Week 13

18 April 2025

Welcome to Solve@NUS!

This is **not** a competitive event. Feel free to approach us for hints as often as desired. The aim is for you to have fun, not frustration!

Each puzzle will give you a word or short phrase as the answer. How? That's for you to discover!

Need a code sheet or solving resources? Ask us or check out these online pages:
https://puzzle.tools/
https://puzzles.mit.edu/resources.html

You can use anything to aid in solving. Using your phone, computer or Internet is completely okay!

When discussing answers, please be mindful of other teams around you to avoid revealing spoilers.

Have fun!

Team Name	Start time
Team Size	End time

Puzzle Answers	
Final Presentations	
Final Gambit	
Mind Maps	
Reference List	
Verify your answers to receive the metapuzzle!	
Final Exam!	

Constructed by: Victor, Alyxia

Final Presentations

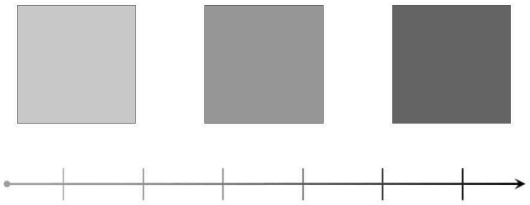
By: Victor

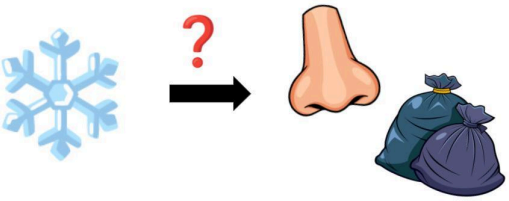
Difficulty: 2/5

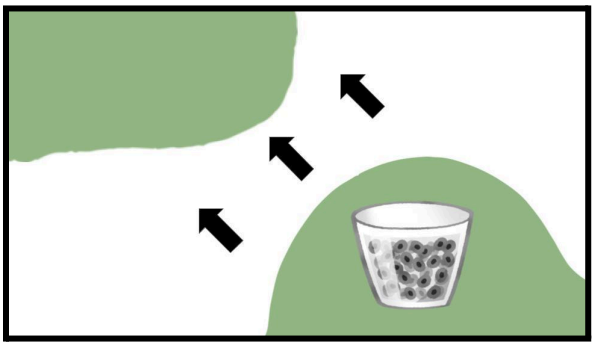
You have so many final presentations, and your incompetent group mates couldn't even read the title correctly!

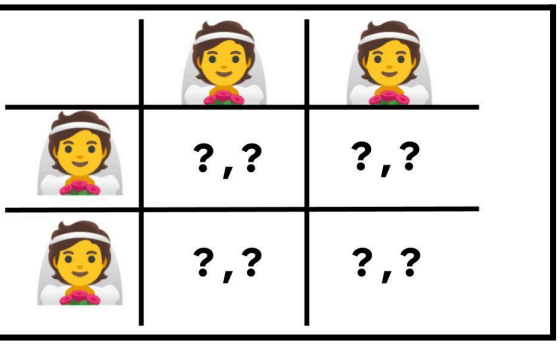
Presentation Titles

1. Contract Bridge and Game Theory
2. Effect of the Cold on Noise Pollution
3. Goal Oriented Learning: Dos and Don'ts
4. Good Gravy! A Short History
5. Land Wars in China
6. The Importance of Play for Mental Health
7. Why it is Impossible to Measure a Coast









Final Gambit

By: Alyxia

Difficulty: 5(?)/5

Faced with the toughest paper you've ever seen, you decide to head into the exam hall with a plan to wildly guess every question. But when your answers were transformed into a letter grade, what kind of risk did you realize you'd taken?

