

The Kessler Proof

A math-puzzle murder mystery at a research institute. Hard · about 75 minutes · 2 or more players. Everyone plays, including the host.

WHAT YOU NEED

- This PDF, printed single-sided on A4 or Letter (black and white works)
- 3 envelopes or folders, tape, pens, scratch paper
- Everyone's phones (no app or account needed)
- Recommended: a laptop on the TV for the story, soundtrack and live events

PREP (10 MINUTES, BEFORE GUESTS ARRIVE)

1. Page 2 has labels **A, B, C**. Cut them out and tape one to each envelope.
2. Every later page shows **Envelope A, B or C** in its top-left corner. File each page in the matching envelope **without reading it**.
3. Seal B and C. Leave A closed on the table.
4. Laptop on the TV: open the case link, tap **Host a new game**, then **Make this the Command Screen (TV)**, then **Enable sound**.
5. Players scan the QR code on the TV, type a name and pick a role. Don't tap Start yet.

SET THE MOOD (OPTIONAL)

Bright desk lamps, pencils, a pile of scratch paper and a calculator for emergencies (purists ban it). Let the TV soundtrack play (ticking clock and nervous arpeggios). Serve tea, but maybe not from a teapot.

HOUSE RULES

Don't open an envelope until the app says so. Don't search the internet; everything you need is on paper. Everything in this case is fictional.

CASE APP



casenight.pages.dev/kessler/

This is a public link: anyone with the game code can join. Every phone and the TV stay in sync. No printer? Skip this pack: every document is also in each phone's Evidence tab.

RUNNING THE GAME

1. Tap **Start the case** on any phone. Lights down: a short story plays on the TV, then the clock starts. Open Envelope A.
2. Each role holds different evidence, so talk. Interrogate suspects in the app (each question costs a minute). Type answers into a phone; the app says when to open the next envelope.
3. **Live events:** the TV will throw pop challenges, team decisions and a blackout at you. Answer fast on a phone. Right answers add time; wrong or slow ones cost time.
4. Stuck 5+ minutes? Take a hint. Hint 3 gives the answer, so nobody stays stuck.
5. After Envelope C, file the final report. Then the true story plays on the TV.



ENVELOPE A · OPEN WHEN YOU TAP START



ENVELOPE B · DO NOT OPEN UNTIL THE APP SAYS SO



ENVELOPE C · DO NOT OPEN UNTIL THE APP SAYS SO

The death of Professor Kessler

Calder Institute for Mathematics, Baguio · Saturday · 7:45 AM

BRIEFING

INSPECTOR R. DALISAY, BAGUIO CITY POLICE

Professor Ilse Kessler, 62, was found dead at her desk at 7:12 this morning by her niece, Nora. A cup of tea sat half-finished beside her. Preliminary tests show **digitalis**, the heart poison found in foxglove leaves. The coroner puts the time of death between **21:45 and 22:30** last night.

The study has one door, with an electronic keypad. Every person who works with Kessler has their own four-digit code. The keypad logs every code entered, in and out. The windows don't open.

On Monday, Kessler was going to present a proof she'd worked on for eleven years. At 9 AM today the Institute's lawyers seal the study and all its papers. After that, we get nothing.

Fair warning: Kessler protected everything with puzzles. Her notebook is locked. Bring a pencil.

YOUR TASK

Work through the evidence together. The case app asks one question per envelope. Each correct answer opens the next envelope. At the end, submit your final proof: **who**, **how**, and **why**.

In this envelope: A1 Case brief · A2 Persons of interest · A3 The desk

Persons of interest

Prof. Ilse Kessler, 62

THE VICTIM · NUMBER THEORIST

Brilliant, exacting, generous with students. Turned everything into a puzzle: passwords, door codes, birthday cards. Drank the same jasmine tea every night at her desk.

Dr. Victor Amsel, 58

RIVAL · VISITING PROFESSOR

Claims he had the key idea for the proof first. They fought about co-authorship for years. Gave a public lecture last night.

