



The Great Blueprint Heist

Grade 8 math · Exponents, Square roots, Pythagorean theorem, Order of operations, Two-step equations · Reading level grades 7-9

Detective: _____ Date: _____

A rogue geometer has altered the scale factors of Isometric City's core blueprints! If the measurements aren't restored to their perfectly congruent proportions, the entire city's towers will collapse like a house of cards. The Chief Architect needs your help to find the culprit before the countdown ends.

1. Solve each math problem. The answer is a number, and the letter beside it is what that number stands for.
2. In the clue boxes, write that letter in every box showing the same number, then read the secret clue.
3. Use each clue to cross suspects off the list. The one suspect left at the end is the culprit!

My answer: the The Rescaler is _____

Possible suspects

Cross off a row as each clue rules it out. The one left at the end is the culprit.

NAME	SCALING TOOL	SECONDARY GEAR	HAND DOMINANCE	HAIR STYLE	VULNERABILITY
Pascal	Dilation Beam	Proportional Compass	Left-handed stylus use	Slicked silver braids	Uncalibrated scales
Fibonacci	Reflection Mirror	Ratio Caliper	Left-handed stylus use	Spiky copper locks	Uncalibrated scales
Mandelbrot	Shear Stretcher	Vector Thruster	Left-handed stylus use	Slicked silver braids	Uncalibrated scales
Riemann	Rotation Pivot	Similarity Scanner	Right-handed stylus use	Neon blue buzzcut	Asymmetrical mirrors
Bolyai	Rotation Pivot	Similarity Scanner	Right-handed stylus use	Neon blue buzzcut	Static distortion fields
Euclid	Translation Slide	Vector Thruster	Left-handed stylus use	Neon blue buzzcut	Static distortion fields
Escher	Dilation Beam	Ratio Caliper	Right-handed stylus use	Neon blue buzzcut	Uncalibrated scales
Hilbert	Translation Slide	Grid Overlay HUD	Left-handed stylus use	Slicked silver braids	Uncalibrated scales
Noether	Reflection Mirror	Proportional Compass	Left-handed stylus use	Spiky copper locks	Static distortion fields
Hypatia	Dilation Beam	Proportional Compass	Right-handed stylus use	Neon blue buzzcut	Static distortion fields
Archimedes	Rotation Pivot	Vector Thruster	Left-handed stylus use	Spiky copper locks	Static distortion fields
Leibniz	Dilation Beam	Proportional Compass	Left-handed stylus use	Neon blue buzzcut	Static distortion fields
Kepler	Translation Slide	Proportional Compass	Right-handed stylus use	Slicked silver braids	Uncalibrated scales
Cantor	Reflection Mirror	Vector Thruster	Left-handed stylus use	Spiky copper locks	Static distortion fields
Euler	Translation Slide	Ratio Caliper	Left-handed stylus use	Slicked silver braids	Uncalibrated scales
Lovelace	Reflection Mirror	Similarity Scanner	Left-handed stylus use	Spiky copper locks	Asymmetrical mirrors
Lobachevsky	Translation Slide	Similarity Scanner	Left-handed stylus use	Slicked silver braids	Asymmetrical mirrors
Gauss	Reflection Mirror	Ratio Caliper	Right-handed stylus use	Slicked silver braids	Uncalibrated scales
Fermat	Rotation Pivot	Proportional Compass	Left-handed stylus use	Slicked silver braids	Static distortion fields
Thales	Rotation Pivot	Ratio Caliper	Left-handed stylus use	Slicked silver braids	Uncalibrated scales
Descartes	Shear Stretcher	Proportional Compass	Left-handed stylus use	Slicked silver braids	Asymmetrical mirrors

CLUE 1

We cracked the encryption on the thief's tablet. The passcode length grew exponentially based on the blueprint's scale dimensions. Solve the exponent chain to unlock the system files.

Solve each problem, then write its letter in every clue box that shows the same number.

25 8 400 225 216 225 441 400 128 25 484 196 400 225 49 196 25

216 225 400 169 400 128 25 196 16 25 8 16 216 225 25 400 16 225

$$5^2 = \boxed{} \rightarrow \boxed{\text{T}}$$

$$2^4 = \boxed{} \rightarrow \boxed{\text{R}}$$

$$6^3 = \boxed{} \rightarrow \boxed{\text{U}}$$

$$21^2 = \boxed{} \rightarrow \boxed{\text{P}}$$

$$15^2 = \boxed{} \rightarrow \boxed{\text{S}}$$

$$2^3 = \boxed{} \rightarrow \boxed{\text{H}}$$

$2^7 = \boxed{} \rightarrow \boxed{\text{C}}$

$$22^2 = \boxed{} \rightarrow \boxed{\mathbf{D}}$$

$$20^2 = \boxed{} \rightarrow \boxed{\text{E}}$$

$$13^2 = \boxed{} \rightarrow \boxed{\mathbf{v}}$$

$$7^2 = \boxed{} \rightarrow \boxed{\text{N}}$$

$$14^2 = \boxed{} \rightarrow \boxed{0}$$

Scratch space:

CLUE 2

To restore a shrunken gallery, we have to find the actual side length of its perfectly square floor plan. Taking the square root of the scaled area will unlock the security locker.

