



## LOCKED OUT MATH: CAPTAIN SIGMA'S TREASURE TROVE

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Welcome to Locked Out Math: Captain Sigma's Treasure Trove. This is a fun, three part locked room experience. This locked room is designed for grade 7+ students, but I've used (with great success) in grade 7-11 classes. Some of the concepts students will need to solve the puzzles are listed below:

- Solving equations in two variables
- Cartesian Coordinates
- Area
- Logic and Reasoning
- Pattern Recognition

Each part will take a different amount of time. Completing each part is intended to take 60-120 minutes (depending on strength of students). Part 2 is notably shorter than parts 1 and 3. This document includes instructions for each of the three parts, and all printable files.

## PART 1 INSTRUCTIONS

The goal of the first part of the experience is for students to correctly match the pirates to their descriptions, and then use the equations on the pirates to determine the coordinates.

- **Description:** Describes the story. I recommend printing one large copy for everyone participating.
- **Letter with Answer Sheet:** Describes the story. Gives background context. Also gives two tables that students must use to puzzle out the coordinates (and order) for each pirate. Each group participating should get one copy (or one copy per student). The answer sheet also has a scannable QR code where students can access the pirate paintings/descriptions if they don't finish and want to take home. You may also use [this link](#).
- **Map:** Map where students draw the path to the treasure trove. This is what students must submit to complete this part.
- **Paintings:** Paintings of the pirates for students to use in matching/algebra puzzle. Note that the painting with treasure/symbols on it is only used in part 2 of the locked room experience.
- **Pirate Descriptions:** Descriptions of pirates for students to use in matching/algebra puzzle.
- **Pirate Medallion:** The pirate medallion is used in part 3 of the locked out experience. You may choose to omit it for the first part and provide it when solving part 3 (usually the first part takes 1-2 hours).
- **Solutions:** This shows the filled in tables, pirates identified, and solved map.

# SIGMA'S TREASURE TROVE: PART I

In the expansive Caribbean Sea lies an island shrouded in mystery and whispered tales of hidden treasures. Legend has it that centuries ago, a notorious pirate by the name of Captain Sigma Dreadnought the Merciless ruled these waters with an iron fist and a cunning mind. His exploits were renowned, and his treasure hoard was said to be unmatched in its riches. Generations passed, and the legend of Captain Dreadnought faded into obscurity, relegated to the realm of bedtime stories and sailor's yarns. Yet, unbeknownst to many, the captain's legacy endured through his descendants, safeguarding the secrets of his fabled treasure.

Two years ago, a curious letter arrived, stamped with the seal of Captain Sigma Dreadnought the Merciless, a distant relative. Inside, he unveiled tantalizing tales of a hidden island, where the secrets of his treasure awaited discovery. Accompanying the letter was a weathered map, its edges worn with age, promising adventures and riches beyond imagination. Alongside these treasures, Sigma bestowed upon you a golden pirate medallion.

Fuelled by curiosity and the promise of untold wealth, you embarked on a journey to unravel the mysteries of Captain Dreadnought's legacy. However, your years of research since receiving the letter have yielded only paintings depicting Sigma's formidable crew, and his vast treasure.

If you are reading this, then fate has deemed it time for you to step into the legacy of our family's past, a legacy filled with adventure, danger, and treasures beyond measure. I, your distant great uncle, Captain Sigma Dreadnought the Merciless, write to you from the depths of the Caribbean, where the waves whisper tales of our exploits and the winds carry the secrets of our adventures.

As a humble merchant, you may have only heard whispers of my name, perhaps seen the brushstrokes of my likeness in dusty taverns, or heard the songs sung by drunken sailors of the dreaded Dreadnought and his crew. But now, it is time for you to truly know the legacy you inherit.

Hidden within the folds of this letter lies the key to unlocking a treasure beyond your wildest imagination, a treasure that has been guarded by our family for generations. Venture forth to the coordinates marked upon the enclosed map. Sail to the western reaches until you find the cove marked with the skull and bones, a testament to our fearsome reputation.

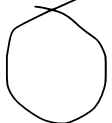
But heed my words, for the path to the treasure is fraught with peril. My crew and I, in our quest to safeguard our bounty, booby-trapped the island with mines and sorcery beyond the realm of mortal comprehension. Yet fear not, for amidst the dangers lies a single safe path, a path marked by the unique tattoos adorning the skin of my loyal crew.

Each member of my crew was entrusted with a specific coordinate, known only to them. They etched their positions upon their flesh with ink and needle, a map in the form of artistry. Furthermore, each crew member provided me with a unique clue, a testament to their loyalty and cunning, revealing their positions along the safe path.

As for me, Sigma Dreadnought the Merciless, I hold the all the crews clues, the key to deciphering the intricate web of hints and riddles left by my crew. Clues that I now pass on to you. Together, these clues will guide you along the treacherous journey, leading you to the lair where the treasure awaits.

May the winds be ever at your back, and the stars light your path.

With kindest regards,



Captain Sigma Dreadnought the Merciless



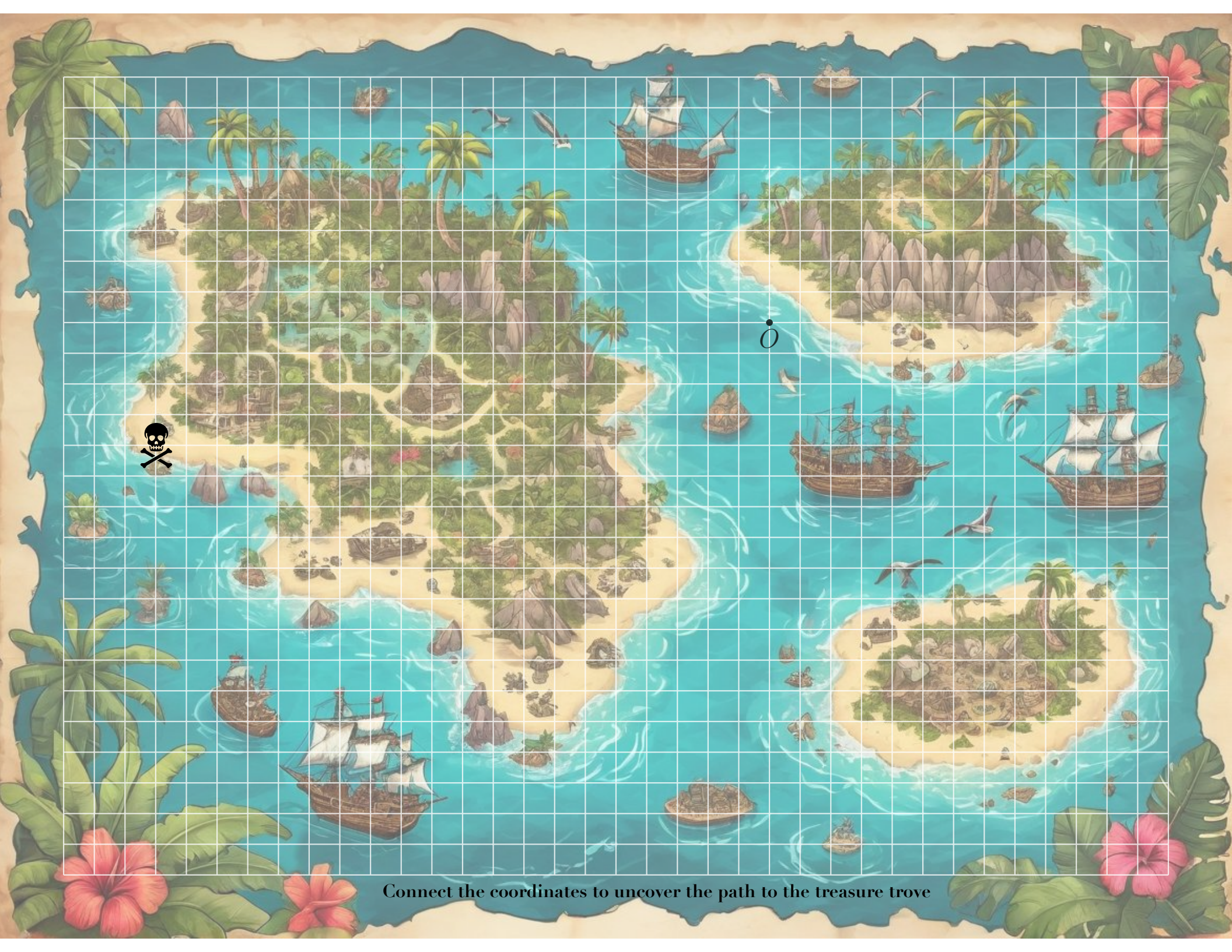
Pirate	$x$	$y$	Notes
Carlos Trigonomi			
Davy Decimaro			
Blackbeard Binario			
Anne Algorithmaria			
Catalyn Calcosair			
Parabola "Pete" Peterson			
Gerry Geomar "Gibbs"			
Radian "Rad" Rackham			
Prime Pearson			

### The Lost Coordinates of Sigma's Crew

Order	1	2	3	4	5	6	7	8	9
$x$	-17	-2	2	10	1	-4	-10	-8	-12
$y$	?	?	?	?	?	?	?	?	?



Start at  and Connect Each Pirate's Coordinate **In Order**



Connect the coordinates to uncover the path to the treasure trove













◆  
 $\sigma$

$\psi$

$y = -\frac{1}{3}(x-12)^2 - 13$

$y = (x+20)(x-20) + 4$   
🌿





## CARLOS TRIGONOMI

Carlos Trigonomi, affectionately known as “Cactus Carlos” among the crew, serves as the ship’s botanist aboard Captain Bloqueado’s vessel. Hailing from the lush jungles of the Caribbean, Carlos’s affinity for plants traces back to his childhood, where he spent his days exploring the untamed wilderness and unraveling the mysteries of nature. With a background steeped in botanical knowledge, Carlos brings a unique skill set to the crew, capable of identifying rare flora and fauna that dot the landscape on their journey. On the path to the treasure lair, Carlos’s x-coordinate holds a cryptic clue: “An odd number, and only 2 positive divisors.” This mathematical riddle serves as a testament to Carlos’s intellect and analytical prowess, challenging the crew to unravel its meaning and unlock the secrets it holds. As the crew’s resident botanist and mathematician, Carlos is determined to solve the puzzle and guide them towards the coveted prize that awaits at journey’s end.

## DAVY DECIMARO

Davy Decimaro, known as “Red Bandana Davy” among the crew, is a mysterious figure aboard Captain Bloqueado’s ship, distinguished by his enigmatic demeanor and unwavering loyalty to the captain’s cause. Born into the tumultuous world of piracy, Davy’s origins remain shrouded in secrecy, with whispers of his past echoing through the corridors of the ship. His stoic presence, accentuated by the ever-present blood-red bandana that adorns his head, sets him apart from his fellow crewmates and strikes fear into the hearts of their enemies. Whether navigating treacherous waters or engaging in fierce battles against rival pirates, Davy’s unwavering resolve and steadfast determination inspire trust and admiration among his comrades. On the path to the treasure lair, Davy’s x-coordinate holds a clue: “the biggest number.” This mysterious riddle serves as a challenge for the crew to decipher, hinting at the magnitude of the task that lies ahead. As they embark on their perilous journey, guided by Davy’s steady hand and unwavering resolve, they remain determined to unlock the secrets of the clue and claim the ultimate prize that awaits them at journey’s end.



## BLACKBEARD BINARIO

Blackbeard Binario “Bellamy” is a seasoned member of Captain Bloqueado’s crew, renowned for his fearless demeanor and unwavering loyalty to the captain’s cause. Originating from the bustling ports of the Caribbean, Bellamy’s background is veiled in secrecy, with whispers of daring escapades echoing through the taverns of coastal towns. His imposing presence, marked by a rugged countenance etched with tales of maritime conquests, instills both respect and apprehension among his fellow crewmates. Adorned with a compass tattoo Bellamy carries a constant reminder of the crew’s mission—a directive never to lose sight of their ultimate goal under Captain Bloqueado’s command. His  $x$ -position on the path to the lair holds a unique trait: “It possesses exactly four positive divisors.” This mathematical peculiarity underscores Bellamy’s role as a vital navigator within the crew, ensuring they remain steadfast on their course despite the tempestuous seas and looming threats that await them on their journey under Captain Bloqueado’s leadership.

## ANNE ALGORITHMARA

Anne Algorithmara, also known as “Stargazer Anne,” is a revered astronomer and navigator aboard Captain Bloqueado’s ship, revered for her keen intellect and unwavering determination in the face of adversity. Born under the starlit skies of the Caribbean, Anne’s fascination with the cosmos began at an early age, as she spent countless nights mapping constellations and unraveling the mysteries of the universe. Her striking appearance is marked by a series of intricate star tattoos, each one a reminder of the celestial wonders that captivate her imagination.

As the crew’s resident astronomer, Anne plays a pivotal role in guiding their journey through the treacherous seas, using her knowledge of the stars to chart their course with pinpoint accuracy. With a steady hand and unwavering focus, she navigates by the light of distant galaxies, ensuring that the crew stays on course despite the challenges that lie ahead.

On the path to the treasure lair, Anne’s x-coordinate holds a cryptic clue:

“It possesses four positive divisors and is a perfect cube”.

## CATALYN CALCOSAIR

Catalyn Calcosair is a fiery and spirited member aboard Captain Bloqueado's ship. With her vibrant red hair flowing like flames in the wind, Catalyn cuts a striking figure on the deck of the vessel. Born and raised amidst the chaos of pirate life, Catalyn's fierce determination and unwavering loyalty to her crewmates have earned her respect and admiration from all who sail alongside her. Despite her youthful appearance, Catalyn possesses a keen intellect and sharp wit, capable of outsmarting even the most cunning of adversaries. Whether wielding a cutlass in battle or navigating through treacherous waters, she approaches every challenge with courage and determination, inspiring those around her to rise to the occasion. On the path to the treasure lair, Catalyn's x-coordinate holds a cryptic clue: "the only number with a single positive divisor."

## PARABOLA “PETE” PETERSON

Parabola “Pete” Peterson, affectionately known as “Pear Pete” among the crew, is a jovial and resourceful member aboard Captain Bloqueado’s ship.

With a penchant for mathematics and a deep-seated fear of scurvy, Pete brings a unique blend of intellect and practicality to the crew. His most distinguishing feature is a tattoo of a ripe fruit, serving as a constant reminder to consume vitamin C and avoid the perils of scurvy during their long voyages at sea.

Despite his lighthearted demeanor, Pete’s expertise in navigation and seamanship is second to none. With a keen eye for detail and a knack for solving complex problems, he plays a crucial role in charting the ship’s course and guiding them safely through treacherous waters.

On the path to the treasure lair, Pete’s x-coordinate holds a cryptic clue: “It possesses three positive divisors.”

## GERRY GEOMAR “GIBBS”

Gerry Geomar, fondly referred to as “Gibbs” by his crewmates, is a seasoned sailor aboard Captain Bloqueado’s ship. With his distinctive bold yellow hat perched atop his head, Gibbs cuts a memorable figure on the deck of the vessel. Born into a life of piracy, Gibbs’ rugged appearance and weather-beaten features tell the tale of countless adventures on the high seas.

Despite his gruff exterior, Gibbs is known for his unwavering loyalty and steadfast commitment to the crew. Whether repairing sails or manning the helm, he approaches every task with a sense of purpose and determination, earning the respect of his fellow sailors in the process.

On the path to the treasure lair, Gibbs’ x-coordinate holds a cryptic clue: “The same as Pearson’s, but positive.” This riddle serves as a challenge for the crew to unravel, hinting at the connection between Gibbs’ position and that of his fellow crewmate, Pearson.

## RADIAN “RAD” RACKHAM

Radian Rackham, known for his wind-swept hair and disdain for hats, stands as a free-spirited navigator aboard Captain Bloqueado's ship. Born to the sea, Radian's love for adventure and the open ocean is matched only by his unwavering loyalty to his crewmates. With his tousled locks billowing in the breeze, he cuts a striking figure on the deck, embodying the spirit of freedom and exploration that defines the life of a pirate. Despite his carefree appearance, Radian possesses a keen intellect and sharp instincts, making him a valuable asset to the crew. Whether steering the ship through treacherous waters or navigating by the stars, his expertise in seamanship is unmatched, guiding the crew safely through even the most perilous of voyages. On the path to the treasure lair, Radian's x-coordinate holds a cryptic clue: “It possesses six positive divisors.”

