



The Aurora Outpost Emergency

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

Detective: _____ **Date:** _____

A rogue saboteur has locked down the main reactor of the Aurora-9 Orbital Research Outpost, trapping the Chief Astrophysicist inside! The station's oxygen levels are slowly dropping. You must crack the security grid to identify the saboteur before time runs out.

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 saboteur is _____

Possible suspects

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

NAME	PRIMARY SKILL	SPECIALIZED TECH	OBSERVED GRIP	HELMET STRIPE	SUIT VULNERABILITY
Franklin Chang	thruster sabotage	oxygen scrubbers	left handed grip	gold helmet stripe	magnetic fields
Neil Armstrong	quantum stealth	magnetic boots	right handed grip	gold helmet stripe	magnetic fields
Halley Comet	quantum stealth	magnetic boots	left handed grip	gold helmet stripe	strobe lights
Valentina Tereshkova	thruster sabotage	oxygen scrubbers	left handed grip	red helmet stripe	strobe lights
Michael Collins	quantum stealth	ion blasters	left handed grip	gold helmet stripe	strobe lights
Ellen Ochoa	plasma welding	magnetic boots	right handed grip	gold helmet stripe	strobe lights
James Webb	gravity manipulation	magnetic boots	left handed grip	gold helmet stripe	strobe lights
Isaac Asimov	cybernetic hacking	emp disruptor	left handed grip	red helmet stripe	strobe lights
Arthur Clarke	thruster sabotage	solar shields	right handed grip	gold helmet stripe	magnetic fields
Yuri Gagarin	quantum stealth	ion blasters	right handed grip	blue helmet stripe	magnetic fields
Mae Jemison	thruster sabotage	magnetic boots	right handed grip	gold helmet stripe	strobe lights
Buzz Aldrin	quantum stealth	solar shields	left handed grip	gold helmet stripe	magnetic fields
Guion Bluford	plasma welding	oxygen scrubbers	right handed grip	blue helmet stripe	strobe lights
Kalpana Chawla	cybernetic hacking	oxygen scrubbers	right handed grip	blue helmet stripe	magnetic fields
Hubble Edwin	thruster sabotage	magnetic boots	right handed grip	red helmet stripe	magnetic fields
John Glenn	cybernetic hacking	ion blasters	left handed grip	gold helmet stripe	coolant spray
Stephen Hawking	cybernetic hacking	ion blasters	right handed grip	gold helmet stripe	coolant spray
Kepler Johannes	cybernetic hacking	magnetic boots	left handed grip	gold helmet stripe	strobe lights
Sally Ride	thruster sabotage	oxygen scrubbers	left handed grip	gold helmet stripe	strobe lights
Chris Hadfield	gravity manipulation	emp disruptor	left handed grip	blue helmet stripe	strobe lights
Alan Shepard	quantum stealth	ion blasters	left handed grip	blue helmet stripe	strobe lights

CLUE 1 Two-step equations

To unlock the secure database containing the first clue, you need to calculate the cargo weight of the titanium shipments. Solve this two-step equation to find the number of containers on board.

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

The diagram shows two rows of boxes. The top row has 15 boxes, and the bottom row has 12 boxes. Some boxes are shaded orange and contain the letter 'T', while others are white and contain numbers. The numbers are: Row 1: 2, 19, 12, 4, 6, 14, 5, 2, 12, 7, 21, 16, 5, 12, 4, 11, 5, 2. Row 2: 19, 6, 9, 12, 17, 5, 11, 14, 8, 6, 4, 2, 12, 21, 4.

$$4x + 3 = 11, x = \boxed{} \rightarrow \boxed{\mathbf{T}}$$

$$3x + 10 = 25, x = \boxed{} \rightarrow \boxed{0}$$

$9x + 9 = 135, x = \boxed{} \rightarrow \boxed{\mathbf{B}}$

$$4x + 1 = 69, x = \boxed{} \rightarrow \boxed{1}$$

$$7x + 12 = 145, x = \boxed{} \rightarrow \mathbf{H}$$

$$4x + 4 = 32, x = \boxed{} \rightarrow \boxed{\mathbf{U}}$$

$$8x + 3 = 75, x = \boxed{} \rightarrow \mathbf{v}$$

$7x + 4 = 116, x = \boxed{} \rightarrow \mathbf{D}$

$6x + 2 = 74, x = \boxed{} \rightarrow \mathbf{E}$

$$7x + 11 = 39, x = \boxed{} \rightarrow \boxed{\text{S}}$$

$$8x + 11 = 99, x = \boxed{} \rightarrow \boxed{\text{N}}$$

$$2x + 7 = 49, x = \boxed{} \rightarrow \boxed{\mathbf{R}}$$

$$5x + 9 = 49, x = \boxed{} \rightarrow \boxed{\text{L}}$$

$$5x + 9 = 39, x = \boxed{} \rightarrow \boxed{\text{A}}$$

Scratch space:

CLUE 2 Exponents

The backup power grid operates on an exponential scale. To route energy to the decryption terminal, calculate the watt spike when the generator banks are raised to the correct power.