Solve each problem, then write its letter in every clue box that shows the same number.

Diagram illustrating the merge sort algorithm. The top row shows the initial array: 10, 18, 2, 4, 14, 16, 11, 17, 10, 8, 13, 12, 19, 14, 17, 18, 2, 5, 11. The bottom row shows the recursive splitting process, with the array [10, 18, 2] being split into [10] and [18, 2], and the array [10, 8, 13, 12] being split into [10] and [8, 13, 12]. The boxes containing the number 10 are highlighted in orange.

sqrt(100) = → **T**

sqrt(25) = → **L**

sqrt(361) = → **W**

$\text{sqrt}(121) = \square \rightarrow \boxed{\text{D}}$

sqrt(81) = → **F**

$\text{sqrt}(144) = \square \rightarrow \boxed{\text{K}}$

$\text{sqrt}(196) = \square \rightarrow \boxed{\mathbf{A}}$

sqrt(16) = →

sqrt(64) = →

sqrt(4) = → **E**

sqrt(289) = →

sqrt(256) = → **R**

sqrt(324) = →

$\text{sqrt}(169) =$ $\rightarrow$ **C**

sqrt(49) = → **N**

Scratch space:

CLUE 3

Pythagorean theorem

The culprit ran diagonally across the digital coordinate grid. We must calculate the hypotenuse of their scaled path to find where they dropped a crucial clue.

Solve each problem, then write its letter in every clue box that shows the same number.

T			T																
40	41	75	40	41	17	75	10	17	39	40	74	17	65	65	75	52	5	26	
										T									
15	85	51	34	30	17	5	74	34	40	75	52	39	51	34	30	75	39		

legs 24 and 32, hypotenuse = → **T**

legs 16 and 30, hypotenuse = → **A**

legs 24 and 70, hypotenuse = → **R**

legs 9 and 12, hypotenuse = → **U**

legs 25 and 60, hypotenuse = → **P**

legs 24 and 45, hypotenuse = → **C**

legs 6 and 8, hypotenuse = → **F**

legs 18 and 24, hypotenuse = → **L**

legs 10 and 24, hypotenuse = → **Y**

legs 3 and 4, hypotenuse = → **B**

legs 15 and 36, hypotenuse = → **S**

legs 20 and 48, hypotenuse = → **D**

legs 21 and 72, hypotenuse = → **E**

legs 8 and 15, hypotenuse = → **I**

legs 40 and 75, hypotenuse = → **N**

legs 9 and 40, hypotenuse = → **H**

Scratch space:

CLUE 4 Order of operations

The Rescaler left a booby-trapped formula combining several scale ratios, additions, and divisions. Run the order of operations perfectly to defuse the trap.

Solve each problem, then write its letter in every clue box that shows the same number.

A				A													
79	108	66	94	79	27	50	11	54	108	101	100	98	55	42	50		
								A				A					
108	100	101	95	42	94	44	94	79	100	50	40	79	108	101	42	54	66

$11 \times 9 - 20 = \square \rightarrow$ A	$98 + 5 \times 2 = \square \rightarrow$ S	$1 + 2 \times 5 = \square \rightarrow$ O
$20 + 9 \times 9 = \square \rightarrow$ L	$29 + 7 \times 3 = \square \rightarrow$ D	$76 + 6 \times 4 = \square \rightarrow$ I
$41 + 9 \times 6 = \square \rightarrow$ V	$11 \times 4 - 2 = \square \rightarrow$ E	$8 + 6 \times 6 = \square \rightarrow$ B
$9 \times 12 - 10 = \square \rightarrow$ C	$33 + 7 \times 3 = \square \rightarrow$ F	$7 + 4 \times 5 = \square \rightarrow$ N
$8 \times 10 - 25 = \square \rightarrow$ K	$8 \times 9 - 6 = \square \rightarrow$ T	$9 \times 5 - 5 = \square \rightarrow$ W
$31 + 9 \times 7 = \square \rightarrow$ R		

Scratch space:

CLUE 5**Two-step equations - the last clue**

A laser beam's target height depends on the original scale factor times the base height plus a constant offset.
Solve this two-step equation to trace the culprit's laser beam.

First solve each problem. Then find each answer in the numbered list below and cross that sentence out. One sentence will be left - that is exactly what the villain did!