## PRIME PEARSON

Prime Pearson, the sole clean-shaven member among Captain Bloqueado's crew, stands out with his immaculate appearance and sharp wit. With a face devoid of facial hair, Pearson exudes an air of sophistication and refinement amidst the rugged backdrop of pirate life. Born into a world of chaos and adventure, Pearson's calm demeanor and keen intellect make him a valuable asset to the crew. Despite his polished exterior, Pearson is no stranger to the perils of life at sea. With a keen eye for detail and a knack for strategy, he plays a crucial role in navigating the treacherous waters and outsmarting rival pirates at every turn. Whether plotting their course or negotiating with potential allies, Pearson's leadership and expertise are instrumental in ensuring the crew's success. On the path to the treasure lair, Pearson's x-coordinate holds a cryptic clue: "less than zero and the only even prime number."





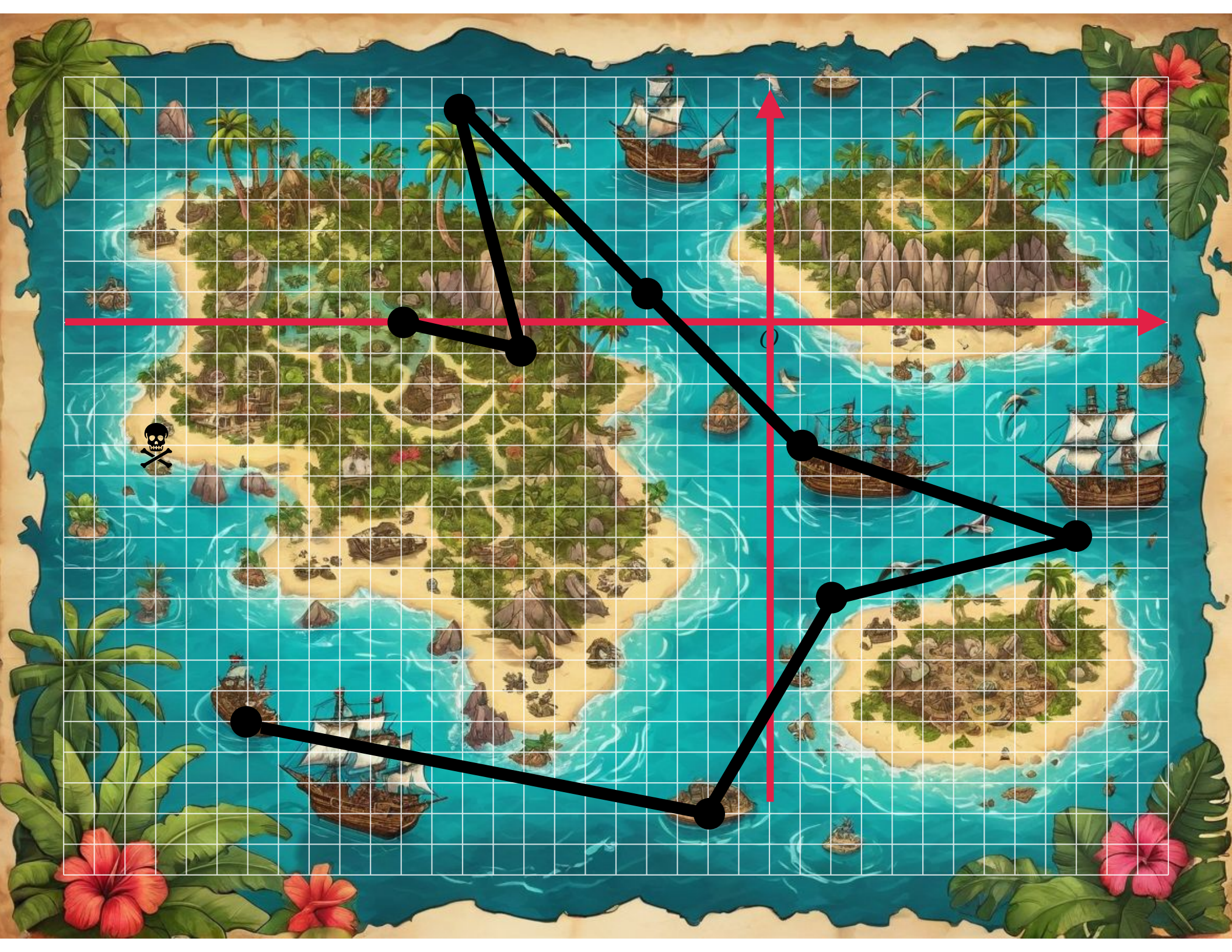


Pirate	$x$	$y$	Notes
Carlos Trigonomi	<b>-17</b>	<b>-13</b>	- Odd number with 2 positive divisors. $y=-(x+20)^2$ - 'Cactus' Carlos (Cactus tattoo)
Davy Decimaro	<b>10</b>	<b>-7</b>	- The biggest number. $y=-(1/4)(x+2)-10$ - Red Bandana (No compass tattoo)
Blackbeard Binario	<b>-10</b>	<b>7</b>	- Exactly 4 positive divisors. $y=-(x+4)+1$ - Compass Tattoo on neck
Anne Algorithmara	<b>-8</b>	<b>-1</b>	- Perfect cube, 4 positive divisors. $y=-4(x+10)+7$ - Star tattoos on cheeks
Catalyn Calcosair	<b>1</b>	<b>-4</b>	- Only number with single factor. $y=-(1/3)(x-10)-7$ - Vibrant red hair (no star tattoo)
Parabola "Pete" Peterson	<b>-4</b>	<b>1</b>	- Three positive divisors. $y=(1/5)(x+4)^2+1$ - Pear tattoo on his arm
Gerry Geomar "Gibbs"	<b>2</b>	<b>-9</b>	- Same as Pearson, but positive. $y=(7/4)(x+2)-16$ - Bold yellow hat
Radian "Rad" Rackham	<b>-12</b>	<b>0</b>	- 6 positive divisors. $y=-(1/4)(x+12)$ - No hat or bandana
Prime Pearson	<b>-2</b>	<b>-16</b>	- Less than zero, even prime number. $y=-(1/5)(x+17)-13$ - No facial hair

Order	1	2	3	4	5	6	7	8	9
$x$	-17	-2	2	10	1	-4	-10	-8	-12
$y$	?	?	?	?	?	?	?	?	?

Start at  and Connect Each Pirate's Coordinate **In Order**







## PART 2 INSTRUCTIONS

The goal of the second part of the locked room experience is for students to correctly identify the value of each of the symbols (stones) and then using the values solve the logic puzzle. The students must match the stone symbols with pirate tattoos from part one (the paintings will be required).

- **Description:** Describes the story. I recommend printing one large copy for everyone participating.
- **Answer Sheet:** This is what students must submit to complete part II of the locked out experience. There is also a scannable QR code if students don't finish in class and want to take home. You can also use [this link](#).
- **Cave Entrance:** Shows the symbols painted at the cave entrance, students will need to match pirates (from part I) to gems (via colour). Note that students will need to use all the paintings from part I to solve part II. The gems are depicted in one of the paintings and the values of symbols correspond with number of gems for each type.
- **Solutions:** This shows all of the correct symbol values, and the solved logic puzzle.

## SIGMA'S TREASURE TROVE: PART II

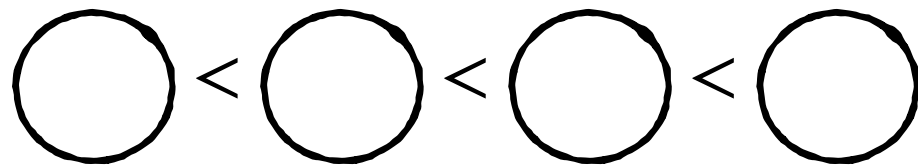
Following the secret path outlined on the map provided by Captain Dreadnought, you arrive at the entrance of a cave hidden from the prying eyes of the world. Towering before you stands a formidable stone door, its surface adorned with enigmatic markings that seem to pulsate with ancient energy. Smooth stones, each bearing cryptic symbols, are scattered at the base of the door, hinting at a puzzle waiting to be solved. As you approach, a sense of anticipation courses through your veins, mingling with the thrill of discovery and the promise of adventure that lies beyond.



Place the Stones to  
open the door!

Pirate	Stone Symbol	Value

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>



Final SUM

Exactly one of each stone/  
symbol in each row/column



Sum The Painted  
Slots







A dark, textured rock surface, possibly a piece of slate or a cave wall, with several lines of handwritten text in different colors. The text is slanted and appears to be written with markers or paint. The background is a mottled grey and black rock.

Anne painted Sapphires

Rad painted Emeralds

Kurt painted the Diamonds

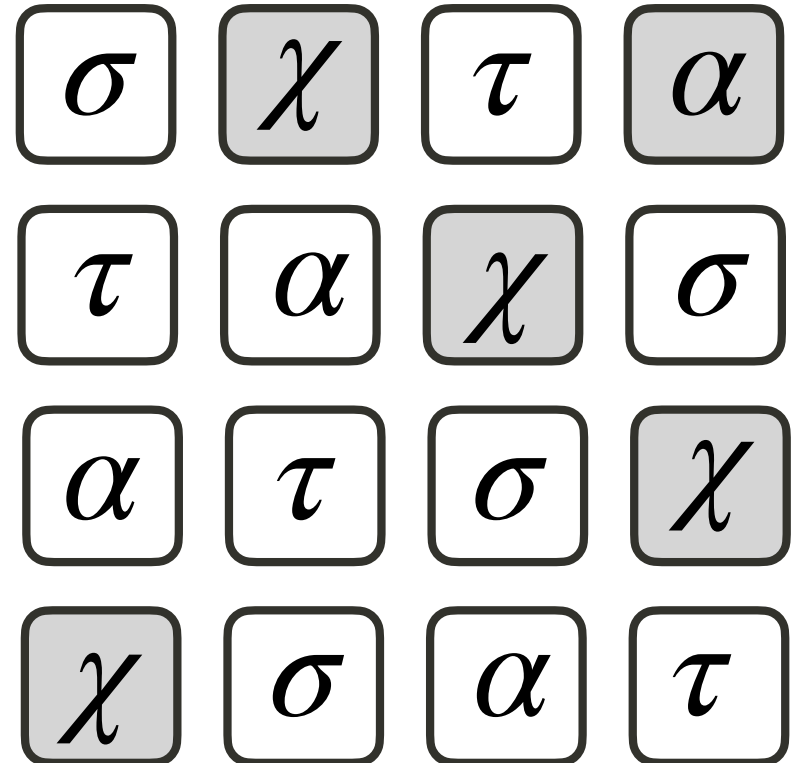
Pete painted Rubies

Each pirate has corresponding  
matching symbol tattoo

Pirate	Stone Symbol	Value
Anne	$\chi$	20
Kurt	$\sigma$	12
Rad	$\tau$	10
Pete	$\alpha$	8

$$\alpha < \tau < \sigma < \chi$$

Place the Stones to  
open the door!



Final SUM

$$4(20) + 8 = 88$$

## PART 3 INSTRUCTIONS

The goal of the second part of the locked room experience is for students to correctly draw the pirate flag using the matching symbols from **the medallion given in part one**. After drawing the flag they must find the area of the flag which is the ‘code’ to access the treasure trove. Part 3 can take a long time and requires detail orientation. I recommend students a maximum of an hour to draw the flag, and have students find the area for homework.

- **Description:** Describes the story. I recommend printing one large copy for everyone participating. Note that the story implies time pressure (water flooding the cave).
- **Answer Sheet:** This is what students must submit to complete part III of the locked out experience. It is composed of the flag (grid), and code (three digits at the bottom). There is also a scannable QR code that students can use if they don’t finish and would like to take home. You may also use [this link](#).
- **Cave Medallion Markings:** This contains correct/incorrect matching parts of the medallion that students must identify in order to draw the flag. It also contains the Rhexbus style puzzle that tells them the code is the area of the flag.
- **Cave Flag Markings:** Students must use the correct markings to fill in the proper flag. I recommend printing 2/4 of these to a tabloid page to save on paper (or present digitally as a pdf using this link).
- **Solutions:** This shows the correct filled in area for the flag as well as the calculated area.

### SIGMA'S TREASURE TROVE: PART III

With a deep rumble, the stone door grinds open, revealing a passage into the heart of the cave. As you step forward, your eyes trace the peculiar painted markings adorning the walls. Progressing deeper into the cavern, you eventually reach a sturdy wooden door, its surface adorned with three turnable wooden dials, each etched with the digits 0-9.

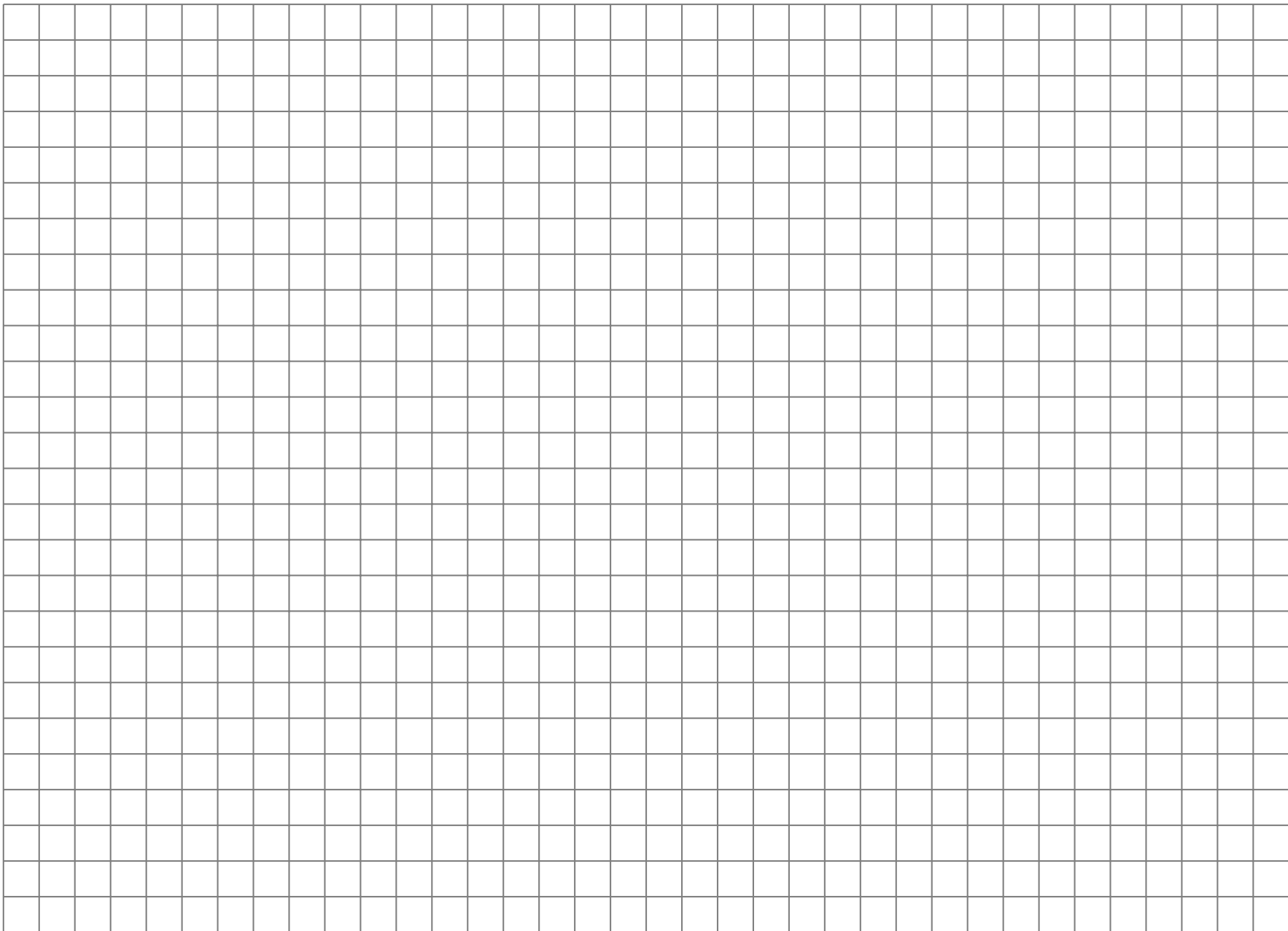
Adjacent to the door stands a shrine, upon which rests a blank piece of parchment. As you approach. As you approach the shrine the air grows heavy with a palpable energy, and an ominous, magical voice resonates throughout the cavern, sending shivers down your spine. "Present my flag to survive," it whispers, a command laden with mystery and intrigue.

With cautious hands, you reach for the flag resting atop the shrine. The moment your fingers brush against the fabric, a deafening crash echoes behind you-the cave entrance slams shut, sealing you within.

A deep, guttural groan rumbles from the walls as water begins seeping through the cracks in the stone, pooling at your feet and rising at an alarming rate. Panic threatens to set in. It looks like you're going to have to present the flag to stop the water from drowning you.