Theo Ruiz, 29

PHD STUDENT · STUDENT NO. 2019-11873

Ran the giant computer verification that the proof depends on. Kessler's favourite student. Due to graduate in December.

Nora Kessler, 33

NIECE · ARCHITECT

Kessler's only family and heir. Brings her aunt breakfast every Saturday. Found the body.

Prof. Margit Hale, 55

DEPARTMENT CHAIR

Has been cutting budgets all year. Pushed Kessler, unsuccessfully, to retire early.

Inspector R. Dalisay

BAGUIO CITY POLICE

Hates puzzles. That's why you're here.

What was on her desk

SCENE NOTES

FORENSICS, 7:40 AM

Teacup (jasmine tea, half-finished). Electric kettle on the side table. Three pencils, all sharpened. A notebook with a number lock on its clasp. Under the notebook, an index card in Kessler's handwriting (below). The whiteboard behind the desk is covered in notes; one corner is copied below.

INDEX CARD UNDER THE NOTEBOOK

KESSLER'S HANDWRITING

Notebook password: the basket of eggs.

A woman brings a basket of eggs to market. Counted out by twos, there is one egg left over. By threes, one left over. By fours, by fives, by sixes: always one left over. But counted out by sevens, none are left.

What is the smallest number of eggs her basket can hold?

CORNER OF THE WHITEBOARD

UNDATED

verification: cases 1 – 12,000 ✓ (T.)

runtime per case ≈ ??

Monday 10:00: colloquium, Hall B

"A proof is only as strong as its weakest step."

Pages from the unlocked notebook

PAGE 3

"OFFICE DOOR CODES"

Everyone forgets their study code, so I chose each one to suit its owner. If they forget, they can work it out. Four digits each.

- **Victor:** a perfect square, of course. He thinks he's perfect.
- **Theo:** a prime. Indivisible, like his focus.
- **Nora:** reads the same forwards and backwards, like her.
- **Margit:** a Fibonacci number. She keeps growing her empire.
- **Me:** the taxicab number. Hardy's boring one.

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"MY PRIME CIPHER"

For notes that are nobody's business. Each letter steps forward through the alphabet by the next prime, in order: the first letter by 2, the second by 3, the third by 5, then 7, then 11, and so on. Z wraps around to A.

Example: **CAT** becomes **EDY**.

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FRIDAY

Theo at 6 to go over the verification tables. Something is bothering me about them. Margit at 7:15 about the budget, ugh. Victor's lecture tonight at 9. Will not go. Tea, then the tables again.

STUDY KEYPAD LOG • ROOM 3-14

FRIDAY 17:00 TO SATURDAY 08:00

TIME	CODE ENTERED	DIRECTION
17:30	1729	In
18:02	7919	In
18:40	7919	Out
19:15	6765	In
19:31	6765	Out
21:34	4096	In
21:49	4096	Out
07:12	2442	In

The keypad records codes, not names. No other entries. Kessler did not leave the study after 17:30.

CORONER'S PRELIMINARY NOTE

DR. P. OCAMPO

Cause of death: cardiac arrest from digitalis poisoning, consistent with fresh foxglove leaves steeped in tea. Onset of symptoms usually 30 to 60 minutes after drinking. Time of death between 21:45 and 22:30.

The kettle contained clean water only. The poison was in the cup.

USEFUL FACTS, FROM THE INSPECTOR'S DICTIONARY

HE LOOKED THESE UP

Perfect square: a number times itself (like $49 = 7 \times 7$). **Prime:** divisible only by 1 and itself. **Palindrome:** reads the same backwards. **Fibonacci numbers:** 1, 1, 2, 3, 5, 8, 13, 21... each is the sum of the two before. **Taxicab number:** the number Hardy rode in a taxi; Ramanujan said it was the smallest number that is a sum of two cubes in two different ways.

