



The Case of the Ruined Ratios

Grade 7 math · Fractions of a number, Integers, Percentages, Order of operations · Reading level grades 7-9

Detective: _____ Date: _____

The Golden Ratio Academy is in total chaos! Someone has stolen the Master Scale, a device that keeps the city's landmarks in perfect proportion. Without it, the buildings are warping and stretching. The Chief Architect needs your help to deduce which student or staff member is the Ratio Ruiner before the city collapses!

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 Ratio Ruiner 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	MATH SPECIALTY	DRAFTING HAND	INK STAIN COLOR	MATH ERROR
Cartesian	proportion wheel	golden ratio	left-handed pencil grip	cyan ink smudge	dropped decimal
Penrose	caliper compass	vector calculus	left-handed pencil grip	magenta ink smudge	divide by zero
Noether	laser transit	vector calculus	right-handed pencil grip	cyan ink smudge	divide by zero
Mandelbrot	grid projector	prime factors	left-handed pencil grip	magenta ink smudge	swapped numerator
Pythagoras	laser transit	golden ratio	right-handed pencil grip	magenta ink smudge	swapped numerator
Lagrange	caliper compass	geometric series	right-handed pencil grip	yellow ink smudge	swapped numerator
Euler	caliper compass	fractal chaos	right-handed pencil grip	yellow ink smudge	divide by zero
Fourier	proportion wheel	golden ratio	right-handed pencil grip	cyan ink smudge	swapped numerator
Bernoulli	laser transit	prime factors	right-handed pencil grip	magenta ink smudge	divide by zero
Hypatia	laser transit	golden ratio	right-handed pencil grip	cyan ink smudge	dropped decimal
Ada Lovelace	laser transit	golden ratio	left-handed pencil grip	cyan ink smudge	dropped decimal
Da Vinci	caliper compass	geometric series	left-handed pencil grip	magenta ink smudge	dropped decimal
Pascal	proportion wheel	geometric series	right-handed pencil grip	cyan ink smudge	dropped decimal
Archimedes	proportion wheel	prime factors	left-handed pencil grip	magenta ink smudge	swapped numerator
Kepler	caliper compass	golden ratio	right-handed pencil grip	yellow ink smudge	dropped decimal
Escher	laser transit	prime factors	right-handed pencil grip	cyan ink smudge	dropped decimal
Le Corbusier	micrometer slide	vector calculus	right-handed pencil grip	yellow ink smudge	swapped numerator
Hilbert	grid projector	fractal chaos	right-handed pencil grip	cyan ink smudge	dropped decimal
Brunelleschi	proportion wheel	prime factors	left-handed pencil grip	yellow ink smudge	dropped decimal
Newton	micrometer slide	geometric series	right-handed pencil grip	cyan ink smudge	dropped decimal
Euclid	grid projector	golden ratio	right-handed pencil grip	cyan ink smudge	swapped numerator

CLUE 1

Fractions of a number

To unlock the drafting room blueprints, we need to analyze the fractional distribution of the blueprints stored in the vault.

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

T																T
35	59	25	10	51	60	30	25	10	34	16	25	39	30	16	35	
	T								T							
39	35	51	34	8	11	10	57	27	35	57	17	27	59	57	16	39

$$5/8 \text{ of } 56 = \boxed{} \rightarrow \boxed{\text{T}}$$

$$5/10 \text{ of } 118 = \boxed{} \rightarrow \boxed{\text{H}}$$

$$5/10 \text{ of } 54 = \boxed{} \rightarrow \boxed{\text{C}}$$

$$3/4 \text{ of } 76 = \boxed{} \rightarrow \boxed{\text{A}}$$

$$1/2 \text{ of } 16 = \boxed{} \rightarrow \boxed{\text{Y}}$$

$$2/6 \text{ of } 51 = \boxed{} \rightarrow \boxed{\text{L}}$$

$$5/6 \text{ of } 12 = \boxed{} \rightarrow \boxed{\text{R}}$$

$$1/6 \text{ of } 96 = \boxed{} \rightarrow \boxed{\text{O}}$$

$$4/8 \text{ of } 78 = \boxed{} \rightarrow \boxed{\text{S}}$$

$$1/2 \text{ of } 102 = \boxed{} \rightarrow \boxed{\text{U}}$$

$$5/6 \text{ of } 30 = \boxed{} \rightarrow \boxed{\text{E}}$$

$$2/8 \text{ of } 120 = \boxed{} \rightarrow \boxed{\text{N}}$$

$$4/8 \text{ of } 22 = \boxed{} \rightarrow \boxed{\text{F}}$$

$$4/6 \text{ of } 51 = \boxed{} \rightarrow \boxed{\text{D}}$$

$$5/6 \text{ of } 72 = \boxed{} \rightarrow \boxed{\text{I}}$$

Scratch space:

CLUE 2 Integers

The temperature controls on the laser transit are fluctuating wildly above and below zero, requiring a precise sum of positive and negative values.