Draw the **correct** flag to stop the flow of water

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36



Enter the 3 number code on the dials to enter the treasure trove:



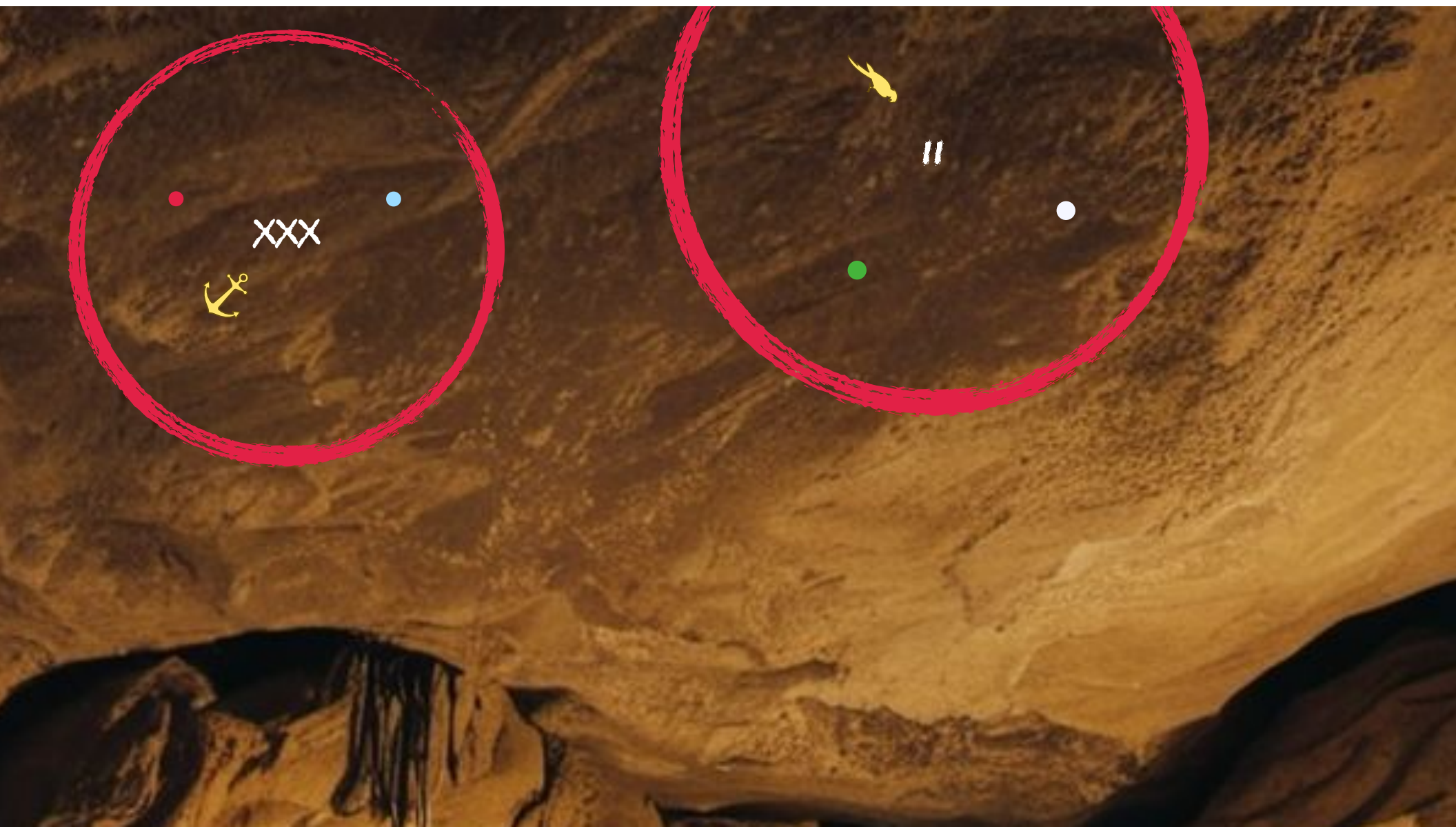




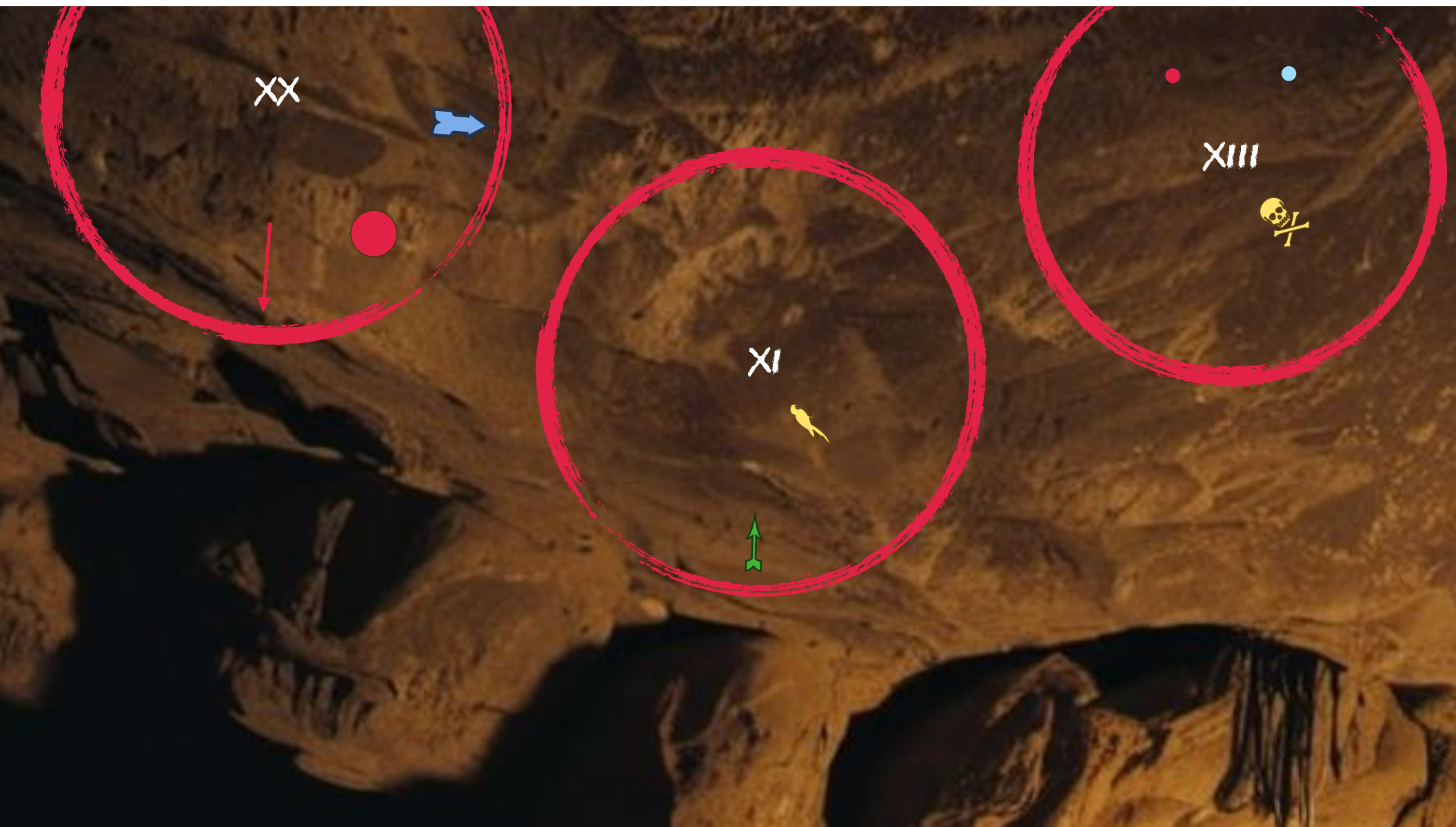








