be colloquially referred by the term popularized by A.

Give me the term. Explain.

10	3	8	21
5	7	9	21
6	11	4	21
21	21	21	21	21





Safety Slide

Another Safety Slide

“When Mr Bilbo Baggins of Bag End announced that he would shortly be celebrating his **eleventy-first** birthday with a party of special magnificence, there was much talk and excitement in Hobbiton.”

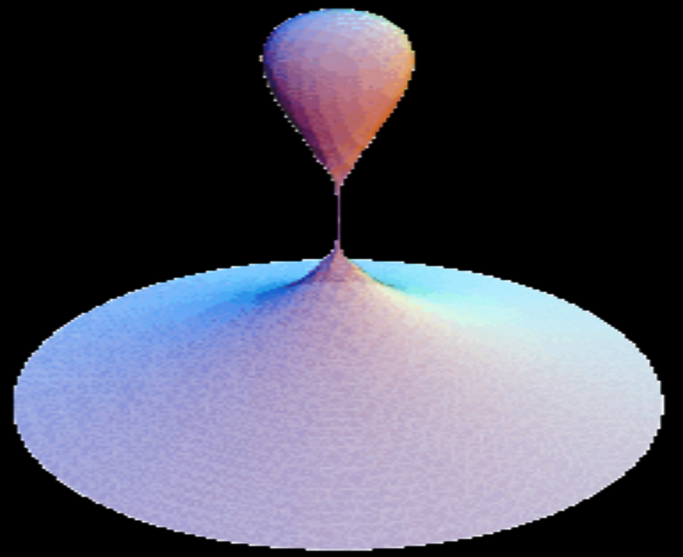
111: Fear of the Nelson

Number 111

Question 18

A surface of revolution is a surface generated by rotating a two-dimensional curve about an axis. The resulting surface therefore always has azimuthal symmetry.

The quintic surface of revolution given by the equation $x^2 + y^2 = (1 - z)z^4$ can be represented by the adjoining figure.



The surface is also known as the _____ surface because of its close semblance to a certain object that is often identified by its "foil wrapped conical configuration with plume”.

FITB.

Safety Slide

Another Safety Slide

Kiss Surface, after Hershey’s kisses

Question 19

Apart from his known accomplishments, the gentleman in the picture worked as the Head Experimental Brewer at Guinness.

A certain economics historian discovered in the Guinness Archives that to prevent disclosure of confidential information of the company, the Guinness Board of Directors allowed its scientists to publish research on condition that they do not mention “1) beer, 2) Guinness, or 3) their own surname” in their communications.

This could be one of the reasons why we seem to have forgotten the actual name of the gentleman while he remains immortal amongst everyone engaged in experimental science. Why is he famous?