AUDITORIUM A/V LOG · CALDER HALL

FRIDAY NIGHT PUBLIC LECTURE

TIME	EVENT
20:50	Dr. V. Amsel arrives backstage, mic fitted
21:00	Lecture begins, livestream on. 140 people in the hall.
21:00–22:15	Speaker on stage and on camera without a break (livestream recording available)
22:15–22:30	Q&A, speaker on stage
22:41	Mic returned

STATEMENT · DR. VICTOR AMSEL

8:05 AM

"I was on a stage in front of 140 people and a camera. Ilse chose all our codes herself, as little riddles in that notebook of hers. Anyone who's read that notebook could work out mine in ten seconds. Find out who's had it in their hands."

MESSAGES ON KESSLER'S PHONE

RECOVERED FROM HER DESK

THEO

Theo, bring my notebook back tomorrow, I need it for Monday. Thank you for copying the tables.

Wed 22:10

Will do Prof! Returning it Thursday morning. Haha I finally saw what the "perfect square" thing is about 😊

Wed 22:31

We need to talk about the runtimes. Friday 6pm. Please be honest with me.

Thu 23:48

Of course. See you Friday.

Thu 23:59

ROOFTOP GREENHOUSE · BOTANY CLUB SIGN-OUT LOG			MEMBERS SIGN WITH THEIR STUDENT OR STAFF NUMBER	
DATE	TIME	PLANT	CUT / TAKEN	SIGNED
Thu	16:10	Basil	1 bunch	2021-04412
Fri	12:30	Mint	4 sprigs	STAFF-0093
Fri	20:40	Foxglove (<i>Digitalis purpurea</i>)	3 leaves	2019-11873
Sat	06:55	Tomatoes	6	2022-00871
Sign on the foxglove bed: "POISONOUS. Ornamental only. Do not ingest."				

VERIFICATION OUTPUT · EXCERPT			FILE: TABLES_FINAL_TR.CSV
CASE	RESULT	RUNTIME (S)	CHECKSUM
10,994	✓ holds	4.000	a1f0
10,995	✓ holds	4.000	a1f0
10,996	✓ holds	4.000	a1f0
10,997	✓ holds	4.000	a1f0
10,998	✓ holds	4.000	a1f0
Margin note in Kessler's pencil: "Every single case takes exactly 4.000 s? Same checksum every time? Impossible."			

TORN FROM THE NOTEBOOK, FOUND IN KESSLER'S CARDIGAN POCKET

FRIDAY NIGHT

H D P L O

(prime cipher)

Tell Margit on Monday. All of it. Then withdraw the proof.

EMAIL · ILSE KESSLER TO MARGIT HALE

FRI 19:58

Subject: Monday, 9 AM. Integrity.

Margit, I need an hour with you on Monday morning before the colloquium. It concerns research integrity in my group. Please keep it confidential until we speak. I may have to withdraw the proof. I will explain everything. — Ilse

STATEMENT · NORA KESSLER

8:20 AM

"I came at 7:12 like every Saturday, with pandesal. My code is 2442. She was just... sitting there. I don't care about the house. I want whoever did this."

RECEIPT · THE MANOR RESTAURANT, CAMP JOHN HAY

FRIDAY

Table	12 · party of 2 (Prof. M. Hale, Dean R. Abad)
Seated	21:02
Bill paid	22:58 · Institute card ending 0417
Items	2 × set menu, 1 bottle of water, 2 × coffee

The Manor is a 25-minute drive from the Institute.

STATEMENT · DEAN R. ABAD

TAKEN BY PHONE, 8:30 AM

"Margit and I were at dinner from just after nine until almost eleven, going line by line through next year's budget. She never left the table except once, for two minutes, to take a call outside. I drove her home after."

STATEMENT · PROF. MARGIT HALE

8:40 AM

"Ilse showed me her door-code riddles at lunch a month ago, very proud of them. I laughed and forgot them. Whoever used Victor's code had read that notebook properly, and recently."