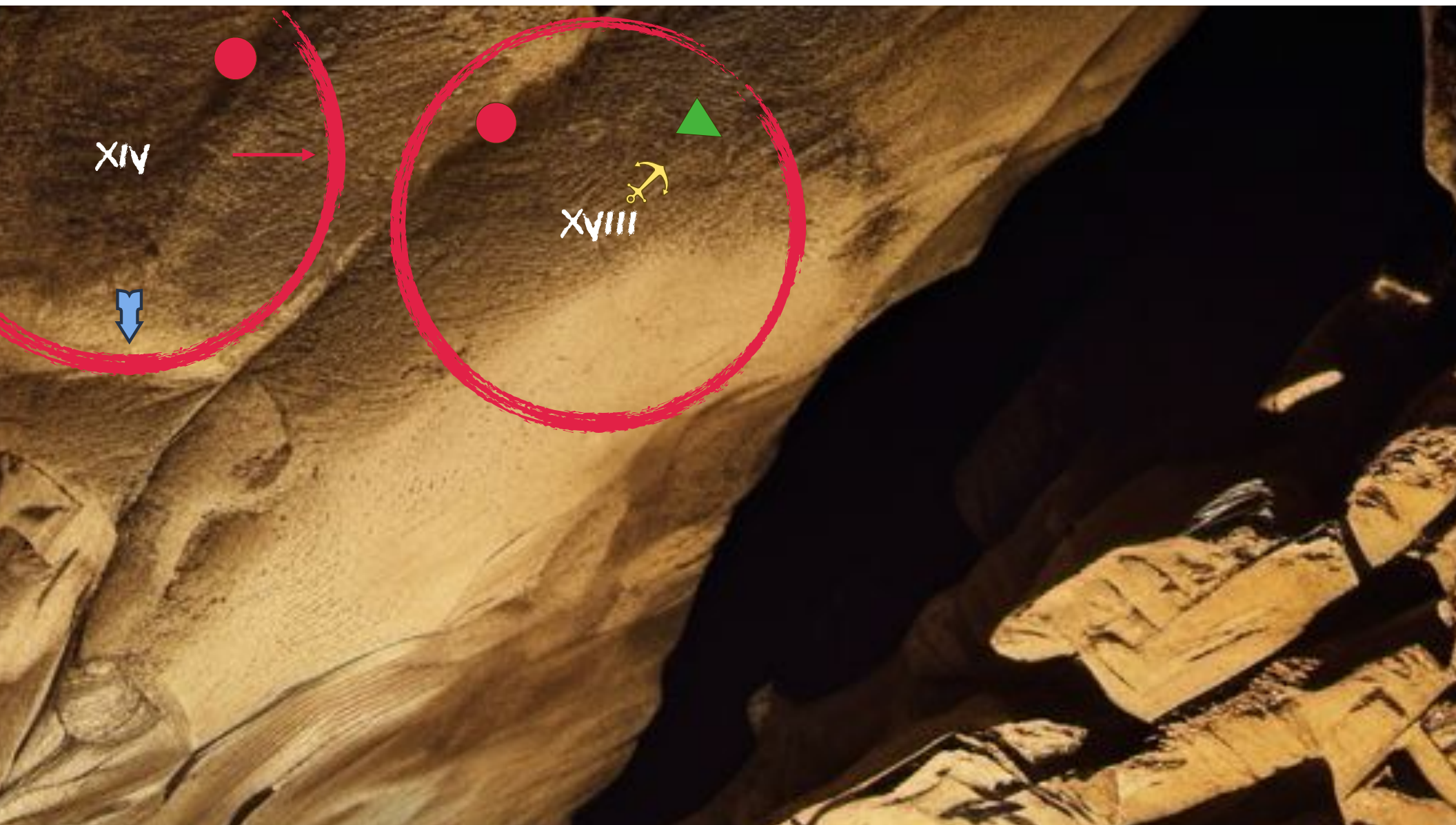






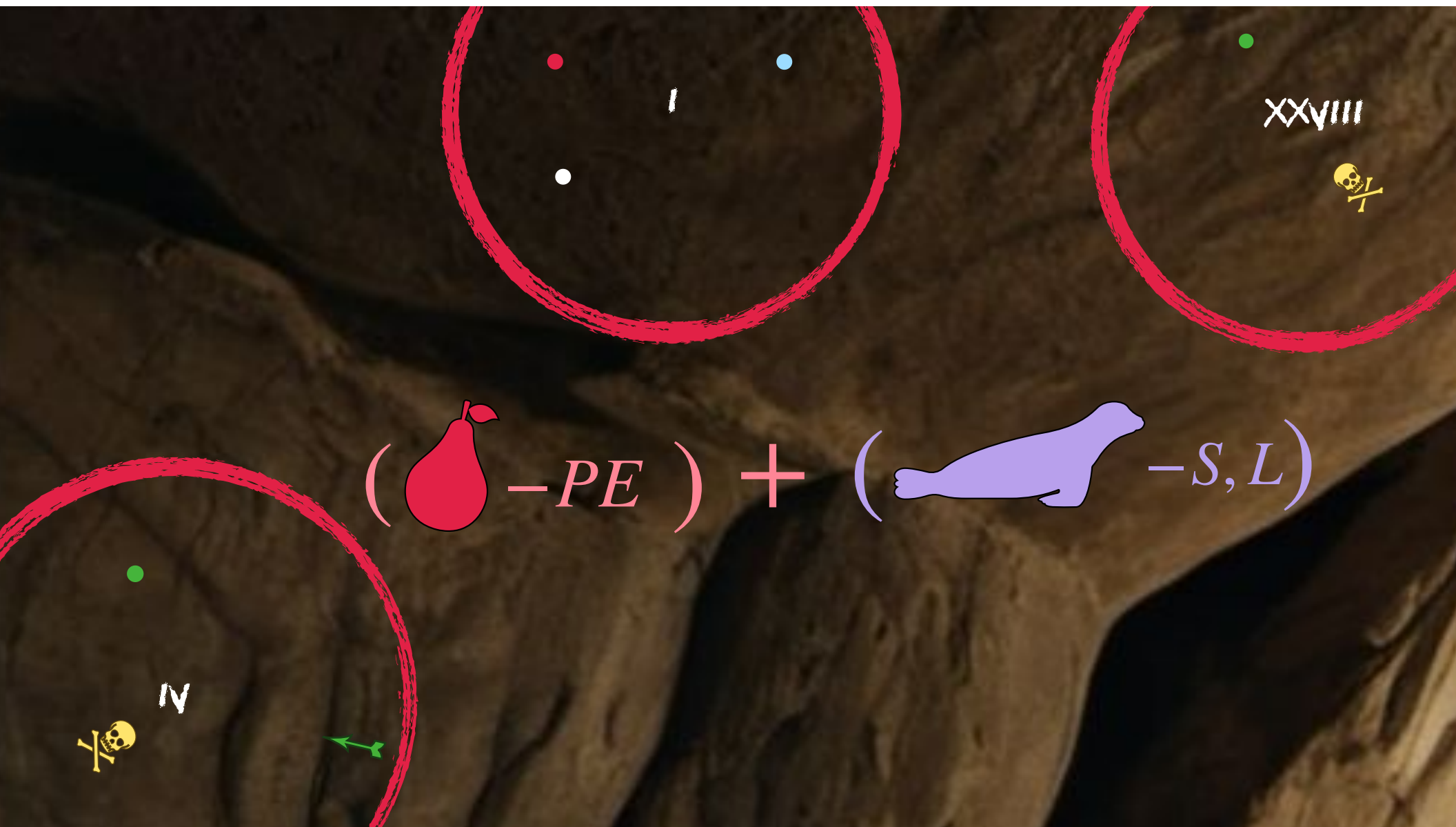






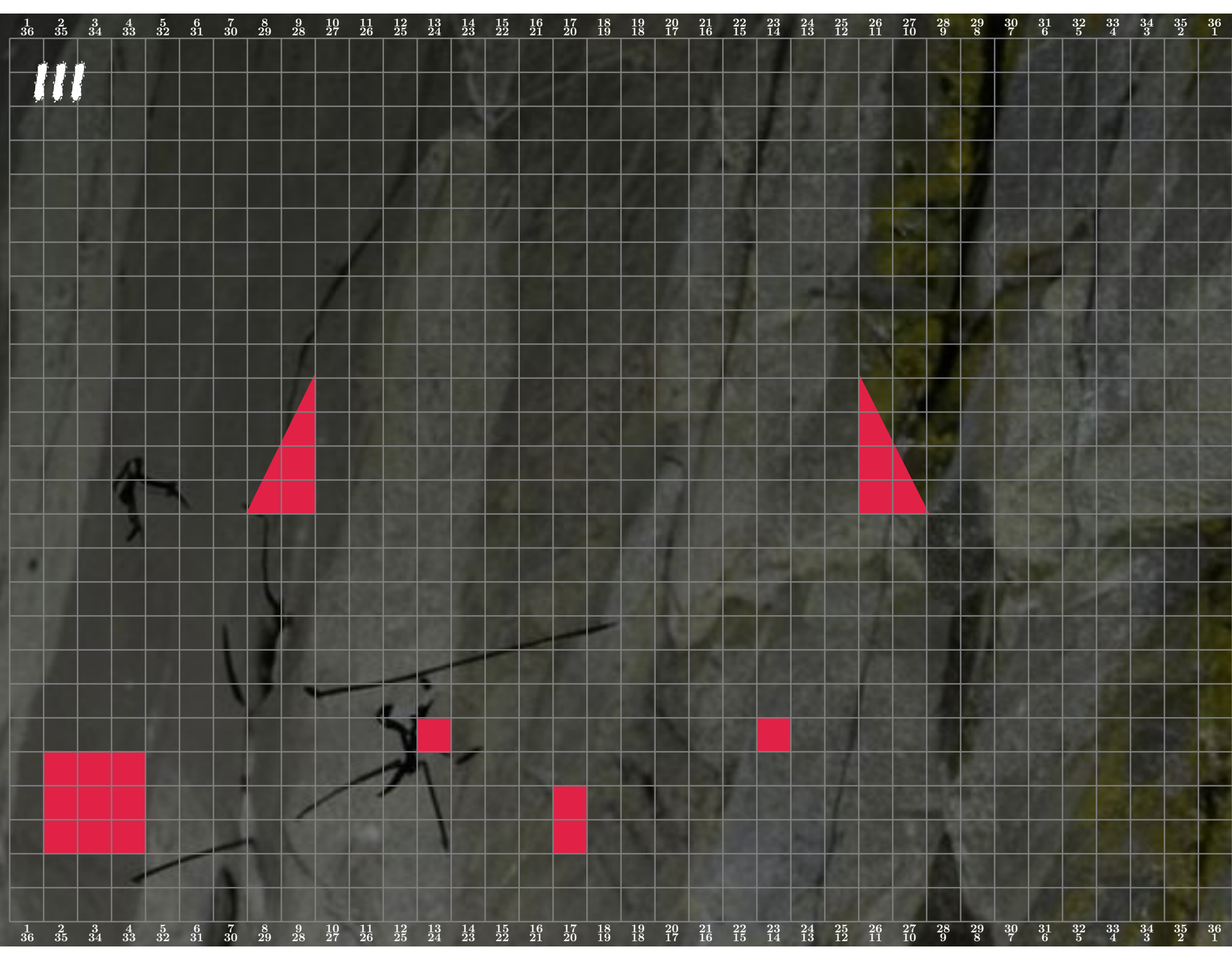




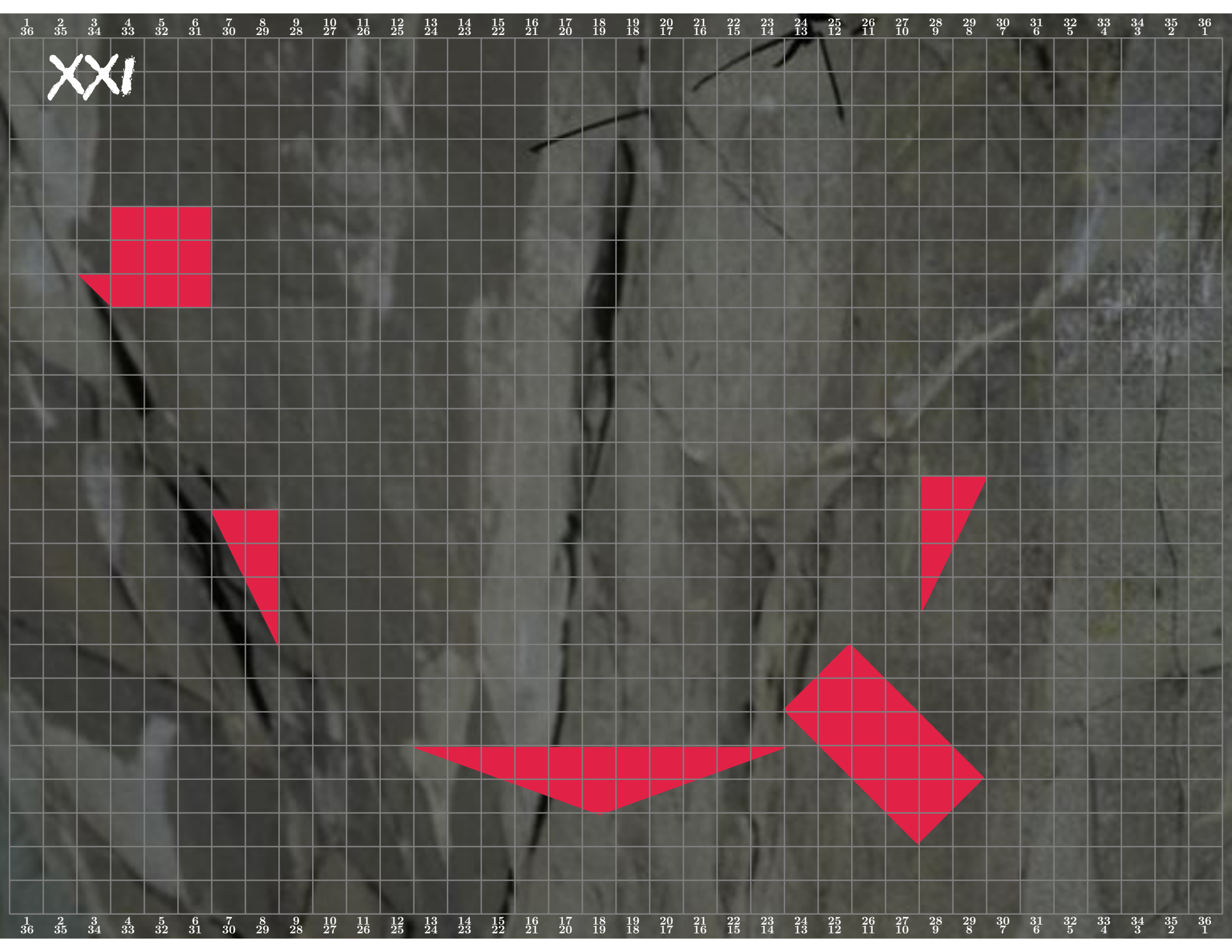


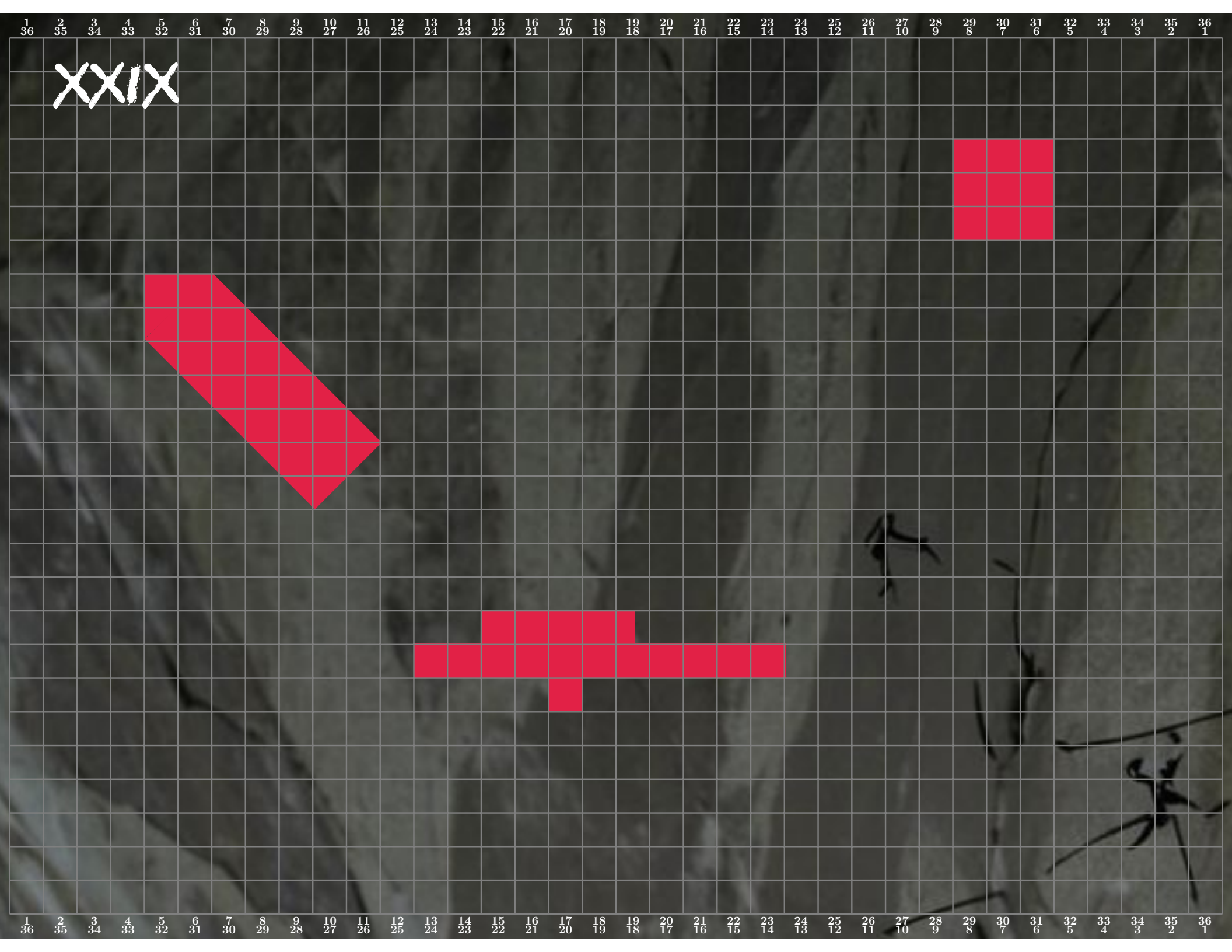
$$\left( \text{🍐} - PE \right) + \left( \text{🦦} - S, L \right)$$