Safety Slide

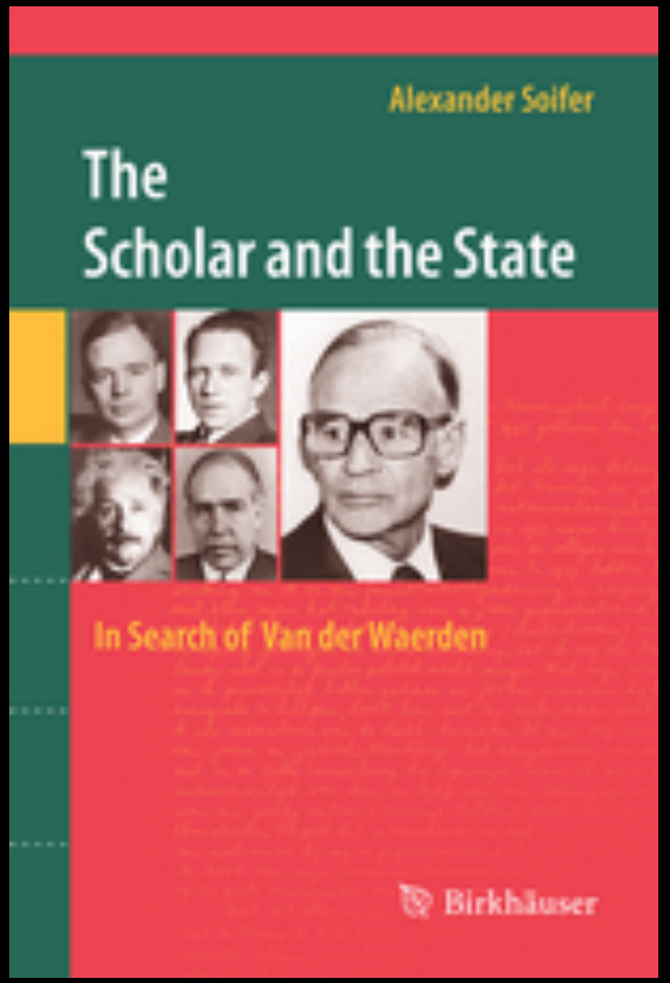
Another Safety Slide

William Gosset of Students’ t-test

Question 20

The author of the book (picture of the cover alongside) is believed to have pointed out an “innocent mistake” of an international organization which as per the author’s words “were uninformed about historical events.” This mistake, according to the author, stains the profession of mathematicians.

A decision was eventually taken by the international organization in its 2018, General Assembly. By the 7th resolution that was moved in that assembly, it was decided that the “name” would be removed and changed to a more acceptable name. What am I talking about?



Safety Slide

Another Safety Slide

Rolf Nevanlinna Prize renamed as IMU Abacus award as Nevanlinna was a Nazi sympathizer

Scores?

Question 21

Few years ago, YouTuber Vi Hart used mathematics to explain that X did not infact lived in a Y, because the Y shown is not mathematically possible. Using Fibonacci numbers, Hart explained the mathematics behind spirals and how real Y's follow this principle but the one that X lives in doesn't.

This prompted Kenny Pittenger to respond to Hart saying "… in the interest of truth and justice, I've made some slight alterations to the design …. I've attempted to ferret out a few interesting proportions and relationsships that have existed in the geometry of the design since the beginning……Throughout the course of the show, the number of rivets on the windows has varied between 5 and 6, so I've standardized it to 5….".

What is X and Y? (Half points for each)

Safety Slide

Another Safety Slide

X=Spongebob Squarepants, Y=Pineapple

Question 22

X was a polymath and a mathematician of the highest calibre. X's doctoral thesis was published by the Royal Society in 1901 and David Hilbert was one of his doctoral advisors. X's celebrated paper “On the Theory of Modules and Ideals “ was generalised by Emmy Noether and is now regarded as of fundamental importance to modern algebra and algebraic geometry.

X's first philosophical essay of 1906, Struggle, discovered the meaning of life in conflict which he tried to reduce to a system called machology. This was followed by the Comprehension of the Universe and the “Philosophy of the Unattainable“, “The World View of the Player” and "The Community of the Future."

Yet X was one of the most dominant champions and generally regarded as one of the strongest players in history of a game. X has the longest reign of any officially recognised World Champion in the history of the sport.

Identify X and the sport. (Half points for each part)

Safety Slide

Another Safety Slide

Emanual Lasker, Chess

Question 23

Among X's many contributions include translating Newton's Principia into French and adding to it a conservation law of total energy which actually led to the conceptualization of energy as such.

X had a varied professional life and contributed to several branches of study including philosophy, finance, optics and mathematics. X is often represented in portraits with mathematical iconography, such as holding a pair of dividers or a page of geometrical calculations.

Who is X?