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

T										T				T						T		
22	25	30	24	6	24	3	30	16	22	21	12	1	22	30	24	21	1	22	25			
T										T												
22	25	30	1	12	12	1	4	25	22	25	15	20	2									

$$(-4) + 26 = \boxed{} \rightarrow \boxed{\text{T}}$$

$$(-8) + 14 = \boxed{} \rightarrow \boxed{\text{U}}$$

$$(-6) + 8 = \boxed{} \rightarrow \boxed{\text{D}}$$

$$(-13) + 16 = \boxed{} \rightarrow \boxed{\text{P}}$$

$$4 - (-12) = \boxed{} \rightarrow \boxed{\text{C}}$$

$$(-9) + 13 = \boxed{} \rightarrow \boxed{\text{G}}$$

$$(-2) + 22 = \boxed{} \rightarrow \boxed{\text{N}}$$

$$(-1) + 2 = \boxed{} \rightarrow \boxed{\text{I}}$$

$$7 - (-14) = \boxed{} \rightarrow \boxed{\text{W}}$$

$$19 - (-11) = \boxed{} \rightarrow \boxed{\text{E}}$$

$$(-11) + 26 = \boxed{} \rightarrow \boxed{\text{A}}$$

$$(-9) + 21 = \boxed{} \rightarrow \boxed{\text{R}}$$

$$16 - (-9) = \boxed{} \rightarrow \boxed{\text{H}}$$

$$10 - (-14) = \boxed{} \rightarrow \boxed{\text{S}}$$

Scratch space:

CLUE 3 Percentages

The academy's scale models are only partially complete, and we must calculate the exact percentage of the remaining marble blocks.

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

A 2x10 grid of boxes. The top row contains the following sequence: an orange box with 'T', three empty boxes, an orange box with 'T', and seven empty boxes. The bottom row contains the following sequence: five empty boxes, an orange box with 'T', four empty boxes, an orange box with 'T', and five empty boxes.

T																			
15	3	34	17	35	42	21	34	17	38	7	42	22	34	59	15	36			
7	22	42	43	21	15	3	34	59	34	33	42	18	7	22	32	36	42	21	15

5% of 300 = $\rightarrow$ **T**

50% of 86 = → **G**

5% of 660 = $\rightarrow$ **C**

20% of 160 = $\rightarrow$ **P**

20% of 110 = → **L**

5% of 340 = $\rightarrow$ **R**

50% of 68 = → **E**

60% of 5 = $\rightarrow$ **H**

$$60\% \text{ of } 60 = \boxed{} \rightarrow \boxed{0}$$

20% of 295 = $\rightarrow$ **D**

40% of 105 = $\rightarrow$

10% of 380 = → **F**

25% of 28 = $\rightarrow$ **A**

10% of 350 = → **U**

60% of 35 = $\rightarrow$ **N**

75% of 24 = $\rightarrow$ **M**

Scratch space:

CLUE 4 Order of operations

The security system requires a complex mathematical expression to override, following the strict sequence of operations.

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

T																	
80	20	19	115	42	19	35	19	20	75	56	115	87	33	80	115	33	48
42	86	75	35	56	46	75	48	80	23	35	55	23	35	68			

$12 \times 8 - 16 = \square \rightarrow \text{T}$	$8 \times 12 - 28 = \square \rightarrow \text{K}$	$9 \times 10 - 3 = \square \rightarrow \text{P}$
$68 + 3 \times 6 = \square \rightarrow \text{Y}$	$4 + 8 \times 2 = \square \rightarrow \text{H}$	$12 + 4 \times 9 = \square \rightarrow \text{F}$
$3 \times 12 - 1 = \square \rightarrow \text{N}$	$8 \times 6 - 2 = \square \rightarrow \text{R}$	$12 \times 10 - 5 = \square \rightarrow \text{S}$
$12 \times 5 - 4 = \square \rightarrow \text{D}$	$61 + 7 \times 2 = \square \rightarrow \text{A}$	$7 \times 8 - 23 = \square \rightarrow \text{O}$
$10 \times 3 - 7 = \square \rightarrow \text{I}$	$35 + 5 \times 4 = \square \rightarrow \text{G}$	$11 \times 4 - 2 = \square \rightarrow \text{C}$
$3 + 4 \times 4 = \square \rightarrow \text{E}$		

Scratch space:

CLUE 5**Fractions of a number - the last clue**

We recovered a damaged ledger from the suspect's desk showing a fraction of the total stolen design files.