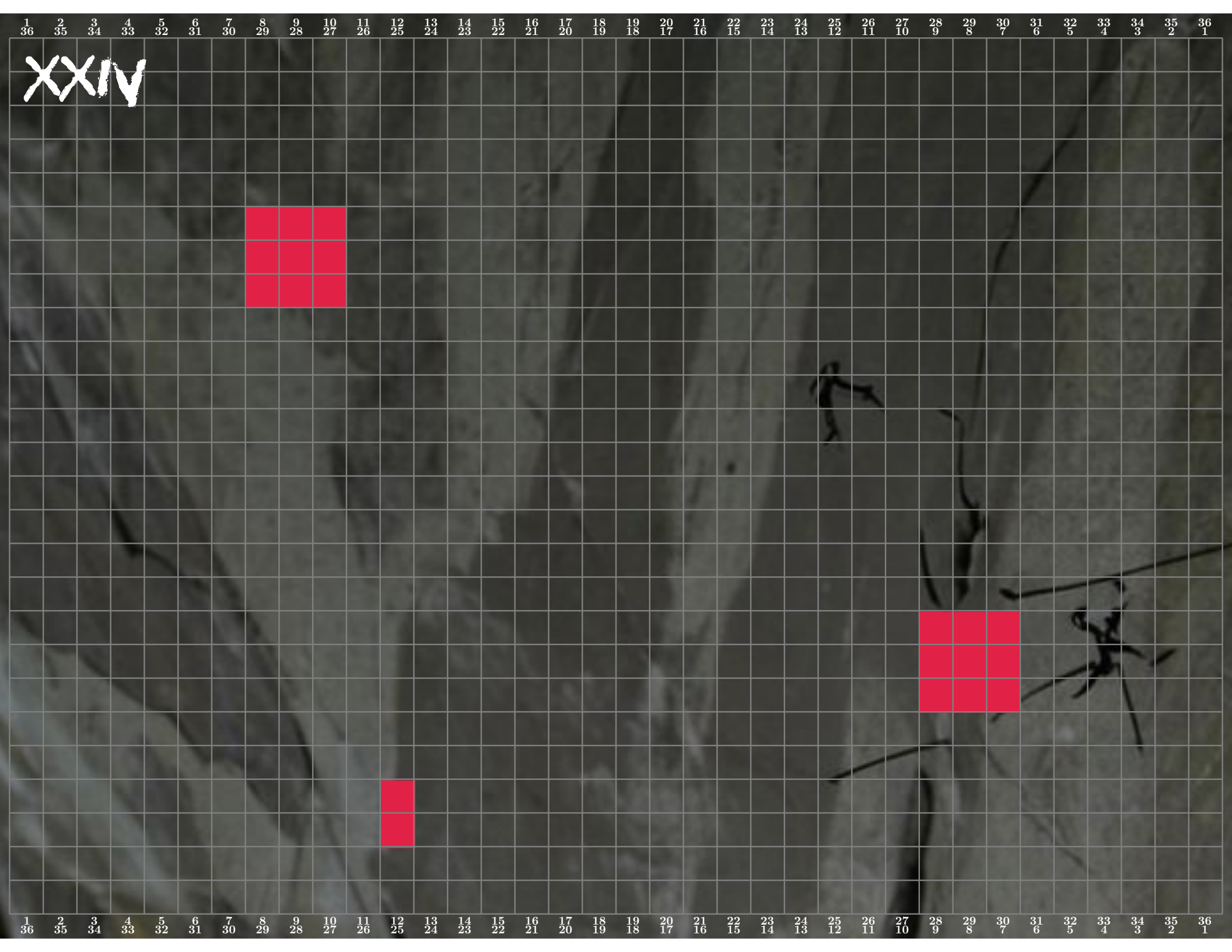




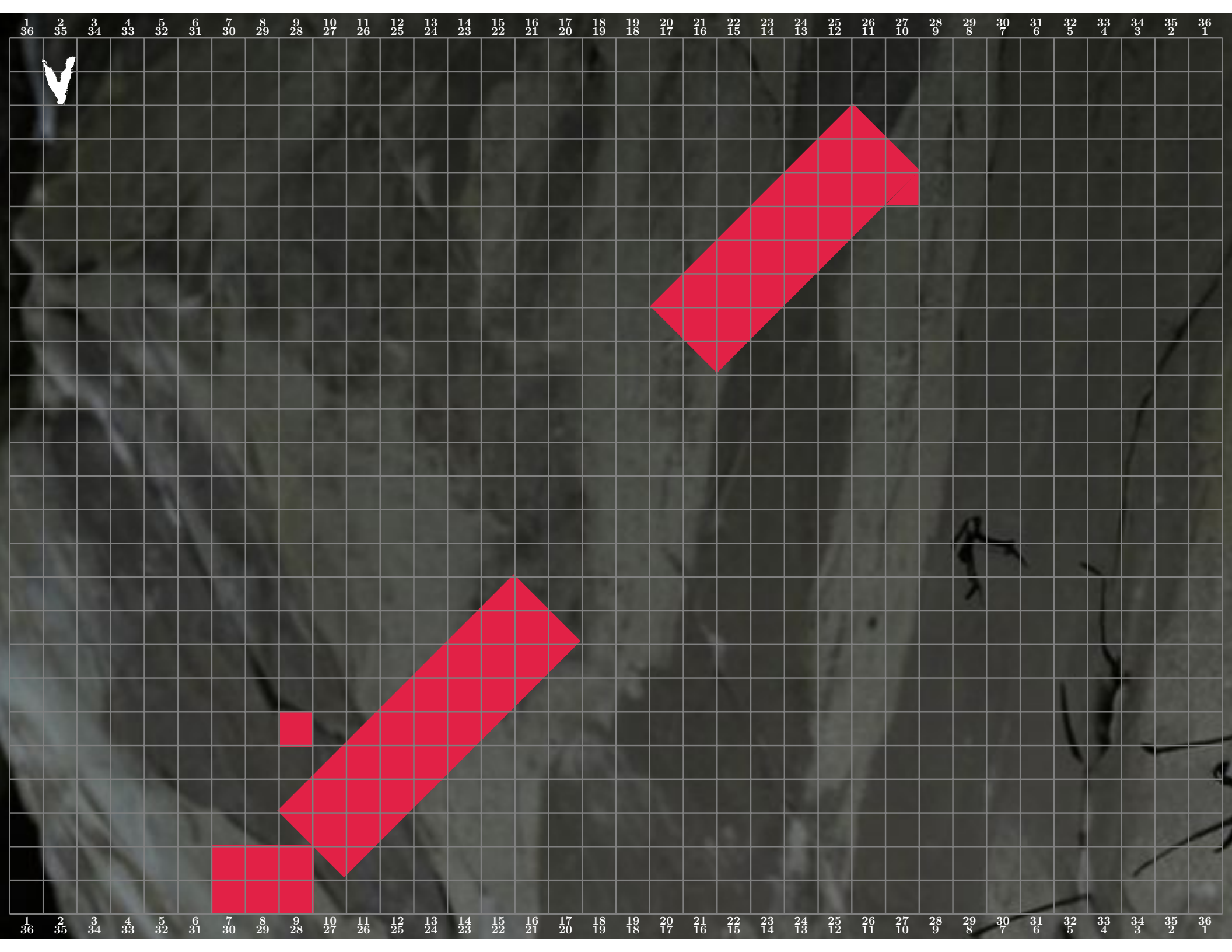


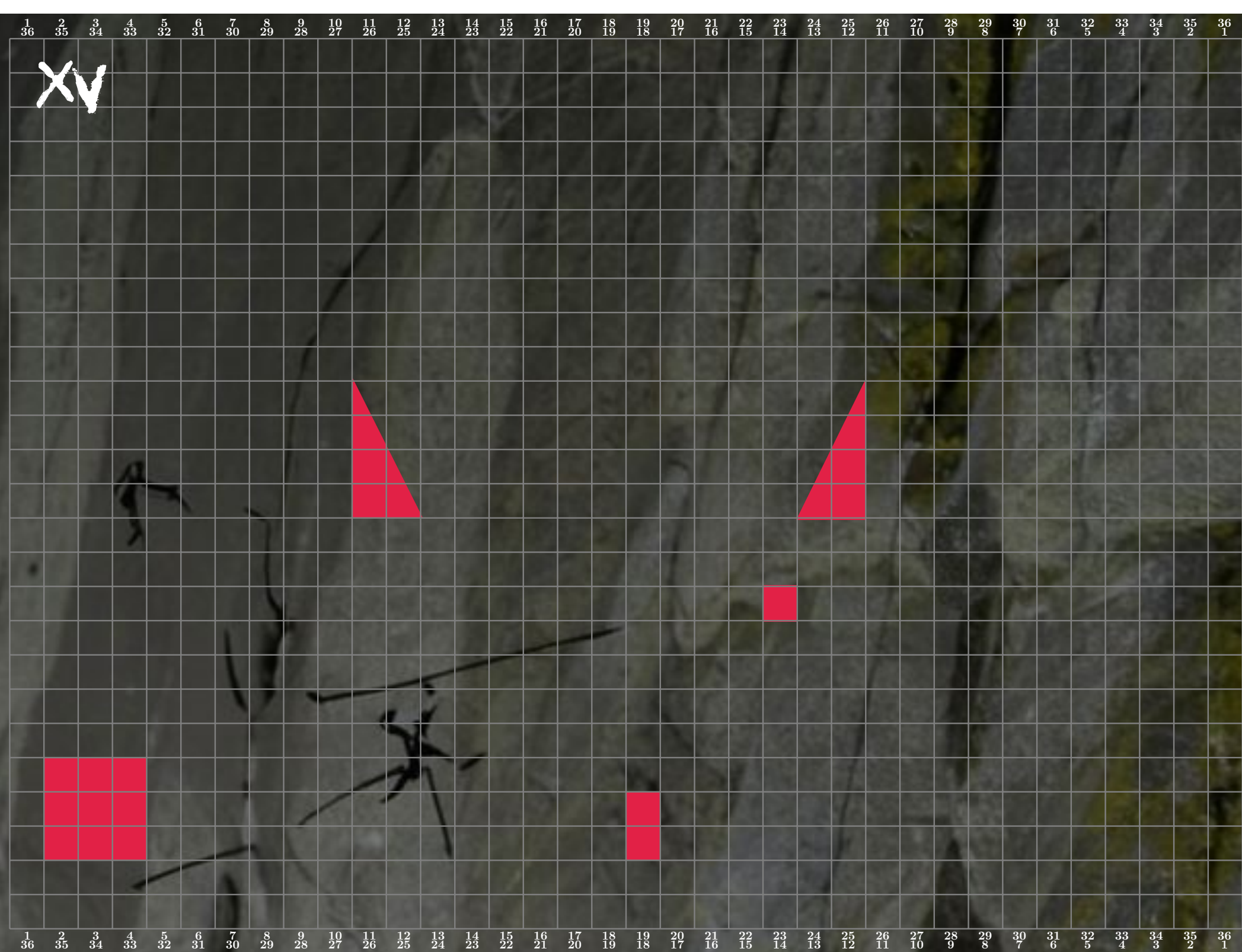


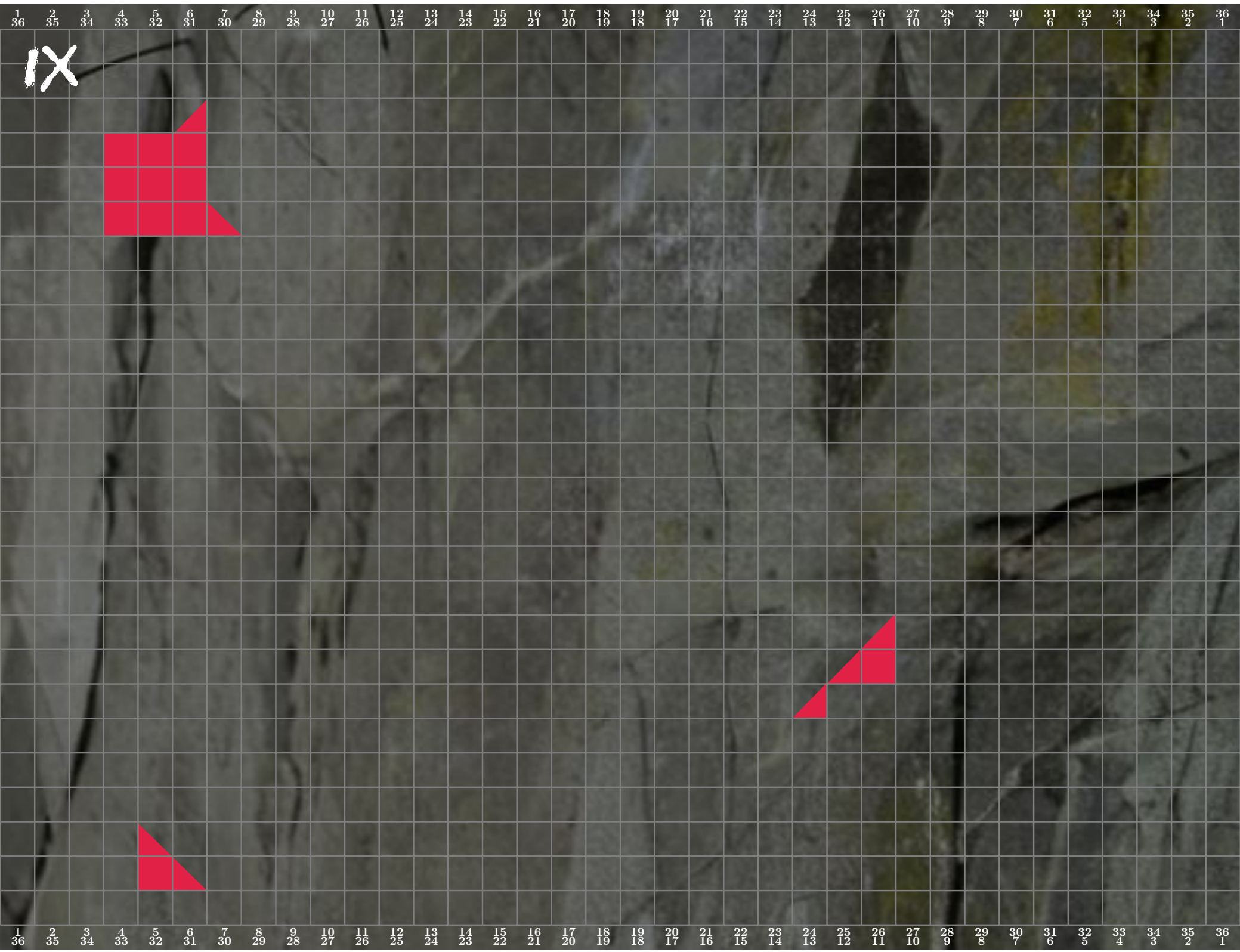






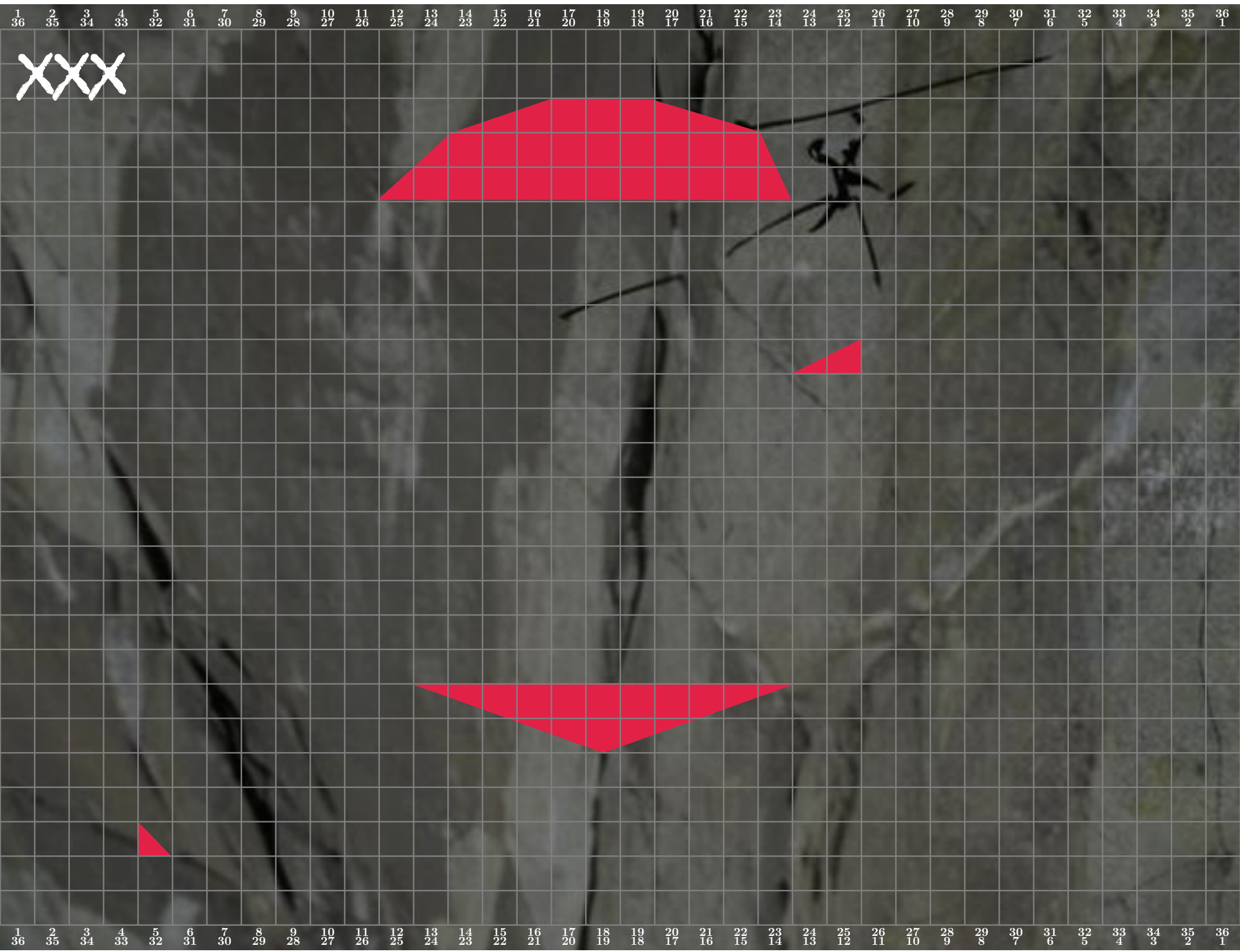