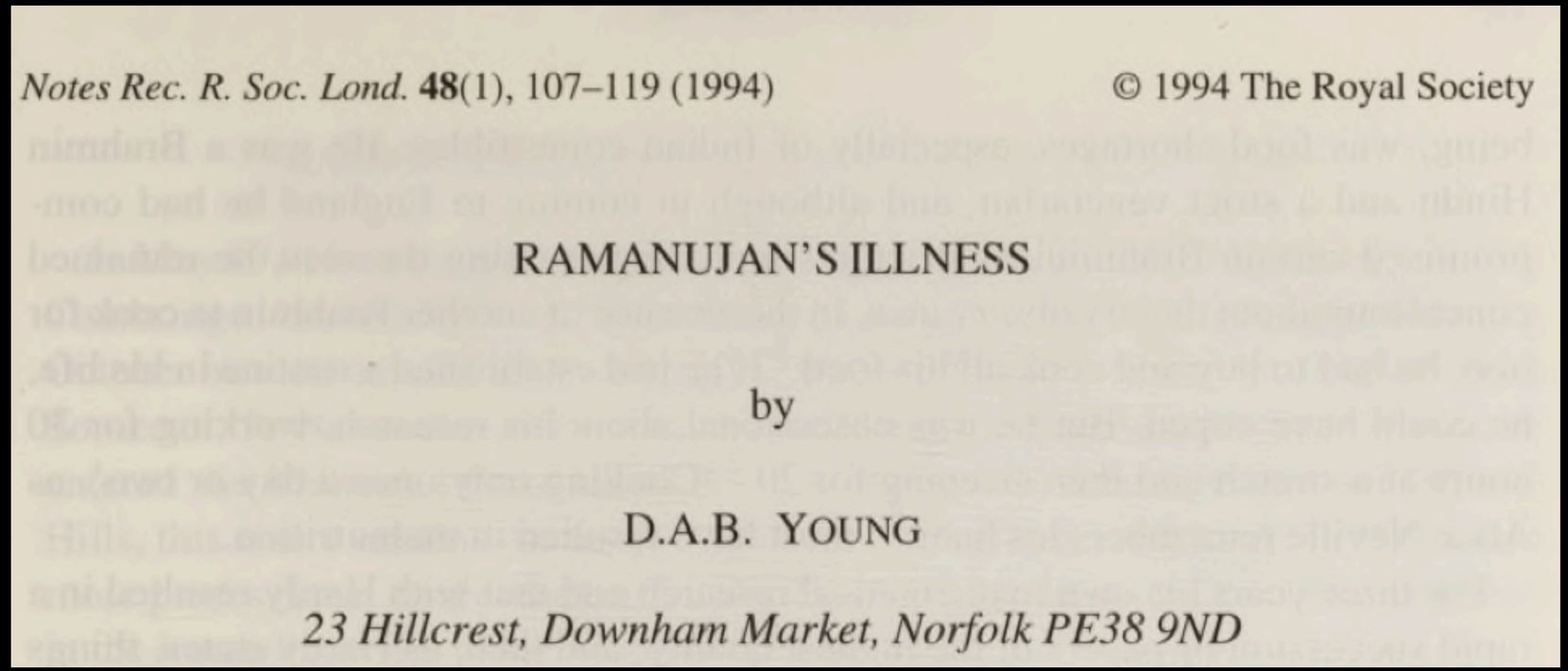
Safety Slide

Another Safety Slide

Émilie du Châtelet

Question 24

What was the primary conclusion of this paper?



Notes Rec. R. Soc. Lond. **48**(1), 107–119 (1994)

RAMANUJAN'S ILLNESS

by

D.A.B. YOUNG

23 Hillcrest, Downham Market, Norfolk PE38 9ND

Safety Slide

Another Safety Slide

Ramanujan died due to hepatic amoebiasis, and not tuberculosis

Scores?

Ties?

Question 25

"Ueber die Anzahl der Primzahlen unter einer gegebenen Grösse" ("On the Number of Primes Less Than a Given Magnitude”) is the sole paper in number theory published by the prominent German mathematician X.

Why is this paper primarily remembered today?

Safety Slide

Another Safety Slide

Stated the Riemann Hypothesis, one of the Clay Millenium Problems

Question 26

Born to a mother (an organist at the church) and father (a mathematics teacher at school), **X** has been successful in creating one of the most relatable fictional characters **Y,** who happened to be an acclaimed exponent of a fictional discipline in a real institution of learning. **X** has conceded that the character **Y** was based on a certain gentleman whose works were introduced to **X** by his father. The gentleman's work majorly relied on the use of symmetry to create visually appealing depictions. A mathematical version of similar depictions was posted by a Trinity college undergraduate in his blog (shown below). Id. **X** and **Y.**

$$98 \times 99 - (609 + 6969 + 111) = (111 + 6969 + 609) - 66 \times 86$$

Safety Slide

Another Safety Slide

Dan Brown, Robert Langdon

Question 27

In one of his conversations, X rues declining a job offer at the Jodrell Bank Observatory under the stewardship of Sir Bernard Lovell. X mentions that the urge to decline the offer majorly stemmed from the fact that he didn't want to leave his friends as well his earnest desire to continue his other "big passion". Identify X, who attended Imperial College, studying mathematics and physics among other subjects, and graduated with an upper second-class degree. In the adjoining figure, X could be seen with a coelostat in the Canary Islands.

Who is X?

Safety Slide

Another Safety Slide

Brian May (Lead Guitarist of Queen)

The End