Consider a non-orientable 3-manifold M embedded within $\mathbb{R}^5$ exhibiting Euler characteristic $\chi(M) = -2$. If we perform simultaneous Dehn surgeries along three distinct non-homotopic simple closed geodesics with surgery coefficients forming an arithmetic sequence with common difference 3, and subsequently compute the Reidemeister torsion invariant of the resulting manifold modulo 7, what value emerges when this quantity is raised to the power of zero, multiplied by the square of the first non-trivial eigenvalue of the Laplace-Beltrami operator restricted to co-closed 1-forms divided by itself, and subtracted from 6?

You pick up a six-sided die, but somehow you roll every face at once...

Despite having never been directly observed, people have speculated the existence of particles more fundamental than protons and neutrons. In contrast to their lighter cousins known for changing flavours, these sub-particles have charming and strange names. They are the only elementary particles in the Standard Model to experience all four fundamental forces, as well as the only known particles whose electric charges are not integer multiples of the elementary charge. How many types of them are there?

You ask your resident Mersenne Twister for a hint. It returns 12.

On Monkey Meadow in Bloons Tower Defence 6, you have a 0-2-5 Elite Defender with 2 base damage. It has a base attack rate of 15.4 times per second. It also gains 1% attack speed for every 1% of the track that the bloons have reached. If you buff the Elite Defender with Jungle Drums, Homeland Defence, Ultraboost, Permabrew, Elite Sniper buff, Vengeful True Sun God buff, and Overclock, how many shots will it take to pop a red bloon with 1 health?

You didn't win immediately, but the third time's the charm. RNG in games is so annoying!

Recall that the Riemann curvature tensor Rm of (M, g) induces a self-adjoint with respect to the pointwise inner product on the space of trace-less symmetric two-tensors $S_0^2(T_xM)$. It is a well-known fact that for an n-dimensional ($n \geq 3$) connected compact Riemannian manifold (M, g), if we are given that the inequality $n\, sec_{\text{inf}} > Ric_{\text{sup}}$ holds, where sec_{inf} and Ric_{sup} are the infimum and supremum of its sectional and Ricci curvatures, respectively, then M is diffeomorphic to a spherical space form $\mathbb{S}^n/\Gamma$. Find the minimum value of n for which this statement holds.

You start with two Aces, then draw a ten. Ugh, you suck at blackjack...

Final Gambit

By: Alyxia

Difficulty: 3/5

Some travels have taken you to a tiny town; with night looming, you sought refuge in the inn. Beneath the lodging was a bar, which you decided to settle with for a few stiff drinks before nightfall. Walking in, the musty air assaulted your nostrils, the dim lights barely illuminating the faces of the guests. You took a seat by the bar, and ordered some whisky on the rocks. Moments later, a beautiful stranger invited you to dance. How many did it take to tango?

You go on a random walk, but after a long while you arrive back at square one...

The Abrahamic religions are a grouping of several religions that revere Abraham in their scripture, with the three largest and most influential being Judaism, Christianity, and Islam. All Abrahamic religions accept the tradition that God revealed himself to the patriarch Abraham. All of them are monotheistic, and all of them conceive God to be a transcendent creator and the source of moral law. In many Abrahamic religions, people often choose to live by a set of commandments. How many of these commandments are there?

You pray to the higher beings for an answer. On the fourth try your prayers are answered...

The Carboniferous Period was a geological epoch spanning from 358.9 to 298.9 million years ago, characterized by the formation of vast coal deposits and the evolution of amphibians and early reptiles. Since the late Carboniferous, all that was afforded as landmass was but Pangea. Today we instead find a varied number of how many landmasses?

You draw a bamboo Mahjong tile, but it didn't have any bamboo on it...

What's the ranking of NUS in the QS World University Rankings?

You have no idea, so you roll a d20 for initiative. Score! A Nat 20!

