



The Case of the Swapped Crown

Grade 9 math · Two-step equations, Word problems, Exponents, Square roots · Reading level grades 7-9

Detective: _____ Date: _____

A master thief has infiltrated the central archives, swapping the real crown jewels with replicas. As the lead detective on the night shift, you must analyze the forensic evidence, solve the equations left behind in the criminal's notebook, and unmask the Rogue Agent before they board the midnight train.

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 Rogue Agent is _____

Possible suspects

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

NAME	SLEUTHING TOOL	BACKUP GADGET	SIGNATURE HANDWRITING	INK STAIN COLOR	TACTICAL WEAKNESS
C Auguste Dupin	Laser Distance Measurer	Invisible Ink Pen	Right-Tilted Script	Black Ink	Flashlight Glare
Sam Spade	Laser Distance Measurer	Miniature Camera	Right-Tilted Script	Blue Ink	Flashlight Glare
Joe Hardy	Ultraviolet Torch	Invisible Ink Pen	Left-Tilted Script	Black Ink	Flashlight Glare
Hercule Poirot	Pocket Magnifier	Miniature Camera	Right-Tilted Script	Red Ink	Flashlight Glare
Nero Wolfe	Directional Microphone	Miniature Camera	Left-Tilted Script	Black Ink	Typewriter Noise
Ellery Queen	Pocket Magnifier	Voice Recorder	Left-Tilted Script	Blue Ink	Coffee Aroma
Lieutenant Columbo	Laser Distance Measurer	Fingerprint Dust	Right-Tilted Script	Red Ink	Flashlight Glare
Sherlock Holmes	Directional Microphone	Voice Recorder	Right-Tilted Script	Blue Ink	Typewriter Noise
Perry Mason	Fiber-Optic Camera	Invisible Ink Pen	Right-Tilted Script	Blue Ink	Typewriter Noise
Jacques Clouseau	Fiber-Optic Camera	Fingerprint Dust	Right-Tilted Script	Black Ink	Coffee Aroma
Jane Marple	Fiber-Optic Camera	Miniature Camera	Left-Tilted Script	Black Ink	Typewriter Noise
Miss Scarlet	Pocket Magnifier	Lockpick Set	Right-Tilted Script	Black Ink	Coffee Aroma
Professor Plum	Ultraviolet Torch	Fingerprint Dust	Left-Tilted Script	Black Ink	Typewriter Noise
Adrian Monk	Fiber-Optic Camera	Voice Recorder	Right-Tilted Script	Black Ink	Coffee Aroma
Dick Tracy	Pocket Magnifier	Lockpick Set	Left-Tilted Script	Black Ink	Typewriter Noise
Arsene Lupin	Ultraviolet Torch	Invisible Ink Pen	Left-Tilted Script	Black Ink	Typewriter Noise
Frank Hardy	Fiber-Optic Camera	Lockpick Set	Right-Tilted Script	Black Ink	Typewriter Noise
Philo Vance	Fiber-Optic Camera	Voice Recorder	Left-Tilted Script	Blue Ink	Typewriter Noise
Charlie Chan	Ultraviolet Torch	Voice Recorder	Left-Tilted Script	Blue Ink	Typewriter Noise
John Watson	Laser Distance Measurer	Invisible Ink Pen	Left-Tilted Script	Red Ink	Typewriter Noise
Philip Marlowe	Pocket Magnifier	Fingerprint Dust	Right-Tilted Script	Black Ink	Coffee Aroma

CLUE 1

Two-step equations

We found a torn page from the suspect's logbook. By calculating the total number of evidence boxes they sorted, we can figure out what gadget was missing from their toolbelt.

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

T									T			
16	10	21	5	11	6	9	6	16	7	14	21	

										T				T
20	15	9	2	21	8	18	8	15	9	16	11	7	14	16

$7x + 1 = 113, x = \square \rightarrow \boxed{\text{T}}$

$7x + 11 = 137, x = \square \rightarrow \boxed{\text{P}}$

$7x + 11 = 88, x = \square \rightarrow \boxed{\text{D}}$

$7x + 2 = 51, x = \square \rightarrow \boxed{\text{U}}$

$5x + 6 = 46, x = \square \rightarrow \boxed{\text{R}}$

$5x + 6 = 51, x = \square \rightarrow \boxed{\text{N}}$

$9x + 1 = 136, x = \square \rightarrow \boxed{\text{I}}$

$9x + 9 = 63, x = \square \rightarrow \boxed{\text{O}}$

$8x + 11 = 171, x = \square \rightarrow \boxed{\text{F}}$

$6x + 11 = 71, x = \square \rightarrow \boxed{\text{H}}$

$6x + 8 = 38, x = \square \rightarrow \boxed{\text{Y}}$

$3x + 10 = 52, x = \square \rightarrow \boxed{\text{S}}$

$2x + 11 = 15, x = \square \rightarrow \boxed{\text{G}}$

$8x + 1 = 169, x = \square \rightarrow \boxed{\text{E}}$

Scratch space:

CLUE 2

Word problems

The thief left a locked cryptographic safe. Solving the equation on the keypad reveals the tilt of the handwriting on the ransom note.