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:

$1/4 \text{ of } 44 = \boxed{}$

$1/2 \text{ of } 24 = \boxed{}$

$3/10 \text{ of } 10 = \boxed{}$

$1/10 \text{ of } 70 = \boxed{}$

$2/8 \text{ of } 20 = \boxed{}$

$4/8 \text{ of } 16 = \boxed{}$

$1/5 \text{ of } 30 = \boxed{}$

$2/6 \text{ of } 27 = \boxed{}$

$1/10 \text{ of } 100 = \boxed{}$

$2/3 \text{ of } 3 = \boxed{}$

$2/10 \text{ of } 5 = \boxed{}$

Step 2 - cross out the sentence with each answer:

1. The villain stretched the clock tower with a grid projector, then mapped the escape path using vector calculus.
2. The villain skewed the library columns with a laser transit, then scrambled the school database with fractal chaos.
3. The villain skewed the library columns with a laser transit, then calculated a perfect golden ratio spiral.
4. The villain skewed the library columns with a laser transit, then factored the security code into prime factors.
5. The villain recalibrated the city arch with a caliper compass, then factored the security code into prime factors.
6. The villain warped the museum dome with a proportion wheel, then calculated a perfect golden ratio spiral.
7. The villain recalibrated the city arch with a caliper compass, then calculated a perfect golden ratio spiral.
8. The villain recalibrated the city arch with a caliper compass, then mapped the escape path using vector calculus.
9. The villain recalibrated the city arch with a caliper compass, then scrambled the school database with fractal chaos.
10. The villain shrank the main bridge with a micrometer slide, then calculated a perfect golden ratio spiral.
11. The villain shrank the main bridge with a micrometer slide, then plotted a shrinking geometric series.
12. The villain warped the museum dome with a proportion wheel, then plotted a shrinking geometric series.

Answer Key

The Case of the Ruined Ratios

Culprit: Escher

laser transit · prime factors · right-handed pencil grip · cyan ink smudge · dropped decimal

Trail: Start 21 → Clue 1 19 → Clue 2 12 → Clue 3 5 → Clue 4 4 → Clue 5 1

Clue 1 (Fractions of a number): "THE RUINER DOES NOT STUDY FRACTAL CHAOS"

$5/8$ of 56 = 35 (T) · $5/10$ of 118 = 59 (H) · $5/10$ of 54 = 27 (C) · $3/4$ of 76 = 57 (A) · $1/2$ of 16 = 8 (Y) · $2/6$ of 51 = 17 (L) · $5/6$ of 12 = 10 (R) · $1/6$ of 96 = 16 (O) · $4/8$ of 78 = 39 (S) · $1/2$ of 102 = 51 (U) · $5/6$ of 30 = 25 (E) · $2/8$ of 120 = 30 (N) · $4/8$ of 22 = 11 (F) · $4/6$ of 51 = 34 (D) · $5/6$ of 72 = 60 (I)

Clue 2 (Integers): "THE SUSPECT WRITES WITH THEIR RIGHT HAND"

$(-4) + 26 = 22$ (T) · $(-8) + 14 = 6$ (U) · $(-6) + 8 = 2$ (D) · $(-13) + 16 = 3$ (P) · $4 - (-12) = 16$ (C) · $(-9) + 13 = 4$ (G) · $(-2) + 22 = 20$ (N) · $(-1) + 2 = 1$ (I) · $7 - (-14) = 21$ (W) · $19 - (-11) = 30$ (E) · $(-11) + 26 = 15$ (A) · $(-9) + 21 = 12$ (R) · $16 - (-9) = 25$ (H) · $10 - (-14) = 24$ (S)

Clue 3 (Percentages): "THE RUINER FAILED TO ALIGN THE DECIMAL POINT"

5% of 300 = 15 (T) · 50% of 86 = 43 (G) · 5% of 660 = 33 (C) · 20% of 160 = 32 (P) · 20% of 110 = 22 (L) · 5% of 340 = 17 (R) · 50% of 68 = 34 (E) · 60% of 5 = 3 (H) · 60% of 60 = 36 (O) · 20% of 295 = 59 (D) · 40% of 105 = 42 (I) · 10% of 380 = 38 (F) · 25% of 28 = 7 (A) · 10% of 350 = 35 (U) · 60% of 35 = 21 (N) · 75% of 24 = 18 (M)

Clue 4 (Order of operations): "THE SCENE HAD SPOTS OF CYAN DRAFTING INK"

$12 \times 8 - 16 = 80$ (T) · $8 \times 12 - 28 = 68$ (K) · $9 \times 10 - 3 = 87$ (P) · $68 + 3 \times 6 = 86$ (Y) · $4 + 8 \times 2 = 20$ (H) · $12 + 4 \times 9 = 48$ (F) · $3 \times 12 - 1 = 35$ (N) · $8 \times 6 - 2 = 46$ (R) · $12 \times 10 - 5 = 115$ (S) · $12 \times 5 - 4 = 56$ (D) · $61 + 7 \times 2 = 75$ (A) · $7 \times 8 - 23 = 33$ (O) · $10 \times 3 - 7 = 23$ (I) · $35 + 5 \times 4 = 55$ (G) · $11 \times 4 - 2 = 42$ (C) · $3 + 4 \times 4 = 19$ (E)

Clue 5 (Fractions of a number): surviving statement is box 4 → Escher

$1/4$ of 44 = 11 · $1/2$ of 24 = 12 · $3/10$ of 10 = 3 · $1/10$ of 70 = 7 · $2/8$ of 20 = 5 · $4/8$ of 16 = 8 · $1/5$ of 30 = 6 · $2/6$ of 27 = 9 · $1/10$ of 100 = 10 · $2/3$ of 3 = 2 · $2/10$ of 5 = 1