The Mystery of the Abyss Engine

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

Detective: _____ **Date:** _____

A rogue diver sabotaged the submarine main generator and hid the emergency power core in the deep trenches. Decipher the telemetry logs to unmask the culprit!

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 Saboteur is _____

Possible suspects

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

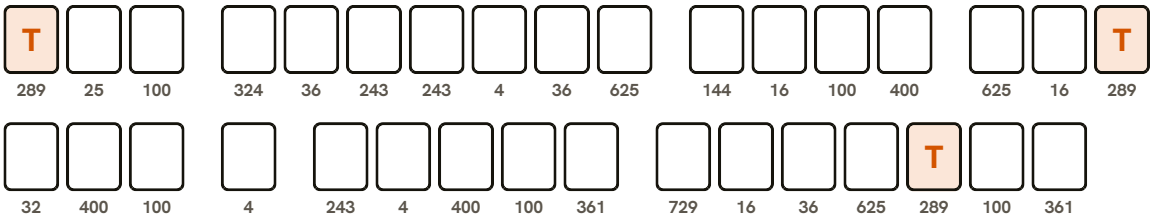
NAME	DIVING TECH	GADGET	DOMINANT HAND	WETSUIT HOOD	PHOBIA
Leo Sterling	Thermal Suit	Signal Jammer	Right Handed	Cobalt Blue Hood	High Pitch Tones
Marcus Vance	Deep Radar	Flash Grenade	Right Handed	Crimson Red Hood	High Pitch Tones
Nadia Ray	Thermal Suit	Smoke Canister	Right Handed	Cobalt Blue Hood	Bright Lights
Iris Mercer	Plasma Cutter	Flash Grenade	Right Handed	Cobalt Blue Hood	Bright Lights
Captain Drake	Plasma Cutter	Flash Grenade	Left Handed	Crimson Red Hood	Bright Lights
Commander Holt	Thermal Suit	Signal Jammer	Right Handed	Crimson Red Hood	Magnetic Fields
Dr Aris Thorne	Hydro Thrusters	Signal Jammer	Right Handed	Cobalt Blue Hood	Magnetic Fields
Owen Vance	Hydro Thrusters	Signal Jammer	Left Handed	Crimson Red Hood	Magnetic Fields
Olivia Chen	Thermal Suit	Grappling Hook	Right Handed	Crimson Red Hood	High Pitch Tones
Kai Rivera	Deep Radar	Signal Jammer	Right Handed	Crimson Red Hood	Magnetic Fields
Jax Brooks	Deep Radar	Signal Jammer	Left Handed	Neon Yellow Hood	Bright Lights
Samuel Bishop	Sonar Pulse	Laser Pointer	Right Handed	Crimson Red Hood	Magnetic Fields
Elena Cruz	Plasma Cutter	Grappling Hook	Right Handed	Crimson Red Hood	High Pitch Tones
Cora West	Plasma Cutter	Grappling Hook	Right Handed	Crimson Red Hood	Magnetic Fields
Professor Finch	Sonar Pulse	Flash Grenade	Left Handed	Crimson Red Hood	Magnetic Fields
Hugo Frost	Plasma Cutter	Laser Pointer	Right Handed	Neon Yellow Hood	Magnetic Fields
Zoe Gallagher	Thermal Suit	Flash Grenade	Right Handed	Neon Yellow Hood	Bright Lights
Nina Petrov	Hydro Thrusters	Grappling Hook	Right Handed	Crimson Red Hood	High Pitch Tones
Tessa Rhodes	Thermal Suit	Signal Jammer	Left Handed	Crimson Red Hood	Bright Lights
Silas Kane	Sonar Pulse	Signal Jammer	Right Handed	Crimson Red Hood	Magnetic Fields
Victor Vance	Thermal Suit	Flash Grenade	Left Handed	Cobalt Blue Hood	Bright Lights

make your own at mathcrackers.com

CLUE 1 Exponents

> The diving computer encrypted the generator status logs into exponential scales. Calculate the values to decode the first clue.

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



17^2 = ☐ → T

9^3 = ☐ → P

6^2 = ☐ → I

12^2 = ☐ → D

2^5 = ☐ → U

2^4 = ☐ → O

2^2 = ☐ → A

19^2 = ☐ → R

18^2 = ☐ → V

3^5 = ☐ → L

20^2 = ☐ → S

10^2 = ☐ → E

5^4 = ☐ → N

5^2 = ☐ → H

Scratch space:

CLUE 2 Square roots

To map out the exact square bay where the thief fled, calculate the square roots of these area measurements.