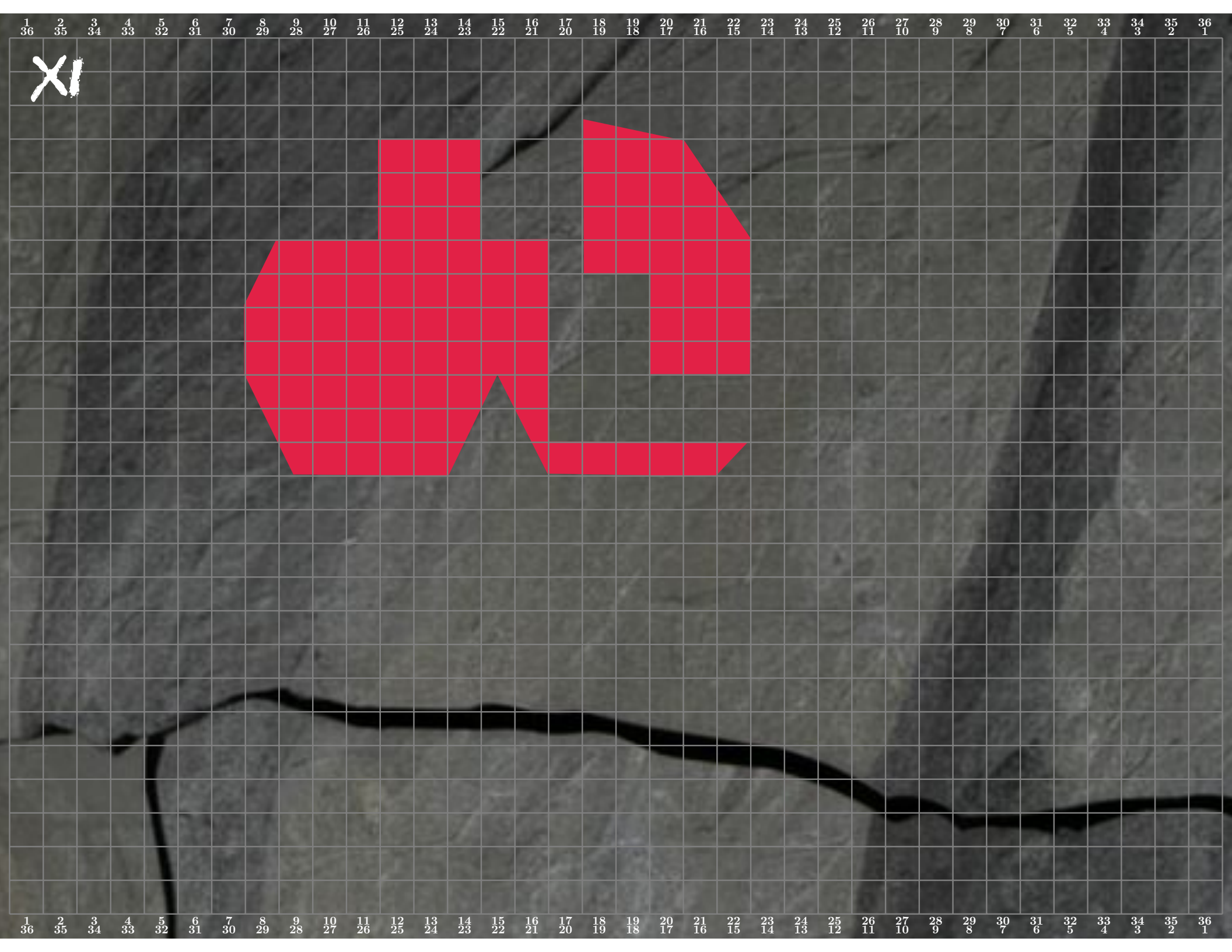






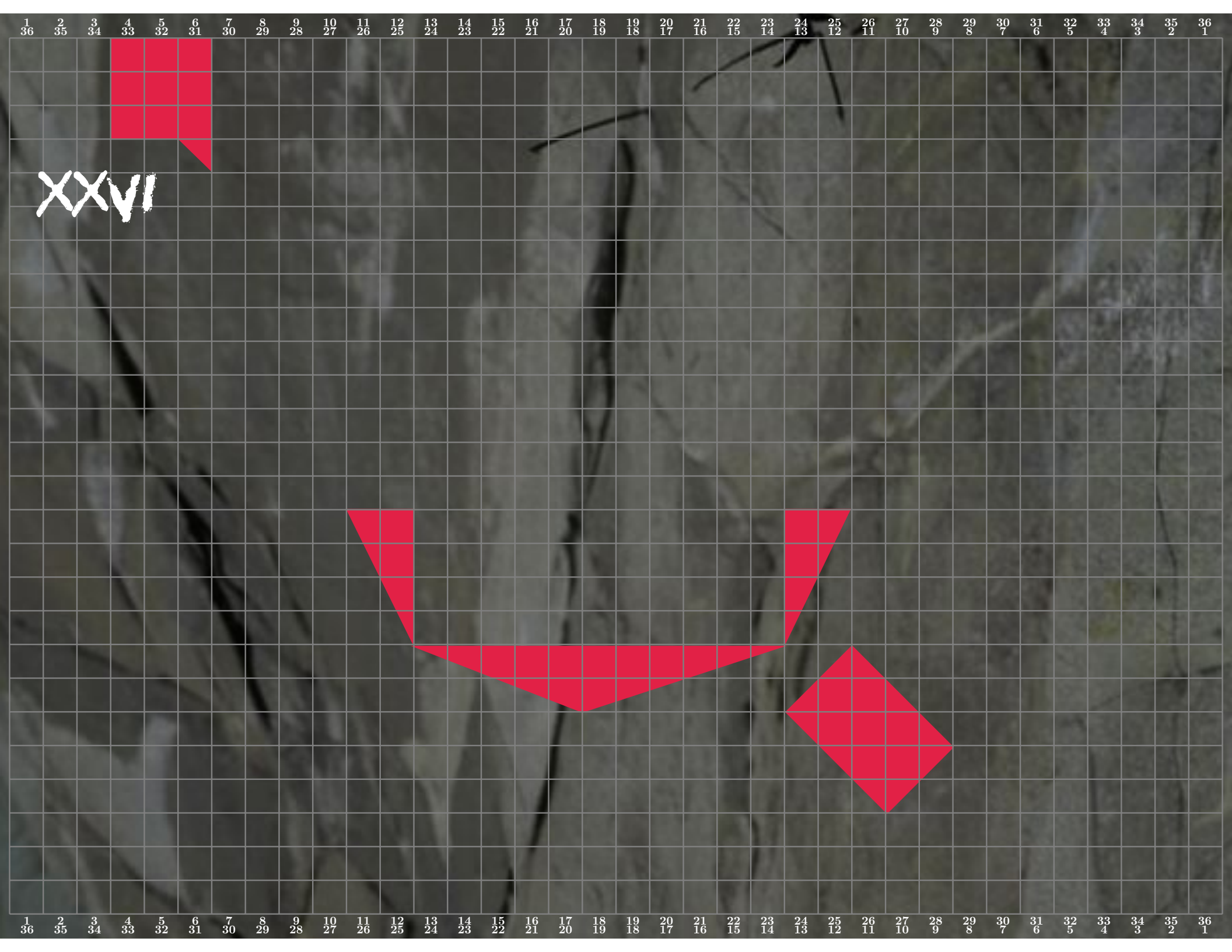


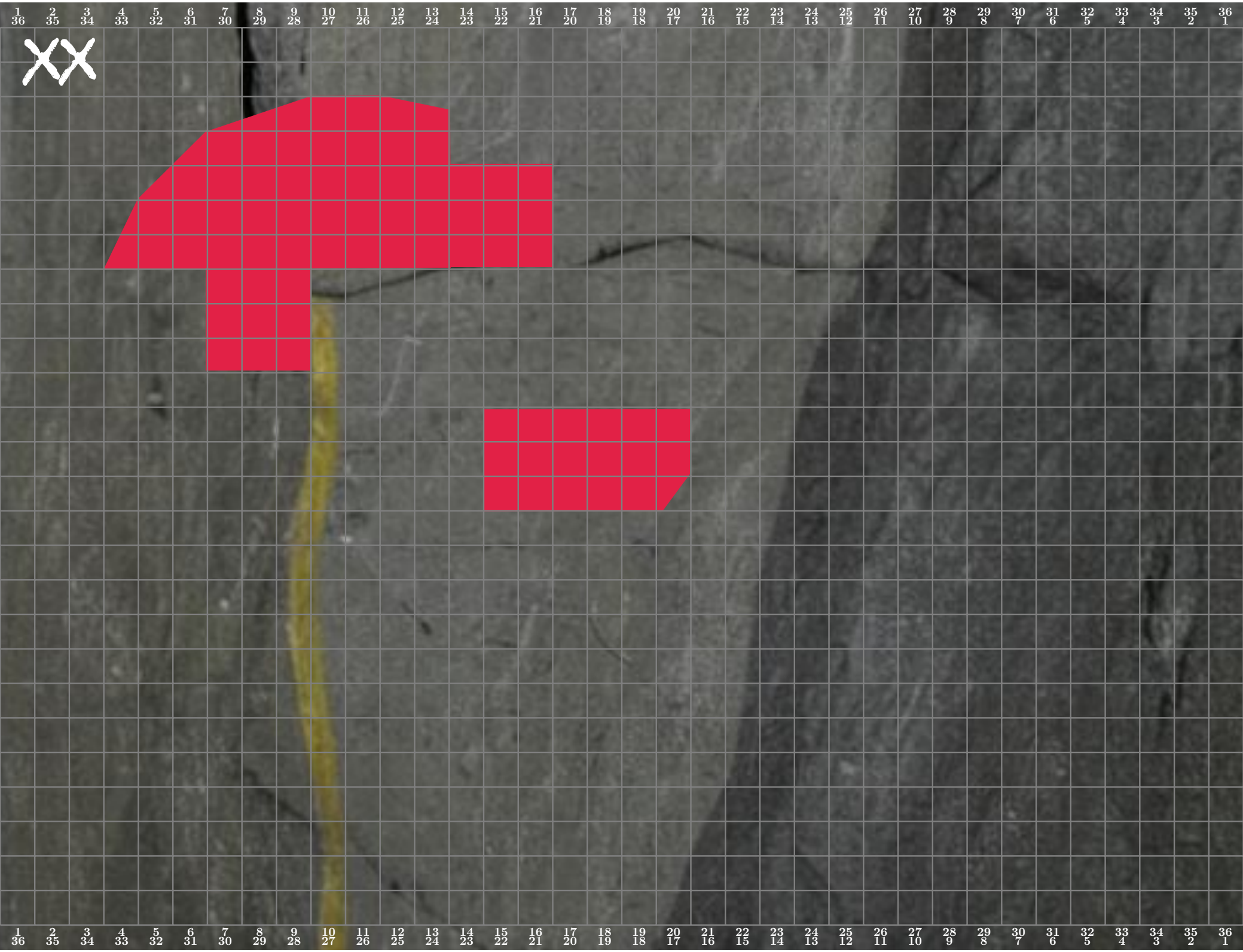


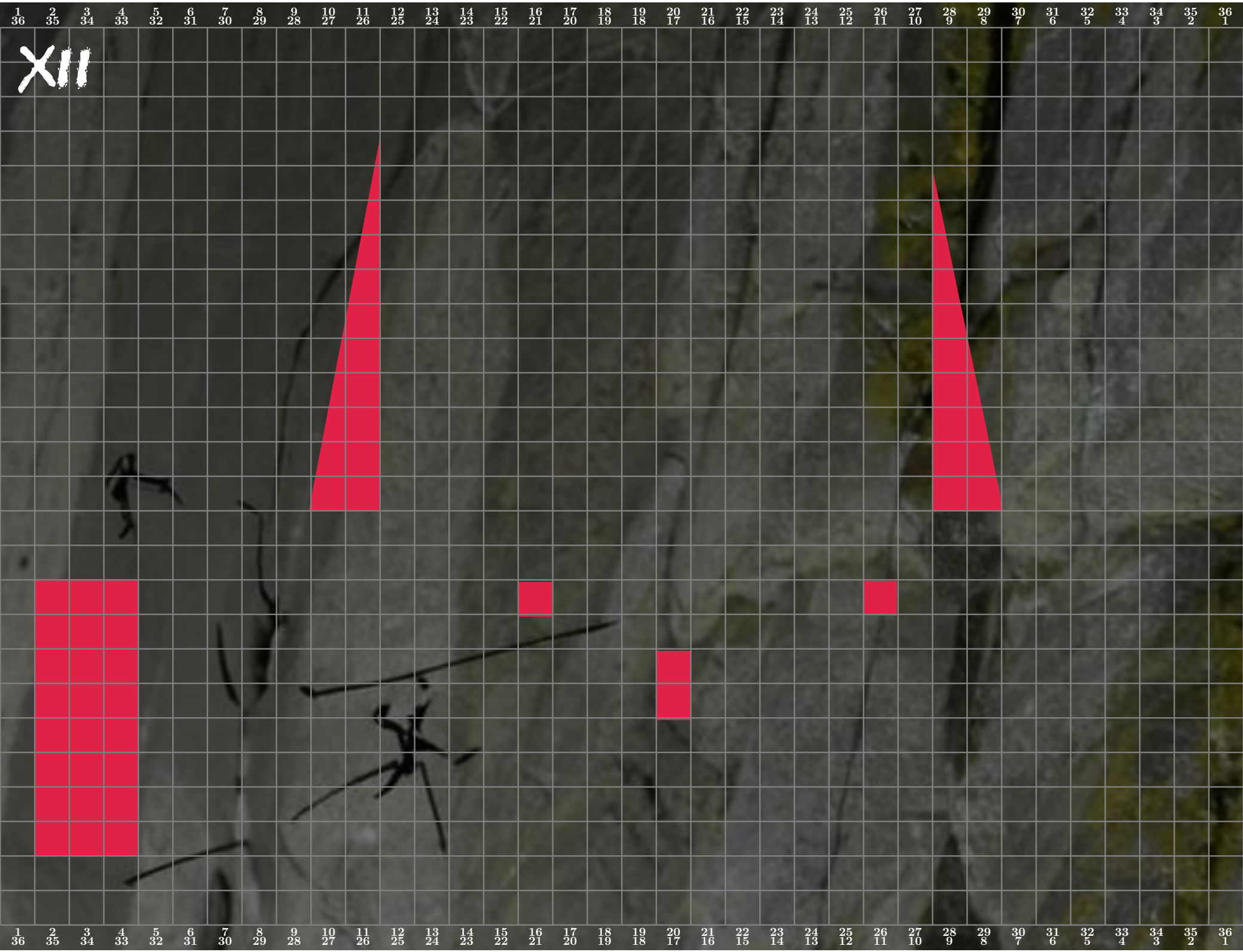


XI

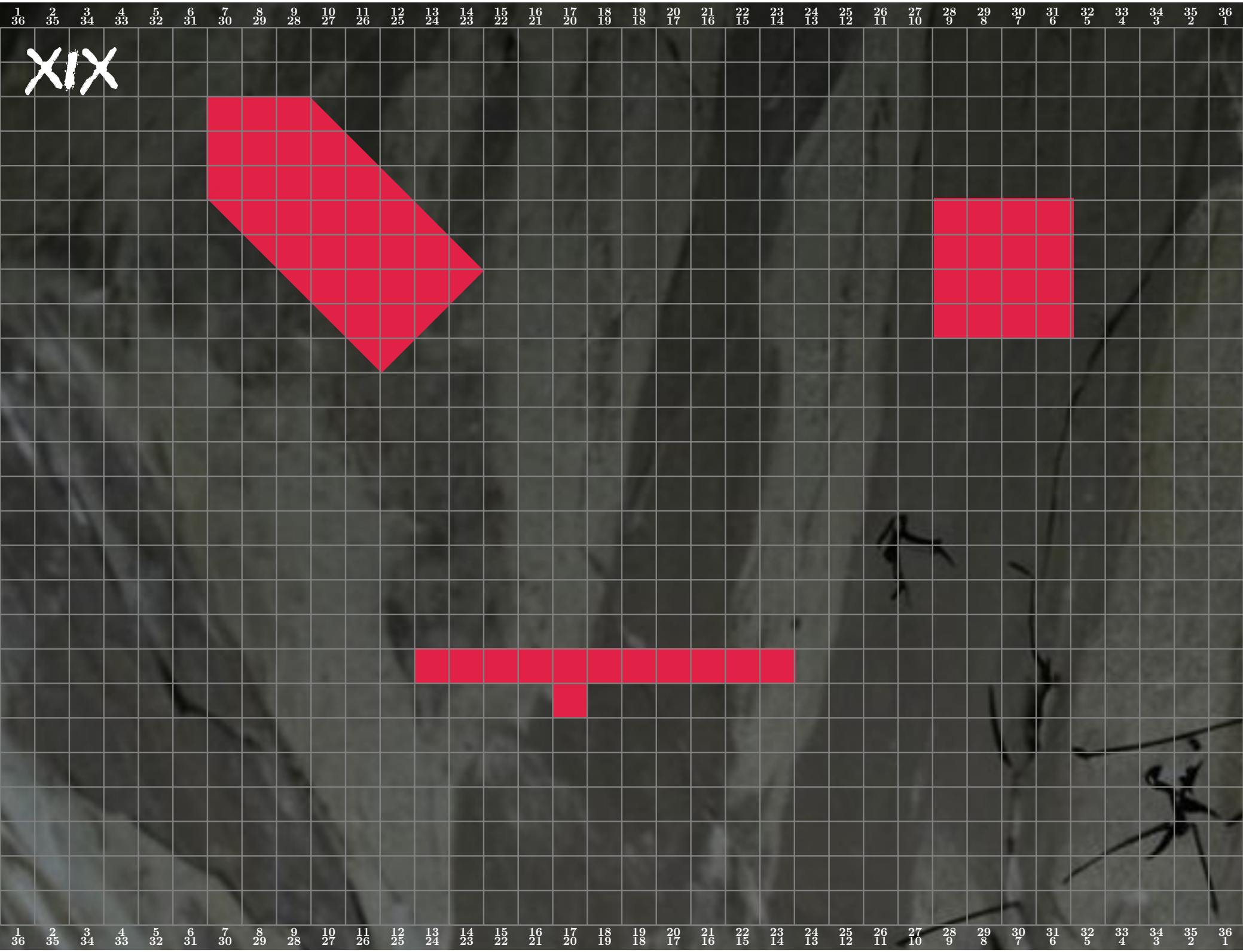


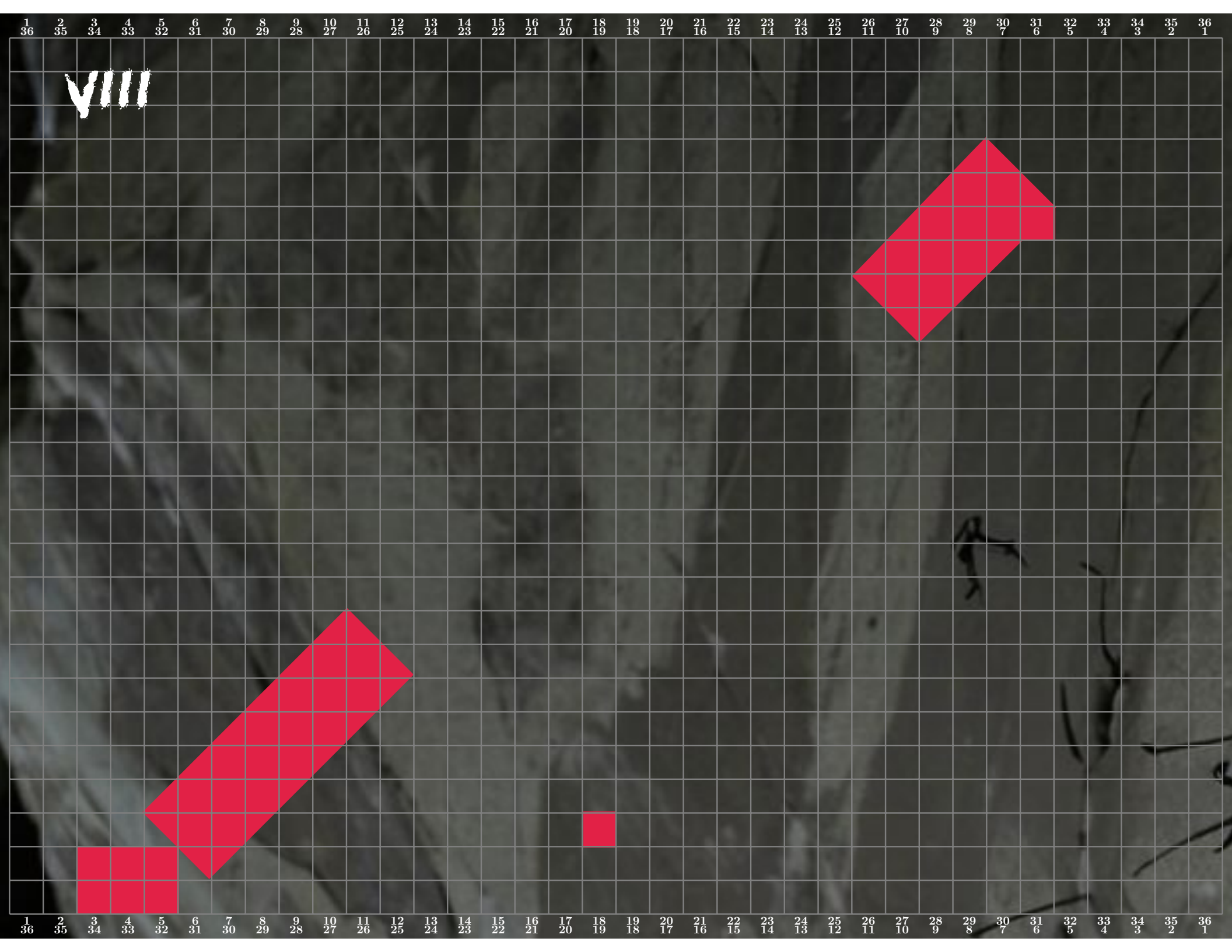