Solve each problem, then write its letter in the boxes to fill in the missing word.

A witness saw the villain was

L						L					C	R		P	
50	40	25	83	83	64	50	83	40	88	117			64		83

Chief Inspector lined up 5 rows of 10 magnifying glasses. How many magnifying glasses in all?

Answer: → **L**

Chief Inspector found 46 secret dossiers yesterday and 42 more today. How many secret dossiers in all?

Answer: → **D**

Chief Inspector lined up 8 rows of 8 decoder rings. How many decoder rings in all?

Answer: → **I**

Chief Inspector found 29 notepad pages yesterday and 88 more today. How many notepad pages in all?

Answer: → **S**

There were 88 magnifying glasses. 5 were used up. How many magnifying glasses are left?

Answer: → **T**

Chief Inspector lined up 4 rows of 10 secret dossiers. How many secret dossiers in all?

Answer: → **E**

Chief Inspector found 5 decoder rings yesterday and 20 more today. How many decoder rings in all?

Answer: → **F**

Scratch space:

CLUE 3

The suspect's getaway path multiplied rapidly. Calculating the exponential growth of the footprints reveals the unique weakness that stops them in their tracks.

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

484 32 49 484 32 324 81 441 361 441 25 81 400 128 512 49 25 32 324 400

729 144 128 81 196 216 484 729 144

$$22^2 = \boxed{} \rightarrow \boxed{\text{A}}$$

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

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

$$9^3 = \boxed{} \rightarrow \boxed{\text{T}}$$

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

$12^2 = \boxed{} \rightarrow \boxed{\text{H}}$

$$18^2 = \boxed{} \rightarrow \boxed{\text{K}}$$

$$7^2 = \boxed{} \rightarrow \boxed{L}$$

$$5^2 = \boxed{} \rightarrow \boxed{0}$$

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

$$14^2 = \boxed{} \rightarrow \boxed{\text{R}}$$

$$2^9 = \boxed{} \rightarrow \boxed{\mathbf{B}}$$

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

$$19^2 = \boxed{} \rightarrow \boxed{\text{G}}$$

$$9^2 = \boxed{} \rightarrow \boxed{1}$$

Scratch space:

CLUE 4 Square roots

We discovered a perfect square grid of fingerprint dust. Finding the root of this area points directly to the ink stain color found on the suspect's collar.

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

B																			
19	21	11	18	10	16	8	13	3	23	20	16	14	20	25	20	21	20	7	17
24	12	17	2	20	3	20	16	10											

$\sqrt{361} = \square \rightarrow \mathbf{B}$	$\sqrt{529} = \square \rightarrow \mathbf{G}$	$\sqrt{169} = \square \rightarrow \mathbf{U}$
$\sqrt{324} = \square \rightarrow \mathbf{C}$	$\sqrt{9} = \square \rightarrow \mathbf{D}$	$\sqrt{121} = \square \rightarrow \mathbf{A}$
$\sqrt{576} = \square \rightarrow \mathbf{O}$	$\sqrt{144} = \square \rightarrow \mathbf{N}$	$\sqrt{441} = \square \rightarrow \mathbf{L}$
$\sqrt{400} = \square \rightarrow \mathbf{E}$	$\sqrt{256} = \square \rightarrow \mathbf{S}$	$\sqrt{625} = \square \rightarrow \mathbf{R}$
$\sqrt{64} = \square \rightarrow \mathbf{M}$	$\sqrt{49} = \square \rightarrow \mathbf{F}$	$\sqrt{289} = \square \rightarrow \mathbf{T}$
$\sqrt{4} = \square \rightarrow \mathbf{H}$	$\sqrt{100} = \square \rightarrow \mathbf{K}$	$\sqrt{196} = \square \rightarrow \mathbf{W}$

Scratch space:

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

The getaway vehicle's tire pressure sensor displayed a calibrated equation. Solving it unmasks the thief's final weakness.

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:

$9x + 4 = 94, x = \boxed{}$

$3x + 7 = 34, x = \boxed{}$

$4x + 12 = 60, x = \boxed{}$

$7x + 5 = 26, x = \boxed{}$

$4x + 1 = 9, x = \boxed{}$

$9x + 8 = 17, x = \boxed{}$

$7x + 4 = 60, x = \boxed{}$

$5x + 10 = 30, x = \boxed{}$

$6x + 10 = 52, x = \boxed{}$

$5x + 2 = 27, x = \boxed{}$

$4x + 6 = 30, x = \boxed{}$

Step 2 - cross out the sentence with each answer:

1. The villain intercepted the coded message, then fled across the foggy bridge.
2. The villain intercepted the coded message, then blended into the busy crowd.
3. The villain bypassed the laser grid, then blended into the busy crowd.
4. The villain bypassed the laser grid, then fled across the foggy bridge.
5. The villain intercepted the coded message, then vanished into the rainy night.
6. The villain cracked the master safe, then fled across the foggy bridge.
7. The villain cloned the security badge, then fled across the foggy bridge.
8. The villain cloned the security badge, then blended into the busy crowd.
9. The villain bypassed the laser grid, then escaped in a yellow cab.
10. The villain cracked the master safe, then vanished into the rainy night.
11. The villain intercepted the coded message, then escaped in a yellow cab.
12. The villain swiped the secret files, then fled across the foggy bridge.