Step 1 - solve these:

$3x + 9 = 21, x = \boxed{}$

$3x + 12 = 33, x = \boxed{}$

$5x + 5 = 20, x = \boxed{}$

$5x + 4 = 44, x = \boxed{}$

$5x + 5 = 10, x = \boxed{}$

$2x + 12 = 24, x = \boxed{}$

$4x + 4 = 48, x = \boxed{}$

$5x + 9 = 69, x = \boxed{}$

$4x + 9 = 17, x = \boxed{}$

$6x + 11 = 65, x = \boxed{}$

$4x + 1 = 41, x = \boxed{}$

Step 2 - cross out the sentence with each answer:

1. The villain slid the city hall grid, then recalibrated the proportional compasses.
2. The villain tilted the structural pillars, then scrambled the grid overlay system.
3. The villain rotated the suspension bridge, then locked the ratio calipers.
4. The villain slid the city hall grid, then scrambled the grid overlay system.
5. The villain slid the city hall grid, then locked the ratio calipers.
6. The villain tilted the structural pillars, then locked the ratio calipers.
7. The villain shrank the central monument, then recalibrated the proportional compasses.
8. The villain shrank the central monument, then scrambled the grid overlay system.
9. The villain rotated the suspension bridge, then scrambled the grid overlay system.
10. The villain slid the city hall grid, then fired up the vector thrusters.
11. The villain shrank the central monument, then locked the ratio calipers.
12. The villain flipped the skyline reflections, then fired up the vector thrusters.

Answer Key

The Great Blueprint Heist

Culprit: Euler

Translation Slide · Ratio Caliper · Left-handed stylus use · Slicked silver braids · Uncalibrated scales

Trail: Start 21 → Clue 1 17 → Clue 2 11 → Clue 3 5 → Clue 4 4 → Clue 5 1

Clue 1 (Exponents): "THE SUSPECT DOES NOT USE VECTOR THRUSTERS"

$5^2 = 25$ (T) · $2^4 = 16$ (R) · $6^3 = 216$ (U) · $21^2 = 441$ (P) · $15^2 = 225$ (S) · $2^3 = 8$ (H) · $2^7 = 128$ (C) · $22^2 = 484$ (D) · $20^2 = 400$ (E) · $13^2 = 169$ (V) · $7^2 = 49$ (N) · $14^2 = 196$ (O)

Clue 2 (Square roots): "THE YARDSTICK WAS HELD IN THE LEFT HAND"

$\sqrt{100} = 10$ (T) · $\sqrt{25} = 5$ (L) · $\sqrt{361} = 19$ (W) · $\sqrt{121} = 11$ (D) · $\sqrt{81} = 9$ (F) · $\sqrt{144} = 12$ (K) · $\sqrt{196} = 14$ (A) · $\sqrt{16} = 4$ (Y) · $\sqrt{64} = 8$ (I) · $\sqrt{4} = 2$ (E) · $\sqrt{289} = 17$ (S) · $\sqrt{256} = 16$ (R) · $\sqrt{324} = 18$ (H) · $\sqrt{169} = 13$ (C) · $\sqrt{49} = 7$ (N)

Clue 3 (Pythagorean theorem): "THE THIEF IS TRIPPED BY UNCALIBRATED SCALES"

legs 24 and 32, hypotenuse = 40 (T) · legs 16 and 30, hypotenuse = 34 (A) · legs 24 and 70, hypotenuse = 74 (R) · legs 9 and 12, hypotenuse = 15 (U) · legs 25 and 60, hypotenuse = 65 (P) · legs 24 and 45, hypotenuse = 51 (C) · legs 6 and 8, hypotenuse = 10 (F) · legs 18 and 24, hypotenuse = 30 (L) · legs 10 and 24, hypotenuse = 26 (Y) · legs 3 and 4, hypotenuse = 5 (B) · legs 15 and 36, hypotenuse = 39 (S) · legs 20 and 48, hypotenuse = 52 (D) · legs 21 and 72, hypotenuse = 75 (E) · legs 8 and 15, hypotenuse = 17 (I) · legs 40 and 75, hypotenuse = 85 (N) · legs 9 and 40, hypotenuse = 41 (H)

Clue 4 (Order of operations): "A STRAND OF SLICKED SILVER BRAID WAS LEFT"

$11 \times 9 - 20 = 79$ (A) · $98 + 5 \times 2 = 108$ (S) · $1 + 2 \times 5 = 11$ (O) · $20 + 9 \times 9 = 101$ (L) · $29 + 7 \times 3 = 50$ (D) · $76 + 6 \times 4 = 100$ (I) · $41 + 9 \times 6 = 95$ (V) · $11 \times 4 - 2 = 42$ (E) · $8 + 6 \times 6 = 44$ (B) · $9 \times 12 - 10 = 98$ (C) · $33 + 7 \times 3 = 54$ (F) · $7 + 4 \times 5 = 27$ (N) · $8 \times 10 - 25 = 55$ (K) · $8 \times 9 - 6 = 66$ (T) · $9 \times 5 - 5 = 40$ (W) · $31 + 9 \times 7 = 94$ (R)

Clue 5 (Two-step equations): surviving statement is box 5 → Euler

$3x + 9 = 21, x = 4$ · $3x + 12 = 33, x = 7$ · $5x + 5 = 20, x = 3$ · $5x + 4 = 44, x = 8$ · $5x + 5 = 10, x = 1$ · $2x + 12 = 24, x = 6$ · $4x + 4 = 48, x = 11$ · $5x + 9 = 69, x = 12$ · $4x + 9 = 17, x = 2$ · $6x + 11 = 65, x = 9$ · $4x + 1 = 41, x = 10$