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

T									T										T
17	16	18	14	13	14	19	18	15	17	2	14	25	2	5	16	17			
16	10	7	22	18	22														

sqrt(289) = ☐ → T

sqrt(25) = ☐ → G

sqrt(324) = ☐ → E

sqrt(625) = ☐ → R

sqrt(169) = ☐ → U

sqrt(4) = ☐ → I

sqrt(100) = ☐ → A

sqrt(256) = ☐ → H

sqrt(225) = ☐ → C

sqrt(49) = ☐ → N

sqrt(484) = ☐ → D

sqrt(196) = ☐ → S

sqrt(361) = ☐ → P

Scratch space:

CLUE 3 Pythagorean theorem

> The sub navigator tracked the diagonal escape path across the docking grid. Use the Pythagorean theorem to calculate the distance.

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

T																			
34	17	37	58	41	82	82	74	41	68	26	87	37	74	5	68	37	26	26	

						T										
41	26	25	74	39	68	37	34	41	13	52	41	37	82	51	26	

legs 16 and 30, hypotenuse = ☐ → T

legs 3 and 4, hypotenuse = ☐ → K

legs 24 and 70, hypotenuse = ☐ → A

legs 20 and 48, hypotenuse = ☐ → F

legs 18 and 80, hypotenuse = ☐ → L

legs 32 and 60, hypotenuse = ☐ → N

legs 15 and 36, hypotenuse = ☐ → G

legs 10 and 24, hypotenuse = ☐ → S

legs 15 and 20, hypotenuse = ☐ → M

legs 40 and 42, hypotenuse = ☐ → V

legs 60 and 63, hypotenuse = ☐ → W

legs 24 and 45, hypotenuse = ☐ → D

legs 5 and 12, hypotenuse = ☐ → C

legs 8 and 15, hypotenuse = ☐ → H

legs 9 and 40, hypotenuse = ☐ → I

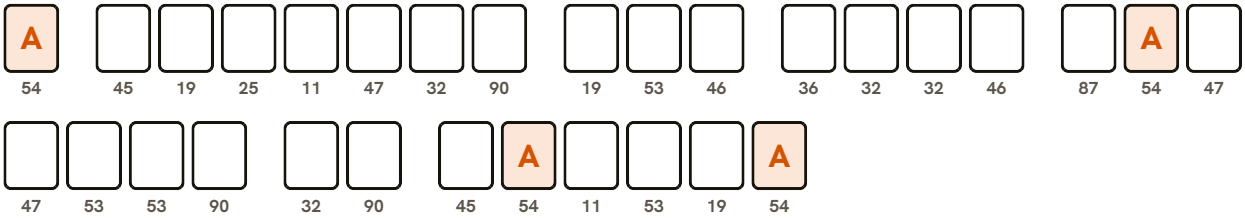
legs 12 and 35, hypotenuse = ☐ → E

Scratch space:

CLUE 4 Order of operations

To unlock the emergency terminal, solve the order of operations code sequence programmed on the keypad.

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



5 × 11 - 1 = ☐ → A

10 × 7 - 24 = ☐ → D

10 × 6 - 13 = ☐ → S

4 × 12 - 12 = ☐ → H

3 × 9 - 2 = ☐ → I

11 × 9 - 9 = ☐ → N

8 × 9 - 27 = ☐ → C

7 × 2 - 3 = ☐ → M

8 × 11 - 1 = ☐ → W

3 × 7 - 2 = ☐ → R

11 × 3 - 1 = ☐ → O

8 + 9 × 5 = ☐ → E

Scratch space:

CLUE 5 Two-step equations - the last clue

> The base engineer set up balanced algebraic equations to uncover the final hidden pressure reading.