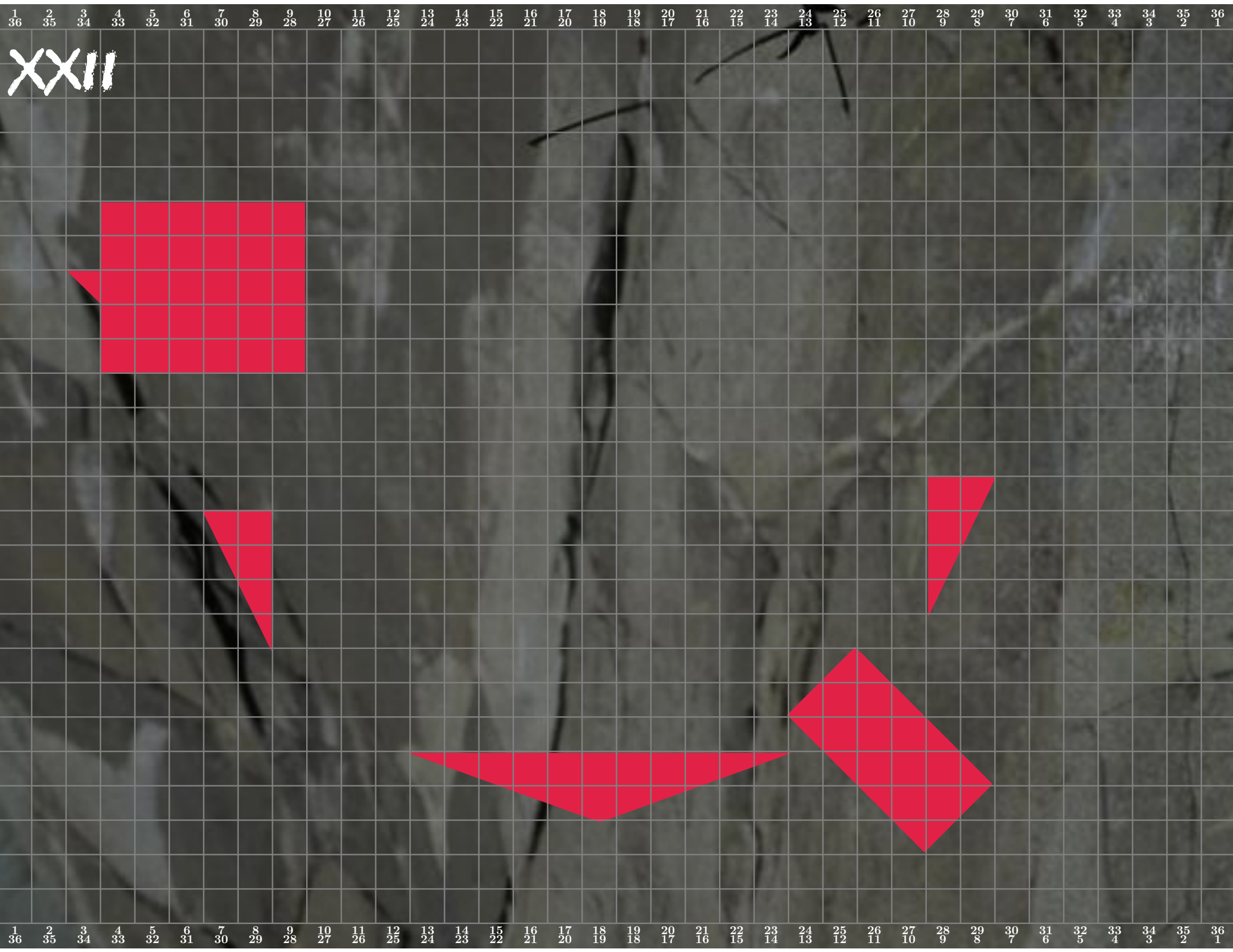




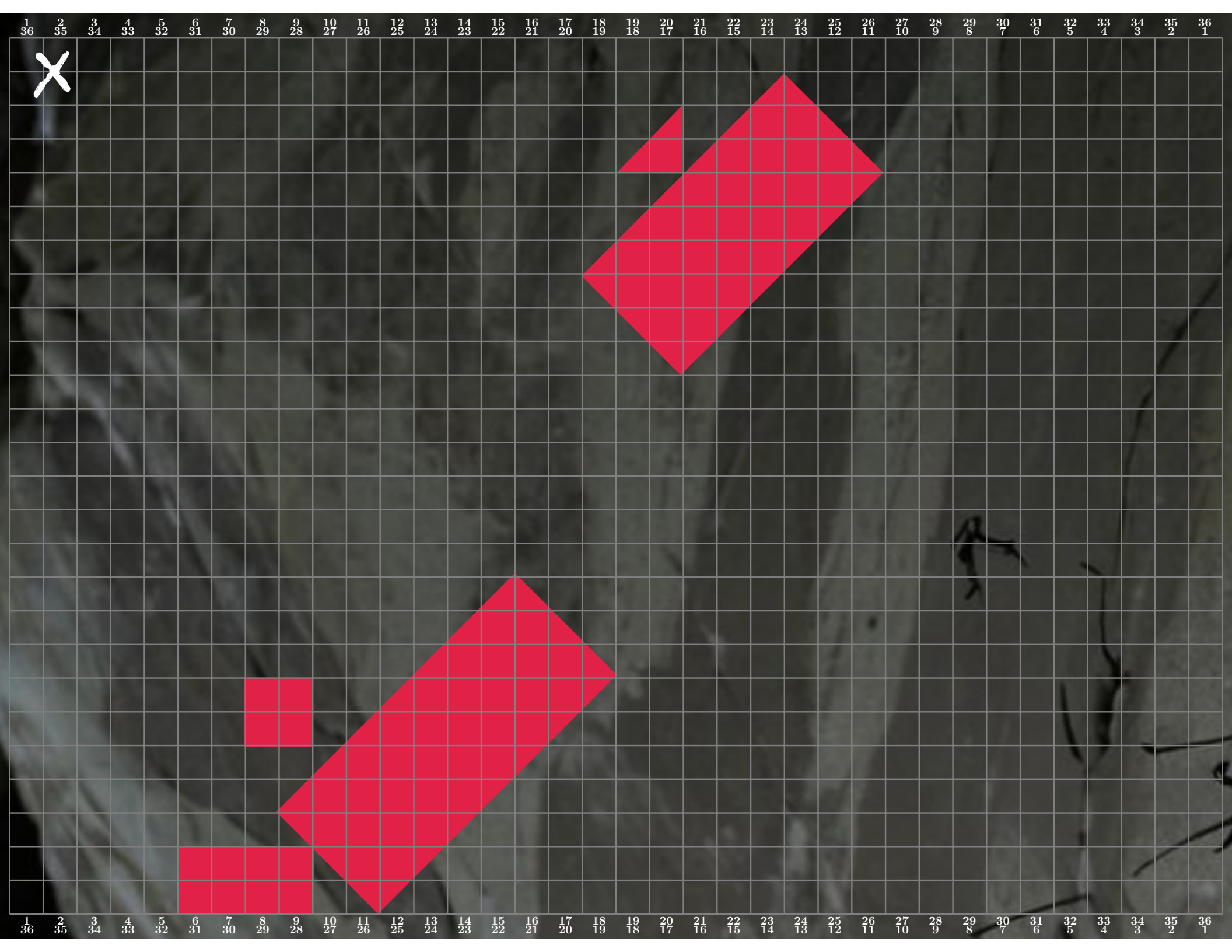


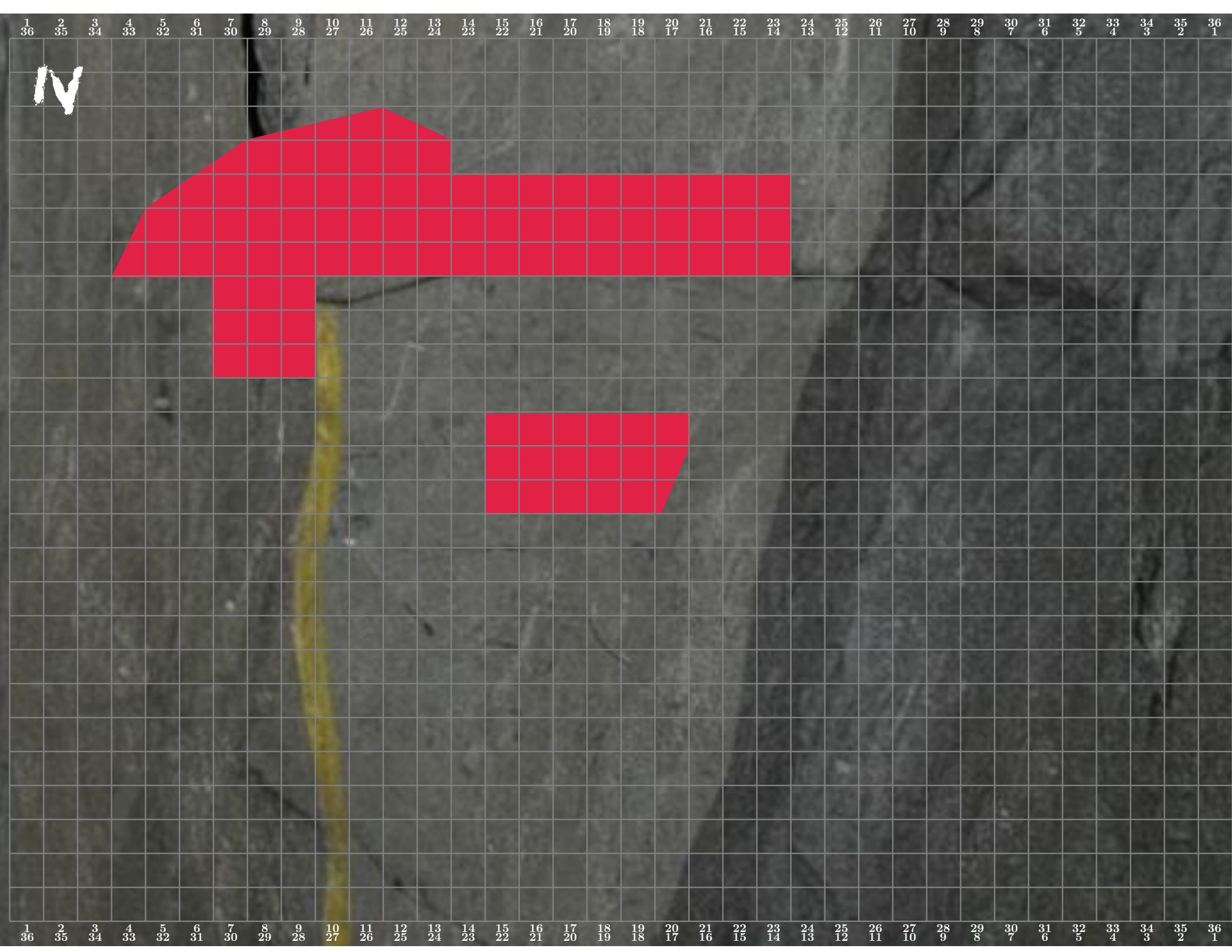






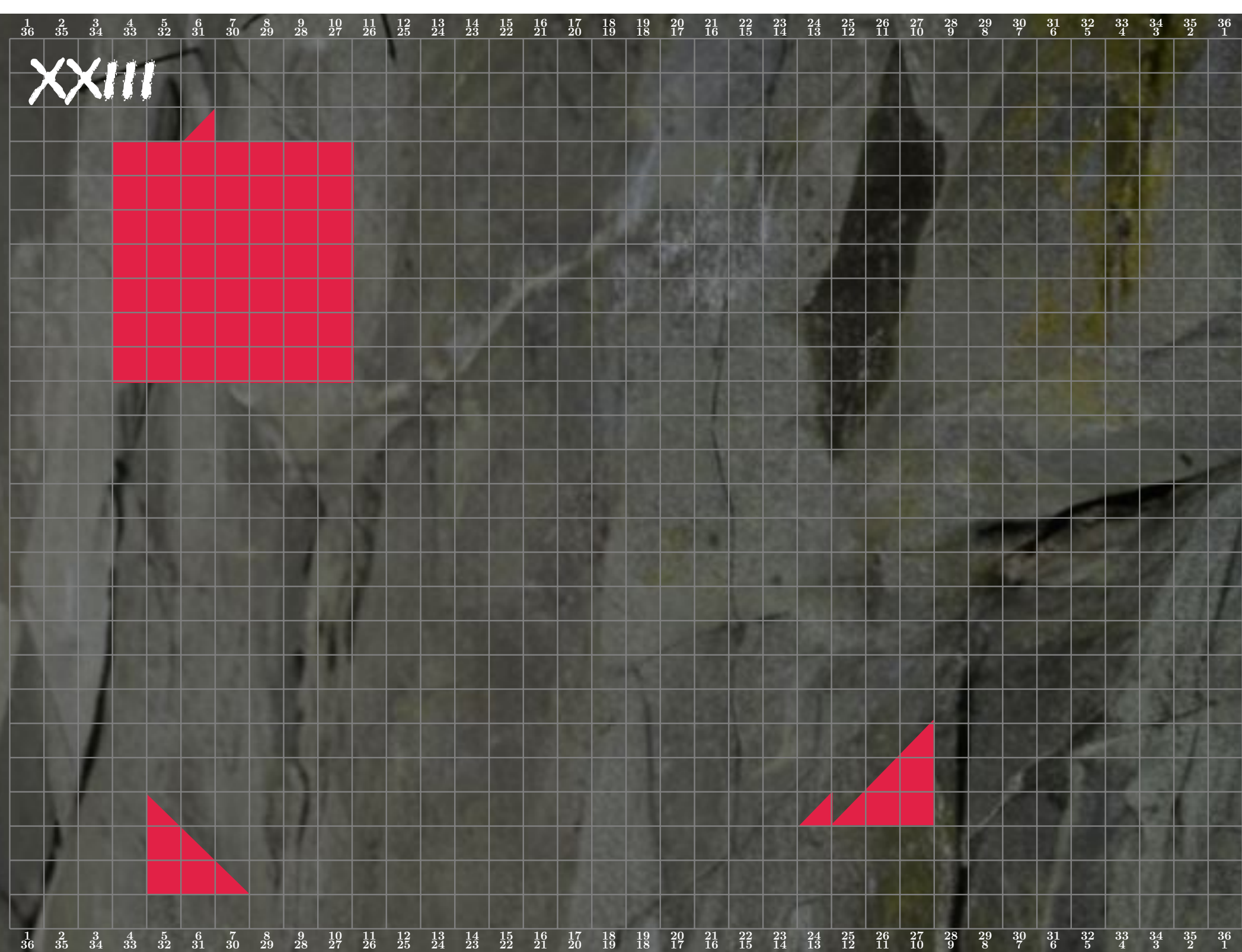


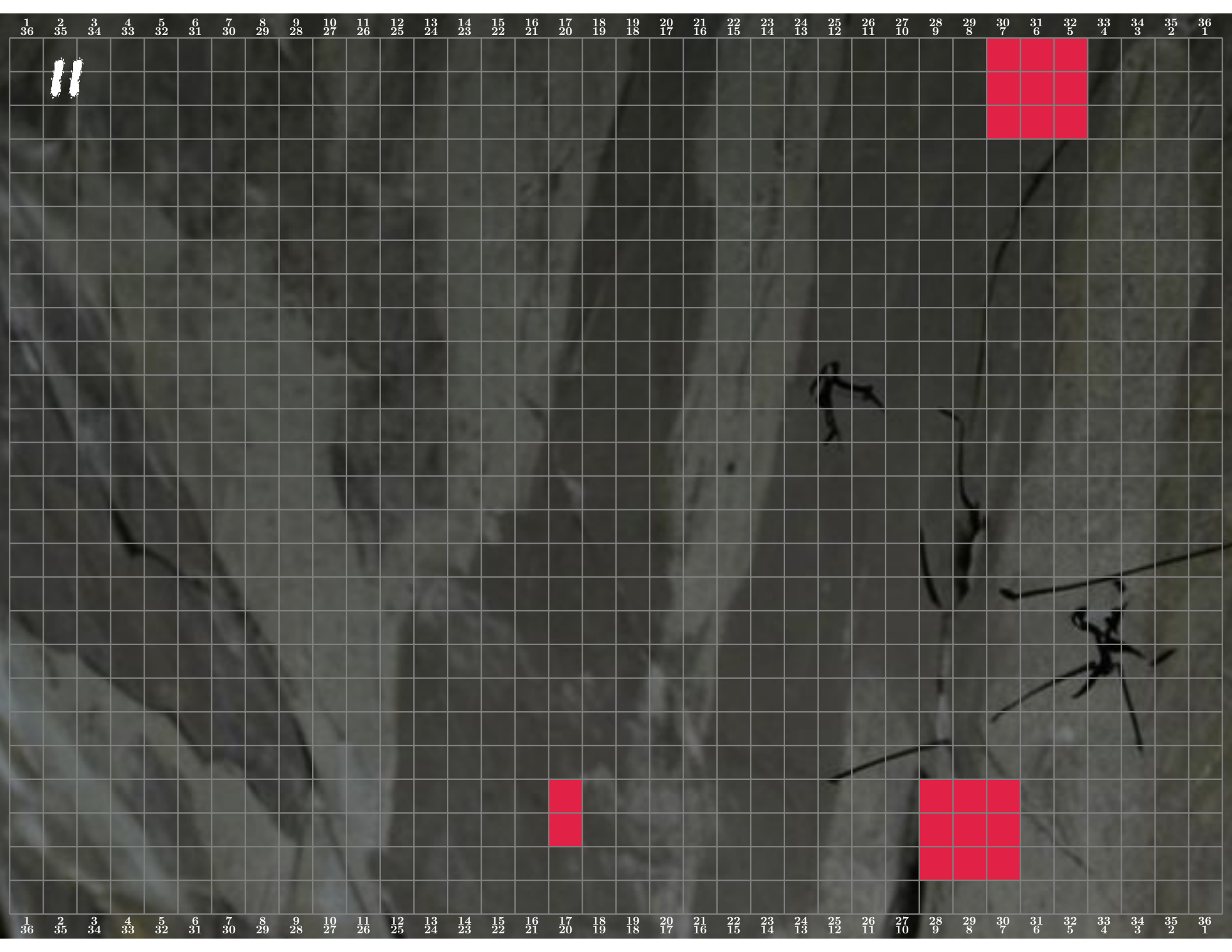