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

T																		
441	324	100	32	100	49	225	27	100	256	64	625	256	225	169	100	32		
		T						T										
256	225	441	324	64	196	100	8	441	324	64	4	32	100	32	16	169	225	400

$21^2 = \square \rightarrow \text{T}$	$18^2 = \square \rightarrow \text{H}$	$2^3 = \square \rightarrow \text{F}$	$2^5 = \square \rightarrow \text{D}$
$4^2 = \square \rightarrow \text{G}$	$14^2 = \square \rightarrow \text{L}$	$7^2 = \square \rightarrow \text{V}$	$10^2 = \square \rightarrow \text{E}$
$5^4 = \square \rightarrow \text{S}$	$2^6 = \square \rightarrow \text{A}$	$2^8 = \square \rightarrow \text{W}$	$3^3 = \square \rightarrow \text{C}$
$2^2 = \square \rightarrow \text{N}$	$13^2 = \square \rightarrow \text{R}$	$20^2 = \square \rightarrow \text{P}$	$15^2 = \square \rightarrow \text{I}$

Scratch space:

CLUE 3 Square roots

The thermal shield tiles are arranged in a perfect square. To find the boundary line of the safe zone, calculate the side length by taking the square root of the total grid area.

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

F																			
14	19	7	21	13	16	24	20	21	11	9	10	25	18	19	16	20	13	11	21
25	19	16	24	5	18	5	11	13	18	11	7	9	20	18	11				

$\text{sqrt}(196) = \square \rightarrow \text{F}$	$\text{sqrt}(81) = \square \rightarrow \text{R}$	$\text{sqrt}(256) = \square \rightarrow \text{I}$
$\text{sqrt}(361) = \square \rightarrow \text{L}$	$\text{sqrt}(100) = \square \rightarrow \text{O}$	$\text{sqrt}(121) = \square \rightarrow \text{T}$
$\text{sqrt}(169) = \square \rightarrow \text{H}$	$\text{sqrt}(324) = \square \rightarrow \text{E}$	$\text{sqrt}(400) = \square \rightarrow \text{G}$
$\text{sqrt}(576) = \square \rightarrow \text{N}$	$\text{sqrt}(49) = \square \rightarrow \text{A}$	$\text{sqrt}(25) = \square \rightarrow \text{D}$
$\text{sqrt}(441) = \square \rightarrow \text{S}$	$\text{sqrt}(625) = \square \rightarrow \text{B}$	

Scratch space:

CLUE 4 Integers

The station's external sensors are fluctuating wildly in deep space. By adding the negative temperatures on the sunny side, you can balance the life-support grid.

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

A																
25	4	21	31	12	39	32	20	39	17	22	21	35	17	38	35	28
						A										
26	28	13	31	12	35	10	25	26	17	35	32	28	3	35	21	31

$$(-5) + 30 = \boxed{} \rightarrow \boxed{\text{A}}$$

$$(-3) + 7 = \boxed{} \rightarrow \boxed{\text{C}}$$

$$18 - (-10) = \boxed{} \rightarrow \boxed{\text{T}}$$

$$(-11) + 37 = \boxed{} \rightarrow \boxed{\text{S}}$$

$$(-10) + 20 = \boxed{} \rightarrow \boxed{\text{W}}$$

$$28 - (-3) = \boxed{} \rightarrow \boxed{\text{I}}$$

$$10 - (-2) = \boxed{} \rightarrow \boxed{\text{P}}$$

$$12 - (-9) = \boxed{} \rightarrow \boxed{\text{H}}$$

$$33 - (-6) = \boxed{} \rightarrow \boxed{\text{O}}$$

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

$$(-4) + 7 = \boxed{} \rightarrow \boxed{\text{B}}$$

$$7 - (-13) = \boxed{} \rightarrow \boxed{\text{G}}$$

$$24 - (-8) = \boxed{} \rightarrow \boxed{\text{F}}$$

$$2 - (-11) = \boxed{} \rightarrow \boxed{\text{R}}$$

$$27 - (-11) = \boxed{} \rightarrow \boxed{\text{M}}$$

$$29 - (-6) = \boxed{} \rightarrow \boxed{\text{E}}$$

$$(-1) + 23 = \boxed{} \rightarrow \boxed{\text{D}}$$

$$3 - (-14) = \boxed{} \rightarrow \boxed{\text{L}}$$

Scratch space:

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

The emergency oxygen reserve is depleting at a steady rate. You have a starting volume and a constant loss per minute. Solve this final two-step equation to discover how many minutes remain.