Whereas bulk mRNA export occurs via the NXF1/TAP1 pathway after its association with TREX complex, the exportin CRM1 (XPO1) mediates the export of proteins containing a Nuclear Export Signal (NES). These cargoes may be associated with a specific subset of RNA such as rRNA, snRNA and some mRNA. NES are characterized by a specific stretch of 3 hydrophobic amino acids with variable interspaced amino acids that influences NES affinities to CRM1. The formation of the complex between CRM1 and the NES containing protein also requires the GTPase Ran to conformationally stabilize the NES binding groove of CRM1. How many nucleotide bases, of which three encode an amino acid, are needed to specifically characterize NES?

You draw a few cards from a deck. Wow, a straight flush!

You are trying to overclock 4 sticks of memory to maximize clock speed. Your row access time is 36ns, column latency is 16ns, row to column read/write delay are 8ns, row precharge time is 21ns, bank cycle time is 58ns, row refresh read same bank delay is 4ns, row refresh read different bank delay is 8ns, and fake address window is 34ns. How many sticks of memory do you now have?

Whilst you were pondering, a cosmic flare flipped three bits in your memory.

Mind Maps

By: Victor

Difficulty: 3/5

You make a mind map to connect your train of thoughts. It's also a little incomplete, but that doesn't matter.

1. HIGH
2. TEA
3. BANTAM
4. FEATHER
5. BRAVO
6. PAIR
7. GOBLET
8. PRISONER
9. RAT
10. PIG
11. LIGHT
12. SEW
13. TANGO
14. VICTOR
15. ECHO
16. GOLF
17. RABBIT
18. TIGER
19. WELTER
20. WHISKEY
21. DOG
22. FLY
23. MONKEY
24. QUADS
25. PHOENIX
26. FAR
27. CHAMBER
28. TRIPS
29. PAPA
30. ROMEO
31. DRAGON
32. INDIA
33. MIDDLE
34. RAY
35. HORSE
36. SNAKE
37. KILO
38. STRAIGHT
39. FLUSH
40. CRUISER
41. HEAVY
42. STONE
43. DOE
44. PRINCE

🧑‍🚒📅21 (8), 💪🤼3 (4), 🎵📢13 (5),

🧙‍♂️📚8 (3), 🌍🔠20 (9), 🃏🖐6 (8)

Reference List

By: Victor

Difficulty: 3/5

Evelyn, S (2005) *Exocytosis - some dangers. Alanine keeps levels down - what's left?* Neuro, 41-50, doi:011.10

Ivans, W. (2018) *Proteins and Leucine, the right treatment for cancer?* Journal Medivision, 51-60, doi:10.100

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Morris, S.W. (2015) *Controlling serine levels - how to keep it down,* Journal for Medical Fungi, 1-10, doi:10011

Owens, S.E. (2014) *Right ways to improve isoleucine levels,* Journal of Cell Protection, 11-20, doi:001.01

Richards, E. (2005) *Dangers when glycine production is left up to the body,* Cell Chief, 21-30, doi:10110

Snow, S. (2026) *Upright posture and asparagine - a new link,* The Inhibitor, 31-40, doi:00101

Taylor, SE (2015) *The sale of serine - leftover market.* Pharmanet, 61-70. doi:01000

Final Exam!

By: Victor

META

Difficulty: 2/5

It's time for finals! All you can do is count on yourself.

1. How many questions does each feeder use in this puzzle?
2. Which Fire Emblem game is the Lord "Eirika" from?
3. What is 4x3/(2+1)?
4. Chinatown, Chua Chu Kang, Hume, Promenade, Springleaf, Tanah Merah.

   What do these six MRT stations have in common?
5. The equation x^2+6x+k=0 has at least one real root. What is the largest value of k?
6. Which generation of Pokemon introduced Z-Moves?
7. How many puzzles are there in a typical Solve@NUS puzzle set?
8. You get 68/100 for a paper in your O Level Examination. What grade do you get?
9. In which week was the Solve@NUS puzzle theme "Musicals"?
10. Which Legend of Zelda game was played entirely as a side-scroller?
11. Determine the limit of sin10x/(e^x-1) as x approaches 0.
12. Which president of Singapore was the only one to serve two full terms?

Now that Week 13 is over, it is time to be...