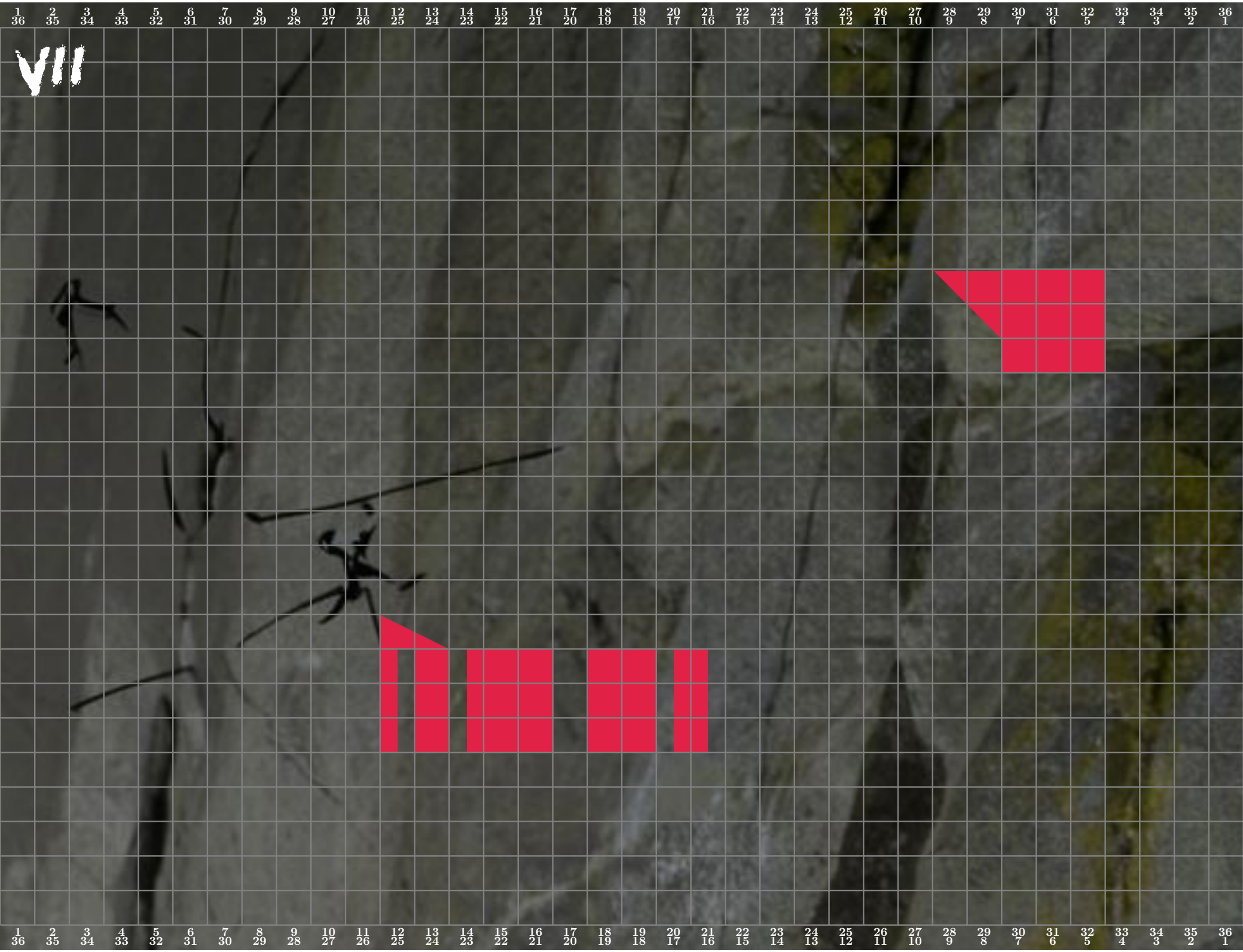


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X	V	II	II

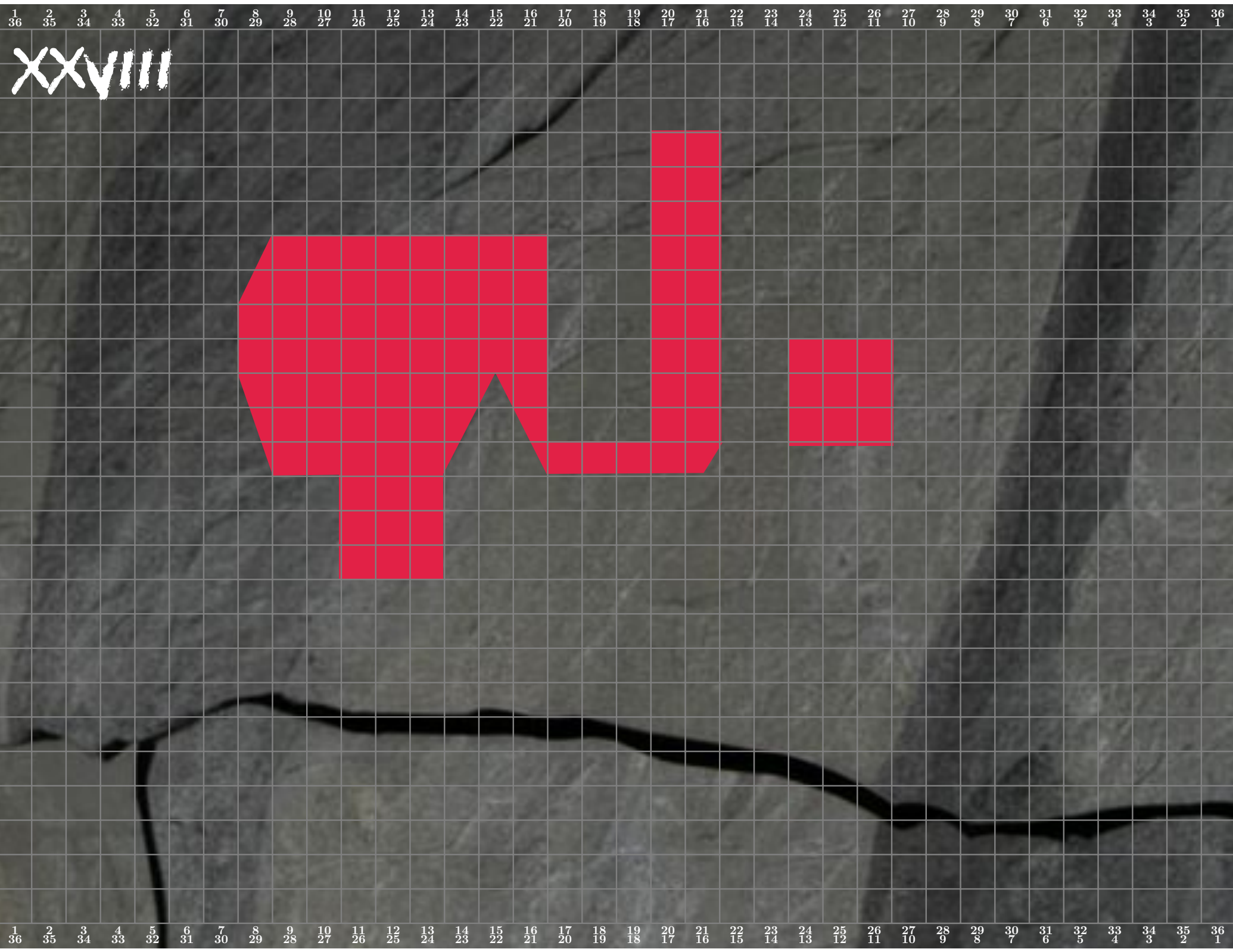




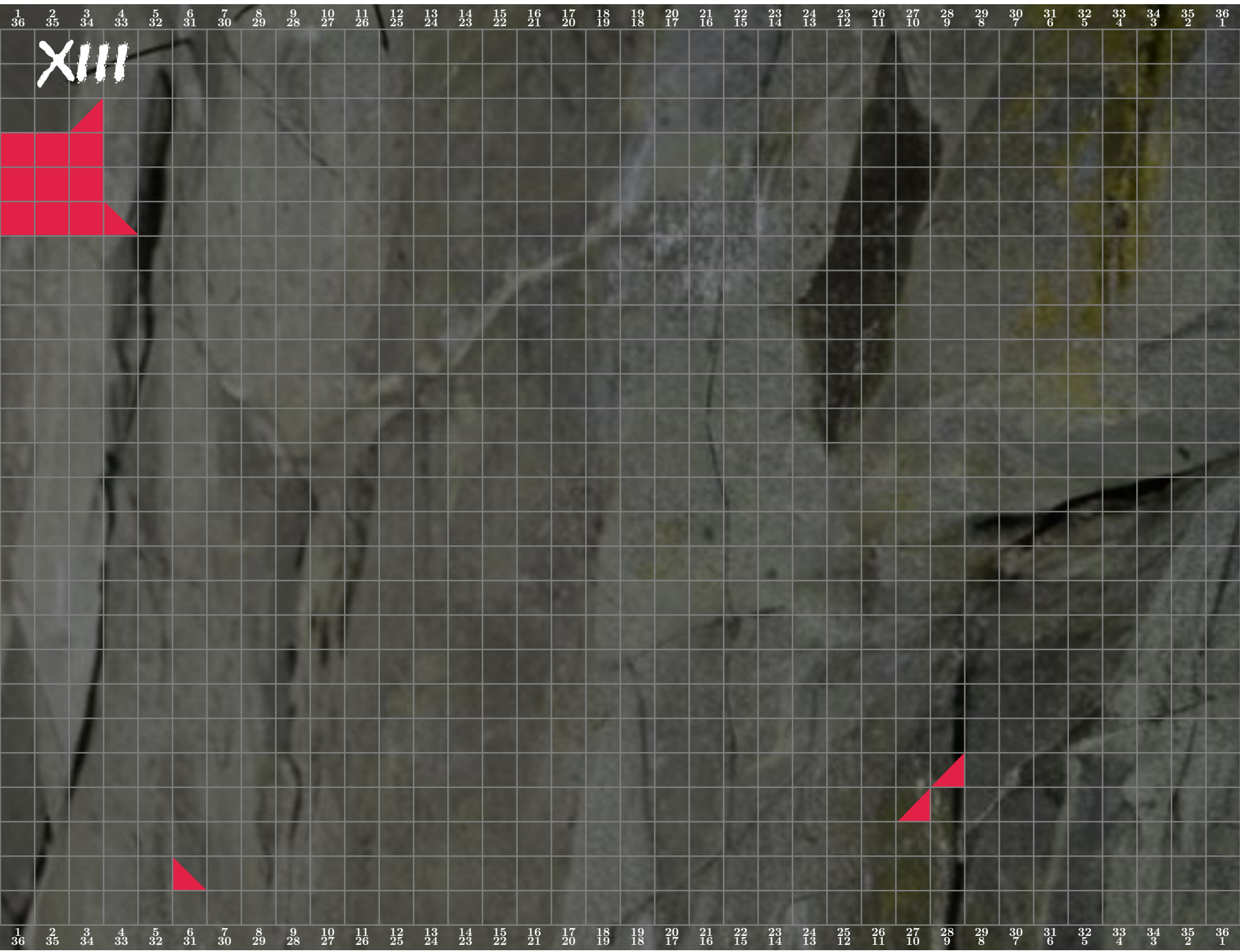




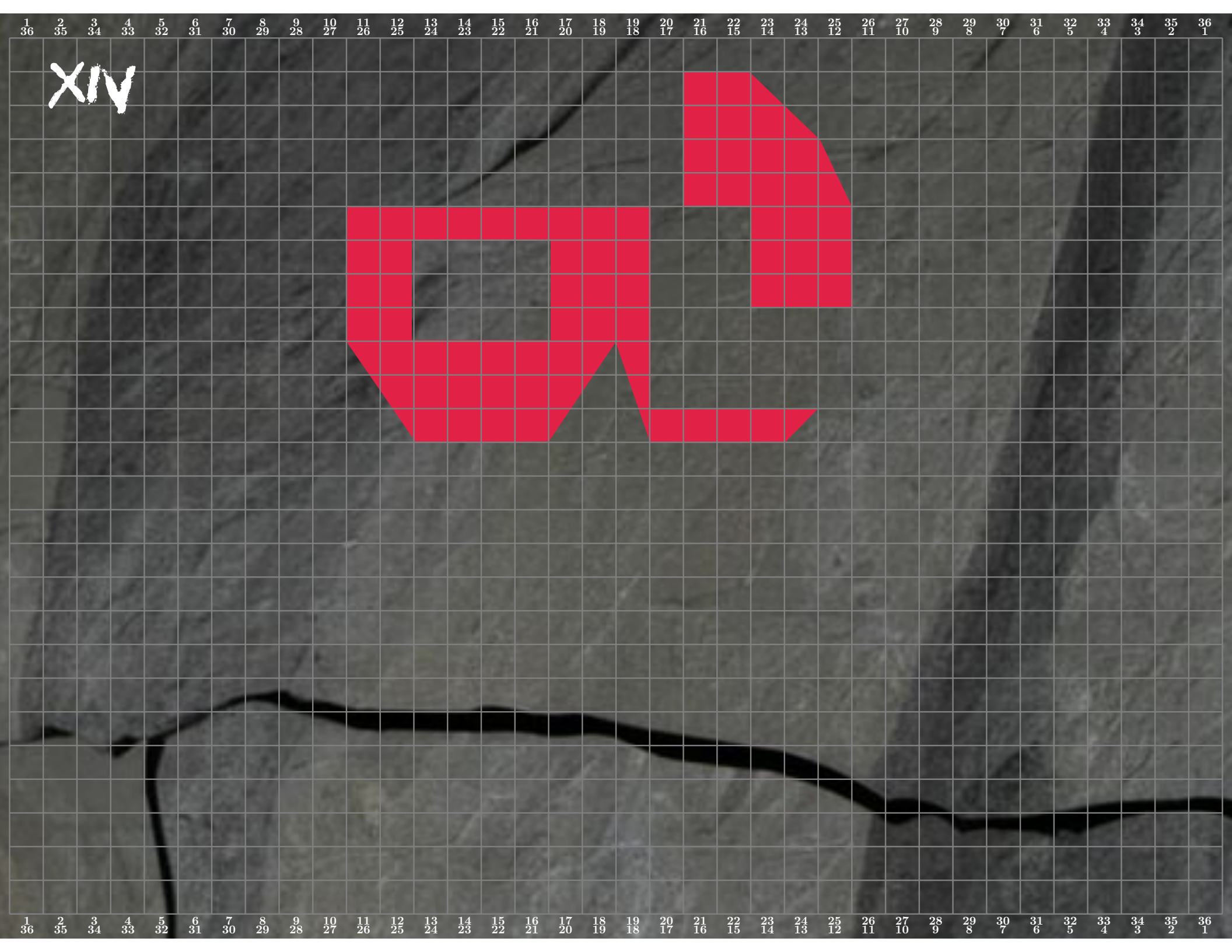












XIV