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:

4x + 11 = 23, x = ☐	3x + 3 = 15, x = ☐	3x + 1 = 34, x = ☐	4x + 6 = 26, x = ☐
5x + 1 = 36, x = ☐	3x + 1 = 4, x = ☐	4x + 11 = 51, x = ☐	2x + 8 = 20, x = ☐
2x + 8 = 24, x = ☐	2x + 8 = 12, x = ☐	6x + 9 = 63, x = ☐	

Step 2 - cross out the sentence with each answer:

1. The villain disabled the sonar sensors, then vanished behind a smoke cloud.
2. The villain overrode the security portal, then pointed a laser to jam cameras.
3. The villain switched off the main power, then jammed all radio transmissions.
4. The villain overrode the security portal, then jammed all radio transmissions.
5. The villain overrode the security portal, then blinded the guards with a flash.
6. The villain overrode the security portal, then grappled away into the dark.
7. The villain unlocked the diving airlock, then jammed all radio transmissions.
8. The villain overrode the security portal, then vanished behind a smoke cloud.
9. The villain disabled the sonar sensors, then jammed all radio transmissions.
10. The villain unlocked the diving airlock, then blinded the guards with a flash.
11. The villain drained the ballast tanks, then jammed all radio transmissions.
12. The villain unlocked the diving airlock, then grappled away into the dark.

TEACHER / PARENT

Answer Key

The Mystery of the Abyss Engine

Culprit: Cora West

Plasma Cutter · Grappling Hook · Right Handed · Crimson Red Hood · Magnetic Fields

Trail: Start 21 → Clue 1 19 → Clue 2 13 → Clue 3 5 → Clue 4 4 → Clue 5 1

Clue 1 (Exponents): "THE VILLAIN DOES NOT USE A LASER POINTER"

17^2 = 289 (T) · 9^3 = 729 (P) · 6^2 = 36 (I) · 12^2 = 144 (D) · 2^5 = 32 (U) · 2^4 = 16 (O) · 2^2 = 4 (A) · 19^2 = 361 (R) · 18^2 = 324 (V) · 3^5 = 243 (L) · 20^2 = 400 (S) · 10^2 = 100 (E) · 5^4 = 625 (N) · 5^2 = 25 (H)

Clue 2 (Square roots): "THE SUSPECT IS RIGHT HANDED"

sqrt(289) = 17 (T) · sqrt(25) = 5 (G) · sqrt(324) = 18 (E) · sqrt(625) = 25 (R) · sqrt(169) = 13 (U) · sqrt(4) = 2 (I) · sqrt(100) = 10 (A) · sqrt(256) = 16 (H) · sqrt(225) = 15 (C) · sqrt(49) = 7 (N) · sqrt(484) = 22 (D) · sqrt(196) = 14 (S) · sqrt(361) = 19 (P)

Clue 3 (Pythagorean theorem): "THE VILLAINS WEAKNESS IS MAGNETIC FIELDS"

legs 16 and 30, hypotenuse = 34 (T) · legs 3 and 4, hypotenuse = 5 (K) · legs 24 and 70, hypotenuse = 74 (A) · legs 20 and 48, hypotenuse = 52 (F) · legs 18 and 80, hypotenuse = 82 (L) · legs 32 and 60, hypotenuse = 68 (N) · legs 15 and 36, hypotenuse = 39 (G) · legs 10 and 24, hypotenuse = 26 (S) · legs 15 and 20, hypotenuse = 25 (M) · legs 40 and 42, hypotenuse = 58 (V) · legs 60 and 63, hypotenuse = 87 (W) · legs 24 and 45, hypotenuse = 51 (D) · legs 5 and 12, hypotenuse = 13 (C) · legs 8 and 15, hypotenuse = 17 (H) · legs 9 and 40, hypotenuse = 41 (I) · legs 12 and 35, hypotenuse = 37 (E)

Clue 4 (Order of operations): "A CRIMSON RED HOOD WAS SEEN ON CAMERA"

5 × 11 - 1 = 54 (A) · 10 × 7 - 24 = 46 (D) · 10 × 6 - 13 = 47 (S) · 4 × 12 - 12 = 36 (H) · 3 × 9 - 2 = 25 (I) · 11 × 9 - 9 = 90 (N) · 8 × 9 - 27 = 45 (C) · 7 × 2 - 3 = 11 (M) · 8 × 11 - 1 = 87 (W) · 3 × 7 - 2 = 19 (R) · 11 × 3 - 1 = 32 (O) · 8 + 9 × 5 = 53 (E)

Clue 5 (Two-step equations): surviving statement is box 12 → Cora West

4x + 11 = 23, x = 3 · 3x + 3 = 15, x = 4 · 3x + 1 = 34, x = 11 · 4x + 6 = 26, x = 5 · 5x + 1 = 36, x = 7 · 3x + 1 = 4, x = 1 · 4x + 11 = 51, x = 10 · 2x + 8 = 20, x = 6 · 2x + 8 = 24, x = 8 · 2x + 8 = 12, x = 2 · 6x + 9 = 63, x = 9