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:

$5x + 12 = 17, x = \boxed{}$

$5x + 3 = 48, x = \boxed{}$

$5x + 9 = 59, x = \boxed{}$

$6x + 8 = 80, x = \boxed{}$

$6x + 3 = 21, x = \boxed{}$

$8x + 11 = 75, x = \boxed{}$

$7x + 5 = 19, x = \boxed{}$

$7x + 6 = 48, x = \boxed{}$

$8x + 10 = 98, x = \boxed{}$

$2x + 10 = 20, x = \boxed{}$

$3x + 7 = 28, x = \boxed{}$

Step 2 - cross out the sentence with each answer:

1. The villain disabled the escape pods, then stole the backup oxygen scrubbers.
2. The villain disabled the escape pods, then triggered an emp pulse across the deck.
3. The villain altered the artificial gravity, then stole the backup oxygen scrubbers.
4. The villain hacked the security systems, then scaled the outer hull with magnetic boots.
5. The villain welded the airlock shut, then escaped through the solar shield array.
6. The villain altered the artificial gravity, then triggered an emp pulse across the deck.
7. The villain altered the artificial gravity, then escaped through the solar shield array.
8. The villain cloaked their heat signature, then escaped through the solar shield array.
9. The villain cloaked their heat signature, then scaled the outer hull with magnetic boots.
10. The villain altered the artificial gravity, then scaled the outer hull with magnetic boots.
11. The villain hacked the security systems, then blasted the main antenna with ion rays.
12. The villain cloaked their heat signature, then stole the backup oxygen scrubbers.

Answer Key

The Aurora Outpost Emergency

Culprit: Kepler Johannes

cybernetic hacking · magnetic boots · left handed grip · gold helmet stripe · strobe lights

Trail: Start 21 → Clue 1 16 → Clue 2 9 → Clue 3 7 → Clue 4 4 → Clue 5 1

Clue 1 (Two-step equations): "THE SABOTEUR DOES NOT HAVE ION BLASTERS"

$4x + 3 = 11$, $x = 2$ (T) · $3x + 10 = 25$, $x = 5$ (O) · $9x + 9 = 135$, $x = 14$ (B) · $4x + 1 = 69$, $x = 17$ (I) · $7x + 12 = 145$, $x = 19$ (H) · $4x + 4 = 32$, $x = 7$ (U) · $8x + 3 = 75$, $x = 9$ (V) · $7x + 4 = 116$, $x = 16$ (D) · $6x + 2 = 74$, $x = 12$ (E) · $7x + 11 = 39$, $x = 4$ (S) · $8x + 11 = 99$, $x = 11$ (N) · $2x + 7 = 49$, $x = 21$ (R) · $5x + 9 = 49$, $x = 8$ (L) · $5x + 9 = 39$, $x = 6$ (A)

Clue 2 (Exponents): "THE DEVICE WAS WIRED WITH A LEFT HANDED GRIP"

$21^2 = 441$ (T) · $18^2 = 324$ (H) · $2^3 = 8$ (F) · $2^5 = 32$ (D) · $4^2 = 16$ (G) · $14^2 = 196$ (L) · $7^2 = 49$ (V) · $10^2 = 100$ (E) · $5^4 = 625$ (S) · $2^6 = 64$ (A) · $2^8 = 256$ (W) · $3^3 = 27$ (C) · $2^2 = 4$ (N) · $13^2 = 169$ (R) · $20^2 = 400$ (P) · $15^2 = 225$ (I)

Clue 3 (Square roots): "FLASHING STROBE LIGHTS BLINDED THE TARGET"

$\sqrt{196} = 14$ (F) · $\sqrt{81} = 9$ (R) · $\sqrt{256} = 16$ (I) · $\sqrt{361} = 19$ (L) · $\sqrt{100} = 10$ (O) · $\sqrt{121} = 11$ (T) · $\sqrt{169} = 13$ (H) · $\sqrt{324} = 18$ (E) · $\sqrt{400} = 20$ (G) · $\sqrt{576} = 24$ (N) · $\sqrt{49} = 7$ (A) · $\sqrt{25} = 5$ (D) · $\sqrt{441} = 21$ (S) · $\sqrt{625} = 25$ (B)

Clue 4 (Integers): "A CHIP OF GOLD HELMET STRIPE WAS LEFT BEHIND"

$(-5) + 30 = 25$ (A) · $(-3) + 7 = 4$ (C) · $18 - (-10) = 28$ (T) · $(-11) + 37 = 26$ (S) · $(-10) + 20 = 10$ (W) · $28 - (-3) = 31$ (I) · $10 - (-2) = 12$ (P) · $12 - (-9) = 21$ (H) · $33 - (-6) = 39$ (O) · $14 - (-10) = 24$ (N) · $(-4) + 7 = 3$ (B) · $7 - (-13) = 20$ (G) · $24 - (-8) = 32$ (F) · $2 - (-11) = 13$ (R) · $27 - (-11) = 38$ (M) · $29 - (-6) = 35$ (E) · $(-1) + 23 = 22$ (D) · $3 - (-14) = 17$ (L)

Clue 5 (Two-step equations): surviving statement is box 4 → Kepler Johannes

$5x + 12 = 17$, $x = 1$ · $5x + 3 = 48$, $x = 9$ · $5x + 9 = 59$, $x = 10$ · $6x + 8 = 80$, $x = 12$ · $6x + 3 = 21$, $x = 3$ · $8x + 11 = 75$, $x = 8$ · $7x + 5 = 19$, $x = 2$ · $7x + 6 = 48$, $x = 6$ · $8x + 10 = 98$, $x = 11$ · $2x + 10 = 20$, $x = 5$ · $3x + 7 = 28$, $x = 7$