Answer Key

The Case of the Swapped Crown

Culprit: Jane Marple

Fiber-Optic Camera · Miniature Camera · Left-Tilted Script · Black Ink · Typewriter Noise

Trail: Start 21 → Clue 1 17 → Clue 2 9 → Clue 3 7 → Clue 4 4 → Clue 5 1

Clue 1 (Two-step equations): "THEY DO NOT USE FINGERPRINT DUST"

$7x + 1 = 113$, $x = 16$ (T) · $7x + 11 = 137$, $x = 18$ (P) · $7x + 11 = 88$, $x = 11$ (D) · $7x + 2 = 51$, $x = 7$ (U) · $5x + 6 = 46$, $x = 8$ (R) · $5x + 6 = 51$, $x = 9$ (N) · $9x + 1 = 136$, $x = 15$ (I) · $9x + 9 = 63$, $x = 6$ (O) · $8x + 11 = 171$, $x = 20$ (F) · $6x + 11 = 71$, $x = 10$ (H) · $6x + 8 = 38$, $x = 5$ (Y) · $3x + 10 = 52$, $x = 14$ (S) · $2x + 11 = 15$, $x = 2$ (G) · $8x + 1 = 169$, $x = 21$ (E)

Clue 2 (Word problems): "LEFT TILTED SCRIPT"

Chief Inspector lined up 5 rows of 10 magnifying glasses. How many magnifying glasses in all? = 50 (L) · Chief Inspector found 46 secret dossiers yesterday and 42 more today. How many secret dossiers in all? = 88 (D) · Chief Inspector lined up 8 rows of 8 decoder rings. How many decoder rings in all? = 64 (I) · Chief Inspector found 29 notepad pages yesterday and 88 more today. How many notepad pages in all? = 117 (S) · There were 88 magnifying glasses. 5 were used up. How many magnifying glasses are left? = 83 (T) · Chief Inspector lined up 4 rows of 10 secret dossiers. How many secret dossiers in all? = 40 (E) · Chief Inspector found 5 decoder rings yesterday and 20 more today. How many decoder rings in all? = 25 (F)

Clue 3 (Exponents): "A CLACKING NOISE BLOCKS THEIR PATH"

$22^2 = 484$ (A) · $20^2 = 400$ (S) · $21^2 = 441$ (N) · $9^3 = 729$ (T) · $6^3 = 216$ (P) · $12^2 = 144$ (H) · $18^2 = 324$ (K) · $7^2 = 49$ (L) · $5^2 = 25$ (O) · $2^7 = 128$ (E) · $14^2 = 196$ (R) · $2^9 = 512$ (B) · $2^5 = 32$ (C) · $19^2 = 361$ (G) · $9^2 = 81$ (I)

Clue 4 (Square roots): "BLACK SMUDGES WERE LEFT ON THE DESK"

$\sqrt{361} = 19$ (B) · $\sqrt{529} = 23$ (G) · $\sqrt{169} = 13$ (U) · $\sqrt{324} = 18$ (C) · $\sqrt{9} = 3$ (D) · $\sqrt{121} = 11$ (A) · $\sqrt{576} = 24$ (O) · $\sqrt{144} = 12$ (N) · $\sqrt{441} = 21$ (L) · $\sqrt{400} = 20$ (E) · $\sqrt{256} = 16$ (S) · $\sqrt{625} = 25$ (R) · $\sqrt{64} = 8$ (M) · $\sqrt{49} = 7$ (F) · $\sqrt{289} = 17$ (T) · $\sqrt{4} = 2$ (H) · $\sqrt{100} = 10$ (K) · $\sqrt{196} = 14$ (W)

Clue 5 (Two-step equations): surviving statement is box 11 → Jane Marple

$9x + 4 = 94$, $x = 10$ · $3x + 7 = 34$, $x = 9$ · $4x + 12 = 60$, $x = 12$ · $7x + 5 = 26$, $x = 3$ · $4x + 1 = 9$, $x = 2$ · $9x + 8 = 17$, $x = 1$ · $7x + 4 = 60$, $x = 8$ · $5x + 10 = 30$, $x = 4$ · $6x + 10 = 52$, $x = 7$ · $5x + 2 = 27$, $x = 5$ · $4x + 6 = 30$, $x = 6$